Getting Started with Flash Communication Server

Macromedia Flash™ Communication Server MX

macromedia®

Acknowledgments

Director: Erick Vera

Producer: JuLee Burdekin

Writing: Jay Armstrong, Jody Bleyle, JuLee Burdekin, Barbara Herbert, and Barbara Nelson

Editing: Mary Ferguson, Anne Szabla

Multimedia Design and Production: Aaron Begley, Benjamin Salles

Print Design, Production, and Illustrations: Chris Basmajian

First Edition: May 2002

Macromedia, Inc.
600 Townsend St.
San Francisco, CA 94103

CONTENTS

CHAPTER 1
Introducing Flash Communication Server

Welcome to Macromedia Flash Communication Server MX—the easiest way to create rich communication applications in Macromedia Flash MX. Flash Communication Server lets two or more people participate in a real-time conversation using text, audio, or video. For example, you can use Flash Communication Server for meetings, online communities, customer support, sales support, training, remote presence, or instant messaging. Flash Communication Server is a platform for streaming live data across networks for delivery to the Internet, PDAs, interactive TV, and more, and it is part of Macromedia's complete solution for database connectivity, directory systems, and presence services. Flash Communication Server can also be used for personal projects such as a house intercom, a pet camera, or video publishing.

Flash Communication Server editions

Flash Communication Server is available in a variety of editions. See the Flash Communication Server website at http://www.macromedia.com/go/flashcom_mx for a description of each edition. The information in the Flash Communication Server documentation applies to all Flash Communication Server editions.

About this manual

This manual contains information to help you get started using Flash Communication Server and the documentation set. It tells where to find all the other manuals and help systems, provides system requirements and instructions for installing the software, presents an overview of the Flash Communication Server architecture, and describes your workflow.

The Flash Communication Server documentation set assumes that you already have Macromedia Flash MX installed and know how to use it.

Guide to instructional media

The Flash Communication Server instructional media is designed to be used in conjunction with the Flash MX documentation, namely *Using Flash MX* and the Flash MX online ActionScript Dictionary.

All Flash Communication Server documents are available in PDF format (viewable and printable with Adobe Acrobat Reader) and as HTML help.

For the best experience with Flash Communication Server Help, Macromedia strongly recommends that you use a browser with Java player support, such as Microsoft® Internet Explorer 6.0 or later. Flash Help also supports Netscape 6.1 or later on Windows and the Macintosh. Running Flash MX and Flash Communication Server Help simultaneously on a Macintosh may require up to 32 MB of memory, depending on your browser's memory needs.

The Flash Communication Server instructional media includes the following documentation:

- This manual, *Getting Started with Flash Communication Server,* explains how to install the server and provides an overview of the software architecture.

  You can find the PDF version of this manual on the Flash Communication Server CD (FlashCom_GetStarted.pdf). To view this manual as HTML help within Flash MX, select Help > Welcome to Flash Communication Server, click General, and click Getting Started with Flash Communication Server.

- *Managing Flash Communication Server* explains the details of configuring and maintaining the server and using the Administration Console.

  If you're an administrator, you can use the PDF version of this manual on the Flash Communication Server CD (FlashCom_Managing.pdf). Administrators also have access to HTML help within Flash MX and through the Help button on the Administration Console.

- *Developing Communication Applications* is a "how-to" book that illustrates the steps involved in setting up a development environment and creating Flash Communication Server applications, including debugging and testing applications. It describes samples that can serve as templates for your own applications, and it includes tips and tricks to help you optimize your applications.

  You can find the PDF version of this manual on the Flash Communication Server CD (FlashCom_Developing.pdf). To view this manual as HTML help within Flash MX, select Help > Welcome to Flash Communication Server, click Developer, and click Developing Communication Applications.

- The *Client-Side Communication ActionScript Dictionary* documents the ActionScript you can use to create client-side functionality.

  You can find the PDF version of this manual on the Flash Communication Server CD (FlashCom_CS_ASD.pdf). To view this manual as HTML help within Flash MX, select Help > Welcome to Flash Communication Server; click Developer, click the right arrow, and click Client-Side Communication ActionScript Dictionary. You can also read this information by clicking the Reference button in the Flash MX Actions panel.

- The *Server-Side Communication ActionScript Dictionary* documents the ActionScript you can use to create server-side functionality.

  You can find the PDF version of this manual on the Flash Communication Server CD (FlashCom_SS_ASD.pdf). To view this manual as HTML help within Flash MX, select Help > Welcome to Flash Communication Server; click Developer, click the right arrow, and click Server-Side Communication ActionScript Dictionary. You can also read this information by clicking the Reference button in the Flash MX Actions panel.

Using additional resources

The Flash Communication Server Support Center website at www.macromedia.com/go/flashcom_support is updated regularly with the latest information on Flash Communication Server, plus advice from expert users, advanced topics, examples, tips, and other updates. Check the website often for the latest news on Flash Communication Server and how to get the most out of the program.

The Flash Communication Server Designer & Developer Center at http://www.macromedia.com/go/flashcom_desdev provides tips and support for application developers.

The Flash Communication Server Online Forum at http://www.macromedia.com/go/flashcom_forum provides a place for you to chat with other Flash Communication Server users.

Release notes

For late-breaking information and a complete list of issues that are still outstanding, read the Flash Communication Server release notes at http://www.macromedia.com/go/flashcom_mx_releasenotes.

Third-party resources

Macromedia recommends several websites with links to third-party resources on Flash Communication Server:

These include the following:

- Macromedia Flash community sites
- Macromedia Flash books
- Object-oriented programming concepts

You can access these websites at http://www.macromedia.com/go/Flashcom_resources.

CHAPTER 2
Installation and Workflow

Macromedia Flash Communication Server MX is a development framework and a deployment environment for rich communication applications. A developer uses Macromedia Flash MX and Flash Communication Server MX to write a communication application, and then uses Flash Communication Server to deploy the application and its scripts. Flash Player 6 is the end user's interface.

The server is available only for Microsoft® Windows. However, you can also use either Windows or the Macintosh for your development environment.

This chapter provides system requirements and installation instructions, presents an overview of the Flash Communication Server architecture, and describes the workflow for developers and administrators.

System requirements for Flash Communication Server

The following hardware and software are required to run Flash Communication Server.

Development

You can develop Flash Communication Server applications on a computer running either the Windows operating system or the Mac OS.

- For Microsoft Windows: Macromedia Flash MX; an Intel Pentium 200 MHz or equivalent processor running Windows XP Professional, Windows XP Home, Windows 2000 Professional, or Windows NT 4.0 Workstation SP6 or later (Windows 98 and Windows ME are supported for application authoring, but not deployment); 64 MB of available RAM (128 MB recommended); 50 MB of available disk space; a 16-bit color monitor capable of 1024 x 768 resolution; and a CD-ROM drive.
- For the Macintosh (application authoring only): Macromedia Flash MX; a Power Macintosh running Mac OS 9.1 (or later) or Mac OS X version 10.1 (or later); 64 MB of available RAM (128 MB recommended); 10 MB of available disk space; a 16-bit color monitor capable of 1024 x 768 resolution; and a CD-ROM drive.

Deployment

Flash Communication Server applications must be deployed on the Windows operating system.

Your deployment system requires a Pentium III 500 MHz processor or greater (dual Pentium 4 or better recommended) running Windows 2000 Advanced Server or Windows NT 4.0 Server (SP6 or later); 256 MB of available RAM (512 MB recommended); 50 MB of available disk space; and a CD-ROM drive.

System requirements for the Flash Player

Because the client side of a Flash Communication Server application runs in Flash Player 6, you (and your users) need to run one of the following operating systems and browsers.

Platform	Browser
Microsoft Windows 95, 98, ME	Microsoft Internet Explorer 4.0 or later Netscape Navigator 4 or later Netscape 6.2 or later, default installation America Online 7 Opera 6
Microsoft Windows NT, 2000, XP, or later	Microsoft Internet Explorer 4.0 or later Netscape Navigator 4 or later Netscape 6.2 or later, default installation CompuServe 7 (Windows 2000 and XP only) America Online 7 Opera 6
Mac OS 8.6, 9.0, 9.1, 9.2	Netscape Navigator 4.5 or later Netscape 6.2 or later Microsoft Internet Explorer 5.0 or later Opera 5
Mac OS X version 10.1 or later	Netscape 6.2 or later Microsoft Internet Explorer 5.1 or later Opera 5

Installing Flash Communication Server

The Flash Communication Server must be installed on Microsoft Windows 2000 Advanced Server or Windows NT 4.0 Server (SP6 or later).

Installing the server is easy. Be prepared to choose an administrator user name and password during the installation; you'll need them to use the server's administration, monitoring, and debugging tools. You can change them later if necessary.

In addition to the Flash Communication Server, the installer adds two windows to the Macromedia Flash MX authoring environment if you have it installed on the same computer. These two windows are the Communication App inspector and the NetConnection Debugger. For more information about these windows, see *Developing Communication Applications.*

During installation, you can choose either a Developer Install or a Production Install of the product. If you choose Developer Install, you can run the samples and test your applications from the \flashcom\applications directory under the directory you specify. For convenience during development, client-side application files (SWFs and HTMLs) are stored in the same directory with your server-side application files (ASCs, FLVs, FLAs).

When you deploy applications, you'll need to separate client files from your server-side source files. While your SWF and HTML files should be accessible through a web server, your server-side ASC files, your audio/video FLV files, and your ActionScript FLA source files should not be accessible to a user browsing your Web site. You can either install the server again on your production machine and choose Production Install, or you can change the configuration settings in the administration XML files as described in the *Managing Flash Communication Server* manual.

If you choose Production Install, you can specify both the location of your client-side application files (SWFs and HTMLs) and the location of your server-side application files (ASCs, FLVs, and FLAs). The server will look for your client-side files under \flashcom\applications in the Web server's root directory and will look for your server-side application files under \applications under the directory you specify.

System configuration

You can set up your software in one of a few configurations:

- You can install the Flash Communication Server software on the same computer that is running Flash MX and the Flash Player.
- You can install the Flash Communication Server software on one computer and use another computer for Flash MX and the Flash Player.

To install Flash Communication Server:

1. Locate the FlashComInstaller.exe file.

   This file is on your installation CD, or you may have downloaded it.
2. Double-click the installer icon. The installer launches.
3. Enter your name and serial number in the dialog box that appears. Click OK.
4. Read the license agreement and click Yes to accept the agreement.
5. The installer suggests a default location for the server installation. The default location is C:\Program Files\Macromedia\Flash Communication Server MX. Click Next to accept the default location or Browse to choose another location.
6. Choose either the typical installation or a custom installation. (A typical installation is recommended.) Click Next.
7. Enter the user name and password you have chosen. You must enter a password. The server does not accept administrators with empty passwords.

   The installer copies your user name and password into the server's XML configuration files. You can edit or add administrators later using the Administration Console. For more information, see "Adding and editing administrators" in *Managing Flash Communication Server*.
8. Choose Developer Install or Production Install. If you choose Production Install, you will be asked to provide two directories: a directory for the Flash SWF files and accompanying HTML files, and another directory for server-side files that should not be accessible to users browsing your site. If you choose Developer Install, both types of files will be installed in the same location.
9. Next, the installer suggests a location for the server administration tools and sample files, including the Administration Console. If you have a web server installed on the same computer, the installer asks if you want to install these files into the web server's publishing directory. You can install these files into the web server's publishing directory or click Browse to choose another location. Click Next when you are satisfied with the installation location.
10. Click Next to accept the new program icons.
11. Click Next to accept the installer settings and install Flash Communication Server.

12 Click Finish. The Flash Communication Server service starts up. The server runs as a service, which means it runs in the background and starts automatically when the computer is started up.

The installation is complete. If you choose not to start the Flash Communication Server service right away, you can start it later. See "Starting and stopping the server" in *Managing Flash Communication Server*.

About the installed files

When the server has been installed, you'll find several files together with it in the installation directory. If you chose the default directory in the installer, these files are located in C:\Program Files\Macromedia\Flash Communication Server MX\.

It's a good idea to familiarize yourself with the contents of the Flash Communication Server MX directory before continuing with this chapter. The Flash Communication Server MX directory contains these items:

- FlashCom.exe is the server application.
- FlashComAdmin.exe is the server's administration controller.
- License.htm contains the text of the Flash Communication Server license agreement.
- Js32.dll contains the server's Server-Side Communication ActionScript engine.
- TcSrvMsg.dll, xmlparse.dll, and xmltok.dll are additional components of the server.
- The conf directory contains the server's hierarchy of XML configuration files.
- The Tools directory contains BAT files that can be used to start and stop the server.
- The flashcom application directory contains sample client applications you can use to experiment with the server and get an idea of the kinds of things that can be done with it. Also included is the Administration Console (admin.swf) that you can use to connect to the server to monitor and control its activity remotely.
- The admin directory contains the Administration Console (admin.swf), which you can use to connect to the server to monitor and control its activity remotely.
- You can find running samples in \flashcom\applications and additional documentation samples in flashcom_help\help_collateral, both of which can serve as templates for your own applications.
- If you have Flash MX installed on the same computer, the Flash Communication Server installer adds the new Communication App inspector and the NetConnection Debugger to Flash MX. These provide support for creating and debugging communication applications. For more information on using these features, see *Developing Communication Applications.*

Installing Flash authoring components on the Macintosh

To install the Communication App inspector, NetConnection Debugger, and related help files into an existing copy of Macromedia Flash MX on a Macintosh computer, you use the Macintosh FlashComInstaller.

To install the authoring components:

1. Locate the FlashComInstaller file.

   This file is on your installation CD, or you may have downloaded it.

2. Double-click the installer icon. The installer launches. The installer locates your existing copy of Flash MX automatically.

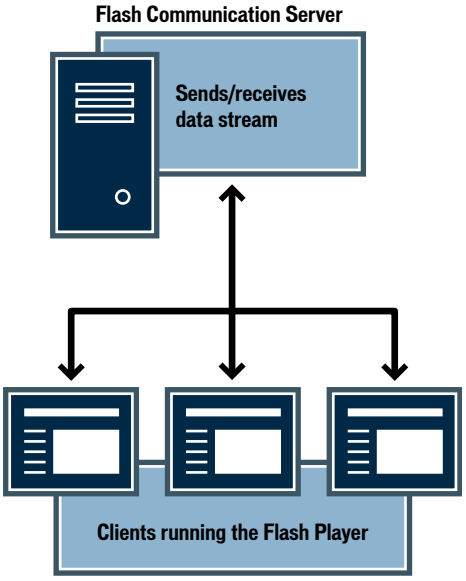
3. Click Install to install the authoring components and help. The installer copies files to your hard disk.

When the installation is complete you can launch Flash MX and begin using the new windows to create communication applications. For more information about creating communication applications, see *Developing Communication Applications*.

How Flash Communication Server works

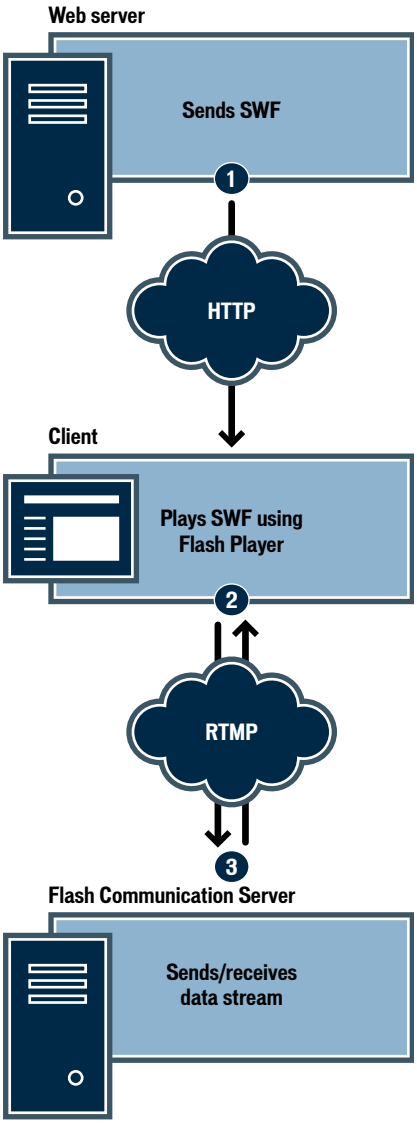
The Flash Communication Server platform comprises the server that provides the means of communication and a Flash application (a SWF file that runs in Macromedia Flash Player) that provides the end user's interface. You use the Flash MX authoring tool as your development environment to create applications that use Flash Communication Server services. You can also use server-side scripting to add functionality to your application.

Communications pass through Flash Communication Server and are delivered to the client—the Flash Player on a user's computer. When a Flash movie uses Flash Communication Server, the player connects to the server, which provides a flow of information, called a *network stream*, to and from the client. Other users can connect to the same server and receive messages, data updates, and audio/video streams.



You can design Flash Communication Server applications so that the Flash Communication Server and the application server communicate with each other. Flash Communication Server can talk to other application servers such as Macromedia ColdFusion MX Server, Macromedia JRun, Microsoft® .NET Framework, IBM WebSphere, and Apache Tomcat. For a more detailed explanation, see *Developing Communication Applications.*

Client connections to Flash Communication Server use the Real-Time Messaging Protocol (RTMP), which, unlike HTTP, provides a persistent socket connection for two-way communication between Flash Player clients and the Flash Communication Server.



Flash Communication Server applications include two basic items: a *server-side data stream* that plays from the server thin client, and *shared objects*.

Sever-side data stream The server-side data stream is managed by two objects: the NetConnection object and a Stream object.

The NetConnection object tells the Flash Player to connect to an application on the server. You can use NetConnection objects to create powerful Flash Communication Server applications. For example, you could get weather information from an application server, or share an application load with other Flash Communication Servers or application instances.

The Stream object lets you handle each stream in a Flash Communication Server application. A user can access multiple streams at the same time, and there can be many Stream objects active at the same time.

Shared objects Shared objects are used to store data from the client. They let you manage distributed data with ActionScript in the Flash Player. If you're a developer, you can use shared objects to create your own models for how the data is managed.

For more information about NetConnection objects, Stream objects, and shared objects, see *Developing Communication Applications.*

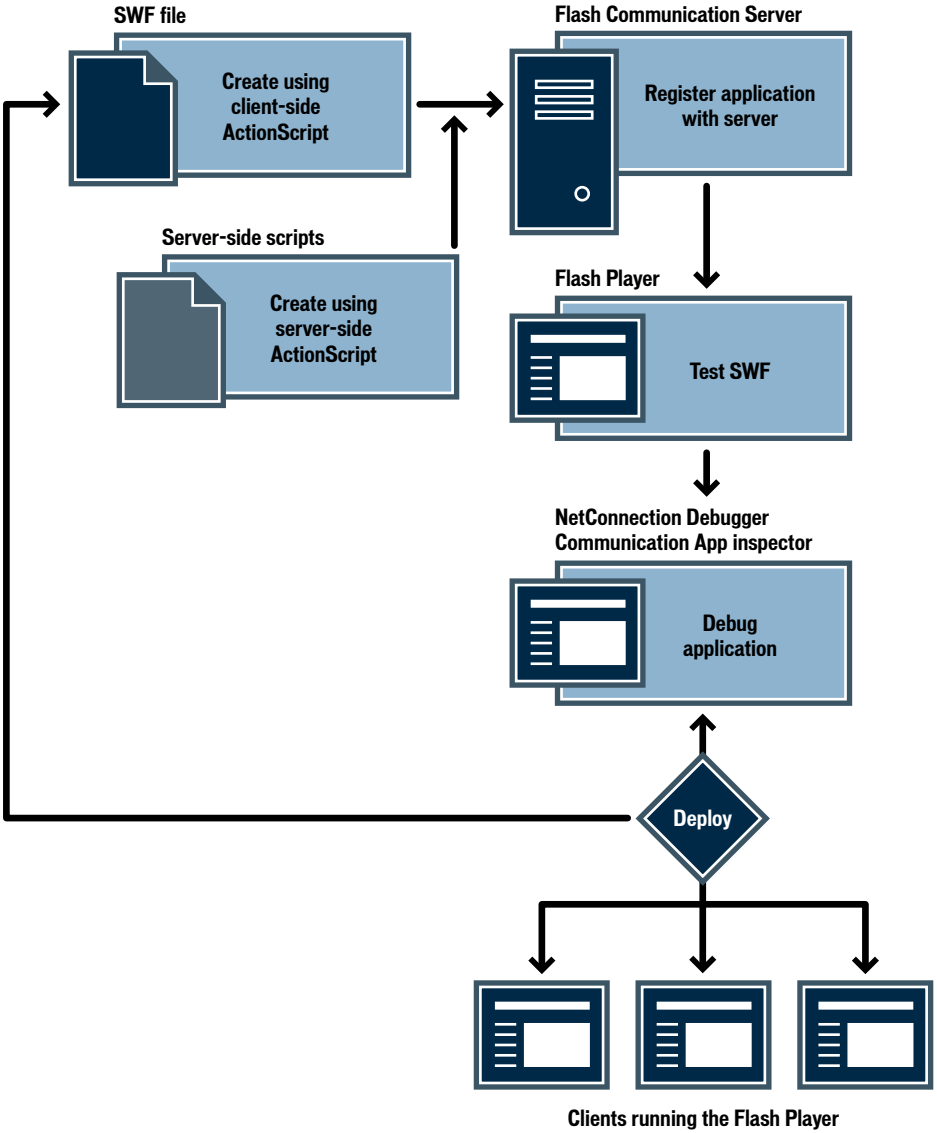
How do I use Flash Communication Server?

The following sections describe your workflow, depending on what you intend to do with Flash Communication Server.

For the locations of the manuals mentioned in the following sections, see Guide to instructional media.

Developer workflow

If you're a developer, you can create a Flash Communication Server application that has a client component and, if needed, a server component. The client component is a Flash MX movie (SWF) that you develop using Client-Side Communication ActionScript, and the server component is a program you write using Server-Side Communication ActionScript. After you create the application, register it on the Flash Communication Server; if there are any server-side scripts, upload them to the Flash Communication Server. You can then test the application using the Flash Player to connect to the server. While you're testing the movie, you can debug it using the NetConnection Debugger and the Communication App inspector. After the application works properly, you can deploy it.



The following resources will help you develop Flash Communication Server applications.

To begin To get started in the development process, begin with *Developing Communication Applications.* This manual describes how to connect to the Flash Communication Server. It also supplies samples that you can use as templates for creating, testing, and debugging applications. To use these samples, open the directory where Flash MX is installed, and go to \flashcom_help\help_collateral\.

Scripting For scripting reference, consult the following manuals:

- The *Client-Side Communication ActionScript Dictionary* explains the ActionScript commands you use in the Flash MX authoring environment.
- The *Server-Side Communication ActionScript Dictionary* explains the ActionScript commands you use in scripts that reside on the server.
- *Using Flash MX* describes how to write basic ActionScript, presents samples, and provides references to additional instructional media that can assist you in becoming a Flash developer. *Using Flash MX* is available in printed form and as a help system (select Help > Using Flash MX).

Testing and debugging When you're ready to test and debug your application, use the Communication App inspector and the NetConnection Debugger.

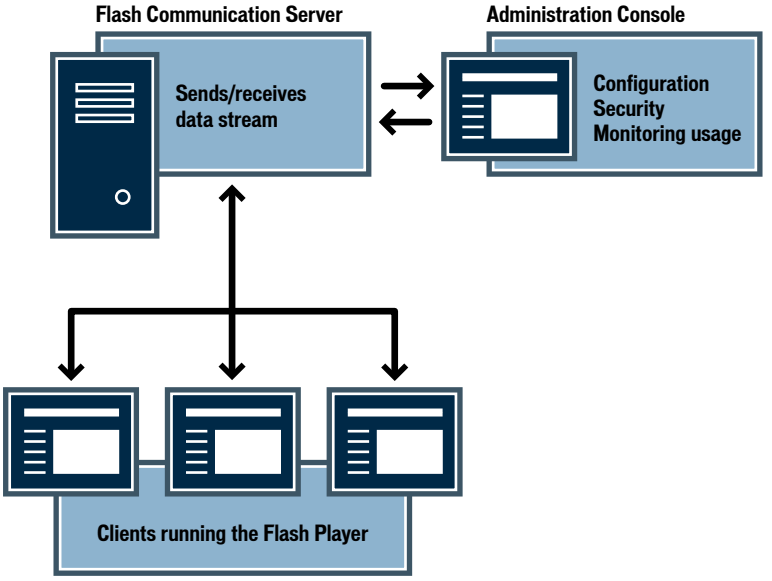
- The Communication App inspector lets you view detailed server information when the application is running. To open this inspector, in Flash MX select Window > Communication App Inspector. When the inspector is open, you can view online help by clicking the Help button.
- The NetConnection Debugger lets you debug applications when they are running. To open this debugger, in Flash MX select Window > NetConnection Debugger. When the debugger is open, you can view online help by clicking the Help button.

Additional resources You may want to explore these other sources of information on Flash Communication Server:

- The Flash Communication Server Support Center at http://www.macromedia.com/go/flashcom_support provides TechNotes and up-to-date information about Flash Communication Server.
- The Flash Communication Server Designer & Developer Center at http://www.macromedia.com/go/flashcom_desdev provides tips and samples for creating Flash Communication Server applications.

Administrator workflow

If you're an administrator, you'll use the Administration Console to configure Flash Communication Server, set up system security, monitor usage, start and stop the server, and add users.



Use the following resources to help you manage Flash Communication Server:

- *Managing Flash Communication Server* tells how to use the Administration Console to install, manage, start and stop, and configure the Flash Communication Server.
- To read online help, open the Administration Console (in Windows, select Start > Programs > Macromedia Flash Communication Server MX > Server Administrator) and select the appropriate documentation.
- The Flash Communication Server Support Center at http://www.macromedia.com/go/flashcom_support provides TechNotes and up-to-date information about Flash Communication Server.
- The Flash Communication Server Designer & Developer Center at http://www.macromedia.com/go/flashcom_desdev provides tips and samples for creating Flash Communication Server applications.

GLOSSARY
Flash Communication Server Terms

application server Software that helps a web server process web pages that contain server-side scripts or tags. When such a page is requested, the web server sends the page to the application server for processing before sending the page to the browser.

Common application servers include Macromedia ColdFusion MX Server, Macromedia JRun, Microsoft .NET Framework, IBM WebSphere, and Apache Tomcat.

HTTP (Hypertext Transfer Protocol) The communication protocol used to connect to servers on the World Wide Web. HTTP's primary function is to establish a connection with a web server and transmit HTML pages to a client browser.

NetConnection object The object that tells the Flash Player to connect to an application on the server.

Real-Time Messaging Protocol (RTMP) The communication protocol that provides persistent socket connection for two-way communication between Flash Player clients and the Flash Communication Server.

shared objects Objects used to store data locally or remotely.

stream object An object that lets you handle each stream in a Flash Communication Server application.

streaming audio The continuous transmission of audio over a data network.

streaming video The continuous transmission of video over a data network.

thin client A user's computer that stores nothing locally but downloads the program from a server. It performs normal computer processing, but stores data on the server.

web client The client side (user side) of the web. A web client can be the user's web browser, plug-ins, or other applications that support the browser.

web server Software that sends web pages in response to requests from web browsers.

Managing Flash Communication Server

Macromedia Flash™ Communication Server MX

macromedia®

Acknowledgments

Director: Erick Vera

Producer: JuLee Burdekin

Writing: Jay Armstrong, Jody Bleyle, JuLee Burdekin, Barbara Herbert, and Barbara Nelson

Editing: Anne Szabla

Multimedia Design and Production: Aaron Begley and Benjamin Salles

Print Design, Production, and Illustrations: Chris Basmajian

First Edition: May 2002

Macromedia, Inc.
600 Townsend St.
San Francisco, CA 94103

CONTENTS

INTRODUCTION
Managing Flash Communication Server

Macromedia Flash Communication Server MX enables one-to-one, one-to-many, many-to-one, and many-to-many communication in real time between applications created in Macromedia Flash MX. Developers create these applications using Flash MX ActionScript, a scripting language based on the same standard used by the JavaScript language.

Flash Communication Server MX uses the Real-Time Messaging Protocol (RTMP), an unencrypted TCP/IP protocol designed for high-speed transmission of audio, video, and data messages.

This manual describes how to configure and manage Flash Communication Server to support communication applications deployed on a variety of network configurations. The rest of this chapter provides system requirements, describes the Flash Communication Server documentation, and lists additional resources.

Flash Communication Server enables applications to communicate with other servers. This manual does not discuss web server and application server management or server operating system setup.

Intended audience

This manual is aimed at system administrators who will configure and manage the Flash Communication Server to support communication applications. You should already be familiar with basic network infrastructure and security. You should also have some familiarity with client-server application models, XML, and JavaScript.

System requirements

Flash Communication Server applications must be deployed on the Microsoft® Windows operating system.

Your deployment system requires a Pentium III 500 MHz processor or greater (dual Pentium 4 or better recommended) running Windows 2000 Advanced Server or Windows NT 4.0 Server (SP6 or later); 256 MB of available RAM (512 MB recommended); 50 MB of available disk space; and a CD-ROM drive.

For the best experience with Flash Communication Server Help, Macromedia strongly recommends that you use a browser with Java player support, such as Microsoft® Internet Explorer 6.0 or later. Flash Communication Server Help also supports Netscape 6.1 or later on Windows and Macintosh. Running Macromedia Flash MX and Flash Communication Server Help simultaneously on a Macintosh may require up to 32 MB of memory, depending on your browser's memory needs.

About the Flash Communication Server documentation

All Flash Communication Server documents are available in PDF format (viewable and printable with Adobe Acrobat Reader) and as HTML help. For document locations, see *Getting Started with Flash Communication Server*.

Typographical conventions

The following typographical conventions are used in this book:

- `Code font` indicates ActionScript statements, XML tag and attribute names, and literal text used in examples.
- *Italic* indicates placeholder elements in code or paths. For example, \settings*myPrinter*\ means that you should specify your own location for *myPrinter*.

Additional resources

The Flash Communication Server documentation was written before the code in the product was complete. Therefore, there may be discrepancies between the final implementation of the product's features and how they are documented in this manual. For a list of known discrepancies, see the documentation update in the Flash Support Center (http://www.macromedia.com/go/flashcom_documentation_update).

The Flash Support Center is updated regularly with the latest information on Flash and Flash Communication Server, as well as advice from expert users, advanced topics, examples, tips, and other updates.

CHAPTER 1
Installing Flash Communication Server

Installing Macromedia Flash Communication Server MX is a simple process. This chapter describes the installation procedure and the files that are installed.

The Flash Communication Server must be installed on Microsoft Windows 2000 Advanced Server or Windows NT 4.0 Server (SP6 or later).

Installing the server

Installing the server is easy. Be prepared to choose an administrator user name and password during the installation; you'll need them to use the server's administration, monitoring, and debugging tools. You can change them later if necessary.

In addition to the Flash Communication Server, the installer adds two windows to the Macromedia Flash MX authoring environment if you have it installed on the same computer. These two windows are the Communication App inspector and the NetConnection Debugger. For more information about these windows, see *Developing Communication Applications.*

During installation, you can choose either a Developer Install or a Production Install of the product. If you choose Developer Install, you can run the samples and test your applications from the \flashcom\applications directory under the directory you specify. For convenience during development, client-side application files (SWFs and HTMLs) are stored in the same directory with your server-side application files (ASCs, FLVs, FLAs).

When you deploy applications, you'll need to separate client files from your server-side source files. While your SWF and HTML files should be accessible through a web server, your server-side ASC files, your audio/video FLV files, and your ActionScript FLA source files should not be accessible to a user browsing your Web site. You can either install the server again on your production machine and choose Production Install, or you can change the configuration settings in the administration XML files as described in Chapter 3, "Configuring Flash Communication Server," on page 25.

If you choose Production Install, you can specify both the location of your client-side application files (SWFs and HTMLs) and the location of your server-side application files (ASCs, FLVs, and FLAs). The server will look for your client-side files under \flashcom\applications in the Web server's root directory and will look for your server-side application files under \applications under the directory you specify.

To install Flash Communication Server:

1. Locate the FlashComInstaller.exe file.

   This file is on your installation CD, or you may have downloaded it.

2. Double-click the installer icon. The installer launches.

3. Enter your name and serial number in the dialog box that appears. Click OK.

4. Read the license agreement and click Yes to accept the agreement.

5. The installer suggests a default location for the server installation. The default location is C:\Program Files\Macromedia\Flash Communication Server MX. Click Next to accept the default location or Browse to choose another location.

6. Choose either the typical installation or a custom installation. (A typical installation is recommended.) Click Next.

7. Enter the user name and password you have chosen. You must enter a password. The server does not accept administrators with empty passwords.

   The installer copies your user name and password into the server's XML configuration files. You can edit or add administrators later using the Administration Console. For more information, see Adding and editing administrators.

8. Choose Developer Install or Production Install". If you choose Production Install, you will be asked to provide two directories: a directory for the Flash SWF files and accompanying HTML files, and another directory for server-side files that should not be accessible to users browsing your site. If you choose Developer Install, both types of files will be installed in the same location.

9. Next, the installer suggests a location for the server administration tools and sample files, including the Administration Console. If you have a web server installed on the same computer, the installer asks if you want to install these files into the web server's publishing directory. You can install these files into this location or click Browse to choose another location. Click Next when you are satisfied with the installation location.

10. Click Next to accept the new program icons.

11. Click Next to accept the installer settings and install Flash Communication Server.

12. Click Finish. The Flash Communication Server service starts up. The server runs as a service, which means it runs in the background and starts automatically when the computer is started up.

The installation is complete. If you choose not to start the Flash Communication Server service right away, you can start it later. See Starting and stopping the server.

About the installed files

When the server has been installed, you'll find several other files in the installation directory. If you chose the default directory in the installer, these files are located in C:\Program Files\Macromedia\Flash Communication Server MX\.

It's a good idea to become familiar with the contents of the Flash Communication Server MX directory before continuing with this chapter. The Flash Communication Server MX directory contains these items:

- FlashCom.exe is the server application.
- FlashComAdmin.exe is the server's administration controller. When administrators connect to the server with the Administration Console, they are actually connected to the FlashCom Admin Service, which communicates with the server to perform administration tasks. For more information about the Administration Console, see Using the Administration Console.
- License.htm contains the text of the Flash Communication Server license agreement.
- Js32.dll contains the server's Server-Side Communication ActionScript engine.
- TcSrvMsg.dll, xmlparse.dll, and xmltok.dll are additional components of the server.
- The conf directory contains the server's hierarchy of XML configuration files. For more information about these files, see Chapter 3, "Configuring Flash Communication Server," on page 25.
- The Tools directory contains BAT files that can be used to start and stop the server. For more information, see Starting and stopping the server.
- The flashcom application directory contains sample client applications you can use to experiment with the server.
- The admin directory contains the Administration Console (admin.swf), which you can use to connect to the server to monitor and control its activity remotely. For more information, see Using the Administration Console.
- If you have Flash MX installed on the same computer, the Flash Communication Server installer adds the new Communication App inspector and the NetConnection Debugger to Flash MX. These features provide support for creating and debugging communication applications. For more information on using these features, see *Developing Communication Applications.*

Installing Flash authoring components on the Macintosh

To install the Communication App inspector, NetConnection Debugger, and related help files into an existing copy of Macromedia Flash MX on a Macintosh computer, you use the Macintosh FlashComInstaller.

To install the authoring components:

1. Locate the FlashComInstaller file.

   This file is on your installation CD, or you may have downloaded it.

2. Double-click the installer icon.

   The installer launches. The installer locates your existing copy of Flash MX automatically.

3. Click Install to install the authoring components and help.

   The installer copies files to your hard disk.

When the installation is complete you can launch Flash MX and begin using the new windows to create communication applications. For more information about creating communication applications, see *Developing Communication Applications*.

CHAPTER 2
Managing the Server

As a Flash Communication Server administrator, you'll need to perform several administrative tasks after the server is installed. This chapter describes how Macromedia Flash Communication Server MX is configured when you first install it, how to set up additional administrators, and how to monitor the server's activity.

For many of these tasks, you'll use the Administration Console that was installed with the server. This chapter describes the Administration Console in detail.

Performing administration tasks

When you've installed Flash Communication Server, you should perform the following tasks before connecting to the server with client applications:

- Review the included sample applications.
- Become familiar with the server's initial configuration.
- Define additional server administrators.
- Register client applications.
- Configure virtual hosts.
- Configure new applications, including uploading server-side scripts or audio/video files.
- Become familiar with the procedures for starting and stopping the server.

Reviewing the sample applications

When you install Flash Communication Server, several sample applications are included. To see a description of each one, select Programs > Macromedia Flash Communication Server MX > Macromedia Flash Communication Server MX Sample Applications from the Start menu in Microsoft Windows.

Understanding application elements

It is important to understand the files, scripts, and other parts of a communication application that runs on the server. These elements include the following:

A Macromedia Flash MX SWF file that is served from a web server. This is the application itself.

A directory inside the flashcom application directory, named to match the application name. This is the name the SWF file uses when connecting to Flash Communication Server. The server registers each application when it finds its directory in the flashcom application directory. For more information about the flashcom application directory, see Registering client applications.

An optional Application.xml file in the application's directory in the flashcom application directory. If present, this file provides specific settings for the application that may be different from the settings in the server's primary Application.xml file. For more information about the server's configuration files, see About the configuration files.

Optional server-side scripts. Some applications may make use of Server-Side Communication ActionScript. If server-side scripts are used, they are located in the application's directory in the flashcom application directory or in the directory specified in the `<ScriptLibPath>` tag in the application's optional Application.xml file. These scripts may have file extensions of .js or .asc.

Optional audio and/or video stream files. Some applications may make use of preexisting audio/video streams or may record them to disk. Stream files have the extension .flv. These files are located in a directory named Streams inside the application's directory in the flashcom application directory or in the directory specified in the `<StreamManager>:<StorageDir>` tag in the application's optional Application.xml file.

Optional shared object files. Some applications may make use of preexisting shared objects or may write them to disk. Shared objects contain nonstreaming data that is used by more than one client of a communication application. Shared object files have the extension .fso. These files are located in a directory named Sharedobjects inside the application's directory in the flashcom application directory or in the directory specified in the `<SharedObjManager>:<StorageDir>` tag in the application's optional Application.xml file. Shared objects can also exist on the client side. For more information about using shared objects, see *Developing Communication Applications*.

Understanding basic server settings

When Flash Communication Server is first installed, it's configured in a generic way so that you can begin using it with the sample client applications. You should become familiar with this configuration so that you can make decisions about how to change it to suit your needs.

The server is installed with a set of configuration files in XML format. These files define a default server adaptor, a default flashcom application directory, default server administrators, and default settings for application behavior.

The default server adaptor uses port 1935, the number assigned to Flash Communication Server by the Internet Assigned Numbers Authority (www.iana.org). Although you can use any port number, this increases the risk of conflicting with another application that may be assigned to the same port. Applications must be authored to use the same port the server is using. Be sure the port is set to the open state.

The server is preconfigured with one adaptor containing one virtual host. The virtual host is equivalent to a domain name. The default application directory for the default virtual host is the the flashcom applications directory. If you chose Developer Install during installation, this directory is under \flashcom\applications. You can view this location by looking at the value for the AppsDir tag in the vhost.xml file. This directory is where the server will look for application subdirectories at startup; you must place an application subdirectory here for each client application that you plan to connect to the server, and the client subdirectory must have the same name as the client application. The presence of the application subdirectory registers the application with the server.

When you install the server, the default flashcom application directory includes sample applications that are provided to illustrate the essential capabilities of the server. Each sample application resides in its self-named directory in the flashcom application directory. However, when you build a Flash MX SWF file of your own, you do not need to place a copy of it in its subdirectory in the flashcom application directory. The only requirement is that the subdirectory exists and is named with the name of the application.

You can add adaptors and virtual hosts and change the location of the application directory by editing the server's configuration files and creating directories in the server's conf directory. For more information, see Chapter 3, "Configuring Flash Communication Server," on page 25.

The default server administrator has the user name and password you chose during the Flash Communication Server installation, and is defined in the Server.xml configuration file. The server administrator can connect to the FlashCom Admin Service with the Administration Console and perform a variety of server administration tasks, including shutting down the server and disconnecting client applications. (In the nomenclature of server administration, this server administrator is equivalent to the "root" user.)

Virtual host administrators can only perform tasks relating to the applications running on their own virtual host. There are no virtual host administrators defined when the server is first installed. Server administrators, including the default server administrator defined during installation, have access to all virtual hosts. Server administrators can add virtual host administrators using the Administration Console. For more information about adding administrators, see Adding and editing administrators.

Registering client applications

The server is configured at installation with one adaptor directory named _defaultRoot_ containing one virtual host directory named _defaultVHost_. The server defines its virtual hosts at startup by searching for directories within the adaptor directory that contain valid Vhost.xml files, such as the _defaultVHost_ directory. At the same time, the server defines each application that will be allowed to connect to a virtual host by looking for application directories inside a directory specified by the `<AppsDir>` tag in the Vhost.xml file.

You can specify the directory you want to use to store your client applications' directories by editing the `<AppsDir>` tag in the Vhost.xml file. By changing the path specified in this tag, you can locate the application directory for the virtual host anywhere you want. If no application directory is specified, it defaults to the virtual host directory itself.

To edit the `<AppsDir>` tag in the Vhost.xml file:

1. Locate the Vhost.xml file for the virtual host you are working with.
2. Open the file in a text editor.
3. Replace the path inside the `<AppsDir>` tag with the path of your choice, such as C:\Server Files\flashcom\applications. Do not use quotation marks.
4. Save the Vhost.xml file.

You must restart the server in order for this change to take effect.

Once you have specified the directory where you'll store your application directories, you must create a directory inside it for each client application you plan to use with that virtual host. Each client application must have a directory with the same name that the client application uses when connecting to the server. Once you have created a subdirectory for each of your applications, you can decide whether to give any of the applications their own Application.xml file. By including an Application.xml file in a client application's directory, you can give that application different settings from those defined in the virtual host's Application.xml file, which serve as the default settings for applications on the virtual host. For more information about the Application.xml file, see Chapter 3, "Configuring Flash Communication Server," on page 25.

Configuring virtual hosts

With the Enterprise and ISP versions of the server, you can add virtual hosts to the server's configuration. This is useful for separating sets of applications and allows you to define administrators who have access only to a specific virtual host.

Each virtual host on the server is associated with an adaptor. You add a virtual host by adding a directory inside the adaptor's directory in the server's conf directory. The virtual host's directory must be named with the virtual host name, such as www.myCompany.com.

Each new virtual host must include the following items:

- A Vhost.xml file.
- An Application.xml file.
- A directory named admin in the virtual host's flashcom application directory (defined in the VHost.xml file). This ensures that the Administration Console (admin.swf) will be able to connect to the virtual host. For more information, see Using the Administration Console.

Uploading server-side scripts

In developing client applications for Flash Communication Server, you may decide to use server-side scripts to implement some of their functionality. Server-side scripts should be uploaded to the application directory for the application that uses them, or to a "scripts" directory inside the application's directory.

If you create server-side scripts that use characters that are not in the classic 7-bit ASCII character set, such as non-English characters, you must use a text editor that encodes text in UTF-8 format. Macromedia Dreamweaver MX encodes text in this format. (A list of text editors that use the UTF-8 format is available at http://www.thefreecountry.com/developercity/editors.shtml.)

Script files that are encoded in UTF-8 format must be transferred to the server via a binary file transfer.

For more information about using server-side scripts, see *Developing Communication Applications.*

The Communication App inspector and NetConnection Debugger

If you have Flash MX installed, you'll find two new windows related to Flash Communication Server: the Communication App inspector and the NetConnection Debugger.

- The Communication App inspector lets you view information about the applications running on the Flash Communication Server.
- The NetConnection Debugger lets you view information about the events that are taking place on the server. These events include client application connection requests and initiation of data streams. This information can be useful when you are testing and debugging your Flash applications.

For detailed information about using these windows, see *Developing Communication Applications*.

Starting and stopping the server

Because Flash Communication Server runs as a service, it does not appear in the Windows taskbar. Therefore, you don't shut down or restart the server as you would other applications.

You can shut down and restart the server in a few ways:

- Use the Administration Console to connect to the server and then shut it down or halt it remotely. (Only server administrators can perform these tasks.) For more information, see Using the Administration Console and Using the Maintenance panel.
- Use the BAT files in the Flash Communication Server MX\Tools directory.
- Use the Windows Services control panel.

To start or stop the server by means of the BAT files:

In the Start menu, choose Programs > Macromedia Flash Communication Server MX > Start Service or Stop Service. The BAT file executes and then closes automatically.

To stop the server in the Services control panel:

1. In the Windows Start menu, select Settings > Control Panel.
2. In the Control Panels folder, double-click the Administrative Tools folder.
3. In the Administrative Tools folder, open the Services control panel.
4. In the Services list, scroll down and select Flash Communication Server.
5. Click the Stop button at the top of the control panel. The server shuts down.

To restart the server in the Services control panel:

1. Open the Services control panel.
2. Select Flash Communication Server.
3. Click the Start button at the top of the control panel. The server starts up.

Using the Administration Console

You can do common server administration and monitoring tasks using the graphical user interface of the Administration Console and, in Flash MX, the Communication App inspector. These are Flash applications that Macromedia created using public APIs (application programming interfaces). The source files for these applications are available on Macromedia's Flash MX Support Center (www.macromedia.com/support/flash/). You can use the same ActionScript APIs to create your own custom administration tools or extend the ones provided with the server.

When you install Flash Communication Server, the installer places the Administration Console (admin.swf) in the admin directory. If you have the Flash Player installed, you can monitor and control the server's activity by launching the Administration Console and connecting to the server.

With the Administration Console, you can perform the following tasks:

- Check the status of the server and the applications running on it
- Shut down or restart the server, a virtual host, or individual client applications
- Add and edit administrators
- View logs of server connections and other server events
- View and update the server's license key and its bandwidth and connection limits

As a security feature, when you connect to the server with the Administration Console, the console actually connects to a separate FlashCom Admin Service that runs in parallel with the server service. The Admin Service then communicates with the server to perform its administration functions.

To connect to the Flash Communication Server with the Administration Console:

1. In the Windows Start menu, select Programs > Macromedia Flash Communication Server MX > Server Administrator. The Administration Console opens in your web browser.
2. In the Host text box, enter the address of the server you want to connect to.

   The default address is localhost, which refers to the computer that the Administration Console is running on. If you are connecting remotely by running the Administration Console on another computer, enter the address of the server you want to connect to, such as FlashComServer.myCompany.com or 12.34.56.78. If the `<HostPort>` tag in the Server.xml file is set to a port other than 1111, include the port number after the host name, separated by a colon. (For more information about server configuration, see Chapter 3, "Configuring Flash Communication Server," on page 25.)
3. In the Name and Password boxes, enter the name and password you entered during the Flash Communication Server installation. If you've changed the administrator user name and password using the Administration Console or manually in the Server.xml file, enter the new user name and password.
4. If you want the Administration Console to remember your login and password when you use it in the future, select the Remember Connection Data option.
5. If you want the Administration Console to automatically connect to the server when you open it, select the Automatically Log In option.
6. Click the Connect button.

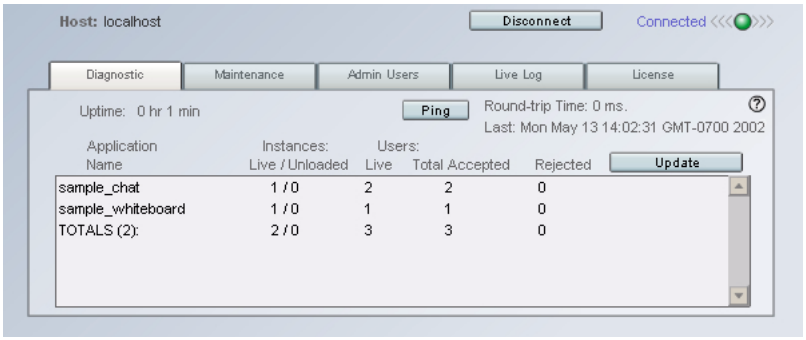
You are now connected to the server, and the Diagnostics, Maintenance, Admin Users, Live Log, and License panels appear. These panels perform the following functions:

- The Diagnostics panel displays information about the applications that are connected to the server and the number of instances and users of each one.
- The Maintenance panel allows you to shut down the server, virtual hosts, or an individual application connected to the server.
- The Admin Users panel allows you to add and edit administrators' log-on information.
- The Live Log panel lets you view information about connections, disconnections, and other server events as they happen.
- The License panel displays the server serial number and information about the number of connections and bandwidth enabled by that serial number.

To use the Administration Console on a computer other than the server computer, copy the Admin folder from the flashcom application directory to the other computer. You'll need to configure the `<Allow>` and `<Deny>` tags in the Server.xml file to allow connections from the other computer's IP address. See About the configuration files.

Viewing server diagnostics

To view information about the server's responsiveness, the amount of time the server has been running, and the applications that are connected to the server, you use the Diagnostics panel.



The Diagnostics panel displays the following information:

Uptime indicates how long the server has been running continuously and is updated once per minute. The uptime information is not available to virtual host administrators.

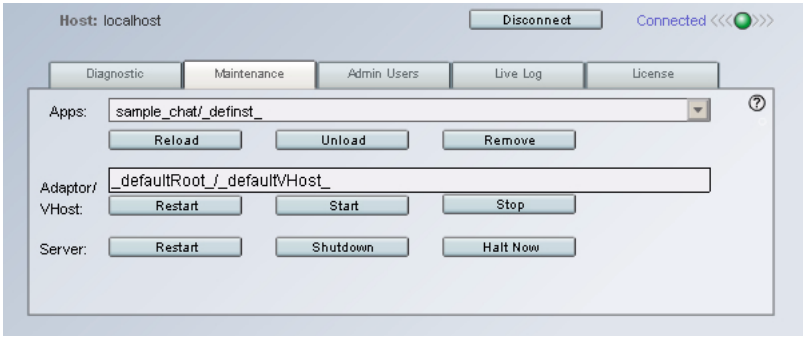
Ping lets you verify that the server is running and view its responsiveness in milliseconds.

Update allows you to get current information about the application instances that are running on the server. The name of each application is displayed, along with the number of instances of the application that have been created on or unloaded from the server, the number of users that are connected, and the total number of connections that have been accepted and rejected for each application. If you are connected as a virtual host administrator, Update displays information only for the virtual host you are connected to.

An application may have more than one instance if its clients connect to the server by using different application instance parameters within their ActionScript NetConnection calls. (For more information on the NetConnection object, see the *Client-Side Communication ActionScript Dictionary*.)

Using the Maintenance panel

To restart or stop the server, a virtual host, or a client application or application instance, you use the Maintenance panel.



Virtual host administrators can shut down only the applications on their own virtual host and restart only that virtual host.

The Maintenance panel includes the following items:

Apps allows you to choose from the applications currently running on the server. The Apps menu will not update while it is open or selected; to allow it to update, click outside the menu. To specify an application instance that is not listed, type the name of the instance into the text box.

Reload lets you reload an application instance that is currently connected to the server. You might do this to reload the instance's server-side scripts or to disconnect all of its users while immediately allowing new connections. To reload an application instance, select it from the Apps menu and click Reload. (You cannot reload applications that have been unloaded with the Remove button).

Unload lets you delete an application instance. To unload an application instance, select it from the Apps menu and click Unload. This disconnects all the clients of that instance. (If the application has more than one instance on the server, only the instance you choose is deleted).

Remove lets you delete all elements of an application. This includes the application instances, the application directory and any script files it contains, and any stream files associated with the application.

Adaptor/VHost allows you to enter the name of the virtual host you want to control. If you want to perform functions on the virtual host you are currently connected to, you can leave this text box blank. To specify another virtual host, enter the name of its adaptor and the name of the virtual host, separated by a forward slash (/), for example, _Root1_/www.macromedia.com. The Adaptor/VHost text box is not visible to virtual host administrators because they can only connect to and control their own virtual host. If you are running a developer edition of the server, you do not need to use the Adaptor/VHost text box because only one virtual host is allowed on the server in addition to the default virtual host.

VHost Restart lets you restart a virtual host. Restarting a virtual host disconnects all users of that virtual host and removes all application instances from memory. If you are a server administrator you can restart any of the server's virtual hosts except the default virtual host (_defaultVHost_). To restart a virtual host, enter its name in the Adaptor/VHost text box and click Restart. If you are a virtual host administrator, you can only connect to and administer your own virtual host. Click Restart to restart the virtual host.

Start lets you start a virtual host that has been previously stopped. This button is available only to server administrators. If you are a server administrator, you can start any of the server's virtual hosts except the default virtual host (_defaultVHost_). To start a virtual host, enter its name in the Adaptor/VHost text box and click Start.

As a security feature, virtual host administrators are not allowed to start a virtual host that has been stopped.

Stop lets you stop a virtual host. This button is available only to server administrators. Stopping a virtual host disconnects all users from that virtual host and prevents future connections. If you are a server administrator you can stop any of the server's virtual hosts except the default virtual host (_defaultVHost_). To stop a virtual host, enter its name in the Adaptor/VHost text box and click Stop.

Server Restart lets you restart the server. This button is available only to server administrators. Restarting the server disconnects all connected users and unloads all application instances on all virtual hosts from memory. A restart also reloads the server's configuration files, allowing any manually entered changes to those files to be read by the server.

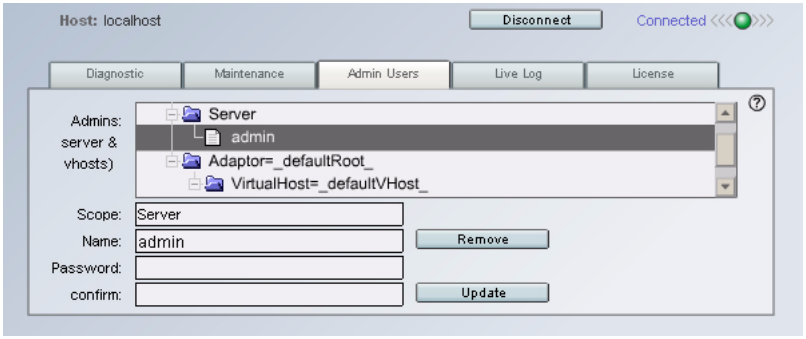
Shutdown lets you exit from the server. This button is only available to server administrators. When you use the Shutdown button, the server unloads all application instances and cleans up all streams and other shared objects that the applications may be using. Shutting down can take a few seconds while the server performs this cleanup procedure. When the server is shut down, the Administration Console is disconnected.

Halt Now lets you quit the server immediately without any cleanup of streams or shared objects. This button is only available to server administrators.

Messages appear at the bottom of the Maintenance panel to indicate the success or failure of each operation you perform.

Adding and editing administrators

To add or edit administrator log-on information, you use the Admin Users panel.



The Admin Users panel contains the following items:

Admins displays a hierarchical view of the server's administrators, adaptors, virtual hosts, and virtual host administrators. Virtual host administrators can only see the administrators of their own virtual host. To perform an operation in the Admin Users panel, you first select a server, virtual host, or administrator icon in the Admins pane; then you use the text boxes and buttons to finish the operation.

Scope displays the level of server access of the currently selected administrator. If the selected administrator is a server administrator, "Server" appears in the Scope text box. If the selected administrator is a virtual host administrator, that administrator's adaptor and virtual host appear in the Scope text box.

Name displays the user name of the currently selected administrator. When adding new administrators, you enter the user name in the Name text box.

Password allows you to enter a password when adding a new administrator or editing an existing one. Administrators cannot have empty passwords.

Confirm allows you to reenter the password when adding or updating an administrator. The password must match the one entered in the Password text box for the operation to be successful.

Add/Update allows you to add a new administrator or change an existing administrator's password; the button is labeled Add when the server or a virtual host is selected in the Admins pane. The button is labeled Update when an existing administrator is selected in the Admins pane. Virtual host administrators can only add or update administrators of their own virtual host.

Remove allows you to delete the currently selected administrator. Virtual host administrators can only remove administrators of their own virtual host.

To add an administrator:

1. Select the server or the virtual host you want to add the administrator to.

   The server or virtual host name appears in the Scope text box.
2. Enter the new administrator's user name in the Name text box.
3. Enter the new administrator's password in the Password text box.
4. Reenter the password in the Confirm text box.
5. Click the Add button.

To update an administrator's password:

1. Select the administrator in the Admins pane.
2. Enter the new password in the Password text box.
3. Reenter the password in the Confirm text box.
4. Click Update.

To remove an administrator:

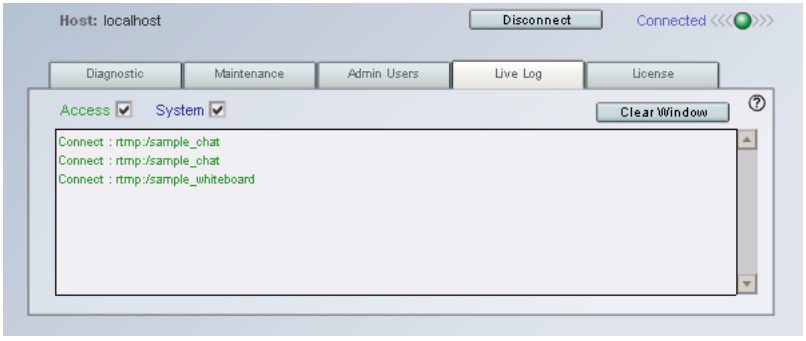
1. Select the administrator in the Admins pane.
2. Click Remove. Be sure not to remove the last server administrator.

Note: When you use the Admin Users panel, the Server.xml file must be writable and not open in any other application.

You can also add and edit administrator information by manually editing the server's Server.xml file. Changes made in this way will not take effect on the server until after a server restart. For more information about editing the server's configuration files, see About the configuration files.

Viewing server logs

To view a list of server activity, you use the Live Log panel. The Live Log panel is not available to virtual host administrators because it may contain sensitive information.



The Live Log panel includes the following options:

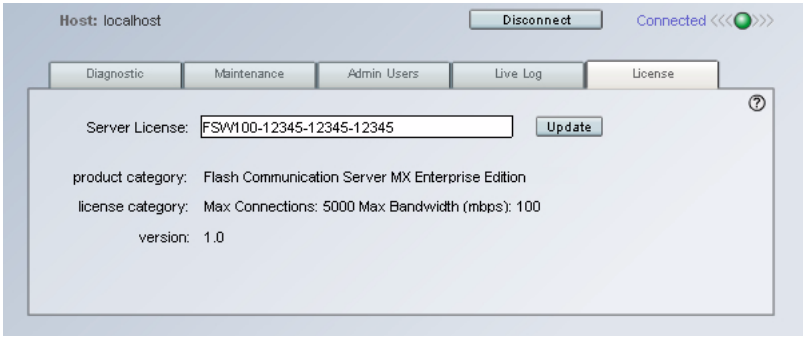
Access lets you view information about user connections and disconnections to and from the server. When you select this option, these items are displayed in green in the output pane.

System lets you view server error messages, such as attempts to connect to nonexistent applications. When you select this option, server messages are displayed in blue.

Clear Window lets you clear the log text from the pane.

Viewing and editing license information

To view or change the server's license key and its capacity parameters, you use the License panel. This panel is only available to server administrators.



To change the license key, enter the new key and click Update. Entering a new license key will write the new key to the Server.xml file, but will not change the key that is in memory on the server. To assert the new key on the server, you must restart the server in the Maintenance panel (see Using the Maintenance panel).

When updating the license key, be sure the Server.xml file is writable and not open in any other application.

Performing advanced administration tasks

Once you're familiar with basic Flash Communication Server administration tasks, you can make operating and troubleshooting the server more convenient and effective.

Advanced administration tasks include the following:

- Viewing server events in the Windows event viewer
- Configuring the server at runtime

Viewing server events in the Windows event viewer

In addition to the Communication App inspector and NetConnection Debugger in Flash MX, you can also use the Windows event viewer for tracking Flash Communication Server activity and debugging server applications. The event viewer displays a list of events that the server generates.

To use the Windows event viewer:

1. From the Windows Start menu, select Settings > Control Panel > Administrative Tools > Event Viewer.
2. Select the Application panel.
3. Double-click an event generated by Flash Communication Server to view the details of the event.

Configuring the server at runtime

Using a special set of ActionScript commands, you can view and edit the server's configuration settings by building your own customized administration applications. You can add or remove administrators, change their user names and passwords, and change most of the other server settings in all four of the server's XML files. For detailed information about using these ActionScript commands, see the Flash MX Support Center (http://www.macromedia.com/support/flash/).

CHAPTER 3
Configuring Flash Communication Server

Macromedia Flash Communication Server MX has been designed to accommodate many types of communication applications. After installation, the server's configuration files contain only simple, generic settings. You'll need to make some decisions about how to configure it to best suit your needs.

This chapter describes the server's initial configuration and the XML files that define the configuration. It then explains how to edit these files to suit the needs of the client applications you intend to use.

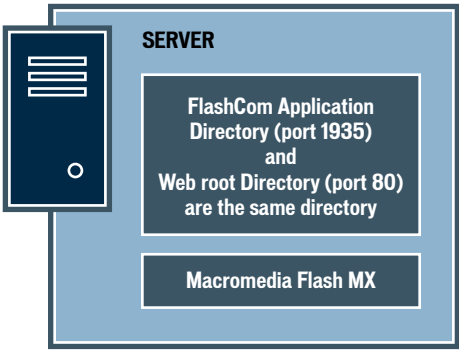
Typical configurations

Flash Communication Server can be used in a variety of different ways, with different configurations. In most cases, the server will be used in conjunction with a web server. As described in Chapter 2, "Managing the Server," on page 11, applications that run on Flash Communication Server consist of clients developed in Macromedia Flash MX (SWF files); directories on the server register the application on the server and contain streams and scripts used by the application.

Your web server is responsible for serving the SWF client files and the HTML pages in which they are embedded. In addition, you may use an application server in conjunction with your web server and Flash Communication Server to incorporate database or other features into your communication applications.

The following diagrams illustrate some typical deployment scenarios.

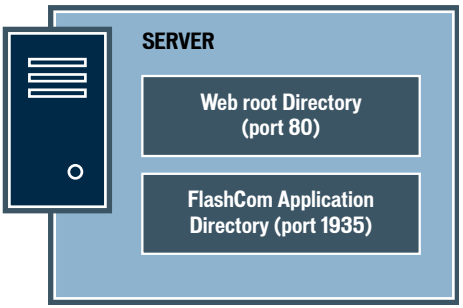
Development During the development process, you may choose to use one computer with a web server, Flash Communication Server, and Flash MX installed.



The Web root directory in this scenario would contain all the components of your applications, such as the flashcom application directory and its individual application subdirectories. These subdirectories would contain the application's FLA, SWF, HTML, script, stream and shared object files. This setup provides a simple working environment for designing and testing your applications.

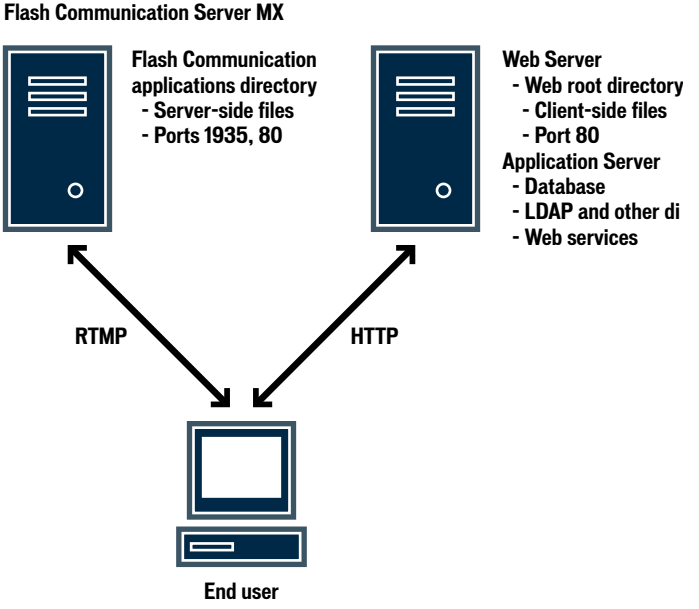
For security reasons, this configuration is not recommended for deployment.

Deployment: one computer A relatively simple deployment scenario consists of one computer with a web server, Flash Communication Server MX, and a firewall installed. The firewall provides security for the server computer and the rest of your local network.

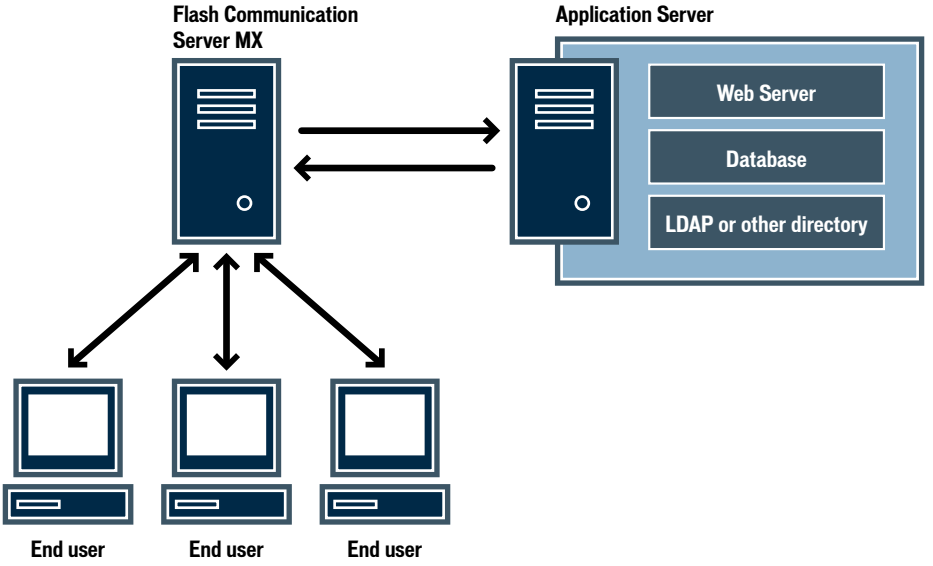


In this and any other deployment scenario, the server-side files (ASCs), the audio/video files (FLVs), and the source files (FLAs) should not reside in the flashcom application directory under the web server's published directories. These files should be located under the application directory you chose during installation or when editing the Application.xml file.. The web server's Web root directory should contain only the HTML and SWF files for your applications.

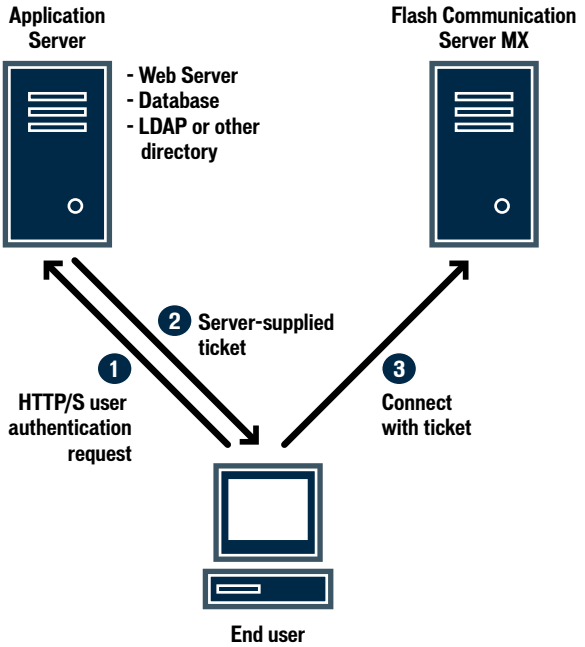
Deployment: two computers In this scenario the Flash Communication Server and application server are on two separate computers. This allows for more separation of files and functions and more processor bandwidth. The web server computer can also host an application server if your situation requires one.



Deployment: two computers with authentication via Flash Communication Server Some scenarios may require authentication of users who want to access information on an application server. In this case you may want to use a separate computer for Flash Communication Server MX, and another for the web server and application server. Your Flash Communication Server can perform the authentication and then retrieve data from the web/application server. This scenario requires the developer to create server-side scripts to perform these functions.



Deployment: two computers with authentication via an application server You may decide to have users authenticated before they are allowed to connect to your Flash Communication Server. In this scenario, users connect first to the web/application server. If they are authenticated, the application server creates a ticket that the user then uses to connect to the Flash Communication Server. The Flash MX communication application must be designed to check for these tickets, typically with server-side scripts.



About configuration levels

The server is capable of hosting more than one adaptor and more than one virtual host on each adaptor. Each virtual host is equivalent to a domain name. Each virtual host can run more than one communication application. (The Developer Edition of the server is limited to one adaptor and one virtual host.)

When you're ready to customize the server for your own virtual hosts and applications, you'll edit the server's XML configuration files and the directory structure that contains them. The server uses four configuration files in XML format: Server.xml, Adaptor.xml, Vhost.xml, and Application.xml. You configure the server by editing the contents of these files, either in a text editor or with the Administration Console.

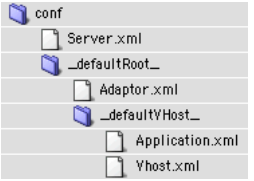
The following sections explain in detail how to configure the server using these files.

About the configuration hierarchy

Flash Communication Server can support several adaptors, virtual hosts, and applications simultaneously. Each adaptor on the server can serve multiple virtual hosts, and each virtual host can host multiple applications. By supporting multiple adaptors and virtual hosts, Flash Communication Server facilitates management of multiple websites that may have different configurations and administrators.

Each of these layers of service has its own configuration settings, stored in separate XML files. These files are stored in a directory structure that reflects the hierarchy of adaptors, virtual hosts, and applications you want to use with the server.

The default directory structure installed with the server looks like this:



The directory structure includes three subdirectories: conf, _defaultRoot_, and _defaultVHost_.

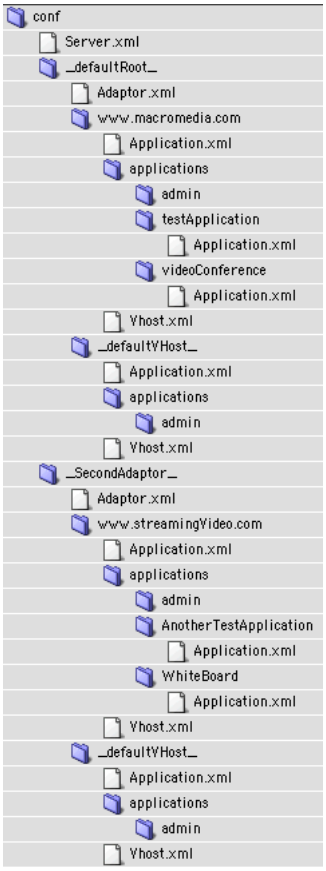
- The conf subdirectory, at the top of the hierarchy, holds all the configuration files for the server. This subdirectory contains the Server.xml file and the _defaultRoot_ subdirectory. The Server.xml file contains settings that relate to the server only. The specific settings for the adaptors, virtual hosts, and applications are stored in separate XML files.
- The _defaultRoot_ subdirectory is the default adaptor directory for the server. It contains the Adaptor.xml file and the _defaultVHost_ subdirectory. The Adaptor.xml file contains the settings that relate to the adaptor. (If there were a separate adaptor, it would have its own subdirectory at the same level as the _defaultRoot_ subdirectory.)
- The _defaultVHost_ subdirectory is the default virtual host subdirectory for the adaptor. It contains the Vhost.xml file, which contains the settings for the virtual host, and the Application.xml file, which contains default settings for the client applications that will connect to the server. (If there were another virtual host on the same adaptor, it would have its own subdirectory at the same level as the _defaultVHost_ subdirectory.) Each adaptor directory must contain a _defaultVHost_ directory.

Adding adaptors and virtual hosts

To add an adaptor to the server, you must add a complete adaptor directory structure to the server's conf directory. Each adaptor directory must contain an Adaptor.xml file and at least one virtual host directory, called _defaultVHost_. When you add virtual hosts, these must be in addition to _defaultVHost_. Each virtual host subdirectory contains a Vhost.xml file and an Application.xml file.

When you design an application in Macromedia Flash MX that will connect to the Flash Communication Server, you add a subdirectory with the application's name to the application directory of the virtual host it will connect to. The application's subdirectory can contain its own Application.xml file if you want the application to override any of the settings in the generic Application.xml file in the virtual host directory.

A typical customized server conf directory might look like this:



A customized conf directory containing multiple adaptor, virtual host, and application subdirectories and configuration files

The conf directory illustrated here contains two adaptor subdirectories: the _defaultRoot_ subdirectory and the _SecondAdaptor_ subdirectory.

- The _defaultRoot_ subdirectory contains the _defaultVHost_ subdirectory and another virtual host subdirectory named www.macromedia.com. Each of these virtual host subdirectories contains an application subdirectory. The application subdirectory for www.macromedia.com contains an admin directory in addition to directories for the applications testApplication and videoConference.
- The _SecondAdaptor_ subdirectory contains a _defaultVHost_ directory and another virtual host directory named www.streamingVideo.com. The www.streamingVideo.com subdirectory contains an application subdirectory with directories for the Administration Console (admin.swf), AnotherTestApplication, and a WhiteBoard application.

In the preceding example, each virtual host directory contains a subdirectory named applications. Each virtual host's Vhost.xml must define a flashcom application directory in its `<AppsDir>` tag. The flashcom application directory contains subdirectories for each application that can connect to the virtual host. However, you do not need to name the directory "applications" or locate it inside the virtual host directory. Each virtual host's flashcom application directory must contain a directory named admin so that the Administration Console can connect to the virtual host. For more information about the Administration Console, see Using the Administration Console.

About the configuration files

Flash Communication Server uses separate XML configuration files for each level of the server hierarchy: server, adaptor, virtual host, and application. Each of these files contains configuration tags that relate to the server, adaptor, virtual host, or application they are associated with. To customize the functionality of the server, you edit these tags. The server edits some of these tags itself when you use the Administration Console.

The following sections describe the tags in each XML file in detail.

The Server.xml file

The Server.xml file is located at the root level of the conf directory and contains tags that define user names and passwords for server administrators and virtual host administrators. You edit the Server.xml file to add or remove administrators. The administrators defined in this file will be able to connect to the server with the Administration Console. Server administrators can use all of the features and see all of the information available in the Administration Console. Virtual host administrators can use the Administration Console only to see information and perform tasks that relate to their particular virtual host.

The Server.xml file contains the following tag structure, along with comments that briefly describe each tag.

```
<Root>
  <Admin>
    <Server>
      <UserList>
        <User name="admin">
          <Password encrypt="true">YWRtaW4=</Password>
          <Allow></Allow>
          <Deny></Deny>
          <Order>Deny,Allow</Order>
        </User>
      </UserList>
    </Server>
    <Adaptor name="_defaultRoot_">
      <VirtualHost name="_defaultVHost_">
        <UserList>
          <User name="">
            <Password encrypt"false"></Password>
            <Allow></Allow>
            <Deny></Deny>
            <Order>Deny,Allow</Order>
          </User>
        </UserList>
      </VirtualHost>
    </Adaptor>
  </Admin>
  <Server>
    <LicenseInfo>FSW100-XXXXX-XXXXX-XXXXX</LicenseInfo>
    <AdminServer>
      <HostPort>:1111</HostPort>
    </AdminServer>
  </Server>
  <ServerDomain></ServerDomain>
</Root>
```

The tags in the Server.xml file serve the following purposes:

- `<Root>` is the root tag for the XML document. It is a container for all the other tags.
- `<Admin>` is a container for server administrator and virtual host administrator settings.
- The first `<Server>` tag is a container for the server administrator `<UserList>` tags.
- `<UserList>` is a container for one or more `<User>` tag groups.

- The <User> tag inside the <UserList> tag specifies the user name of a server administrator in its name parameter and is a container for the <Password>, <Allow>, <Deny>, and <Order> tags.

  To connect with the Administration Console that is installed with the server, a user must be defined in a <User> tag group. For more information about using the Administration Console (admin.swf), see Using the Administration Console.

  You define the first administrator when you run the server installer. There must be at least one administrator defined for the server. Otherwise no users can connect with the Administration Console. You can define additional administrators by including additional <User> sections in the Server.xml file. Each <User> section must contain a <Password> tag. Normally, you edit administrator user names and passwords using the Administration Console. You may use any characters in user names entered with the Administration Console. However, if you edit this information directly in the Server.xml file, remember to use only valid XML.

  By default, only the Administration Console requires a valid administrator user name and password when a connection is being made to the server. Other client applications do not require any user name or password unless they are explicitly programmed to do so by the author.

- <Password> specifies the password for the <User> tag that contains it. The encrypt attribute indicates whether to encrypt the contents of the password. If the encrypt attribute is set to true, the password you see in the file is the encrypted password. If you edit the contents of this tag directly in the Server.xml file rather than with the Administration Console, you must set the encrypt attribute to false and use only valid XML in the password. Passwords cannot be empty ("").

- <Allow> contains a list of hosts from which the administrator user should be allowed to connect. You can include whole host names (also called domain names) or IP addresses in the list. Separate each host name or address with a comma. The keyword all can be specified to allow connections from all hosts.

  For example, an <Allow> tag might look like this:

  ```
  <Allow>www.macromedia.com, 12.34.56.78</Allow>
  ```

  Whenever possible, use IP addresses in the <Allow> tag. This increases the server's performance when processing connection requests.

- <Deny> contains a list of hosts from which the administrator user should not be allowed to connect. You can include whole or partial host names (also called domain names) or IP addresses in the list. By including partial host names, such as myCompany.com, you can deny connections to users connecting from any computer within the myCompany.com domain. Separate host names or addresses with a comma. The keyword all can be specified to deny connections from all hosts.

  For example, a <Deny> tag might look like this:

  ```
  <Deny>hackerSite.com, 87.65.43.21</Deny>
  ```

  As with the <Allow> tag, use IP addresses in the <Deny> tag whenever possible for increased server performance.

- <Order> specifies the order in which to evaluate the preceding <Allow> and <Deny> tags. It can be set to either Deny,Allow (the default) or Allow,Deny.

  When Deny,Allow is specified, the server allows the user specified in <Username> to connect from any host that is not included in the <Deny> tag or is included in the <Allow> tag. Access is denied from any host that is included in the <Deny> tag and is not included in the <Allow> tag.

  When Allow,Deny is specified, the server allows the specified user to connect only from hosts that are included in the <Allow> tag and are not included in the <Deny> tag. Access is denied from any host that is not included in the <Allow> tag or is included in the <Deny> tag.

- <Adaptor> specifies the name of an adaptor in its name attribute. It is a container for one or more <VirtualHost> tag groups that specify the virtual host administrators for each virtual host in the adaptor. You may specify multiple adaptors by adding additional <Adaptor> tag groups to the Server.xml file.

- <VirtualHost> specifies the name of a virtual host in its name parameter. It is a container for a <UserList> tag that defines administrators for the virtual host. The default value is <VirtualHost name="_defaultVHost_"> because the default virtual host included with the server is named _defaultVHost_. The name parameter tells the server which virtual host the enclosed <UserList> tag refers to. A virtual host is defined on the server simply by having a directory inside the adaptor directory that contains a valid Vhost.xml file. If you have more than one virtual host on one or more adaptors on the server, you specify their administrator information with separate sets of <VirtualHost> tags in the Server.xml file.

- The <UserList> tag is a container for one or more <User> tag groups.

- The next <User> tag specifies the name of a virtual host administrator in its name parameter. The user name can contain only alphanumeric characters. The <User> tag contains the same set of password and host-permission tags as the <User> tag in the earlier <Server> tag, but this <User> tag specifies the administrator user information for the virtual host tag that contains it. Virtual host administrators can only perform administration tasks relating to the applications running on their own virtual host. Administration tasks relating to the virtual host itself must be performed by a server administrator.

  You can specify multiple administrator users for a single virtual host by including additional sets of <User> tags in the <UserList> tag for the virtual host.

  Only users defined here and in the earlier <User> tag (in the <Server> section) are allowed to connect to the Administration Console. (For more information, see Using the Administration Console.) Normally, you add and edit virtual host administrator information with the Administration Console. If you edit user names directly in the Server.xml file, you must use only valid XML in the <User> and <Password> tags.

  By default, only the Administration Console requires a valid administrator user name and password when connecting to the server. Other client applications do not require any user name or password unless they are explicitly programmed to do so by the author.

- The <Password> tag specifies the password for the <User> tag that contains it. Its format is the same as the <Password> tag inside the earlier <Server> tag.

- The <Allow> tag inside the <VirtualHost> tag works the same way as the <Allow> tag inside the earlier <Server> tag, but applies only to the <User> tag that contains it.

- The <Deny> tag inside the <VirtualHost> tag works the same way as the <Deny> tag inside the earlier <Server> tag, but applies only to the <User> tag that contains it.

- The <Order> tag inside the <VirtualHost> tag works the same way as the <Order> tag inside the earlier <Server> tag, but applies only to the <User> tag that contains it.
- The <Server> tag near the end of the file contains the <LicenseInfo> tag. This <Server> tag is distinct from the <Server> tag found under the <Admin> tag earlier in the file.
- <LicenseInfo> contains the serial number for the server. The value of this tag is written to the Server.xml file by the server installer during installation.
- <AdminServer> is a container for the <HostPort> tag.
- <HostPort> specifies the port that the Admin Service binds to. The Admin Service is separate from the Flash Communication Server. When administrators connect to the server with the Administration Console, they are connecting to the Flash Communication Admin Service, which in turn connects to the Flash Communication Server. The default value is :1111 (note the colon). Only one port number may be specified in this tag.
- <ServerDomain> specifies the domain name of the server. Set this to the server's domain name so that it can pass the domain name to any application servers it connects to. For security purposes, some application servers require this information as a part of incoming connection requests.

The following set of Server.xml tags has been customized for real-world use. Two server administrators are defined, `root` and `jsmith`. An administrator named `panderson` is defined for two virtual hosts, _defaultVHost_ and www.macromedia.com. The `<Allow>` and `<Deny>` tags are set for all four administrators to allow them to connect only from the IP address 12.34.45.678. The server domain is set to www.macromedia.com.

```
<Root>
  <Admin>
    <Server>
      <UserList>
        <User name="root">
          <Password encrypt="true">WTs5Ka9</Password>
          <Allow>12.34.45.678</Allow>
          <Deny>all</Deny>
          <Order>Deny,Allow</Order>
        </User>
        <User name="jsmith">
          <Password encrypt="true">4flYnH1</Password>
          <Allow>12.34.45.678</Allow>
          <Deny>all</Deny>
          <Order>Deny,Allow</Order>
        </User>
      </UserList>
    </Server>
    <Adaptor name="_defaultRoot_">
      <VirtualHost name="_defaultVHost_">
        <UserList>
          <User name="panderson">
            <Password encrypt="true">jhdAYT2E7</Password>
            <Allow>12.34.45.678</Allow>
            <Deny>all</Deny>
            <Order>Deny,Allow</Order>
          </User>
        </UserList>
      </VirtualHost>
      <VirtualHost name="www.macromedia.com">
        <UserList>
          <User name="panderson">
            <Password encrypt="true">jhdAYT2E7</Password>
            <Allow>12.34.45.678</Allow>
            <Deny>all</Deny>
            <Order>Deny,Allow</Order>
          </User>
        </UserList>
      </VirtualHost>
    </Adaptor>
  </Admin>
  <Server>
    <LicenseInfo>FSW100-12345-67890-54321</LicenseInfo>
    <AdminServer>
      <HostPort>:1111</HostPort>
    </AdminServer>
  </Server>
  <ServerDomain>www.macromedia.com</ServerDomain>
</Root>
```

The Adaptor.xml file

The Adaptor.xml file defines settings for an adaptor. It determines the number of threads that can be used by the adaptor, the communications ports that adaptor binds to, and the IP addresses or domains from which the adaptor can accept connections.

Each adaptor must have its own directory inside the server's conf directory. The name of the directory is the name of the adaptor. Each adaptor directory must contain an Adaptor.xml file. For example, the default adaptor included with the server at installation is named _defaultRoot_, and its directory is found in the \Flash Communication Server MX\conf\ directory.

To change an adaptor's settings, you edit the tags in the Adaptor.xml file.

The Adaptor.xml file contains the following tag structure, along with brief comments for each tag:

```
<Adaptor>
  <ResourceLimits>
    <MaxThreads>100</MaxThreads>
  </ResourceLimits>
  <HostPortList>
    <HostPort>:1935</HostPort>
  </HostPortList>
  <Allow></Allow>
  <Deny></Deny>
  <Order>Deny,Allow</Order>
</Adaptor>
```

The tags in the Adaptor.xml file serve the following purposes:

- `<Adaptor>` contains all the other adaptor configuration tags.
- `<ResourceLimits>` is a container for the `<MaxThreads>` tag.
- `<MaxThreads>` specifies the maximum number of threads to create on the server for processing input/output requests. The default is 100. Increasing this number allows more threads to run concurrently, but also increases the processor workload by requiring more thread-switching operations. Generally you will not need to change this setting. If you do want to change it, test you applications thoroughly to determine the best value.
- `<HostPortList>` is a container for one or more `<HostPort>` tags.

- `<HostPort>` specifies the IP address and one or more port numbers for the adaptor to bind to. The IP address and port number are separated by a colon. If you specify more than one port, separate them with commas.

  For example, a `<HostPort>` tag might look like this:

  ```
  <HostPort>12.34.56.78:1935, 80, 443</HostPort>
  ```

  You can set up the adaptor to listen on more than one IP address by specifying more than one `<HostPort>` tag.

  Flash Communication Server uses port number 1935 by default. You may choose to use another port, such as port 80 (normally reserved for HTTP) or port 443 (normally reserved for HTTPS) if your firewall restricts access to other ports. Whichever port you use, be sure it is set to the "open" state. When you change the port number, you must also change it in the client application's ActionScript `NetConnection` call.

  As a security precaution, when you specify an IP address in the `<HostPort>` tag, the server will not bind to (listen to) localhost. (The term *localhost* refers to the computer the server is running on.) If you do not specify an address, the server will bind to both localhost and the true IP address of the computer it is running on.

- `<Allow>`, `<Deny>`, and `<Order>` serve the same purposes as in the Server.xml file, but indicate permissions specifically for this adaptor.

The following set of Adaptor.xml tags has been customized for real-world use. Up to five threads can be created for the adaptor. The adaptor will bind to ports 1935 and 80 and will accept connections from any IP address.

```
<Adaptor>
  <ResourceLimits>
    <MaxThreads>5</MaxThreads>
  </ResourceLimits>
  <HostPortList>
    <HostPort>:1935, 80</HostPort>
  </HostPortList>
  <Allow>all</Allow>
  <Deny></Deny>
  <Order>Deny,Allow</Order>
</Adaptor>
```

The Vhost.xml file

The Vhost.xml file configures a virtual host within an adaptor. Each virtual host must have its own directory inside the adaptor directory.

The name of the directory must be the actual name of the virtual host, such as streaming.macromedia.com. Each virtual host you define must map to a DNS entry that specifies an IP address on the server computer.

Each adaptor must contain a _defaultVHost_ directory in addition to the custom virtual hosts that you define. If a client application tries to connect to a virtual host that does not exist, the server attempts to connect it to _defaultVHost_.

Each virtual host directory contains a Vhost.xml file. This file contains tags that define the settings for the virtual host. These settings include aliases for the virtual host, the location of the virtual host's application directory, limits on the resources the virtual host can use and other parameters.

The Vhost.xml file contains the following tag structure, with brief comments for each tag:

```
<VirtualHost>
  <AliasList>
    <Alias></Alias>
  </AliasList>
  <AppsDir>C:\inetpub\wwwroot\flashcom\applications\</AppsDir>
  <RecordAccessLog>true</RecordAccessLog>
  <ResourceLimits>
    <MaxConnections>-1</MaxConnections>
    <MaxAppInstances>-1</MaxAppInstances>
    <MaxStreams>-1</MaxStreams>
    <MaxSharedObjects>-1</MaxSharedObjects>
  </ResourceLimits>
  <VirtualDirectory>
    <Streams></Streams>
  </VirtualDirectory>
  <DNSSuffix></DNSSuffix>
  <Allow>all</Allow>
</VirtualHost>
```

The tags in the Vhost.xml file are described below. You can change the values of some of these tags at runtime; to learn how, see the administration API article at Macromedia's website (http://www.macromedia.com/go/flashcom_admin).

- `<VirtualHost>` is the root tag for the XML document. It is a container for all the other tags.
- `<AliasList>` is a container for one or more `<Alias>` tags.
- `<Alias>` allows you to specify an alternative short name to use when connecting to the virtual host. You can use this tag to shorten long host names. You can specify an unlimited number of aliases by adding additional `<Alias>` tags. Each alias you specify must be mapped to the correct IP address for the virtual host.

  For example, if the host name is `machineName.company.com`, then you could use the alias tag to shorten the host name to `machineName`:

  ```
  <Alias>machineName</Alias>
  ```

  Do not use the same alias for more than one virtual host. If more than one virtual host on the same adaptor has the same alias defined, then the first match found will be used by the server. This can cause unpredictable results.

- `<AppsDir>` specifies the path to the flashcom application directory for this virtual host. The application directory must contain a subdirectory for each application that will run on the server. This tag allows you to locate your application directories outside the virtual host directory if you wish. If no application directory is specified, it defaults to C:\Program Files\Macromedia\Flash Communication Server MX\conf_defaultRoot__defaultVHost_\.

  To run on the server, each application must have a directory named with the name of the application inside the flashcom application directory. For example, if you have an application named VideoConference and another named Collaboration and you specify the path C:\MyApps in the `<AppsDir>` tag, then the directories C:\MyApps\VideoConference\ and C:\MyApps\Collaboration\ must exist.

  Be sure to include a directory named admin in each virtual host's flashcom application directory. This ensures that the Administration Console (admin.swf) will be able to connect to the virtual host. For more information, see Using the Administration Console.

  The default Vhost.xml file installed with Flash Communication Server contains your application directory name. If you chose Developer Install during installation, the application path is \flashcom\applications\ under the publishing directory of your web server if you have one installed. If you do not have a web server installed, or if you chose Production Install during installation, the default directory is under C:\Program files\Macromedia\Flash Communication Server MX\flashcom\applications\. The server-side flashcom application directory (containing your ASC, FLV, and FLA files) should be separated from your web root directory when you deploy the server and applications. Only your SWF and HTML files should be inside the web publishing directory.

- `<RecordAccessLog>` indicates whether the server should (`true`) or should not (`false`) record connections to the server. This information is written to an access.flv file in the virtual host's admin\Streams\Logs\ directory inside its application directory.

- `<ResourceLimits>` is a container tag for the next five tags. By specifying values for these five tags, you can ensure that the server does not consume excessive resources for the virtual host, and you can prevent denial of service attacks to the server.

- `<MaxConnections>` specifies the maximum number of simultaneous connections allowed on this virtual host. Connections are denied if the specified limit is exceeded. The default of -1 allows an infinite number of connections. If you supply a different value, it must be a positive integer. If you specify a negative or non-numeric value, the default is used. This value can be changed at runtime.

- `<MaxAppInstances>` specifies the maximum number of application instances that can be loaded by this virtual host. (A chat application, for example, might require more than one instance, because each chat room would be represented by a separate instance of the application on the server.) A Flash movie defines which application instance it is connecting to by the parameters it includes with its ActionScript `connect` call.

  The default value of -1 allows an infinite number of application instances. If you specify a different value, it must be a positive integer. This value can be changed at runtime.

- `<MaxStreams>` specifies the maximum number of streams that the virtual host can create. The default value of -1 allows an infinite number of streams. If you supply a different value, it must be a positive integer. This value can be changed at runtime.

- `<MaxSharedObjects>` specifies the maximum number of shared objects that the virtual host can create. (For more information about shared objects, see *Developing Communication Applications*.) The default value of -1 allows an infinite number of streams. If you supply a different value, it must be a positive integer. This value can be changed at runtime.
- `<VirtualDirectory>` is a container for one or more `<Streams>` tags that specify virtual directories for shared stream resources.
- `<Streams>` allows you to specify a virtual directory for storing stream resources used by more than one application. By using a virtual directory, you can specify a relative path that points to a shared directory used by multiple applications. The contents of this tag must be in the form *`virtualDirectory`*`;`*`actualDirectory`*.

  For example, suppose you specify the following:

  ```
  <Streams>common;C:\FlashComServer\myApplications\shared\resources\</
    Streams>
  ```

  In this case, any application that refers to a stream whose path begins with `common\` will access the item in C:\FlashComServer\myApplications\shared\resources\ regardless of the application's own directory structure. Therefore, if the application VideoConference refers to the item common\video\recorded\June5 and the application Collaboration refers to common\video\recorded\June5, they both actually refer to the item C:\FlashComServer\myApplications\shared\resources\video\recorded\June5.

  If the virtual directory you specify does not end with a backslash, one is added by the server.

  You can specify more than one virtual directory mapping by adding multiple `<Streams>` tags.
- `<DNSSuffix>` allows you to specify a primary DNS suffix for this virtual host, such as myCompany.com or myUniversity.edu. If a reverse DNS lookup fails to return the domain as part of the host name, this tag is used as the domain suffix.
- The `<Allow>` tag lets you specify domain names from which client applications should be allowed to connect to this virtual host. The default value is `all`, which allows connections from any domain. If no value is specified, only connections from the domain that is being connected to are allowed. If you list specific domains in this tag, only connections from those domains are allowed. Separate each domain name in the list with a comma.

The following set of Vhost.xml tags has been customized for real-world use. The alias `stream` is defined for the virtual host. The application directory is set to C:\Inetpub\wwwroot\apps\. The maximum number of simultaneous connections is set to 50. The virtual directory for streams is set to \streamTemp. The domain suffix is set to macromedia.com for reverse DNS lookups. Finally, the virtual host will accept connections from any IP address.

```
<VirtualHost>
  <AliasList>
    <Alias>stream</Alias>
  </AliasList>
  <AppsDir>C:\inetpub\wwwroot\flashcom\applications\</AppsDir>
  <RecordAccessLog>true</RecordAccessLog>
  <ResourceLimits>
    <MaxConnections>50</MaxConnections>
    <MaxAppInstances>-1</MaxAppInstances>
    <MaxStreams>-1</MaxStreams>
    <MaxSharedObjects>-1</MaxSharedObjects>
  </ResourceLimits>
  <VirtualDirectory>
    <Streams>streamTemp</Streams>
  </VirtualDirectory>
  <DNSSuffix>macromedia.com</DNSSuffix>
  <Allow>all</Allow>
</VirtualHost>
```

The Application.xml file

The Application.xml file contains the settings for applications that will run on the server. These settings include, for example, the size of the Server-Side Communication ActionScript runtime engine, the location at which streams and shared objects are stored, and bandwidth limitations.

Each virtual host can contain multiple Application.xml files. The Application.xml file in the virtual host directory configures the default settings for applications within the virtual host. If you want to have different settings for a particular application, it can have its own Application.xml file in its own application directory.

Each tag in the virtual host's Application.xml file can include an optional `override` parameter, as in this example:

```
<LoadOnStartup override="no">false</LoadOnStartup>
```

When this parameter is included in a tag and set to `no`, no application-specific Application.xml files can override that tag's setting. If the tag contains subtags, they also cannot be overridden. When you omit the `override` parameter, the tag can be overridden. Only the `<Client>` tag described in the following text includes an `override="no"` parameter by default.

The Application.xml file contains the following tag structure, with brief comments for each tag:

```
<Application>
  <LoadOnStartup>false</LoadOnStartup>
  <MaxAppIdleTime>1200</MaxAppIdleTime>
  <RecordAppLog>false</RecordAppLog>
  <JSEngine>
    <RuntimeSize>1024</RuntimeSize>
    <GCInterval>20</GCInterval>
    <MaxTimeOut>0</MaxTimeOut>
    <ScriptLibPath></ScriptLibPath>
  </JSEngine>
  <StreamManager>
    <StorageDir></StorageDir>
    <GCInterval>20</GCInterval>
    <EnhancedSeek>false</EnhancedSeek>
  </StreamManager>
  <SharedObjManager>
    <StorageDir></StorageDir>
  </SharedObjManager>
  <Client>
    <Bandwidth override="yes">
      <ServerToClient>25000</ServerToClient>
      <ClientToServer>250000</ClientToServer>
    </Bandwidth>
    <BandwidthCap override="no">
      <ServerToClient>10000000</ServerToClient>
      <ClientToServer>10000000</ClientToServer>
    </BandwidthCap>
  </Client>
</Application>
```

The tags in the Application.xml file perform the following functions:

- `<Application>` is the root tag for the XML document. It is a container for all the other tags.
- `<LoadOnStartup>` indicates whether an application instance is loaded by default when the server starts up. Having an application instance loaded at server startup saves time when the first client connects to that application. The default value is `false`. If you set this tag to `true` in the virtual host's Application.xml file, an instance of each application on the server will be loaded at startup. If you set this tag to `true` in an application's optional Application.xml file, only that application will have an instance loaded at startup.
- `<MaxAppIdleTime>` indicates the number of seconds between the last client disconnection and the unloading of the application instance from the server's memory. The default is 1200 seconds (20 minutes). If this value is set to 0 or less, the default is used.
- `<RecordAppLog>` indicates whether to write the application log to a file. The default value is `false`. If you set this tag to `true`, a log stream file named *applicationName*.flv is created for each application in the virtual host's \admin\Streams\Logs\ directory. (Be sure to include an admin directory in each virtual host's application directory; the server creates the \Streams\ and \Logs\ directories.) Each log file records connections to the application and any error messages that are generated by the server for the application.

  To view the contents of the log stream, you must build a communication application that retrieves the stream file from the server. Because the log files contain no audio or video, they are sent all at once by the server. For more information about creating communication applications, see *Developing Communication Applications.*

- `<JSEngine>` is a container for the next two tags, which control the resource usage of the Server-Side Communication ActionScript engine.
- `<RunTimeSize>` indicates the maximum number of bytes that a particular application instance can use to run server-side ActionScript on the server before garbage collection is performed—that is, before any unreferenced or unused ActionScript objects are purged from memory. The default is 1024K or 1 MB. If you create a client application that requires more than 1 MB of ActionScript memory, this value must be increased. If a new script object is created after garbage collection that will cause the runtime size of the application instance to exceed the value of the `<RunTimeSize>` tag, an out-of-memory error occurs and the application instance is shut down.
- `<GCInterval>` specifies the amount of time that will pass between garbage collection cycles, in minutes. The default value is 20 minutes. If you specify a different value, it must be between 1 and 1440 minutes (24 hours). To keep memory as free of unused objects as possible, set this to a shorter interval. To avoid a brief decrease in performance during garbage collection, set this to a longer interval.

  Because garbage collection is processor intensive, it is recommended that you not set the `<GCInterval>` tag to a value lower than the default.
- `<MaxTimeOut>` indicates the maximum time in seconds that a server-side script function may take to execute. If a script function takes longer than the specified amount of time, it will be stopped by the server. Using this feature increases the processor workload. Setting this tag to a value greater than 0 is useful for debugging scripts during development of your applications. During deployment, it is recommended that you set this tag to the default value of 0, which imposes no limit on the time scripts take to execute.
- `<ScriptLibPath>` allows you to specify a location for scripts other than the default of \flashcom_application_directory\application_name\ or \flashcom_application_directory\application_name\scripts\. The server looks for scripts in the default locations before looking at the path specified in this tag. Do not use quotation marks when specifying the path.
- `<StreamManager>` is a container for the next two tags, which control media streams.
- `<StorageDir>` indicates the directory where streams should be recorded for each application. The default is a directory named Streams in the application's directory. The default is used if no directory is specified. When specifying a directory, use an absolute path.
- The `<GCInterval>` tag inside the `<StreamManager>` tag specifies the interval between purges of unused streams, in minutes. The default is 20 minutes. If you specify a different value, it must be between 1 and 1440 minutes (24 hours). This value can be changed at runtime.
- `<EnhancedSeek>` enables or disables finer seeking performance within streams. When this tag is set to `true`, the server inserts keyframes at the point in the stream where the seek begins if there is no preexisting keyframe there. This results in better visual display while seeking. When this tag is set to `false` (the default), no keyframes are inserted by the server and seeks begin at the nearest existing keyframe.
- `<SharedObjManager>` is a container tag for the `<StorageDir>` tag.

- The <StorageDir> tag inside the <SharedObjManager> tag indicates the directory where shared objects should be stored. The default is a directory named Sharedobjects in the application's directory. The default is used if no directory is specified. When specifying a directory, use an absolute path. (For more information about shared objects, see *Developing Communication Applications*.)
- <Client> is a container for the <Bandwidth> and <BandwidthCap> tags.
- <Bandwidth> is a container for two tags that control the amount of bandwidth to use for upstream (client-to-server) and downstream (server-to-client) data traffic. By default, this tag includes an override parameter set to "yes", which allows both of its subtags to be overridden.
- <ServerToClient> specifies the maximum speed at which the server sends data to the client. The default is 250K (250,000 bytes per second) per client.
- <ClientToServer> specifies the maximum speed at which the client sends data to the server. The default is 250K (250,000 bytes per second) per client.
- <BandwidthCap> is a container for two tags that specify the maximum values that can be used when remotely editing the preceding <ServerToClient> and <ClientToServer> tags inside the <Bandwidth> tag. By default, this tag includes an override parameter set to "no". For more information about editing server configuration remotely, see the Macromedia Flash Support Center at http://www.macromedia.com/support/flash/.
- <ServerToClient> specifies the maximum speed that can be configured remotely for sending data to the client. The default is 10 MB (10,000,000 bytes per second).
- <ClientToServer> specifies the maximum speed that can be configured remotely for sending data to the server. The default is 10 MB (10,000,000 bytes per second).

The following set of Application.xml tags has been customized for real-world use. The `<RecordAppLog>` tag is set to `TRUE`. The runtime size of the JavaScript (JS) engine is increased from the default to 2 MB. The directory for storing server-side scripts is set to C:\FlashComScripts. The storage directory for streams is set to C:\FlashStreams\. The storage directory for shared objects is set to C:\FlashObjs\. The bandwidth limits are set to the defaults.

```
<Application>
  <LoadOnStartup>false</LoadOnStartup>
  <MaxAppIdleTime>1200</MaxAppIdleTime>
  <RecordAppLog>true</RecordAppLog>
  <JSEngine>
    <RuntimeSize>2048</RuntimeSize>
    <GCInterval>20</GCInterval>
    <MaxTimeOut>0</MaxTimeOut>
    <ScriptLibPath>C:\FlashComScripts\</ScriptLibPath>
  </JSEngine>
  <StreamManager>
    <StorageDir>C:\FlashStreams\</StorageDir>
    <GCInterval>20</GCInterval>
    <EnhancedSeek>false</EnhancedSeek>
  </StreamManager>
  <SharedObjManager>
    <StorageDir>C:\FlashObjs\</StorageDir>
  </SharedObjManager>
  <Client>
    <Bandwidth override="yes">
      <ServerToClient>25000</ServerToClient>
      <ClientToServer>250000</ClientToServer>
    </Bandwidth>
    <BandwidthCap override="no">
      <ServerToClient>10000000</ServerToClient>
      <ClientToServer>10000000</ClientToServer>
    </BandwidthCap>
  </Client>
</Application>
```

CHAPTER 4
Understanding Flash Communication Server Security

Macromedia Flash Communication Server MX will typically be used in a network environment where many users will have access to it; by changing its configuration, you can make the server accessible from within a private network, from the public Internet, or both. When deploying any server technology, you will want to consider the implications to both the security of your internal network and the accessibility of the server's host computer.

Flash Communication Server incorporates security features that take these kinds of concerns into account. As a server administrator, you can provide additional security. This chapter describes the security features built into Flash Communication Server as well as additional measures you can take to protect your server.

Additional information about server security can be found in Macromedia's Flash Support Center (http://www.macromedia.com/support/flash/).

Managing server security

Flash Communication Server uses a high-speed TCP/IP protocol called Real-Time Messaging Protocol (RTMP), which is binary and unencrypted. Because the protocol is unencrypted, you must carefully consider the security of your server configuration and the sensitivity of the data you send to and from the server.

Flash Communication Server's default settings at installation provide good security, but as a server administrator, you provide additional settings as you work with the configuration files and manage ongoing file deployment.

Edit the security tags in the XML files. Utilize the limits that can be set in the server's configuration files. Use the following tags in the XML files to enhance the server's security:

- Server.xml

  The <User> tags allow you to specify exactly who can connect to the server with the Administration Console. Only users specified with these tags can connect.

  The <Allow> and <Deny> tags let you specify exactly which domains administrators can connect from. Administrators cannot connect from domains that are not permitted with these tags.

  The <AdminServer>:<HostPort> tag allows you to specify the port of your choice for connecting to the FlashCom Admin Service with the Administration Console. This allows you to use a port that will work with your firewall configuration. The default is port 1111.

  The <ServerDomain> tag lets you specify the domain that the Flash Communication Server is running in so that it can identify its domain to application servers you may want it to connect to.

- Adaptor.xml

  The <ResourceLimits>:<MaxThreads> tag allows you to limit the number of threads to use for processing input/output requests. This prevents denial-of-service attacks from bringing down the server computer itself.

  The <Allow> and <Deny> tags let you specify exactly which domains administrators can connect from. Administrators cannot connect from domains that are not permitted with these tags. In the Adaptor.xml file, these tags indicate permissions specifically for the adaptor.

  The <HostPort> tag allows you to specify the port to use for client connections. This lets you choose a port that works with your firewall configuration. The default is port 1935.

- Vhost.xml

  The <ResourceLimits>:<MaxConnections> tag lets you specify the maximum number of simultaneous connections to allow on the virtual host. This can help denial-of-service attacks using very large numbers of connections. The default is -1, which allows unlimited connections.

  The <ResourceLimits>:<MaxAppInstances> lets you limit the number of application instances that can exist simultaneously on the virtual host. This can help prevent denial-of-service attacks. The default is -1, which allows unlimited application instances.

  The <ResourceLimits>:<MaxStreams> lets you specify the maximum number of streams that can exist simultaneously on the virtual host. This can help prevent denial of service attacks. The default is -1, which allows unlimited streams.

  The <ResourceLimits>:<MaxSharedObjects> lets you specify the maximum number of shared objects that can exist simultaneously on the virtual host. This can help prevent denial of service attacks. The default is -1, which allows unlimited shared objects.

  The <Allow> tag lets you limit connections to the virtual host to only clients who connect from the specified domains.

- Application.xml

  The <JSEngine>:<RuntimeSize> tag lets you limit the amount of memory that can be used by the server-side ActionScript on the virtual host. This can help prevent attacks using very large numbers of scripts. The default is 1024K.

  The <StreamManager>:<StorageDir> and <SharedObjManager>:<StorageDir> tags let you specify the locations for storing streams and shared objects. This allows you to store them in locations outside your web publishing directory and outside your flashcom application directory if you wish.

  The <Bandwidth> tags groups let you specify the maximum amount of data that an application can send and receive.

For more detailed information about the server's XML tags, see Chapter 3, "Configuring Flash Communication Server," on page 25.

Place source and data files carefully. To prevent hackers from gaining access to the source files of your applications, avoid placing sensitive files in your web server's publishing directory. If you have a web server, the Administration Console (admin.swf) and sample applications are installed by default in your web server's publishing directory. During deployment, do not locate Flash Communication Server application source or data files (FLA, FLV, ASC) or the flashcom application directory in the web publishing directory; keep only your applications' SWF and HTML files in the publishing directory.

Protect configuration files. In addition to its communication streams, the server's configuration files should be protected. To ensure that the server's XML files and directory structure cannot be accessed by unauthorized users, place the server computer in a physically secure location and password-protect the operating system so that only the appropriate server administrators have access.

About authentication and authorization

To authenticate (validate) administrators, Flash Communication Server employs several layers of host-based user security. (*Host-based security* refers to security measures that are implemented in the server software itself.) When a user tries to connect to the Administration Console with an administrator user name and password, the server uses the layers of settings in its XML configuration files to determine whether the connection should be allowed. Only administrators who have been explicitly defined can connect to the server to use the Administration Console.

The server authenticates administrators by evaluating the contents of the XML tags in the following order:

1. Server.xml file: <Allow>, <Deny>, and <User> tags. These tags indicate whether a user is allowed to connect to the Administration Console from the current IP address. Administrators can connect only from IP addresses you have specified with these tags.
2. Adaptor.xml file: <Allow> and <Deny> tags. These tags indicate whether a user is allowed to connect to the specified adaptor from their current IP address.
3. Vhost.xml file: <Allow> and <Deny> tags. These tags indicate whether a user is allowed to connect to the specified virtual host from the current IP address.

The server authenticates administrators by comparing their user names and passwords to those defined in the Server.xml file. When you choose these names and passwords, make sure they are not simple ones that can be easily guessed.

To have the server perform authentication of connecting users other than administrators, use the `<Allow>` and `<Deny>` tags in the Adaptor.xml and Vhost.xml files. With these tags you can prevent users from connecting from all domains other than those you specify. The server checks incoming connections against the Adaptor.xml file and then the Vhost.xml file when processing non-administrator connection requests.

To provide administrator *authorization* (assigning permissions), the server uses the Server.xml file. When you define a user as a server or virtual host administrator in this file, the server associates certain permissions with that user. Virtual host administrators can manage only a virtual host—for example, they can reload or disconnect applications on that virtual host. Server administrators can exercise control over all virtual hosts and perform server-level tasks, such as restarting or shutting down the server.

By default, only the Administration Console performs user authorization. When developing your own communication applications, you can decide whether to implement user authorization; some kinds of applications need this capability while others do not. For example, when developing a simple chat application, you might choose to create two different versions of your Macromedia Flash MX client movie. One version might be a chat participant version; another might be a chat moderator version, with additional functionality built in, such as the ability to edit users' posts or disconnect users. Using server-side ActionScript, you can define which uses are able to connect with the moderator version of the movie.

As an additional security feature, the Administration Console actually connects to the FlashCom Admin Service, which then communicates with the server service to perform administration tasks.

Choosing passwords

When choosing passwords, remember to make them as secure as possible. The following guidelines help ensure that a password is secure:

- The minimum length of a password should be 7 characters.
- Passwords should not contain your user name or any part of it (for example: Jane, Doe, Jdoe).
- Passwords should contain three of the following four items: at least one uppercase letter (A-Z), at least one lowercase letter (a-z), at least one numeric character (0-9), and at least one non-alphanumeric character shown here:

  ! _ * # $ % & ; + -
- Passwords should be changed regularly and none of the last five passwords should be reused.

Developing secure applications

If you develop Flash Communication Server applications, there are some strategies you can use to ensure the security of your applications and the data they use.

Confirm the location of the client SWF. When you deploy a Flash Communication Server application, use a server-side script to verify that connecting SWF files are coming from the location you expect (and not from an unknown computer). You can do this by checking the `client.referrer` property of the client object before the server accepts the connection.

For more information about writing server-side scripts, see *Developing Communication Applications*.

Use server-side script precautions. In server-side scripts do not use procedures that can be called by a malicious movie, which could then fill a hard disk, consume the processor, or do other damage. Procedures attached to client objects are particularly vulnerable. Procedures to be aware of include writing to the hard disk without checking the quantity of data being written, procedures that can be infinitely looped, and so on.

Send sensitive data via HTTPS. If you need to send sensitive data such as credit card information, you can use HTTPS to communicate simultaneously between your Flash MX client application and a separate application server that processes the data. To do this, use the ActionScript `getURL` command. (For more information, see the online ActionScript Dictionary in the Flash MX Help menu.)

About privacy

The technology in Macromedia Flash Communication Server MX enables the capture of client audio and video streams. When creating applications, it is your responsibility to comply with all applicable laws, rules, and regulations and to inform the user of privacy rights and your policies in situations such as when the application transports audio or video data across insecure channels or when audio or video data is being recorded for publication. For an example of adding user notification to your sample application, see "Adding a privacy module" in the "Application Development Tips and Tricks" chapter of *Developing Communication Applications*.

Deploying secure applications

When you deploy a Flash Communication Server application, it is important to take steps to ensure that your network is secure.

In addition to the precautions taken during the application development process, it is recommended that you deploy your communication applications in a firewall protected environment. Firewalls provide port-based protection for your network and can be used to prevent connections to the network from specific IP addresses.

You should take precautions when using log files to track server activity, since these files can consume large amounts of disk space over time.

The following two sections describe these precautions in more detail.

About firewalls

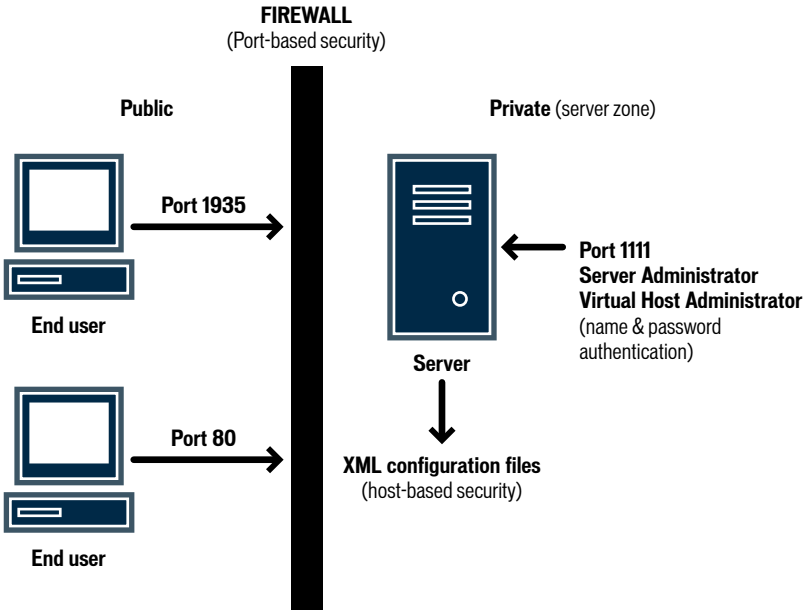
A *firewall* is a combination of hardware and software that controls the flow of information between networks, such as between a company intranet and the wider Internet. Firewalls provide port-based security, meaning they can be configured to allow certain communication ports (1935, 80) to appear "outside" the firewall, making them accessible to external networks.

The port that Flash Communication Server uses should be behind a firewall if it's being used only by users of a private network, such as a corporate intranet. The port should be accessible from outside the firewall if it's meant to be accessible to outside users such as users of the Internet in general.

If the Flash Communication Server and an application server are both behind a firewall, they can communicate with each other and no outside party can eavesdrop on the data to gain access to private information.

You can also configure a firewall to provide additional protection against outside attacks. For example, if the server is being flooded by a particular IP or range of IP addresses, you can configure the firewall to ignore messages from those IP addresses.

The server allows you to strictly control which users can connect to it and where they can connect from. You can also configure a firewall to control the ports users inside and outside your network can connect to.



Log file precautions

A log file is a file that contains information about events that have occurred on the server. When using log files (by specifying `true` for the Vhost.xml file's `<recordAccessLog>` tag and the Application.xml file's `<RecordAppLog>` tag), you are vulnerable to denial-of-service attacks by applications that can fill the hard disk—for example, by making high volumes of connection requests. To prevent this problem, write an operating system script to delete or back up the log regularly.

INDEX

Developing Communication Applications

Macromedia Flash™ Communication Server MX

macromedia®

Acknowledgments

Director: Erick Vera

Producer: JuLee Burdekin

Writing: Jay Armstrong, Jody Bleyle, JuLee Burdekin, Barbara Herbert, and Barbara Nelson

Editing: Mary Ferguson, Anne Szabla

Multimedia Design and Production: Aaron Begley and Benjamin Salles

Print Design, Production, and Illustrations: Chris Basmajian

First Edition: May 2002

Macromedia, Inc.
600 Townsend St.
San Francisco, CA 94103

CONTENTS

INTRODUCTION
About This Manual

Welcome to Macromedia Flash Communication Server MX!

The Flash Communication Server provides the technology to integrate streaming audio, video, and data into a Macromedia Flash MX application using the Macromedia Real-Time Messaging Protocol (RTMP), without requiring users to have anything but the current Macromedia Flash Player. The ability to integrate communication into your Flash MX application supports the development of a wide variety of multiuser collaboration applications, such as chat, webcasts, whiteboards, and multiuser games. The Flash Communication Server also enables scalability, by means of distributing your application's processing among multiple servers, and extensibility, by means of communicating with external sources such as application servers or databases.

Intended audience

This manual is a "how-to" book that takes you, the Flash Communication Server developer, through the steps involved in setting up a development environment and creating Flash Communication Server applications, including debugging and testing applications.

You should already be familiar with Flash MX authoring, ActionScript, and the Flash Player. You should also have some familiarity with JavaScript (because it forms the basis of server-side ActionScript), client-server models, and networking concepts.

About the Flash Communication Server documentation

The Flash Communication Server documentation is designed to be used in with the Flash MX documentation, namely *Using Flash MX* and the Flash MX online ActionScript Dictionary.

This manual explains how to use the Flash MX authoring environment and the Flash Communication Server application programming interface (API) to create communication applications. To develop these applications, you need to write scripts that are contained in your Flash FLA file and, in some cases, scripts that are stored with your application on the server. To do so, you use the objects and methods provided in the Client-Side Communication ActionScript API and Server-Side Communication ActionScript API.

This manual contains a number of sample applications that you can re-create. The samples start simply and increase in complexity, introducing many of the client-side and server-side objects and methods. By following these examples, you can begin writing Flash Communication Server applications right away with Flash MX.

Other Flash Communication Server documentation describes client-side and server-side ActionScript in more detail. All Flash Communication Server documents are available in PDF format (viewable and printable with Adobe Acrobat Reader) and as HTML help. For document locations, see *Getting Started with Flash Communication Server*.

Typographical conventions

The following typographical conventions are used in this manual:

- `Code font` indicates ActionScript statements, HTML tag and attribute names, and literal text used in examples.
- *`Italic`* indicates placeholder elements in code or paths. For example, `attachAudio(`*`source`*`)` means that you should specify your own value for *`source`*; \settings*myPrinter*\ means that you should specify your own location for *myPrinter*.

Additional resources

The Flash Communication Server documentation was written before the code in the product was complete. Therefore, there may be discrepancies between the final implementation of the product's features and how they are documented in this manual. For a list of known discrepancies, see the documentation update website (http://www.macromedia.com/go/flashcom_documentation_update).

The Flash Communication Server Support Center (http://www.macromedia.com/go/flashcom_support) is updated regularly with the latest information on Flash Communication Server, as well as advice from expert users, advanced topics, examples, tips, and other updates.

CHAPTER 1
About Flash Communication Server

Macromedia Flash Communication Server MX, the new platform for interactive personal communication, integrates Macromedia Flash MX multimedia with live audio, video and data streaming over networks, provides a system for storing recorded audio and video streams and shared data objects, and enables the real-time sharing of synchronized distributed data among multiple clients. This technology unites communication and applications, providing audio, video, and data streaming between Macromedia Flash Player 6 clients.

The Flash Communication Server incorporates a number of features that support and enable the creation of next-generation communication applications. In particular, the Flash Communication Server:

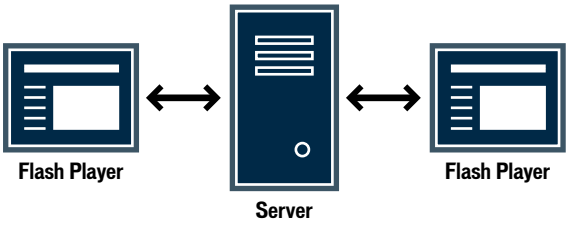
- Provides an efficient, high-performance runtime for executing code, content and communications.
- Integrates content, communications, and application interfaces into a common environment.
- Provides powerful and extensible object models for interactivity.
- Enables rapid application development through components and re-use.
- Enables the use of web and data services provided by application servers.
- Embraces connected and disconnected clients.
- Enables easy deployment on multiple platforms and devices.

Overview of Flash Communication Server architecture

The Flash Communication Server platform is made up of two parts: the server provides the means of communication, and a Flash application (a SWF file that runs in Macromedia Flash Player) provides the end user's interface. You use the Flash MX authoring tool as your development environment to create applications that use Flash Communication Server services. Server-side scripting enables flexible control of shared state information and provides the logic for mediating real-time interactions among multiple users.

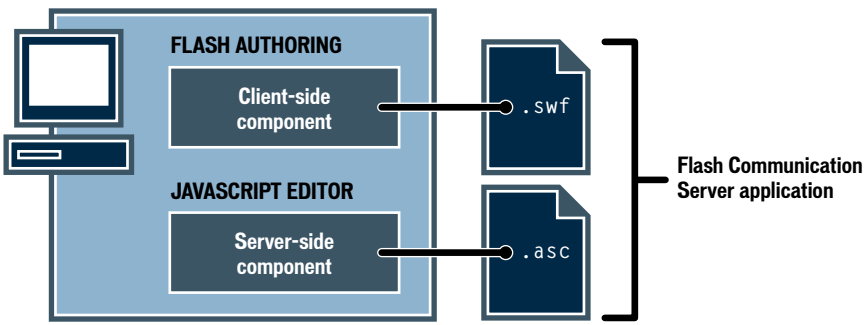
The technology in Macromedia Flash Communication Server MX enables the capture of client audio and video streams. When creating applications, it is your responsibility to comply with all applicable laws, rules and regulations and to inform the user of privacy rights and your policies in situations such as when the application transports audio or video data across insecure channels or when video data is being recorded for publication. For an example of adding user notification to your application, see "Adding a privacy module" on page 60.

Communications pass through the Flash Communication Server and are delivered to the client—the Flash Player on a user's computer—by means of the Macromedia Real-Time Messaging Protocol (RTMP). When a Flash movie uses Flash Communication Server, the player connects to the server, which provides a flow of information, called a *network stream*, to and from the client. Other users can connect to the same server and receive messages, data updates, and audio/video streams



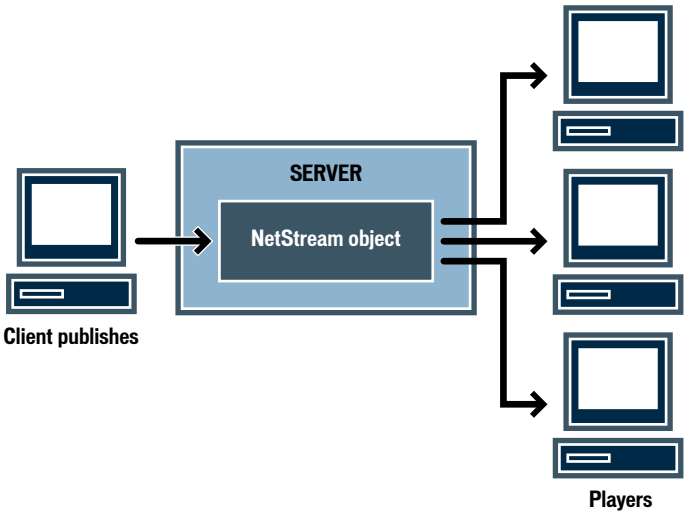
Communications pass through the Flash Communication Server and are delivered to the Flash Player.

As the Flash Communication Server developer, you make this connection happen by working in the Flash authoring environment to create a Flash movie that uses client-side ActionScript commands. The Flash movie is the client element of your application. You can increase the capabilities of your application by using server-side ActionScript. The client-side ActionScript and the server-side ActionScript, combined, form the Flash Communication Server application

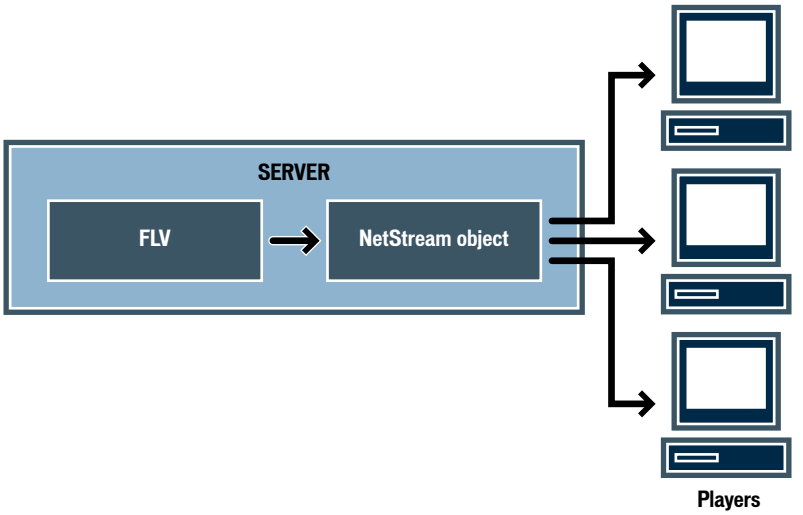


Flash authoring provides an easy way to create audio/visual applications in ActionScript.

The Flash Communication Server lets you stream live media (audio, video, and data) or record data to be played later, as illustrated below.



Live stream



Recorded stream

To create audio/video applications, you must have audio/video capture devices (such as a camera and microphone), Flash MX authoring software, and access to a Flash Communication Server. You can also write applications that don't require audio or video devices, as well as applications that enable communication between Flash Communication Server and application servers or external databases.

The rest of this chapter introduces the objects and files used in Flash Communication Server applications, takes you through the steps involved in setting up your development environment, and shows you how to create your first Flash Communication Server application.

Flash Communication Server objects

As mentioned earlier, Flash Communication Server provides two application program interfaces (APIs): a client-side API and a server-side API. The client-side API provides the following objects: Camera, Microphone, NetConnection, NetStream, SharedObject, and Video. For more information on using these objects, see the *Client-Side Communication ActionScript Dictionary*. The server-side API provides the following objects: Application, Client, NetConnection, SharedObject, and Stream. For more information on using these objects, see the *Server-Side Communication ActionScript Dictionary*.

As you can see, some objects have the same name in both APIs, such as NetConnection. However, a client-side object and a server-side object of the same name don't provide the same functionality. In addition, some client-side objects have server-side counterparts, but others do not. The following sections briefly describe each client-side and server-side object, then explain how some of them work together to allow client-server communications.

Client-side objects

These objects are used only in client-side ActionScript. For more information about these objects, see the *Client-Side Communication ActionScript Dictionary*.

Camera object The client-side Camera object lets you capture video from a video camera attached to the computer that is running the Flash Player. When used with the Flash Communication Server, this object lets you transmit, display, and optionally record the video being captured. With these capabilities, you can develop communication applications such as videoconferencing, instant messaging with video, and so on.

You can also use a Camera object without a server (for example, to view a video feed from a webcam attached to your local system).

Microphone object The client-side Microphone object lets you capture audio from a microphone attached to the computer that is running the Flash Player. When used with the Flash Communication Server, this object lets you transmit, play, and optionally record the audio being captured. With these capabilities, you can develop communication applications such as instant messaging with audio, recording presentations so others can replay them at a later date, and so on.

You can also use a Microphone object without a server—for example, to transmit sound from your microphone through the speakers on your local system.

NetConnection object The client-side NetConnection object allows the Flash client to open a TCP socket on the Flash Communication Server for continuous exchange of data using the Real-Time Messaging Protocol (RTMP). You can also use the NetConnection object to connect to an application server (see Chapter 5, "Connecting through Flash Remoting," on page 85), but this manual focuses on using the NetConnection object to communicate with the Flash Communication Server.

NetStream object The client-side NetStream object opens a one-way streaming connection between the Flash Player and the Flash Communication Server through a connection made available by a client-side NetConnection object. A NetStream object is like a channel inside a NetConnection; this channel can either publish audio, video, and data, using the `NetStream.publish` method, or subscribe to a stream and receive data, using the `NetStream.play` method. You can publish or play live (real-time) data and play previously recorded data. Multiple clients can play a given stream, but a stream can have only one publisher at a time. For information about the creation and storage of recorded streams on the server, see "Recorded stream files" on page 68.

Local shared object Client-side local shared objects let you store information on a user's computer, such as the high score in a game, that can be used later by the same application or by a different application running on that computer. For more information about local shared objects, see "Understanding shared objects" on page 14.

Video object The client-side Video object lets you display streaming video on the Stage. To display a video feed being played or captured through the use of a `NetStream.play` or `Camera.get` command, place a Video object on the Stage and use the `Video.attachVideo` method to attach the feed to the object.

To place a Video object on the Stage:

1. If the Library panel isn't visible, select Window > Library to display it.
2. Add an embedded Video object to the library by clicking the Options menu at the upper right of the Library panel and choosing New Video.
3. Drag the Video object to the Stage and use the Property inspector to give it a unique name.

Server-side objects

These objects are used only in server-side ActionScript. For more information about these objects, see the *Server-Side Communication ActionScript Dictionary.*

Application object The server-side Application object contains information about a Flash Communication Server application instance that lasts until the application instance is unloaded. The Application object lets you accept and reject client connection attempts, register and unregister classes and proxies, and create functions that are invoked when an application starts or stops, or when a client connects or disconnects.

Client object The server-side Client object represents each user's connection to a Flash Communication Server application instance. The Client object can receive messages sent by a client-side `NetConnection.call` command, and can invoke methods of the client-side NetConnection object. You can use the properties of the Client object to determine the version, platform, and IP address of each client. Using the Client object, you can also set individual read and write permissions of various application resources such as Stream objects and SharedObject objects. For more information, see "Implementing dynamic access control" on page 57.

NetConnection object The server-side NetConnection object lets you create a two-way connection between a Flash Communication Server application instance and an application server, another Flash Communication Server, or another Flash Communication Server application instance on the same server. You can also use server-side NetConnection objects to create more powerful applications; for example, you could get weather information from an application server, or share an application load with other Flash Communication Servers or application instances.

Using this object, you can connect to an application server for server-to-server interactions using standard protocols (such as HTTP), or connect to another Flash Communication Server for sharing audio, video, and data using the Macromedia Real-Time Messaging Protocol (RTMP).

You can use Macromedia Flash Remoting with the Flash Communication Server to communicate with application servers such as Macromedia ColdFusion MX, .NET, and J2EE servers. For more information, see the Flash Remoting site (http://www.macromedia.com/go/flashremoting).

Remote shared object. Remote shared objects are created on the client but are also available to the server. They let you share data in real-time between multiple clients, and also store data for later retrieval by the same or different applications. For more information about client-side remote shared objects, see "Understanding shared objects" on page 14.

SharedObject object. Server-side shared objects let you communicate with client-side shared objects and with objects on other Flash Communication Servers. For more information about server-side shared objects, see "Understanding shared objects" on page 14.

Stream object. The server-side Stream object lets you handle each stream in a Flash Communication Server application. The Flash Communication Server automatically creates a Stream object when the `NetStream.play` or `NetStream.publish` method is called in a client-side script. You can also create a stream in server-side ActionScript by calling the `Stream.get` method. A user can access multiple streams at the same time, and there can be many Stream objects active at the same time.

Client-server object communications

The following "object pairs" represent the potential connections you can establish between client-side and server-side objects. For example, when a client-side NetConnection object connects to the server, a server-side Client object is created; this Client object can then call methods of its NetConnection object counterpart.

The following table shows the client-side and server-side objects that are associated with each other.

Client-side object	Corresponding server-side object
`my_nc` (NetConnection object)	`my_client` (Client object or `application.clients` object)
`my_ns` (NetStream object)	`my_server_stream` (Stream object)
`my_so` (remote shared object)	`my_server_so` (server-side shared object)

In the following table, the client-side calls on the left invoke the server-side calls on the right.

Client-side call	Server-side call
`my_nc.connect`	`application.onConnect`
`my_nc.close`	`application.onDisconnect`
`my_nc.call("doThing", myCallbackFcn, 1, "foo")`	`my_client.doThing(1, "foo")`
`my_so.send("doThing", 1, "foo")`	`my_server_so.doThing(1, "foo")`

In the following table, the server-side calls on the left invoke the client-side calls on the right.

Server-side call	Client-side call
`my_client.call ("doThing", myCallbackFcn, 1, "foo")`	`my_nc.doThing (1, "foo")`
`my_server_stream.send ("doThing", 1, "foo")`	`my_ns.doThing (1, "foo")`
`my_server_so.send("doThing", 1, "foo")`	`my_so.doThing(1, "foo")`

Understanding shared objects

Shared objects are a means for sharing data among different clients, among different instances of an application running on the Flash Communication Server, and across applications running on multiple Flash Communication Servers. The Flash Communication Server supports three types of shared objects—local, remote, and server-side. These objects are discussed briefly below. For more information on working with shared objects, see "SharedObject object" on page 80.

Local shared objects

One way to use shared objects is for local storage and retrieval of data. Data is stored on the end-user's computer and may be accessed at different times by one or more Flash applications. Local shared objects can also be non-persistent—that is, available only while the application is running.

Local shared objects don't require a connection to the Flash Communication Server, and are not discussed in detail in this manual. For information about where persistent local shared object data is stored, see "Shared object files" on page 68. For more information about local shared objects, see the `SharedObject.getLocal` entry in the *Client-Side Communication ActionScript Dictionary*.

Remote shared objects

In client-side ActionScript, you can create and reference shared objects that are available to other Flash Communication Server application instances running on the same or different clients. Like local shared objects, these objects can persist on the local computer. However, they can also persist on the server, so that any user who connects to the shared object has access to the same information.

For example, you can open a remote shared object, such as a phone list, that is persistent on the server. Whenever a client makes any changes to the shared object, the revised data is available to all clients that are currently connected to the object or who later connect to it. If the object is also persistent locally and a client changes the data while not connected to the server, the changes are synchronized with the remote shared object the next time the client connects to the object.

Of all the types of shared objects, you will probably use remote shared objects most often in your Flash Communication Server applications. Several of the samples in this manual use shared objects for such tasks as sharing text (see "Sample 2: Shared Text" on page 35) and letting multiple clients manipulate an object on the Stage at the same time (see "Sample 3: Shared Ball" on page 37). For information about where persistent remote shared object data is stored, see "Shared object files" on page 68. For more information about remote shared objects, see the `SharedObject.getRemote` entry in the *Client-Side Communication ActionScript Dictionary*.

Server-side shared objects

As shown earlier (see "Client-server object communications" on page 13), you can use server-side shared objects to communicate with client-side shared objects. In applications that implement connectivity among multiple Flash Communication Servers, you can also use server-side shared objects to share data between the servers. For more information about server-side shared objects, see the `SharedObject.get` entry in the *Server-Side Communication ActionScript Dictionary*.

Applications and application instances

This section discusses where you must place application data that you want the server to find, and also explains how and why to run application instances.

The flashcom application directory

When your Flash application requires the Flash Communication Server, you must place your application data where the server can locate it.

During installation, you choose either a Developer Install or a Production Install of the Flash Communication Server. In both cases, if you don't have a Web server installed, the default directory is C:\Program files\Macromedia\Flash Communication Server MX\flashcom\applications for both client-side application files—SWFs and HTMLs—and server-side application files—ASC files, recorded stream (FLV) and remote shared object (FSO) files, and your FLA source files.

- If you choose Developer Install, you can specify a different default directory during installation, but Flash Communication Server will expect to find both client-side and server-side files in subdirectories this directory. The advantage of choosing Developer Install is that you can run the samples and test your applications from a single directory in the \flashcom\applications directory that has the same name as your application. That is, for convenience during development, client-side application files are stored in the same directory with your server-side application files.
- If you choose Production Install, you can specify a different default directory for client-side files and a different default directory for server-side files. Flash Communication Server will know where to look for the files it needs. The advantage of choosing Production Install is that your client-side application files can be accessible through a web server, while your server-side application files will not be accessible to a user browsing your Web site.

For organizational purposes during your development work, it's convenient to store all your client and server application files (FLA, SWF, HTML, and ASC) in this subdirectory. When you deploy your application, you can place your SWF and HTML files in any location. However, the chat_App subdirectory must remain on the server, along with any ASC files used by the application. The server-side files (your ASC, FLV, FSO, and FLA files) should not be in your web root directory when you deploy the server and applications. Only your SWF and HTML files should remain inside the web publishing directory.

If you chose Developer Install and then want to deploy your applications on the same machine, you'll want to separate client files from your server-side files. To do so, you can either reinstall the server (choosing Production Install) and then relocate your files to the appropriate locations, or you can change the configuration settings in the administration XML files as described in *Managing Flash Communication Server* and then relocate your files to the appropriate locations.

In all cases, you must create a directory in the server-side directory that has the same name as the application you connect to when issuing the `NetConnection.connect` command.

For example, suppose you have an application called chat_App:

```
NetConnection.connect("rtmp://myServer.myDomain.com/chat_app")
```

You must create a subdirectory named chat_App in your server-side flashcom application directory. Suppose also that this application uses some server-side scripting stored in a file called main.asc. You must place main.asc in this same directory.

Note: You must create a subdirectory that matches your application name even if you have no server-side script files to place there. This is because Flash Communication Server stores any stream or shared object files created by your application in subdirectories of this directory (see "File types and paths" on page 67). Also, the existence of this directory tells the Flash Communication Server that the application is authorized and that users can connect to instances of this application.

Using application instances

To distinguish among different instances of a single application, pass a value for *instanceName* to your NetConnection.connect command. For example, you may want to give different groups of people access to the same application without having them interact with each other. To do so, you can open multiple chat rooms at the same time, as shown below.

```
my_nc.connect("rtmp://myServer.myDomain.com/chatApp/room_01")
my_nc.connect("rtmp://myServer.myDomain.com/chatApp/room_02")
```

Another reason to use application instances is to avoid collision of recorded streams or shared objects that are created by the application. In the above example, for instance, any streams or shared objects created by room_01 are distinct from those created by room_02, and vice versa, even though both instances are running the same application, chat_App.

For example, although the support application in the following code creates two shared objects named CustomerInfo, each instance of the support application has access only to its own CustomerInfo object. Also, the data in CustomerInfo used by session1 is different from the data in CustomerInfo used by session2.

```
// One instance of application "support"
first_nc = new NetConnection();
first_nc.connect("myserver.mydomain.com/support/session1");
first_so = SharedObject.getRemote("CustomerInfo", first_nc.URI, false);
first_so.connect(first_nc.URI);


// Another instance of application "support"
second_nc = new NetConnection();
second_nc.connect("myserver.mydomain.com/support/session2");
second_so = SharedObject.getRemote("CustomerInfo", second_nc.URI, false);
second_so.connect(second_nc.URI);
```

Many of the samples in this manual use the instance name room_01. However, you can use any string for an instance name that makes sense in your application. For an example of dynamically creating an instance name, see “Sample 5: Text Chat” on page 41.

For more information on using instance names, see the NetStream.publish entry in the *Client-Side Communication ActionScript Dictionary*. For information on making remote shared objects available to multiple applications, see the SharedObject.getRemote entry in the *Client-Side Communication ActionScript Dictionary*.

File types used by Flash Communication Server

In addition to the file types created and used by Flash MX (FLA, SWF, and SWD), Flash Communication Server uses or creates the following file types:

- ASC—server-side script files that you write
- FLV and IDX—recorded streams and their associated index files
- FSO, SOL, and SOR—shared objects that are persistent on the client, the server, or both

You use a JavaScript editor to write ASC files, which you must place in your application directory; this is illustrated in many of the sample applications in this manual. For more information about creating ASC files, see “Setting up your development environment” on page 17. For information on where Flash Communication Server stores stream and shared object files, see “File types and paths” on page 67.

Setting up your development environment

To write Flash Communication Server applications, you must install the Flash MX authoring software, Flash Communication Server, and the latest Flash Player. If you want to write applications that capture audio or video, you also need to install a microphone or camera. Additionally, if your application requires server-side scripts for your Flash Communication Server applications, you'll need a UTF-8 JavaScript editor, such as Macromedia Dreamweaver MX. Each of these elements of the development environment is discussed in this section.

Flash MX authoring software If you haven't already installed Flash MX, see *Getting Started with Flash Communication Server*.

Flash Communication Server software If you haven't already installed the server, see *Getting Started with Flash Communication Server*.

Flash Player Make sure that you are using the latest version of the Flash Player. To download the latest version, go to the Macromedia Flash Player Download Center (http://www.macromedia.com/go/getflashplayer).

Camera and microphone To install a camera or microphone, follow the instructions that accompany your device. For a list of cameras that are known to be compatible with Flash Communication Server, see the documentation on camera compatibility on the Macromedia website (http://www.macromedia.com/go/camera_compatibility). Cameras that aren't on this list may be compatible with Flash Communication Server, but haven't been tested by Macromedia.

Many cameras contain a built-in microphone. You can also install a separate microphone, or for best results, a microphone/headset combination.

After you've installed your devices, you can specify which camera or microphone Flash should use by default. Right-click (Windows) or Control-click (Macintosh) while any Flash MX movie is playing, choose Settings from the context menu, click the Microphone or Camera panel, and select your preferred device from the pop-up menu.

Using a JavaScript editor You can use any text editor to write server-side ActionScript code, which you'll store in files with an extension of .asc. You may prefer to use software specifically designed for writing web-based applications, such as Macromedia Dreamweaver MX, which offers syntax highlighting and code hinting for ASC files.

If you want to include non-ASCII text in your server-side scripts, such as double-byte characters used in Asian languages, you must use an editor that supports UTF-8 encoding. The Flash Communication Server requires UTF-8-encoded ASC files in order to pass double-byte characters from one client to another. For more information on setting up Dreamweaver MX for double-byte languages, see "Writing double-byte applications" on page 57.

Connecting to the server

To connect to a Flash Communication Server, you first start the service and then issue `new NetConnection` and `NetConnection.connect` commands in your client-side script. These tasks are discussed briefly in this section. For more detailed information, see the *Client-Side Communication ActionScript Dictionary*.

Starting the service

During server installation, you might have chosen to start the service automatically. If you did, the service will be started whenever the server machine is started, and you don't need to start it manually. If you did not, you can start the server from the Windows Start menu: choose Programs > Macromedia Flash Communication Server MX > Start Service. On Windows, to confirm that the service is running, open the Task Manager and make sure both FlashCom.exe and FlashComAdmin.e are listed in the Processes tab.

Opening a connection to the server

Open a new file in the Flash authoring environment, and then add the client-side ActionScript commands to connect to the server.

To use ActionScript to connect to the server:

1. In a new Flash movie, begin opening a connection to the Flash Communication Server by issuing the following command:

   ```
   my_nc = new NetConnection();
   ```

2. Follow this command with a `connect` command:

   ```
   my_nc.connect(targetURI);
   ```

   In this basic syntax for `NetConnection.connect` (omitting optional parameters), *`targetURI`* is the Uniform Resource Identifier (URI) of an application on the Flash Communication Server that should run when the connection is made. To specify *`targetURI`*, use one of the following formats (items in brackets are optional):

   `rtmp:[port]/appName[/instanceName]` (acceptable if the movie and the Flash Communication Server are on the same computer)

   `rtmp://host[:port]/appName[/instanceName]`

   Note that in both syntax examples for *`targetURI`*, you must specify `rtmp` (the Real-Time Messaging Protocol) as the protocol for the connection. If you omit it, the Flash Player assumes you want to make an HTTP connection to an application server, and your connection will fail.

   If the server is running on your local machine, you can use `"localhost"` as the host name in the URI; this is often convenient during application development.

For example, the following code uses the `new NetConnection` constructor to create a new connection object. Then, the object is connected to the server with the call to `my_nc.connect`.

```
// Makes a new connection object
my_nc = new NetConnection();

// Connects to the instance named appInstance
// of the application named appName
// located on the Flash Communication Server
// that is running on myServer.myDomain.com
my_nc.connect("rtmp://myServer.myDomain.com/appName/appInstance");
```

Writing your first application

The Flash Communication Server installation includes a sample application called doc_connect that transmits text through the server between two clients. By viewing the source file and then recreating the application yourself, you'll learn how to write a simple Flash Communication Server application. This example is included only to illustrate how easy it is to implement client-server communication using Flash Communication Server. Before starting to write your own programs, see Chapter 2, "About Flash Communication Server Applications," on page 23.

Examining the sample connection application

The doc_connect application shows how to initialize a movie, connect to the server, and publish and play a stream. It also explains where to save your sample files.

Note: These instructions assume that the service is running. For information on starting the service, see "Starting the service" on page 18.

To view the source file:

Open the doc_connect.fla file located in the \Macromedia\Flash MX\flashcom_help\help_collateral\doc_connect directory.

To see the sample in action:

1. Create a directory named doc_connect in the flashcom application directory (by default, the application directory is Flash Communication Server MX\flashcom\applications).
2. Open the doc_connect.swf file located in the \Macromedia\Flash MX\flashcom_help\help_collateral\doc_connect directory.

Note: If the application doesn't seem to be working, make sure the service is running; see "Starting the service" on page 18.

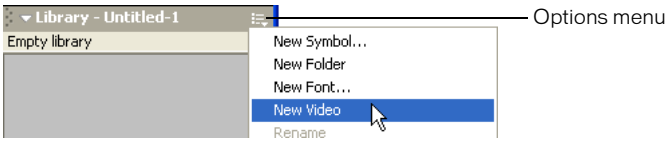
After allowing access to the audio and video devices, you see two images: the live stream from the camera and the published stream sent back from the server.

Recreating the sample

This sample assumes you are using the Flash MX authoring environment on the computer that is running the Flash Communication Server. If you aren't, substitute your server URL for "localhost" in the following steps. The sample also assumes that the service is running.

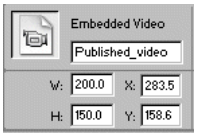
To create the user interface for this sample:

1. In the Flash authoring environment, select File > New to open a new file.
2. If the Library panel isn't visible, select Window > Library to display it.
3. Add an embedded Video object to the library by clicking the Options menu at the upper right of the Library panel and choosing New Video.



4. Drag two embedded Video objects from the library onto the Stage and, in the Property inspector, name them `Live_video` and `Published_video`.

5. Resize the `Published_video` video object to 200 x 150.



6. If you haven't already done so, create a directory named doc_connect in your flashcom application directory. Save the file as doc_connect.fla in this directory. (By default, the application directory is Flash Communication Server MX\flashcom\applications).

To write the ActionScript for this sample:

1. Select the keyframe (frame 1) in the Timeline and open the Actions panel (Window > Actions).

   Note: While re-creating the sample, make sure all of the ActionScript is attached to this first keyframe, and not to the objects you create on the Stage.

2. Get the default camera and attach it to the `Live_video` embedded video object.

```
client_cam = Camera.get();
Live_video.attachVideo(client_cam);
```

3 Create a connection function that connects to the Flash Communication Server, displays a trace message indicating whether the connection was successful, and opens and instance of the doc_connect application named room_01. Remember, you must specify the Real-Time Messaging Protocol, `rtmp`.

```
function doConnect() {

  client_nc = new netConnection();
  client_nc.onStatus = function(info) {
    trace("Level: " + info.level + "   Code: " +  info.code);
  }
  client_nc.connect("rtmp://localhost/doc_connect/room_01");

}
```

Note: If your SWF is on the same computer that is running the Flash Communication Server, you can use rtmp:/doc_connect/test as a shortcut version of rtmp://localhost/doc_connect/test. This usage indicates a relative path and lets you move the files to a different server without changing the code. Also, remember that if you aren't using the Flash MX authoring environment on the computer that is running the Flash Communication Server, substitute your server URL for "localhost".

4 Create a function to publish the video by creating a network stream `out_ns`, attaching the camera to that stream, and then publishing the stream as `myTestStream`.

```
function publishMe() {

  out_ns = new netStream(_root.client_nc);
  out_ns.attachVideo(client_cam);
  out_ns.publish("myTestStream");

}
```

Note: The statement `out_ns.publish("myTestStream")` omits the optional parameter *`howToPublish`*. When this parameter is missing, the server automatically publishes the stream as live (that is, the stream is not recorded while it is being published).

5 Create a function to play the published stream by creating a second network stream `in_ns`, attaching the contents of that stream to the `Published_video` video object, and then playing the stream named `myTestStream` that is being published by the server.

```
function playMe() {

  in_ns = new netStream(_root.client_nc);
  Published_video.attachVideo(in_ns);
  in_ns.play("myTestStream");

}
```

6 Write the commands to call the functions you just created.

```
// Connect to the server
doConnect();

// Publish the live stream
publishMe();

// Play back the stream from the server
playMe();
```

7 Save the file.

To test your sample application:

1. Choose File > Publish Settings, select Flash and HTML, click Publish, and then click OK.
2. Choose Control > Test movie.

   You see two video windows on the Stage, each displaying the same image.

3. To see how the movie looks in a browser, choose File > Publish Preview > Default, or press Control+F12 (Windows) or Command+F12 (Macintosh).

Congratulations, you've just created and tested your first Flash Communication Server application! This sample, of course, is for instructional purposes, and has both streams displayed in a single movie. In a real application, one movie would publish the video feed and another movie would play it.

This sample was included to show how just a few lines of code can implement client-server communications using Flash Communication Server. Before you begin writing your own scripts, be sure to read through the conceptual information provided in Chapter 2, "About Flash Communication Server Applications," on page 23, which provides an important overview of the objects available to you as a Flash Communication Server developer.

CHAPTER 2
About Flash Communication Server Applications

With a few lines of code, your Macromedia Flash MX application (SWF) can communicate with another client through the Macromedia Flash Communication Server MX. Using object-oriented programming techniques and sound programming practices, you can write simple ActionScript code to get started right away.

This chapter explains some ideas behind Macromedia Flash Communication Server MX and describes the types of files you'll generate. An overview of the ActionScript objects specific to Flash Communication Server is also described here.

About Flash Communication Server services

You should be familiar with writing the instructions for a Flash application in a FLA file and publishing it as a SWF file. When you run the SWF file, the Flash Player processes the instructions. If these instructions do not include any calls to a Flash Communication Server, the player relies on all of the technology within the player itself to execute each step. As soon as you make a Flash Communication Server call in your ActionScript, however, the player sends that request to the server.

After you use `new NetConnection` to create an instance of the NetConnection object, the first call you make to the server is `NetConnection.connect`, which tells the player to connect to an application on the server. The Flash Communication Server requires the use of the Real-Time Messaging Protocol (RTMP):

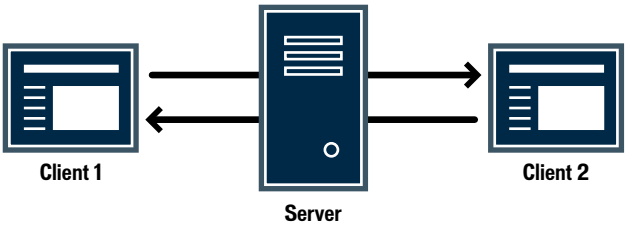
```
my_nc = new NetConnection();
my_nc.connect("rtmp://myFlashComServer/myAppName/instanceName");
```

Once your Flash application issues this command (and succeeds in connecting to the server), it has become a client-server application, and the instance of your Flash application running in the player is referred to as the *client.*

Common client-server workflows

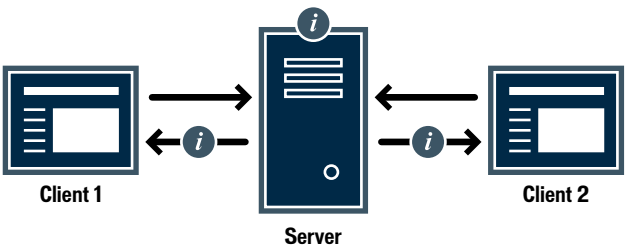
After the connection is established, the services provided by the server depend, in part, on what the client expects. Four common scenarios are described below.

Passing data between clients In Chapter 1, the sample connection application (see "Writing your first application" on page 19) connected to the server, opened a stream to publish some video, and opened another stream to receive the data (play back the video). The only thing the server was expected to do was to pass the video data through and back to the client. (In a real-life scenario, of course, the video data would pass through the server to a different client at another location.)



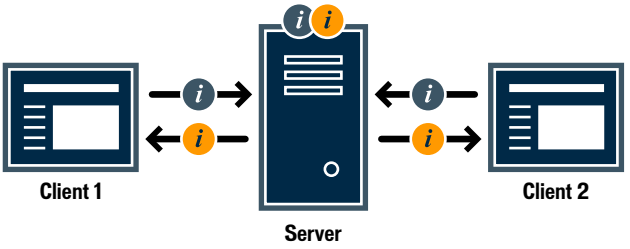
The Flash Communication Server provides a channel of communication for clients.

Storing data for delivery to clients The Flash Communication Server can store information that is useful to multiple clients—for example, a recorded video or the high score in a multiuser game. Many samples in this manual rely on the server to store information. (For more information on where data files are stored, see "File types used by Flash Communication Server" on page 16.)



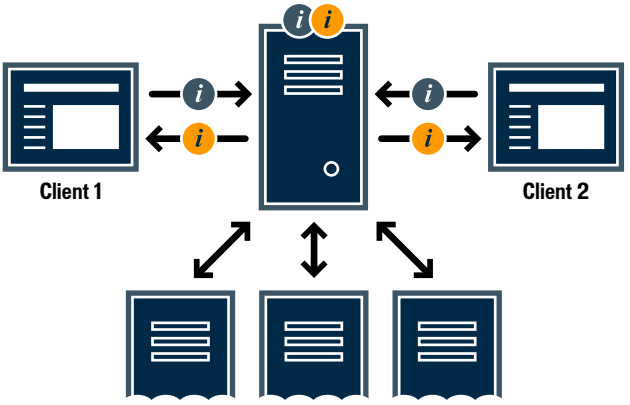
The Flash Communication Server stores information that is useful to one or more clients.

Tracking client information You can use server-side ActionScript to collect and display information regarding clients, transform data, moderate the communication, test conditions, notify using e-mail and other means, and provide many other services. For example, later you'll work through samples that not only rely on the server to route information, but also expect the server to keep track of client information. When you expect the server to provide some application logic and return a result, you must provide the instructions in the form of server-side ActionScript commands.



The Flash Communication Server processes information and sends it back to the client.

Connecting to external sources You can also use server-side ActionScript to develop applications that interact with other servers; for example, your application might access a database, and application server, or another Flash Communication Server. In this way, server-side ActionScript can be used to add dynamic content to your application.



The Flash Communication Server communicates with other services.

The Flash Communication Server design model

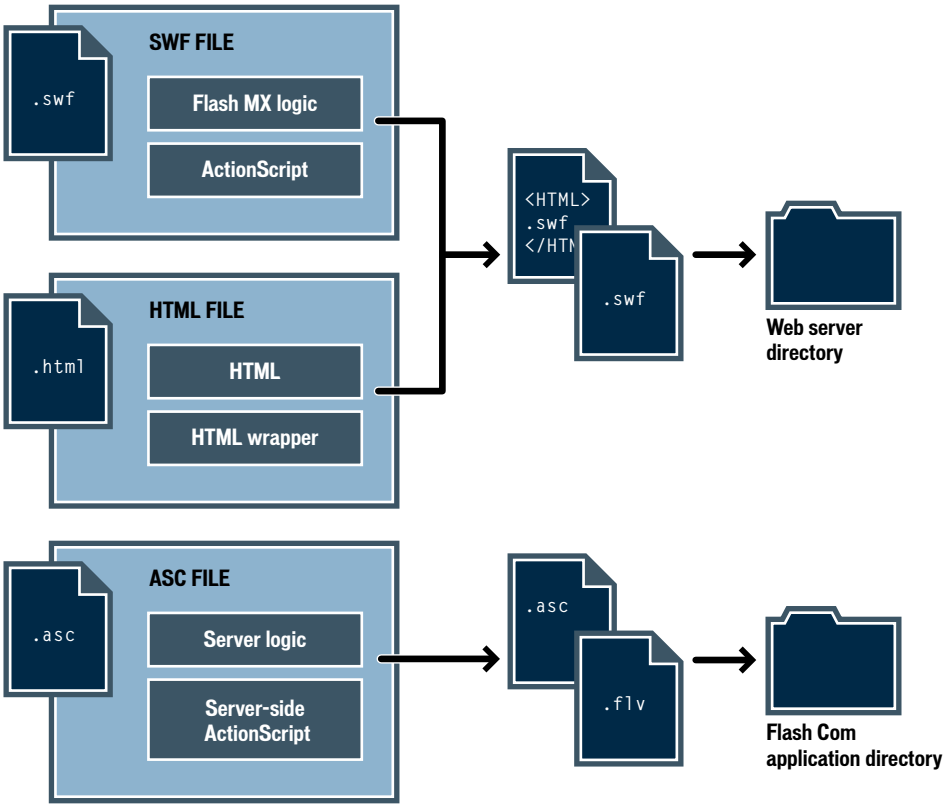
In traditional client-server architecture, the client code provides the presentation layer, and the server code enhances and organizes the experience using behind-the-scenes actions. For example, server-side scripts in traditional web applications are most frequently used for some kind of *transaction*; the client makes a request, the server does a database lookup or some resource-based calculation, and then returns a result to the client.

While you can use the Flash Communication Server server-side scripting language to implement transactions, either internally or by communicating with an external server or data source, the core use of Flash Communication Server is handling *interactions*—coordinating the actions of multiple, connected applications and transmitting server-side data.

The rest of this section discusses the Flash Communication Server in the context of managing client-server and client-client interactions. You should already be familiar with the workflow of ActionScript as described in *Using Flash MX*. If not, see "Understanding the ActionScript Language" in *Using Flash MX*.

Flash Communication Server workflow

This manual uses Flash Communication Server sample applications to demonstrate all the steps involved in writing, testing, and deploying Flash Communication Server applications. In general, however, the workflow is simple: it consists of adding client-side ActionScript to your Flash application, using server-side ActionScript if necessary, and publishing your files in your flashcom application directory. (By default, Flash MX automatically generates an HTML wrapper file when you select File > Publish.)

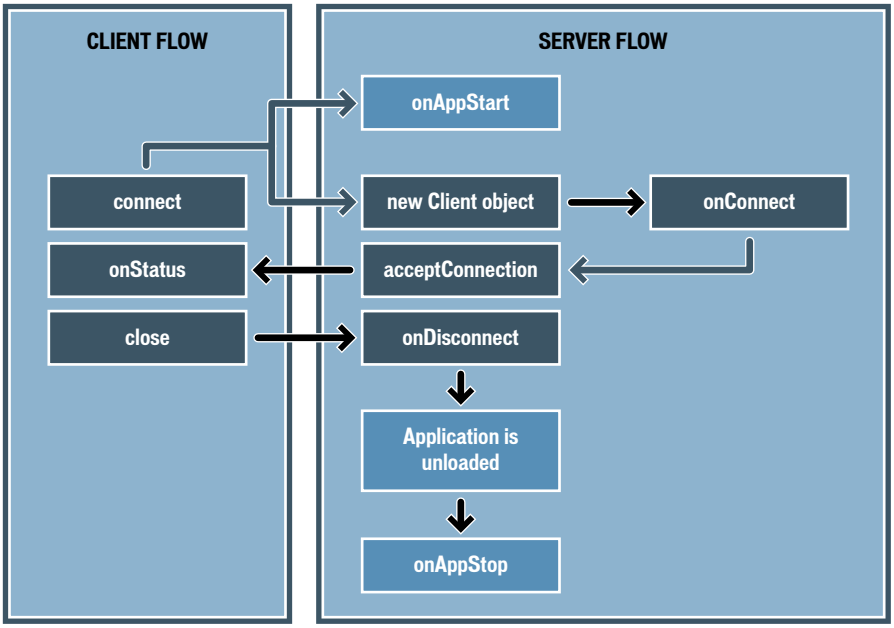


When the user runs your Flash SWF file and the SWF file connects to the server, the server loads the application and creates the application instance if it isn't already running. The server accepts the connection, creates a new Client object to represent the client application on the server, and executes any server-side scripts that you have provided. The client also does its work, initiating streams, sharing objects, and so on. The following sections describe this sequence of events in more detail.

Note: Only the client application can initiate a communication session, and only the server can shut down an application. Both the client and the server send and receive status messages, open and close streams, save and share data, and end the network connection.

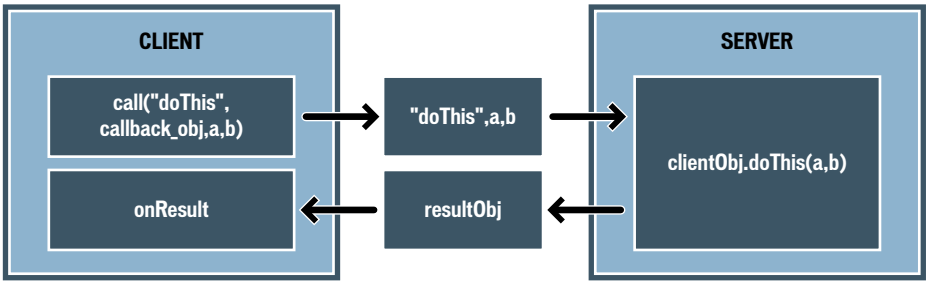
Application workflow

When the client connects to the server, the server calls `onAppStart` if the application instance isn't already running. Next, the server-side `onConnect` method is invoked with a newly created Client object. The logic in this method determines whether to accept or reject the connection. Back on the client side, the `onStatus` method is called to report whether the connection was accepted or rejected. When the client closes the connection, the server-side `onDisconnect` method is called. When the application is unloaded, `onAppStop` is invoked.



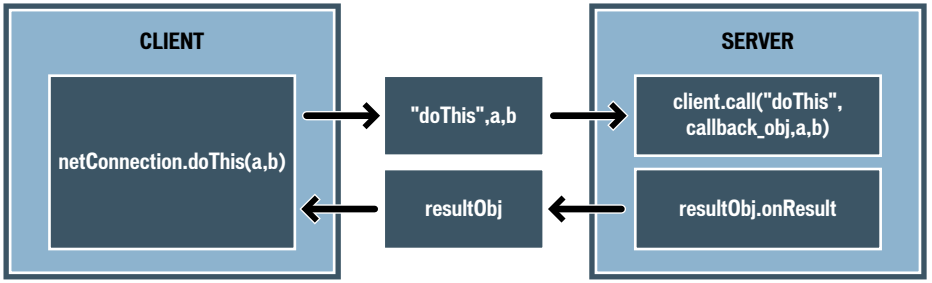
Connection flow

After a successful connection, the client makes a call on the connection. If the client needs a result returned, the client provides a callback object to hold the result. On the server, the method corresponding to the client call is invoked; and a result is returned to the client. The client has an `onResult` handler that is called on the callback object passed in.



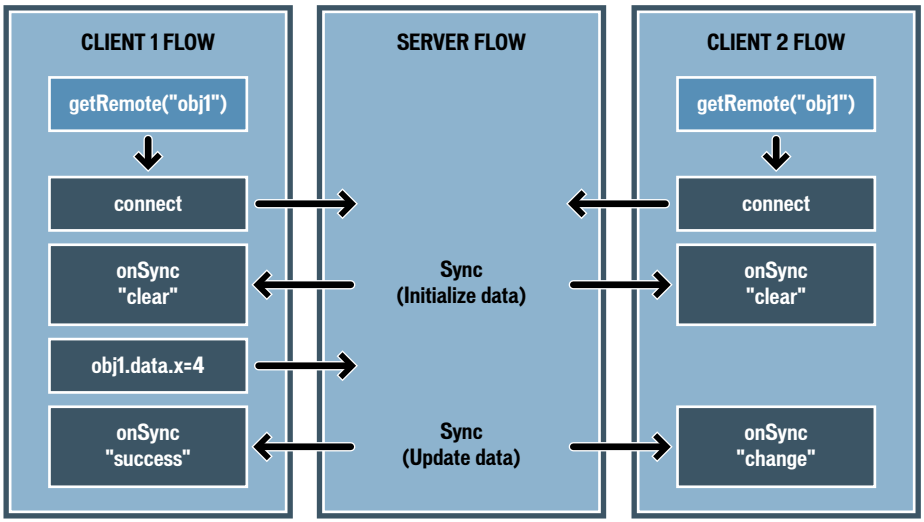
Call flow from client to server, with result passed back to client

Conversely, if a server makes a call to the client, it can provide a callback object. The client should contain a method corresponding to the one called by the server code. Again, the client can return a result, and the server's `onResult` handler is called on the callback object sent to the client.



Call flow from server to client, with result passed back to server

Finally, here's an overview of the remote shared object flow. A Flash client movie subscribes to a remote shared object by issuing a `SharedObject.getRemote` command, and provides a `SharedObject.onSync` method with it. The client then connects the remote shared object to the NetConnection object by issuing a `SharedObject.connect` command. The server sends out a synchronization message for the shared object, but no method on the server side is invoked. This synchronization message causes the `SharedObject.onSync` method on the client to be called. When the client, the server, or any other movie instance makes a change to the shared object, the server again sends out a synchronization message for the shared object. Again, no server method is called, and the synchronization message from the server causes the `SharedObject.onSync` method on each client to be called.



Shared object flow

Designing Flash Communication Server applications

Now that you have a basic understanding of the structure and capabilities of Flash Communication Server, you need to consider how to design your own applications to best take advantage of client-side and server-side scripting.

When designing a Flash Communication Server application, determine what capabilities it will have, what it requires of the server, and whether the application's capabilities call only for client-side ActionScript or for server-side ActionScript as well. If you want the server to act as a conduit for your audio, video, and text streams, you might need only client-side ActionScript; if you want the server to process data, you'll need to write server-side ActionScript as well.

Although building client-server applications may seem complicated, in many cases it is easier to write a small amount of server-side code than it is to handle everything in client-side code. (Of course, in some cases, only server-side code can accomplish certain tasks.) For example, server-side scripts can act as a "gatekeeper" for your application; by setting certain data on the server, you can eliminate race conditions (multiple clients attempting to perform the same task at the same time) and may eliminate the need for client-side code to handle conflict resolution.

When designing your application, note the functionality used on both the client and the server. For a description of how to use the client-side and server-side objects to fulfill the requirements on both sides, see the *Client-Side Communication ActionScript Dictionary* and the *Server-Side Communication ActionScript Dictionary*.

In general, when you write your ActionScript code, you divide it as follows:

- On the client side, write code for connecting, streaming data, getting and setting shared object data, getting status information, and disconnecting.
- On the server side, write code for listening for when an application starts, accepting a connection, providing methods to be invoked by clients, getting and setting shared object data, getting status information, and listening for when an application stops and a connection ends. In more advanced applications, you might also be connecting to external databases, application servers, or other Flash Communication Servers.

For a simple illustration of using client-side and server-side ActionScript in your application, see "Sample 4: Hello Server" on page 38. For more detailed suggestions on how to design and implement your Flash Communication Server applications, see Chapter 4, "Application Development Tips and Tricks," on page 51.

CHAPTER 3
Sample Applications

This chapter provides examples of a number of Macromedia Flash Communication Server MX programming techniques, and illustrates how to use many of the Flash Communication Server objects. These samples are different from the ones provided in the flashcom application directory, although certain concepts are illustrated in both sets of samples. In general, the samples in this chapter are simpler than a full-blown application would be; they have been designed specifically to illustrate certain features in context.

About the samples

The samples in this chapter are progressive: skills shown in later samples rely on information you gain from working with the prior samples. If you're not sure how to proceed with a step, check an earlier sample. You can read more about the commands used here in the *Client-Side Communication ActionScript Dictionary* and the *Server-Side Communication ActionScript Dictionary.* For the core ActionScript commands, see the online ActionScript Dictionary in Macromedia Flash MX.

Each sample section provides an overview of the sample, a description of the user experience, a procedure for creating the user interface and the ActionScript code, and a suggested methodology for testing your application.

Files associated with the samples (FLA, SWF, HTML, and ASC) are located in subdirectories of the \Macromedia\Flash MX\flashcom_help\help_collateral directory.

Creating your working environment

This section explains what you need to know before trying to re-create any of the samples.

Make sure the server is running. The samples assume that the Flash Communication Server is running. For more information, see "Starting the service" on page 18.

Specifying the server URI. The samples assume you're using the Flash MX authoring environment on the same computer that is running the Flash Communication Server. If that isn't the case, add your server name to all the `connect` commands in the samples. For example, if your server is running at *`myServer.myDomain.com`*, change a line like this:

```
new_nc.connect("rtmp:/doc_record/room_01");
```

to this:

```
new_nc.connect("rtmp://myServer.myDomain.com/doc_record/room_01");
```

Note: Be sure you use two slashes (//) after `rtmp:` in the revised code. The use of a single slash is supported only when the SWF application and the Flash Communication Server are running on the same machine.

Specifying publishing formats. You should have Flash MX configured to publish both SWF and HTML files. To specify formats to be created during publishing, choose File > Publish Settings in the Flash MX authoring environment.

Writing client-side ActionScript code. Unless otherwise noted, your client-side ActionScript code should be attached to a layer on the first keyframe of your FLA file, not to individual objects.

Writing server-side ActionScript code. For the samples that use server-side ActionScript code, your main.asc file should be written in a JavaScript editor, such as Macromedia Dreamweaver MX. For more information on appropriate JavaScript editors, see "Setting up your development environment" on page 17. Also, remember that server-side code is case-sensitive.

Initializing your client-side code. Add the following code as the first two lines in each sample as you re-create it (these lines are in each sample FLA but are not included in the steps for re-creating the sample):

```
stop();
#include "netdebug.as"
```

The first line simply ensures that movies stop running before the sample starts. The second line enables the use of the NetConnection debugger, which lets you trace and diagnose details about the streams and shared objects your application is using. For more information on the debugger, see "Using the NetConnection Debugger" on page 105.

Acknowledging the user's right to privacy. Before recording or broadcasting anyone's image or voice, it's important to inform that person of your intention and to gain their consent or agreement. In the samples that illustrate how to record or broadcast audio or video, you'll see instructions to add a text box that informs users they are being recorded or broadcasted and gives them the opportunity to exit the application. For a more robust means of letting users decide whether they want to be recorded or broadcasted, or not, see "Adding a privacy module" on page 60.

Monitoring running applications. If you have server administration privileges, you can view details about an application while you are testing it, such as log messages it is generating, values of shared objects, and so on. To do so, open the Communication App inspector in Flash MX (Window > Communication App Inspector), connect to the Flash Communication Server, select the application instance you want to monitor, and choose View Detail. For more information, see "Using the Communication App inspector" on page 97.

Sample 1: Recording a Stream

This recording sample records a video stream. When the user clicks the Play button, the recorded data is streamed back to the Flash movie.

About the sample

The user opens the doc_record.html file. After the user grants access to its video device, the live output appears in the larger video area called `Live_video`. When the user clicks the Record button, the live camera's stream is sent for recording on the Flash Communication Server. When the user clicks the Stop button, the server stops recording. When the user clicks the Play button, the server sends the recorded stream back to the application, and the recorded stream plays in the smaller video area.

Re-creating the sample

The doc_record.fla file provides the ActionScript for getting a camera, attaching it to a Video object, creating a network connection to the server, recording the camera data on an outgoing stream to the server, and then playing that recorded stream in a second Video object.

When you record a stream in a Flash application, the server creates files with the extensions .flv and .idx. For more information, see "Recorded stream files" on page 68.

See "Creating your working environment" on page 31 before you start to re-create the sample.

To create the user interface for this sample:

1. In the Flash MX authoring environment, select File > New to open a new file.
2. To add a Video object to your library, open the Library panel (Window > Library) and add an embedded Video object by selecting New Video from the library's Options menu.
3. Drag two embedded Video objects from the library onto the Stage, and give them the instance names `Live_video` and `Replay_video`.
4. To add buttons to your movie, open the Components panel by selecting Window > Components.
5. To add the button for recording, drag a push button from the Components panel onto the Stage, placing it below the `Live_video` video object. In the Property inspector, give it the instance name `Record_btn`, the label `Record`, and the click handler `doRecord`.
6. To add the button for playing, repeat the previous step to create a push button with the instance name `Play_btn`, the label `Play`, and the click handler `doPlay`. Place this button beneath the `Replay_video` video object.
7. To add the privacy message, select the Text tool and draw a text box. In the Property inspector, select Static Text for the type of text box. Type (or copy and paste) text such as the following text into the text box: **Your image will be recorded or broadcasted and could be published at a later date. If you don't approve, please exit this application.**

   Note: Please note that this text is provided merely as an example, and the precise wording of the text that you use will be dictated by the nature of your application and/or service and any privacy, legal, or other issues raised by your application and/or service.
8. Create a directory named doc_record in your flashcom application directory, and save the file as doc_record.fla in this directory.

To write the client-side ActionScript for this sample:

1. Select the keyframe in the Timeline and open the Actions panel (Window > Actions).
2. In the Actions panel, stop the progress of the movie.

```
stop();
```

3. Get and attach a camera.

```
// Attach the video device output from client_cam
// to the Live_video video clip
client_cam = Camera.get();
Live_video.attachVideo(client_cam);
```

4 In the `initStreams` function, make a connection to the server. Create the output stream for sending the video data to the server, and the input stream for the data coming back from the server. Then attach the input stream to the `Replay_video` video clip.

```
function initStreams() {

  // Make a connection to the application on the server
  client_nc = new NetConnection();

  // Note that this call includes the protocol, rtmp, the
  // app name, doc_record, and the room, room_01
  client_nc.connect("rtmp:/doc_record/room_01");

  // Handle status message
  client_nc.onStatus = function(info) {
    trace("Level: " + info.level + " Code: " +  info.code);
  }

  // Create output stream
  out_ns = new NetStream(client_nc);

  // Create input stream
  in_ns = new NetStream(client_nc);
  Replay_video.attachVideo(in_ns);

}

// Connect to server and set up streams
initStreams();
```

5 Create the event handler for the Record button. If the user selected the button when the label was Record, then attach video data from the camera to the output stream and publish it. If the button label is Stop, close the stream.

```
function doRecord() {

  if (Record_btn.getLabel() == "Record") {

    // Start publishing the camera output as a recorded stream
    out_ns.attachVideo(Camera.get());
    out_ns.publish("my_recorded_stream", "record");

    // Don't allow the user to play when recording
    Play_btn.setEnabled(false);

    // Change the button label
    Record_btn.setLabel("Stop");

  } else if (Record_btn.getLabel() == "Stop") {

    // Close output stream
    out_ns.close();

    // Now that you're finished recording, allow the user to play
    Play_btn.setEnabled(true);

    // Change the button label
    Record_btn.setLabel("Record");
  }
}
```

6 Create the event handler for the Play button that plays the stream recorded on the server.

```
function doPlay() {

  in_ns.play("my_recorded_stream");

}
```

To test your sample application:

1 In the Flash MX authoring environment, after you have saved your work, publish it by selecting File > Publish.

2 Open the SWF file in the application directory or, in the Flash MX authoring environment, choose Control > Test Movie.

Sample 2: Shared Text

This sample allows users to share text. Any user can update the text on the stage, and other users can see it immediately updated on their own stages.

About the sample

User 1 opens the doc_text.html file and is able to type text in the text box. User 2 opens the same movie and automatically connects to the same shared object. User 2 can see the text as user 1 types it. When user 2 edits the text, user 1 can view the changes as they occur.

Re-creating the sample

The doc_text.fla file uses only a few lines of code to connect to the Flash Communication Server, create and connect to a remote shared object, and update the shared object on the Stage that all connected clients are viewing.

This sample introduces the idea of shared objects (for more information, see the *Client-Side Communication ActionScript Dictionary*). In this sample, you call `SharedObject.getRemote("sharedtext", new_nc.uri, false)`. These shared objects are synchronized with the server over an RTMP connection. Shared objects consist of name-value pairs and can be updated by any client connected to the application and the shared object.

See "Creating your working environment" on page 31 before you start to re-create the sample.

To create the user interface for this sample:

1 In the Flash MX authoring environment, select File > New to open a new file.

2 From the toolbox, select the Text tool and draw a text box.

3 In the Property inspector (Window > Properties), select Input Text for the type of text box, and give it the instance name `TypingStage`.

4 Create a directory named doc_text in your flashcom application directory, and save the file as doc_text.fla in this directory.

To write the client-side ActionScript for this sample:

1 Select the keyframe in the Timeline and open the Actions panel (Window > Actions).

2 Open a connection to the server.

```
// Open connection to server
client_nc = new NetConnection();
client_nc.connect("rtmp:/doc_text/room_01");
```

3 Handle the messages coming from the server.

```
// Handle status message
client_nc.onStatus = function(info) {
  trace("Level: " + info.level + "   Code: " +  info.code);
}
```

4 Initialize the typing stage.

```
TypingStage.text = "";
```

5 Get a remote shared object to hold the text data from the client.

```
// Create a remote shared object. client_nc.uri is the URI of the
// NetConnection the shared object will use to connect to the
// server.
text_so = SharedObject.getRemote("sharedtext", client_nc.uri, false);
```

6 When you get a shared object, make sure you connect to it.

```
// The following is very important, nothing happens otherwise
text_so.connect(client_nc);
```

7 Create an `onSync` callback function to handle the text message.

```
// Each time something changes in the shared object, the server
// sends out a synchronization message. This onSync handler
// updates the movie based on the information.
text_so.onSync = function(list) {

  // Update the text area in the typing stage with the latest
  // text from the shared object. The 'for' loop condition searches
  // through the list of changes, and the 'if' condition ensures
  // that we apply the relevant change only if someone other than
  // this client has changed the value.
  for (var i = 0; i < list.length; i++)
    if (list[i].name == "textValue" && list[i].code != "success")
    {
      TypingStage.text = text_so.data.textValue;
      break;
    }
};
```

8 When the text in the typing stage changes, update the shared object with the new text.

```
// Update the shared object every time the user types in new text
TypingStage.onChanged = function()
{
  text_so.data.textValue = TypingStage.text;
};
```

To test your sample application:

1 In the Flash MX authoring environment, after you have saved your work, publish it by selecting File > Publish.

2 Open two instances of the SWF file in the application directory.

3 Type in one text box to see the other immediately updated.

Sample 3: Shared Ball

This sample allows users to move a ball around the screen and to watch while other participants move the ball around.

About the sample

The previous sample shared text, but you can share graphics as well. This sample allows two users to share the same ball on the Stage. When a user opens the doc_sharedball.htm file, there is a ball on the SWF Stage. When any user moves the ball, all other connected users see it move.

Re-creating the sample

The doc_sharedball.fla provides the ActionScript for creating a remote shared object that synchronizes and updates the ball position for each user.

See "Creating your working environment" on page 31 before you start to re-create the sample.

To create the user interface for this sample:

1. In the Flash MX authoring environment, select File > New to open a new file.
2. From the toolbox, select the Circle tool and draw a circle. With the circle still selected, convert it to a movie clip by selecting Insert > Convert to Symbol, and name it `ball`. In the Property inspector (Window > Properties), give it the instance name `SharedBall_mc`.
3. Create a directory named doc_sharedball in your flashcom application directory, and save the file as doc_sharedball.fla in this directory.

To write the client-side ActionScript for this sample:

1. Select the keyframe in the Timeline and open the Actions panel (Window > Actions).
2. In the Actions panel, stop the progress of the movie.

```
stop();
```

3. Create a new network connection to connect to the server and handle any status messages with the `onStatus` function.

```
// Create a connection
client_nc = new NetConnection();
// Show connection status in output window

client_nc.onStatus = function(info) {
  trace("Level: " + info.level + "   Code: " +  info.code);
};

// Connect to the application
client_nc.connect("rtmp:/doc_sharedball/room_01");
```

4. Create a remote shared object to hold the x/y coordinates of the ball.

```
// Create a remote shared object
ball_so = SharedObject.getRemote("position", client_nc.uri, false);

// Update ball position when another participant moves the ball
ball_so.onSync = function(list) {
  SharedBall_mc._x = ball_so.data.x;
  SharedBall_mc._y = ball_so.data.y;
};
```

5 When you get a shared object, make sure you connect it to the NetConnection object.

```
// Connect to the shared object
ball_so.connect(client_nc);
```

6 Create the function that updates the shared object data with the position of the ball.

```
// Manipulate the ball
SharedBall_mc.onPress = function() {
  this.onMouseMove = function() {
    ball_so.data.x = this._x = _root._xmouse;
    ball_so.data.y = this._y = _root._ymouse;

    // Constrain the ball to the stage
    if (SharedBall_mc._x>=Stage.width) {
      SharedBall_mc._x = Stage.width - 50;
    }
    if (SharedBall_mc._x<=0) {
      SharedBall_mc._x = 50;
    }
    if (SharedBall_mc._y>=Stage.height) {
      SharedBall_mc._y = Stage.height - 50;
    }
    if (SharedBall_mc._y<=0) {
      SharedBall_mc._y = 50;
    }
  };
};
```

7 When the user releases the ball, remove the hold on it.

```
// Release control of the ball
SharedBall_mc.onRelease = SharedBall_mc.onReleaseOutside=function () {
  delete this.onMouseMove;
};
```

To test your sample application:

1 In the Flash MX authoring environment, after you have saved your work, publish it by selecting File > Publish.

2 Open two instances of the SWF file in the application directory.

3 Move the ball in one instance to see the other immediately updated.

Sample 4: Hello Server

This sample is the first to use server-side ActionScript. In it, you write your client-side ActionScript in Macromedia Flash MX. Then, you write a corresponding function in server-side ActionScript that you store in a main.asc file. First, however, you begin with the user interface.

About the sample

The user opens the doc_hello.swf file, enters a name, and gets a message back from the server that includes the user's name.

Re-creating the sample

The doc_hello.fla file provides the ActionScript for sending information from the server to the client.

See "Creating your working environment" on page 31 before you start to re-create the sample.

To create the user interface for this sample:

1. In the Flash MX authoring environment, select File > New to open a new file.
2. From the toolbox, select the Text tool and draw a text box. In the Property inspector (Window > Properties), select Input Text for the type of text box and give it the instance name `User`.
3. Add a dynamic text box for a debug window by selecting the Text tool and drawing another text box. In the Property inspector, select Dynamic Text for the type of text box, and give it the instance name `Message`.
4. To add the button for connecting to the server, open the Components panel (Window > Components) and drag a push button onto the Stage. In the Property inspector, give it the instance name `Connect_btn`, the label `Connect`, and the click handler `doConnect`.
5. Create a directory named doc_hello in your flashcom application directory, and save the file as doc_hello.fla in this directory.

To write the client-side ActionScript for this sample:

1. Select the keyframe in the Timeline and open the Actions panel (Window > Actions).
2. In the Actions panel, stop the progress of the movie.

```
stop();
```

3. Open a connection and handle any status message.

```
// Open connection to the server
client_nc = new NetConnection();

// Handle status message
client_nc.onStatus = function(info) {
  trace("Level: " + info.level + "   Code: " +  info.code);
}
```

4 Create the event handler for the Connect button. If the user selected the button when the label was Connect, then connect to the server. If the button label is Disconnect, close the connection.

```
// Event handler for Connect_Btn
function doConnect() {

  // If user wants to connect...
  if (Connect_btn.getLabel() == "Connect") {

    // Connect to the chat application
    client_nc.connect("rtmp:/doc_hello/room_01", User.text);

    // Update button label
    Connect_btn.setLabel("Disconnect");

  // If user wants to disconnect...
  } else if (Connect_btn.getLabel() == "Disconnect") {

    // Close connection
    client_nc.close();

    // Reset button label
    Connect_btn.setLabel("Connect");

    // Reset the text fields
    user.text = "";
    message.text = "";
  }
}
```

5 Write the function the server will call to return the message to the client.

```
// Callback function server calls to send message back to
// this client.
client_nc.msgFromSrvr = function(msg) {

  var msg;
  _root.Message.text = msg;

}
```

To write the server-side ActionScript for this sample:

1 Create a new file using your server-side ActionScript editor, and write an event handler for when the user connects. In it, you'll receive the name passed in by the client, accept the client connection, create a message that uses the client's name, and call the client `msgFromSrvr` function to return the message.

```
application.onConnect = function(newClient, name) {

  // Give this new client the same name as the user name
  newClient.name=name;

  // Accept the new client's connection
  application.acceptConnection(newClient);

  // Create a customized "Hello [client]" message
  // that the server will send to the client
  var msg = "Hello! You are connected as: " + newClient.name;

  // Print out status message in the application console
  trace("Sending this message: " + msg);

  // Call the client function, message, and pass it the msg
  newClient.call("msgFromSrvr", false, msg);
}
```

2 Save the file as main.asc in a doc_hello directory under the flashcom applications directory.

Note: Save this main.asc file where you've chosen to store your server-side application files. For example, if you chose Developer Install during installation, save this file to the same directory where you've stored the client-side SWF file and its source FLA file. If you chose Production Install and you have a Web server, the Flash Communication Server will look for your client-side files under \flashcom\applications in your Web server's root directory and will look for your server-side application files (including this main.asc file) under \applications in the directory you specified during installation. The <AppsDir> tag in the Vhost.xml server configuration file contains the location of your flashcom application directory. For more information see Chapter 1, "The flashcom application directory," on page 15.

To test your sample application:

1 In the Flash MX authoring environment, after you have saved your work, publish it by selecting File > Publish.

2 Open the SWF file in the application directory.

3 Overwrite the text in the login box by typing your name, then click Connect. You'll see a message like this one:

```
Hello! You are connected as: [your name]
```

Sample 5: Text Chat

In the Shared Text example (see "Sample 2: Shared Text" on page 35), you created a remote shared object that enabled a user to view another user's typing in real time, letter by letter. In this next sample, you'll create a different kind of shared object that sends whole messages on command. You'll also add several elements to make the text chat application more versatile, including fields for logging in, typing in a chat room name, and viewing the list of current participants.

About the sample

In a chat room, you want to view current users dynamically. When users log in to a room, the list should be updated; when users log off, they should be removed from the list. It's best to do this processing work on the server, because keeping data centrally on the server means that any client can come and go, and the data will always be accurate and available.

In addition, in this example, the server doesn't simply hand off the text from one client to another, it actually makes changes to the message by adding the name of the user who typed it. Because you expect the server to provide this functionality, you need to write some server-side ActionScript to handle this work.

Finally, this example also illustrates how to dynamically add an instance name to a `NetConnection.connect` command based on data entered by the user.

Re-creating the sample

The doc_textchat.fla file provides the ActionScript for letting multiple users share text in real time.

See "Creating your working environment" on page 31 before you start to re-create the sample.

To create the user interface for this sample:

1. In the Flash MX authoring environment, select File > New to open a new file.
2. From the toolbox, select the Text tool and draw two text boxes. In the Property inspector (Window > Properties), select Input Text for the type of text box, and give one the instance name `User`, and the other, `Room`.
3. From the toolbox, select the Text tool and draw another text box. In the Property inspector, select Input Text for the type of text box, and give it the instance name `Message`.
4. From the toolbox, select the Text tool and draw a fourth text box. In the Property inspector, select Dynamic Text for the type of text box, and give it the instance name `History`.
5. To add a place where users are listed, open the Components panel (Windows > Components), drag the List Box component onto the Stage, and give it the instance name `People`.
6. To add the button for connecting to the server, drag a push button from the Components panel onto the Stage. In the Property inspector, give it the instance name `Connect_btn`, the label `Connect`, and the click handler `doConnect`.
7. To add the button for sending messages, drag a push button from the Components panel onto the Stage. In the Property inspector, give it the instance name `Send_btn`, the label `Send`, and the click handler `doSend`.
8. Create a directory named doc_textchat in your flashcom application directory, and save the file as doc_textchat.fla in this directory.

To write the client-side ActionScript for this sample:

1. Select the keyframe in the Timeline and open the Actions panel (Window > Actions).
2. In the Actions panel, stop the progress of the movie.

```
stop();
```

3 Provide a value for the maximum scrolling of the History text box component.

```
// Set maximum scroll
History.maxscroll = 1000;
```

4 Prevent the user from sending until after the user has connected to the server.

```
// Don't allow the user to send until after connection
_root.Send_btn.setEnabled(false);
```

5 Create a new network connection.

```
// Open a connection to the server
client_nc = new NetConnection();
```

6 Provide an onStatus function to handle any status messages.

```
// If connection is closed, clear the History and the list
client_nc.onStatus = function(info) {

  trace("Level: " + info.level + "   Code: " +  info.code);

  if (info.description == "NetConnection.Connect.Closed") {
    History.text = "";
    _root.People.removeAll();
  }
}
```

7 Create the event handler for the Connect button. If the user selected the button when the label was Connect, then connect to the server and update the buttons.

```
function doConnect() {

  if (Connect_btn.getLabel() == "Connect") {

    // Connect to the chat application.
    // The second parameter, _root.Room.text,
    // is the application instance.
    _root.client_nc.connect("rtmp:/doc_textchat/" + _root.Room.text,
                            _root.User.text);

    // Update button label
    Connect_btn.setLabel("Disconnect");

    // Enable send button
    _root.Send_btn.setEnabled(true);
```

8 In the same `doConnect` function, create a remote shared object and connect to it.

```
    // Create a remote shared object to keep track
    // of the users. The value client_nc.uri is the URI of the
    // NetConnection the shared object will use to connect to the
    // server. I.e., the one just created.
    users_so = SharedObject.getRemote("users_so", _root.client_nc.uri,
                                      false);

    // Attach the shared object to client_nc
    users_so.connect(_root.client_nc);
```

9 In the same `doConnect` function, create the `onSync` method to handle the change in users.

```
// When the list of users_so is updated, refresh the
// People list box.
users_so.onSync = function(userList) {

  _root.People.removeAll();

  for ( var i in users_so.data) {
    if (users_so.data[i] != null) {
      _root.People.addItem(users_so.data[i]);
    }
  }

  // Sort alphabetically, because order returned
  // is not guaranteed to be consistent.
  _root.People.sortItemsBy("label", "ASC");
}
```

10 Provide a callback function to be called by the server.

```
// Update the shared object with the message.
users_so.msgFromSrvr = function(msg) {

  _root.History.text += msg;
  _root.History.scroll = _root.History.maxscroll;
  historyScroll.setScrollTarget(history);
  historyScroll.setScrollPosition(_root.History.maxscroll);
}
}
```

11 If the label on the Connect button is Disconnect, then close the connection and reset the buttons.

```
else if (Connect_btn.getLabel() == "Disconnect") {

  // Close connection
  _root.client_nc.close();

  // Don't allow the user to send when not connected
  _root.Send_btn.setEnabled(false);

  // Rest button label
  Connect_btn.setLabel("Connect");

}
} // doConnect function ends here
```

12 Create an event handler for when the user selects Send. In this function, if there's any text in the Message input text box, call the server function, `msgFromClient`, and pass it the `Message.text` text.

```
// Send the message text by calling the server message function
function doSend() {

  // If there's message text, pass it to the server function msgFromClient
  if (length(_root.Message.text) > 0) {
    _root.client_nc.call("msgFromClient", null, _root.Message.text);
  }

  // Clear the message text
  _root.Message.text = "";

}
```

13 Create the `setHistory` function that the server calls to update the text in the `History` dynamic text box.

```
// Update the History on the server with the message
client_nc.setHistory = function(msg) {
  _root.History.text = msg;
}
```

To write the server-side ActionScript for this sample:

1 Create a new file using your server-side ActionScript editor, and write the event handler `onAppStart` for initializing the application variables.

```
application.onAppStart = function()
{
  trace("Begin sharing text");

  // Get the server shared object users_so
  application.users_so = SharedObject.get("users_so", false);

  // Initialize the history of the text share
  application.history = "";

  // Initialize the unique user ID
  application.nextId = 0;
}
```

2 Write the event handler `onConnect` for managing users and sending the history to all clients.

```
application.onConnect = function(newClient, name)
{
  // Make this new client's name the user's name
  newClient.name = name;

  // Create a unique ID for this user while incrementing the
  // application.nextID.
  newClient.id = "u" + application.nextId++;

  // Update the users_so shared object with the user's name
  application.users_so.setProperty(newClient.name, name);

  // Accept the client's connection
  application.acceptConnection(newClient);

  // Call the client function setHistory, and pass
  // the initial history
  newClient.call("setHistory", null, application.history);

  // The client will call this function to get the server
  // to accept the message, add the user's name to it, and
  // send it back out to all connected clients.
  newClient.msgFromClient = function(msg) {
    msg = this.name + ": " + msg + "\n";
    application.history += msg;
    application.users_so.send("msgFromSrvr", msg);
  }
}
```

3 Write the event handler `onDisconnect` to clean up.

```
application.onDisconnect = function(client)
{
  trace("disconnect: " + client.name);
  application.users_so.setProperty(client.name, null);
}
```

4 Save the file as main.asc in a doc_textchat directory under the flashcom applications directory.

Note: Save this main.asc file where you've chosen to store your server-side application files. For more information see Chapter 1, "The flashcom application directory," on page 15.

To test your sample application:

1 In the Flash MX authoring environment, after you have saved your work, publish it by selecting File > Publish.

2 Open two instances of the SWF file in the application directory.

3 In each instance, type a user name and room name, and select Connect. (Choose different user names but the same room name in both instances.) The logged-in users are listed in the box. Type text and click Send, and all logged-in clients see the message.

Sample 6: Record a List

This sample lets users record a session and then choose from a playback list which session they want to play back.

About the sample

In this sample, the user can record an audio stream, which then shows up in a playlist. The user can also select from the playlist to play back recorded streams. Multiple users can join this application to record and play back audio streams.

Re-creating the sample

The doc_list.fla file provides the ActionScript to create an audio playback list. By expanding upon this sample, you can create playback lists of video sessions, text sessions, drawing sessions, presentations, and more.

See "Creating your working environment" on page 31 before you start to re-create the sample.

To create the user interface for this sample:

1 In the Flash MX authoring environment, select File > New to open a new file.

2 From the toolbox, select the Text tool and draw a text box. In the Property inspector (Window > Properties), select Input Text for the type of text box, and give it the instance name `ListItem`.

3 To create a place for the playlist to be displayed, open the Component panel (Windows > Components), drag the List Box component onto the Stage, and give it the instance name `Play_list`.

4 To add the button for recording, drag a push button onto the Stage. In the Property inspector, give it the instance name `Record_btn`, the label `Record`, and the click handler `doRecord`.

5 To add the button for recording, drag a push button onto the Stage. In the Property inspector, give it the instance name `Play_btn`, the label `Play`, and the click handler `doPlay`.

6 To add a Video object to your library, open the Library panel (Window > Library) and add an embedded Video object by selecting New Video from the library's Options menu.

7 To add the Video object for playing back the recording, drag a Video object onto the Stage. In the Property inspector, give it the instance name `Replay_video`.

8 From the toolbox, select the Text tool and draw a text box. In the Property inspector (Window > Properties), select Dynamic Text for the text box type, and give it the instance name `Status_msg`.

9 To add the privacy message, select the Text tool and draw a text box. In the Property inspector, select Static Text for the text box type. Type (or copy and paste) text such as the following text into the text box: **Your image will be recorded or broadcasted and could be published at a later date. If you don't approve, please exit this application.**

Note: Please note that this text is provided merely as an example, and the precise wording of the text that you use will be dictated by the nature of your application and/or service and any privacy, legal, or other issues raised by your application and/or service.

10 Create a directory named doc_list in your flashcom application directory, and save the file as doc_list.fla in this directory.

To write the client-side ActionScript for this sample:

1 Select the keyframe in the Timeline and open the Actions panel (Window > Actions).

2 In the Actions panel, stop the progress of the movie.

```
stop();
```

3 Create a new connection to the server, handle the status messages, and connect to the server.

```
// Create a connection
client_nc = new NetConnection();

// Handle status message
client_nc.onStatus = function(info) {
  trace("Level: " + info.level + "   Code: " +  info.code);
}

// Connect to the application
client_nc.connect("rtmp:/doc_list/room_01");
```

4 Create a remote shared object to hold the recordings that the user will make.

```
// Create a remote shared object
rec_so = SharedObject.getRemote("recordings", client_nc.uri, false);
```

5 As new recordings are added to the shared object, update the play list.

```
// Update the list of recordings as new items are added
rec_so.onSync = function(list) {

  _root.Play_list.removeAll();

  // Fill list box with recordings
  for (var i in _root.rec_so.data) {
    _root.Play_list.addItem(i);
  }
}
```

6 Remember to connect the shared object to the NetConnection object.

```
// Connect to the shared object
rec_so.connect(client_nc);
```

7 Create an event handler for when the user selects Record, which publishes the new recordings and updates the shared object.

```
function doRecord() {

  if (ListItem.text == undefined || ListItem.text == "") {
    Status_msg.text="Please enter a title.";
  } else if (Record_btn.getLabel() == "Record") {
    Status_msg.text="Recording...";

    // Stop any currently playing stream
    if (Play_btn.getLabel() == "Stop")
    doPlay();

    // Don't allow the user to play while recording
    Play_btn.setEnabled(false);

    // Create output stream
    out_ns = new NetStream(client_nc);

    // Start publishing the audio output as a recorded stream
    out_ns.attachAudio(Microphone.get());

    // Publish the stream
    out_ns.publish(ListItem.text, "record");

    // This allows the entering of single-word list items
    _root.rec_so.data[ListItem.text] = ListItem.text;
    _root.rec_so.flush();

    // Change the button label
    Record_btn.setLabel("Stop");
```

8 If the button label is Stop, close the output stream and allow the user to play from the list.

```
  } else if (Record_btn.getLabel() == "Stop") {

    // Close output stream
    out_ns.close();

    // Now that you're finished recording, allow the user to play
    Play_btn.setEnabled(true);

    // Change the button label
    Record_btn.setLabel("Record");

    // Clear the ListItem.text
    ListItem.text="";

    Status_msg.text="...";
  }
}
```

9 Create the event handler for the Play button. If the user selects Play, update the button label, create an input stream, and play the selected recording.

```
// Do Play
function doPlay ()
{
  if (Play_btn.getLabel() == "Play") {

    Status_msg.text="Playing...";

    Play_btn.setLabel("Stop");

    // Get the selected recording
    var playFileName = Play_list.getSelectedItem().label;

    // Create input stream and play the recording
    in_ns = new NetStream(_root.client_nc);
    in_ns.play(playFileName);
    in_ns.onStatus = function(info)
    {
      // Handle errors and stream stopping
      if (info.level == "error" || info.code == "NetStream.Play.Stop") {
        Status_msg.text="Stopped sending data...";
        Play_btn.setLabel("Play");
      }
    }

    Replay_video.attachAudio(in_ns);
```

10 If the user selects the Play button when the label is set to Stop, close the input stream and update the button label.

```
  } else if (Play_btn.getLabel() == "Stop") {

    Status_msg.text="...";
    //Close the stream
    in_ns.onStatus = null;
    in_ns.close();
    Play_btn.setLabel("Play");
  }

}
```

To test your sample application:

1 In the Flash MX authoring environment, after you have saved your work, publish it by selecting File > Publish.

2 Open two instances of the SWF file in the application directory.

3 Add recordings to the playlist and play them back. Remember that titles containing more than one word are not supported.

CHAPTER 4
Application Development Tips and Tricks

This chapter is designed to supplement, not replace, application development and best practices recommendations included in *Using Flash MX*. For general information on how Macromedia Flash MX streams data and how you can test and improve the performance of your Flash movies, see "Streaming and file optimization techniques for Flash Player" on the Macromedia Flash Support Site (http://www.macromedia.com/go/flash_stream_optimize).

The rest of this chapter points out some useful information specific to Macromedia Flash Communication Server MX. It includes general sections on application design, coding conventions, and debugging techniques, followed by information relevant to specific objects. (All objects are client-side objects except where noted.)

The best way to use this chapter is to skim it once in its entirety before you begin writing Flash Communication Server programs, to familiarize yourself with its contents. Then, as you begin coding, refer to it as needed.

Application design and development

This section includes recommendations that apply to all Flash Communication Server applications you write.

Designing for portability across servers

If your application (SWF file) is on the same computer that is running the Flash Communication Server, you can use rtmp:/appName/instanceName as a shortcut version of rtmp://server.domain.com/appName/instanceName. The use of a single slash followed by the application name indicates a relative path and lets you move the files to a different server without changing the code.

Designing for interdependence

Because the client-side and server-side ActionScript code are part of the same application, they must work interdependently. One example of the interdependency between the client and server code is the server-side ActionScript `call` method, which acts differently according to which object it is associated with—a client-side NetConnection object or a server-side Client object.

For example, the code below shows how you could create a network connection on the client side, and then make a call to it from the server side:

```
// This is client-side ActionScript in the FLA
my_nc = new NetConnection();
my_nc.someClientMethod = function()
{
  // code here
}

// This is server-side ActionScript in the main.asc file
clientObj.call("someClientMethod");
```

The argument passed to `clientObj.call` must be a previously defined method of the client-side NetConnection object. This is because any method in the client code that may be called by the server must be a property of a client-side NetConnection object.

In contrast, suppose you use the `call` method from the client, to call a method on the server side:

```
// This is client-side ActionScript in the FLA
NetConnection.call("someServerMethod");

// This is server-side ActionScript in the main.asc file
client.prototype.someServerMethod = function()
{
  // code here
}

// The following code would also work
onConnect(newClient)
{
  newClient.someServerMethod = function()
    {
      // code
    }
}
```

In this case, the argument passed to `NetConnection.call` must be a method of the server-side Client object that was previously defined in the main.asc file. This is because any method in the server code that may be called by the client must be a property of a server-side Client object.

Using multiple files

As your application increases in complexity, don't try to use a single script to do everything: break your functionality up into multiple scripts, each of which provides a specific set of functionality. If you do use more than one file, you can optimize performance by using a "once-only inclusion" definition to prevent a file from being evaluated more than once.

On the client side

For example, on the client side, if you want a file named my_file.as to be available to other files in your application, include the following code in my_file.as:

```
if (_root._my_file_as == null) {
  _root._my_file_as = true;
  // All the code for myfile.as goes here
}
```

Then, in your other files, issue the following command:

```
#include "my_file.as";
```

On the server side

On the server side, you must implement slightly different code, using `global` instead of `_root`. Here, assume you want to include a file called my_file.asc.

```
if (global._my_file_asc == null) {
  global._my_file_asc = true;
  // All the code for myfile.asc goes here
}
```

Also, instead of using the `#include` command, the server-side script uses a `load` command:

```
load("my_file.asc");
```

Using unique instance names

A typical deployment environment consists of multiple users connecting to the same server at the same time. To avoid collisions such as streams getting crossed or shared objects being overwritten, use unique instance names in your `NetConnection.connect` commands. This technique is discussed in detail elsewhere in this manual (see "Applications and application instances" on page 14). It is included here as a reminder of how important this is to Flash Communication Server application development.

Adding the NetConnection debugger file

Get in the habit of including the NetConnection debugger file in the first line of your client-side source code. Adding the following ActionScript to your FLA file allows you to view important details about your network connection to the server.

```
#include "NetDebug.as"
```

Forcing the Player Settings panel to appear

When an application tries to access the user's camera or microphone, or to save data on the client machine, the Flash Player displays the Player Settings dialog boxes to get permission. The user can also open the Player Settings panels by right-clicking (Windows) or Control-clicking (Macintosh) on the player Stage. If you want to force the Player Settings panels to appear, use the following code:

```
// Opens the panel the user viewed last
System.ShowSettings();
// Opens the Privacy panel
System.ShowSettings(0);
// Opens the Local Storage panel
System.ShowSettings(1);
// Opens the Microphone panel
System.ShowSettings(2);
// Opens the Camera panel
System.ShowSettings(3);
```

For example, if your application requires the use of a camera, you can inform the user that they must choose "Allow" in the Privacy Settings panel, and then issue a `System.showSettings(0)` command. (Make sure your Stage size is at least 215 by 138 pixels; this is the minimum size Flash requires to display the panel.) For more information, see `System.showSettings` in the *Client-Side Communication ActionScript Dictionary*.

Managing bandwidth

You can control the amount of data the server sends to each client by providing an approximate bandwidth capacity. There are a few ways to do so. One way is to configure the capacity for the Flash Communication Server in the configuration file (Config.xml). For more information on this technique, see *Managing Flash Communication Server*. Another way is to use `NetStream.receiveVideo` to specify the frame rate per second of the incoming video (the default value is the frame rate of the movie). A third way to match the data flow with capacity is to use `Camera.setQuality` on the client side and `Client.setBandwidthLimit` on the server side to inform the server of the client's capacity. This technique is illustrated in the following sample.

The code in the doc_bandwidth.fla file allows the user to choose between different bandwidth settings. On the client side, the microphone and camera settings are updated according to the user's selection. On the server side, the bandwidth limit is updated. You can find the sample file for this code in the flashcom_help\help_collateral\doc_bandwidth directory under the installed Macromedia Flash MX authoring directories.

To see this application in action, create a directory named doc_bandwidth in your flashcom application directory, then open doc_bandwidth.swf. See "Creating your working environment" on page 31 if you want to re-create the sample.

The client-side ActionScript provides the interface for the user to choose between three settings: Modem, DSL, or LAN. There are three buttons on the stage, which when selected return 1 for a modem setting, 2 for a DSL setting, or 3 for a LAN setting. When the user changes the bandwidth limit choice, the camera and microphone settings are updated. Because this change is barely noticeable, extra code in the `updateBandwidth` function also changes the screen size based on the settings chosen.

```
_root.Modem_btn.onPress = function() {
  // Call updateBandwidth to change
  // camera and mic settings and inform
  // the server
  _root.updateBandwidth(1);
}

_root.DSL_btn.onPress = function() {
  _root.updateBandwidth(2);
}

_root.LAN_btn.onPress = function() {
  _root.updateBandwidth(3);
}
```

On the first frame of the FLA file, you can find the following code, which initializes the camera and microphone, plays the stream from the server, and updates the camera and microphone settings based on the user's choices.

Note: If you are using speakers instead of a headset, you may want to comment out the call to Microphone.get() to avoid audio feedback. For more information, see "Avoiding audio feedback" on page 83.

```
#include "NetDebug.as"

stop();

// Initialize movie by getting a camera and microphone, and
// Configure the initial camera and microphone settings
client_cam = Camera.get();
client_cam.setMode(150,120,5);
client_cam.setQuality(0, 90);

client_mic = Microphone.get();
client_mic.setRate(22);

// Get the stream to publish and play
function getPlayStream() {

  // Get new net connection
  client_nc = new NetConnection();

  // Handle status message
  client_nc.onStatus = function(info) {
    trace("Level: " + info.level + newline + "Code: " +  info.code);
  }

  client_nc.connect("rtmp:/doc_bandwidth/room_01");

  // Create a stream to which to publish
  out_ns = new NetStream(client_nc);
  out_ns.attachVideo(client_cam);
  out_ns.attachAudio(client_mic);
  out_ns.publish("myAV");

  // Create a stream to receive the published data
  in_ns = new NetStream(client_nc);
  Output_mc.fromSrvr.attachVideo(in_ns);
  Output_mc.fromSrvr.attachAudio(in_ns);
  in_ns.play("myAV");

}

// Called from the bandwidth buttons
function updateBandwidth(b) {

  // Respond to a change in the bandwidth
  // If "Modem" was selected
  if ( b == 1 ) {
    client_cam.setMode(160,120,2);
    client_cam.setQuality(0, 75);
    client_cam.setKeyFrameInterval(3);
    client_mic.setRate(5);

    // For demonstration purposes, change size of screen
    Output_mc._height = 100;
    Output_mc._width = 150;

  // If "DSL" was selected
  } else if ( b == 2 ) {
    client_cam.setMode(160,120,5);
    client_cam.setQuality(0, 85);
```

```
    cam.setKeyFrameInterval(5);
    client_mic.setRate(11);

    // For demonstration purposes, change size of screen
    Output_mc._height = 130;
    Output_mc._width = 175;

  // If "LAN" was selected
  } else /*if ( b == 3 )*/ {
    client_cam = Camera.get();
    client_cam.setMode(160,120,15);
    client_cam.setQuality(0, 90);
    client_cam.setKeyFrameInterval(10);
    client_mic.setRate(22);

    // For demonstration purposes, change size of screen
    Output_mc._height = 150;
    Output_mc._width = 200;

  }
  // Call the server function setBandwidth and pass the user's
  // selection, b.
  client_nc.call("setBandwidth", 0, b);
}

// Get the stream to play
  getPlayStream();
```

Meanwhile, the main.asc file contains a `setBandwidth` function, which when called from the client-side code, updates the bandwidth limit with the appropriate settings.

```
// If server-side code is part of the application,
// it must define an onConnect function that accepts
// the client connection.
application.onConnect = function(client) {

  // Establish the connection
  application.acceptConnection(client);
}

// Called when user presses a bandwidth choice (Modem=1, DSL=2, LAN=3)
Client.prototype.setBandwidth = function(bw) {

  // set the bandwidth for the client
  if ( bw == 1 ) {
    // modem settings
    this.setBandwidthLimit( 35000/8, 22000/8 );
  } else if ( bw == 2 ) {
    // DSL settings
    this.setBandwidthLimit( 800000/8, 100000/8 );
  } else /*if ( bw == 3 )*/ {
    // LAN settings
    this.setBandwidthLimit( 400000, 400000 );
  }
}
```

Writing double-byte applications

If you are using server-side ActionScript in a development environment or language kit that facilitates double-byte text (such as an Asian language character set), your server-side ActionScript must be in an ASC file that has been UTF-8-encoded. This means you'll need a JavaScript editor, such as Macromedia Dreamweaver MX, that UTF-8-encodes files. (Simple text editors, such as Microsoft Windows Notepad, don't UTF-8-encode files.) Then, you can use built-in JavaScript methods such as `Date.toLocaleString`, which converts the string to the locale encoding for that system.

To ensure UTF-8 encoding, in Dreamweaver MX, you'll need to change two settings: the document encoding setting and the inline input setting.

- To change the document encoding setting, select Modify > Page Properties, then select Document Encoding. Choose Other to create a document with the encoding your operating system is using.
- To change the inline input setting, choose Edit > Preferences or Dreamweaver > Preferences (Mac OS X), and then click General. Select Enable Double-Byte Online Input to enable to enter double-byte text.

To use double-byte characters as method names, the method names must be assigned using the object array operator and not the dot operator:

```
// This is the CORRECT way to create double-byte method names
obj["Any_hi_byte_name"] = function(){}

// This is the INCORRECT way to create double-byte method names
obj.Any_hi_byte_name = function() {}
```

Unloading and reloading applications

Application instances are normally unloaded because of garbage collection. The first time the garbage collector runs after all clients have disconnected from an application, the application will be unloaded. In other words, applications aren't unloaded immediately when all clients disconnect. Since application startup usually takes some time, it is better for the application to stay open for a little while, so that the next client that connects doesn't incur the startup cost.

By default, garbage collection happens once every 20 minutes (every 5 minutes for unused I/O threads). You can configure these values to be any number of minutes (greater than zero); for more information, see *Managing Flash Communication Server*.

Also, whenever you make changes to the main.asc file, you must reload the application for the changes to be applied. This will disconnect all users currently connected to the application. You can do this either through the Administration Console (see *Managing Flash Communication Server*) or the Communication App inspector (see "Using the Communication App inspector" on page 97).

Implementing dynamic access control

Server-side ActionScript provides a mechanism to implement dynamic access control list (ACL) functionality for shared objects and streams. By default, all connections have full access to all streams and shared objects. You can control who has access to create, read, or update shared objects or streams. Every connection to a server-side application instance is represented by a Client object on the server-side, and each Client object has two properties: `readAccess` and `writeAccess`. Using these two properties, you can control access on a per-connection basis.

Because shared object and stream names are strings, and both follow the same rules of URI-encoded data, you can define access based on the name. The `client.readAccess` and `client.writeAccess` commands take string values. These values can contain multiple string tokens, or unique identifiers for the object names you want to control, separated by semicolons (;). Here are two example strings:

```
client.readAccess = "appStream;/appSO/"
client.writeAccess = "appStreams/public/;appSO/public/"
```

Using these calls and the string token convention, you can create shared objects and streams that follow well-defined patterns. For example, suppose all shared objects created by the application start with the prefix `appSO`; shared objects available for all users begin with the prefix `appSO/public`; and shared objects you want to protect have the prefix `appSO/private`.

If you set the read access as follows:

```
client.readAccess = "appSO/"
```

the server will allow all connected clients to subscribe to shared objects whose name begins with `appSO`.

Similarly, you can make the call:

```
client.writeAccess= "appSO/public/"
```

and the client can create only shared objects with names beginning with `appSO/public`, such as `appSO/public/foo`, but would be denied access to `appSO/private`, and so on.

By using the above feature, and designing a naming scheme for streams and shared objects, you can implement ACL. For more information, see the `Client.readAccess` and `Client.writeAccess` entries in the *Server-Side Communication ActionScript Dictionary*.

Debugging your application

This section includes recommendations to help you debug your Flash Communication Server applications, including tips on using debugging tools and writing `onStatus` functions.

Using debugging tools

Flash Communication Server provides three powerful tools to help you debug your applications—the Administration Console, the Communication App inspector, and the NetConnection Debugger. You should have one or more of these open while you are debugging your application, in order to see exactly what log messages are being generated, how object values are being set and updated, etc. For more information on the Administration Console, see *Managing Flash Communication Server*. For more information on the App inspector and the debugger, see the Appendix, “Flash Communication Server Management Tools,” on page 97.

Using onStatus event handlers

The client-side Camera, Microphone, NetConnection, NetStream, and SharedObject objects, as well as the server-side Application, NetConnection, Stream, and SharedObject objects, provide an `onStatus` event handler that uses an information object for providing information, status, or error messages. To respond to this event handler, you must create a function to process the information object, and you must know the format and contents of the information object returned.

In addition to the specific onStatus methods provided for the objects listed above, Flash MX also provides a "super function" called System.onStatus. If onStatus is invoked for a particular object in an error condition and there is no function assigned to respond to it, Flash processes a function assigned to System.onStatus if it exists.

By default, every information object has a code property containing a string that describes the result of the onStatus method, and a level property containing a string that is either "status", "warning", or "error". Some information objects have additional default properties, which provide more information about the reason onStatus was invoked.

For more information about the values returned by various onStatus handlers, see the *Client-Side Communication ActionScript Dictionary*. The following table summarizes the information objects returned by certain server-side calls; the server-side call on the left invokes the client-side NetConnection.onStatus handler with the code value on the right. (This information is not included in the *Client-Side Communication ActionScript Dictionary*.)

Server-side call	Code value for client-side NetConnection.onStatus handler
application.acceptConnection()	NetConnection.Connect.Success
application.rejectConnection()	NetConnection.Connect.Rejected
application.disconnect()	NetConnection.Connect.Closed

The next sections include additional recommendations on how to write applications to best implement this feature.

Putting onStatus handlers in the right place in a script

Because of network and thread timing issues, it is best to place an onStatus handler before a connect method in a script. Otherwise, the connection might complete before the script executes the onStatus handler initialization. Also, all security checks are made within the connect method, and notifications will be lost if the onStatus handler is not yet set up.

Overriding onStatus

One of the first things your application should do, even if you don't need to do anything in the onStatus handler, is to override the generic onStatus handler for all of the Flash Communication Server objects. One strategy is to override the onStatus handler when you start writing the application, as shown in the following example:

```
// Trace all the status info
function traceStatus(info) {
  trace("Level: " + info.level + "   Code: " +  info.code);
}
NetConnection.prototype.onStatus = traceStatus;
NetStream.prototype.onStatus = traceStatus;
SharedObject.prototype.onStatus = traceStatus;
```

As you develop your application and determine that you need to actually override the handler for a specific purpose, you can delete the code above, but in the meantime you will at least see all of the messages related to your application.

Always check for status messages on both the client and server.

Debugging NetConnection.Connect.Failed

If a `NetConnection.connect` command returns an information object with a `code` value of `NetConnection.Connect.Failed`, you are unable to establish a connection with the server. Every time you receive this error, ask yourself some standard troubleshooting questions:

- Are you connecting to a valid application? In other words, is there a subdirectory in the flashcom application directory that has the same name as the application? (This is a very common reason for a connection to fail.)
- Are you connecting to the right server?
- Is the server running?
- Are you specifying the protocol (rtmp:) for connecting to the server?

Attempts to connect to the server can also fail if the permissible number of socket connections on either the client or the server machine is at its limit. This limit is dependent on how much physical memory your server has, and how busy the connections are. On Windows systems, the memory for socket connections is allocated out of the non-paged memory, so it cannot be swapped out to a page file. You may see that you reach the maximum limit at different values from time to time as other running programs (such as core OS services) will be competing with yours for space in the non-paged memory pool.

Getting properties of an object

If you need to know why you might be having problems with a particular object, you can iterate its properties like this:

```
for (i in my_obj) {
         trace(i + " = " + my_obj[i]);
}
```

Adding a privacy module

When creating applications that capture client audio or video streams, you should provide users with explicit notice that you are doing so, and request their permission. Including a self-view is a good way to let the user know that they are "on camera" and a transmission light or microphone activity indicator can let that person know that the microphone is on. For live communication applications it is always a good idea to give the user easy access to controls that allow them to turn their camera and microphone off and to mute the audio they are receiving.

Many of the sample applications provided in the flashcom application directory illustrate how to implement one or more of these techniques. The following sample shows one way to request the user's permission before recording. You can find the sample file for this code in the flashcom_help\help_collateral\doc_approval directory under the installed Macromedia Flash MX authoring directories.

To create the privacy module:

1. In the Flash MX authoring environment, select File > New to open a new file.
2. From the Components panel (Window > Components), drag the Push Button symbol under Flash UI components to a position near the bottom of the Stage. In the Property inspector (Window > Properties), give it the instance name `Record_btn`, the label `Record`, and the click handler `doRecord`.

3 From the options menu in the Library panel (Window > Library), select New Symbol, and give it the name `warnRec_mc`. Click Advanced if necessary, and under Linkage, select Export for ActionScript, and then click OK.

4 On the `warnRec_mc` stage, select the Text tool and draw a text box. In the Property inspector, select Static Text for the type of text box. Type (or copy and paste) text such as the following text into the text box: **Your image will be recorded or broadcasted and could be published at a later date. Is this OK?**

Note: Please note that this text is provided merely as an example, and the precise wording of the text that you use will be dictated by the nature of your application and/or service and any privacy, legal, or other issues raised by your application and/or service.

5 Drag two instances of the Push Button symbol onto the `warnRec_mc` stage. In the Properties panel, give one the instance name `Yes_btn`, the label `Yes`, and the click handler `onYes`. Give the other push button the instance name `No_btn`, the label `No` and the click handler `onNo`.

6 Copy and paste the following code to the Actions panel for the first frame of the movie:

```
stop();

var userAnswer = false;

function doRecord() {
  // If user selects button to record...
  if (Record_btn.getLabel() == "Record") {

    // Call function to get user's approval to record.
    getApproval();

    // When user has provided an answer, if the answer's
    // yes, begin to record, otherwise, send a status
    // message
    WarnNow_mc.onUnload = function () {
      // If user approved, Record.
      if (userAnswer == true) {
        //
        // Record
        // .
        // .
        // .
        //
        trace("Recording...");
        // Change the button label
        Record_btn.setLabel("Stop");
      // Else if user refused, give status.
      } else {
        trace("User did not approve streaming.");
      }
    }
  // Else if user selects button to stop recording...
  } else if (Record_btn.getLabel() == "Stop") {
    trace("Stopped Recording.");
    // Change the button label
    Record_btn.setLabel("Record");
  }
}

function getApproval(){

  // Attach the movie clip to prompt user input,
  // and align it on the stage.
  _root.attachMovie("warnRec_mc", "WarnNow_mc", 1);
  var x = 275;
  var y = 160;
  setProperty("WarnNow_mc", _x, x);
  setProperty("WarnNow_mc", _y, y);

  // If the user selects the Yes button, they
  // approved the recording. So, set userAnswer
  // to true, unload the movie clip and return
  // the updated userAnswer value.
  WarnNow_mc.Yes_btn.onRelease = function () {
    userAnswer = true;
    trace("userAnswer: " + userAnswer);
    WarnNow_mc.unloadMovie();
    trace("Returning: " + userAnswer);
    return userAnswer;
  }
```

```
    // If the user selects the No button, they
    // do not want to record. So, set userAnswer
    // to false, unload the movie clip and return
    // the updated userAnswer value.
    WarnNow_mc.No_btn.onRelease = function () {
      userAnswer = false;
      trace("userAnswer: " + userAnswer);
      WarnNow_mc.unloadMovie();
      trace("Returning: " + userAnswer);
      return userAnswer;

    }
  }
```

7 Create a directory named doc_approval in your flashcom application directory, and save your file as doc_approval.fla in this directory.

You can now publish and test the application.

Coding conventions

This document outlines a system of best practices specifically designed for coding with ActionScript and building applications with Macromedia Flash MX. Applications that use these guidelines should be more efficient and understandable—and the underlying ActionScript code will be easy to debug and reuse.

Following naming guidelines

An application's naming scheme must be consistent and names should be chosen for readability. This means that names should be understandable words or phrases. The primary function or purpose of any entity should be obvious from its name. Since ActionScript is a dynamically typed language, the name should also contain a suffix that defines the type of object being referred to by the name. In general, noun-verb and adjective-noun phrases are the most natural choices for names. For example:

- Movie name: my_movie.swf
- Entity appended to a URL: course_list_output
- Component or object: ProductInformation
- Variable or property: userName

Function names and variables should begin with a lowercase letter. Objects and object constructors should be capitalized. Using mixed case is also recommended when naming variables, although other formats are acceptable as long as they are used consistently within the application. Variable names can only contain letters, numbers, and underscores. However, do not begin variable names with numbers or underscores.

Examples of illegal variable names:

```
_count = 5; // begins with an underscore
5count = 0; // begins with a number
foo/bar = true; // contains a forward slash
foo bar = false; // contains a space
```

In addition, words that are used by ActionScript should never be used as names. Also avoid using variable names of common programming constructs, even if the Macromedia Flash Player does not currently support those constructs. This helps to ensure that future versions of the Player will not conflict with the application. For example, do *not* use commands such as `MovieClip = "myMovieClip"` or `case = false`.

Since ActionScript is based on ECMAScript, application authors can refer to current and future ECMA specifications to view a list of reserved words. While Flash MX does not enforce the use of constant variables, authors should still use a naming scheme that indicates the intent of variables. Variable names should be lower case or mixed case with a lower case first letter, and constant names should be all upper case. For example:

```
course_list_output = "foo"; // variable, all lower case
courseListOutput = "foo"; // variable, mixed case
BASEURL = http://www.foo.com; // constant, all upper case
MAXCOUNTLIMIT = 10; // constant, all upper case
MyObject = function(){}; // constructor function
f = new MyObject(); // object
```

Finally, all SWF files should have names that are lowercase words separated by underscores (for example, lower_case.swf). This facilitates moving applications to a case-sensitive operating system, such as UNIX.

Remember that these syntax recommendations are simply guidelines. The most important thing is to choose a naming scheme and use it consistently.

Commenting your code

Always comment code in an application. Comments are the author's opportunity to tell a story about what the code was written to do. Comments should document every decision that was made while building an application. At each point where a choice was made about how to code the application, place a comment describing that choice and why it was made.

When writing code that is a work-around for specific issue, make sure you add a comment that will make the issue clear to future developers who may be looking at the code. This will make it easier for them to address that issue.

Here is an example of a simple comment for a variable:

```
var clicks = 0; // variable for number of button clicks
```

Block comments are useful when a comment contains a large amount of text:

```
/*
Initialize the clicks variable that keeps track of the number of times
the button has been clicked.
*/
```

Some common methods for indicating specific topics are:

- `// :TODO: topic`

  Indicates that there is more to do here.

- `// :BUG: [bugid] topic`

  Shows a known issue here. The comment should also explain the issue and give a bug ID if applicable.

- `// :KLUDGE:`

Indicates that the following code is not elegant or does not conform to best practices. This comment alerts others to provide suggestions about how to code it differently next time.

- `// :TRICKY:`

Notifies developers that the subsequent code has a lot of interactions. Also advises developers that they should think twice before trying to modify it.

Keeping actions together

Whenever possible, all code should be placed in one location. This makes the code easier to find and debug. One of the primary difficulties in debugging Macromedia Flash MX movies is finding the code. If most of the code is placed in one frame, this problem is eliminated. Usually, the best place to put the code is in frame 1.

When large amounts of code are located in the first frame, make sure you separate sections with comments to ensure readability, as follows:

```
/*** Button Function Section ***/

/*** Variable Constants ***/
```

Initializing your applications

Initialization of an application is used to set the starting state. It should be the first function call in the application. This function should be the only call for initialization made in your program; all other calls should be event driven.

```
// frame 1
this.init();
function init()
{
  if (this.inited != undefined)
    return;
  this.inited = true;
  // initialization code here
}
```

Using var for local variables

All local variables should use the keyword `var`. This prevents variables from being accessed globally and, more importantly, prevents variables from being inadvertently overwritten. For example, the following code does not use the keyword `var` to declare the variable and inadvertently overwrites another variable.

```
counter = 7;
function loopTest()
{
  trace(counter);
  for(counter = 0; counter < 5; counter++)
  {
    trace(counter);
  }
}
trace(counter);
loopTest();
trace(counter);
```

This code outputs:

```
7
7
0
1
2
3
4
5
```

In this case, the `counter` variable on the main Timeline is overwritten by the `counter` variable within the function. Below is the corrected code, which uses the keyword `counter` to declare both of the variables. Using the `counter` declaration in the function fixes the bug in the code above.

```
var counter = 7;
function loopTest()
{
  trace(counter);
  for(var counter = 0; counter < 5; counter++)
  {
    trace(counter);
  }
}
trace(counter);
loopTest();
trace(counter);
```

Using prototypes when creating objects

When creating objects, attach object functions and properties that will be shared across all instances of the object to the prototype of the object. This ensures that only one copy of each function exists within memory. As a general rule, do not define functions within the constructor. This creates a separate copy of the same function for each object instance and unnecessarily wastes memory. This following example is the best practice for creating an object:

```
// Best practice for creating an object
MyObject = function()
{
}
MyObject.prototype.name = "";
MyObject.prototype.setName = function(name)
{
  this.name = name;
}
MyObject.prototype.getName = function()
{
  return this.name;
}
```

The following example demonstrates a correct technique for creating an object, but should be used only when you want properties of the object to be instance-based rather than prototype-based:

```
// Less desirable practice for creating an object
MyObject = function()
{
  this.name = "";
  this.setName = function(name)
  {
    this.name = name;
  }
  this.getName = function()
  {
    return this.name;
  }
}
```

In the first example, each instance of `MyObject` points to the same functions and properties defined in the object's prototype. Note, for instance, that only one copy of `getName` exists in memory, regardless of the number of `MyObject` objects created.

In the second example, each instance of `MyObject` created makes a copy of each property and function. These extra property and function copies use additional memory, and in most cases, do not provide any advantages.

Naming variables to support code hinting

The Macromedia Flash MX ActionScript editor has built-in code hinting support. To take advantage of this, variables must be named in a specific format. The default format is to add a suffix to the variable name that indicates the variable type. Below is a table of supported suffix strings.

Object type	Suffix string	Example
Camera	`_cam`	`my_cam`
Video	`_video`	`small_video`
Microphone	`_mic`	`the_mic`
NetConnection	`_nc`	`my_nc`
NetStream	`_ns`	`a_ns`
SharedObject	`_so`	`myRemote_so`

File types and paths

Flash Communication Server creates files when certain features are used. This section discusses where Flash Communication Server stores files that it creates.

Note: This section assumes that you are passing an instance name along with your application name (see "Applications and application instances" on page 14), If you don't pass an instance name, Flash Communication Server stores files in a subdirectory named _definst_ (for "default instance") in your application directory.

Recorded stream files

When you use methods that record audio, video, or data streams (for example, `NetStream.publish`), Flash Communication Server creates two files—*filename*.flv and *filename*.idx—where *filename* is the string that was passed to the method that recorded the stream. These files are the recorded stream and its associated index file. For example, if you issue the command `NetStream.publish("me", "record")`, files named me.flv and me.idx will be created.

Flash Communication Server stores the FLV and IDX files in subdirectories of the flashcom application directory. Flash creates these directories automatically. For example, if the application instance `ChatApp/MondayChat` records a stream named `chat`, the chat.flv and chat.idx files will be stored in the following location: flashcom\applications\ChatApp\streams\MondayChat. If you run an instance of ChatApp called TuesdayChat, its files will be stored in flashcom\applications\ChatApp\streams\TuesdayChat.

If you want to play back an FLV file that was created by a specialized video application, such as Sorenson Squeeze, place it in the directory where the Flash Communication Server expects to find it; that is, a subdirectory of a \streams directory as discussed in the preceding paragraph. When you run the application, Flash Communication Server will create an IDX file and store it in the same subdirectory.

To avoid overwriting streams, consider using unique names for users, streams, and so on. For example, when recording a new stream, you could provide an incremental value:

```
outStream.publish("myRecording" + numSnaps, "record");
```

For information on deleting recorded stream files, see Stream object. For more information on instance names and file storage, see `NetConnection.connect` and `NetStream.publish` in the *Client-Side Communication ActionScript Dictionary*.

Shared object files

Any shared object, either local or remote, can exist dynamically (for the life of the application instance) or can be saved for use as persistent data. This section discusses the three types of persistent shared objects you can create: persistent local shared objects, remote shared objects that are persistent only on the server, and remote shared objects that are persistent on the client and the server. (For more information on shared objects in general, see “Understanding shared objects” on page 14.)

Local shared objects are always persistent on the client, up to available memory and disk space. However, by default Flash can save locally persistent remote shared objects only up to 100 K in size. When you try to save a larger object, the Flash Player displays a Local Storage dialog box, which lets the user allow or deny local storage for the domain that is requesting access. The user can also use this dialog box to delete all locally persistent remote shared objects. For more information, see “Local disk space considerations” in the SharedObject entry of the *Client-Side Communication ActionScript Dictionary*.

Persistent local shared objects

You create persistent local shared objects by using the client-side `SharedObject.getLocal` command. Persistent local shared objects have the extension .sol and are stored on the client machine in a directory associated with the user who created the shared object. On Windows, the default location is C:\Documents and Settings*userName*\Application Data\Macromedia\Flash Player*serverSubdomain**pathToMovie**movieName*.swf. (You can override the default by passing a value for the *`localPath`* parameter of the `SharedObject.getLocal` command.)

For example, if your logon ID is jsmith, you are running your server on a local machine (localhost), your movie is named myMovie.swf and is located in the C:\test directory, a local shared object created by the code below would be stored in the following location: C:\Documents and Settings\jsmith\Application Data\Macromedia\Flash Player\localhost\test\myMovie.swf.\myObject.sol.

```
my_so = SharedObject.getLocal("myObject");
```

Remotely persistent shared objects

You create remote shared objects that are persistent only on the server by passing a value of `true` for the *`persistence`* parameter in the client-side `SharedObject.getRemote` command or in the server-side `SharedObject.get` command. These shared objects are named with the extension .fso, and are stored on the server in a subdirectory of the application that created the shared object. The Flash Communication Server creates these directories automatically; you don't have to create a directory for each instance name. On Windows, the default location is C:\Program Files\Macromedia\Flash Communication Server MX\flashcom\applications*appName*\sharedobjects*instanceName*.

For example, a remote shared object created by the code below would be stored in the following location: ..\flashcom\applications\myWhiteboard\sharedobjects\monday\myObject.fso.

```
my_nc = new NetConnection();
my_nc.connect("rtmp://myFlashServer.myDomain.com/myWhiteboard/monday");

// The third parameter of "true" specifies that the object
// should persist on the server.
my_so.getRemote("myObject", my_nc.uri, true);
my_so.connect(my_nc);
```

Remotely and locally persistent shared objects

You create remote shared objects that are persistent on the client and the server by passing a local path for the *`persistence`* parameter in your client-side `SharedObject.getRemote` command. The locally persistent shared object is named with the extension .sor and is stored on the client in the specified path. The remotely persistent .fso file is stored on the server in a subdirectory of the application that created the shared object (see "Remotely persistent shared objects" above).

By specifying a partial path for the location of a locally persistent remote shared object, you can let several movies from the same domain access the same shared objects. For more information, see `SharedObject.getRemote` in the *Client-Side Communication ActionScript Dictionary*.

Snapshots and thumbnails

This section compares the techniques for grabbing single frames of video as pictures to use within your application. You can find the sample files for the code in the flashcom_help\help_collateral\doc_snapshot and \doc_thumbnails directories under the installed Macromedia Flash MX authoring directories. To see these applications in action, create directories named doc_snapshot and doc_thumbnails in your flashcom application directory, then open the corresponding SWF file. See "Creating your working environment" on page 31 if you want to re-create these samples.

These samples may seem to behave similarly when you run them, but in fact they work very differently. The doc_snapshot sample records only one frame, which it then displays. The doc_thumbnails sample records multiple frames (an entire stream), but displays only the first frame. You might use a snapshot application when you want to "take a picture" rather than record a stream, while you might use a thumbnail application when you want to let a user choose among multiple streams to play; you could display thumbnails for each of the streams that would give the user an idea of what was recorded on each stream.

Snapshots

If you look at the `NetStream.attachVideo` entry in the *Client-Side Communication ActionScript Dictionary*, you will see the following usage:

```
myStream.attachVideo(source | null [, snapShotMilliseconds])
```

The *`snapShotMilliseconds`* parameter is used to send a single snapshot (by providing a value of 0) or a series of snapshots—in effect, time-lapse footage—by providing a positive number that adds a trailer of the specified number of milliseconds to the video feed. When you specify the *`snapShotMilliseconds`* parameter, you are controlling how much time elapses *during playback* between recorded frames.

The following client-side ActionScript code in doc_snapshot.fla connects to the server and plays camera output locally. When the user chooses to take a snapshot, the event handler, `doRecord`, makes a call to `out_ns.attachVideo(client_cam, 0)`. The second parameter, `0`, causes just one frame to be recorded.

```
#include "NetDebug.as"

stop();

// Recording state variable
RecState_box.text = 0;

// Number of snapshots
numSnaps = 0;

// Initialize button label
Record_btn.setLabel("Record");

// Connect to the snapshot app and get connection status
function doConnect() {
  client_nc = new NetConnection();
  client_nc.onStatus = function(info) {
    trace("Level: " + info.level + newline + "Code: " +  info.code);
  };
  client_nc.connect("rtmp:/doc_snapshot/room_01");
}

// Create a stream for recording and getting the snapshot
function initStreams() {
  // Stream for recording
  out_ns = new NetStream(client_nc);
  out_ns.onStatus = function(info) {
    trace("Level: " + info.level + newline + "Code: " +  info.code);
  };

  // Stream for playing
  in_ns = new NetStream(client_nc);
  in_ns.onStatus = function(info) {
    trace("Level: " + info.level + newline + "Code: " +  info.code);
  };
}

// Get a camera instance and attach it to the local
// video, Live_video, and the output stream
client_cam = Camera.get();
Live_video.attachVideo(client_cam);

// Button event handler for publishing and showing the snapshot
function doRecord() {
  // If you're not recording, begin to record
  if (RecState_box.text == 0) {
    // Clear the snapshot window
    Snapshot_mc.removeMovieClip();
    // Take a snapshot
    out_ns.attachVideo(client_cam, 0);
    out_ns.publish("myRecording"+numSnaps, "record");
    // Set the label to stop
    Record_btn.setLabel("Stop");
    // Update the recording state
    RecState_box.text = 1;
    // If you're recording, stop
```

```
    } else {
      // Stop publishing recorded stream
      out_ns.publish(false);
      // Close the stream so that we can use the same to publish again
      out_ns.close();
      // Set the label to "Record"
      Record_btn.setLabel("Record");
      // Update the recording state
      RecState_box.text = 0;
      showSnapshot();
    }
}

// Show the snapshot by attaching the stream to the SnapView_video
// video object and playing it
function showSnapshot() {
  // Create a new movie clip from the exportable movie clip View_mc,
  // which contains a video object, SnapView_video. Provide a new name, and
  // depth (a number relative to the other View_mcs on the stage used
  // to prevent collision)
  _root.attachMovie("View_mc", "Snapshot_mc", numSnaps);
  // Attach the input stream to the SnapView_video video object
  // in the v instance of the View_mc movie
  Snapshot_mc.SnapView_video.attachVideo(in_ns);
  Snapshot_mc._x=375;
  Snapshot_mc._y=225;

  // Play the recording
  in_ns.play("myRecording"+numSnaps);
  // Update the counter for the number of snapshots for next time.
  numSnaps++;
}


// Connect to the server
doConnect();
// Initialize the streams
initStreams();
```

Thumbnails

Thumbnails are a smaller, discrete version of an original recording. Like snapshots, they provide single-frame representations of recorded video stream. In the snapshot example, you are only sending one frame of data. In this sample, you are playing only the first frame of a recorded stream.

In the previous example, you used the *snapShotMilliseconds* property of the `NetStream.attachVideo` object to get a snapshot of your stream. In this sample, you also need to get a one frame picture of a stream. Here, however, you use a call to `NetStream.play`:

```
thumbStream.play("myRecording", 0, 0, true)
```

If you look at the `NetStream.play` entry in the *Client-Side Communication ActionScript Dictionary*, you can see that the first parameter describes what to play, `"myRecording"`; while the second is where to begin on the stream (0 means at the start of a recorded stream); the third, where to end (0 means play only one frame); and the fourth tells the Player to flush any previous play streams.

In the following client-side ActionScript code in doc_thumbnails.fla, the server records the incoming stream until the user chooses to stop the recording. Then, with the call to `thumb_ns.play("myRecording", 0, 0, true)`, only the first frame of that recording is returned to the client.

```
#include "NetDebug.as"

stop();

// Recording state variable
recState = 0;

// Initialize button label
Record_btn.setLabel("Record");

// Show the recording in a thumbnail
showThumb();

// Connect to the thumbnails app and get connection status
function doConnect()
{
  client_nc = new NetConnection();
  // If connection is closed, clear the History and the list

  // Handle status message
  client_nc.onStatus = function(info) {
    trace("Level: " + info.level + newline + "Code: " +  info.code);
  }

  client_nc.connect("rtmp:/doc_thumbnails/room_01");
}

// Create a stream for recording and getting the thumbnail
function initStreams()
{
  out_ns = new NetStream(client_nc);

  out_ns.onStatus = function(info)
  {
    if (info.code == "NetStream.Publish.Success") {
      var description = "You have published.";
      trace(description);
    }
  };

  thumb_ns = new NetStream(client_nc);
}

// Get a camera instance and attach it to the local
// video, Live_video, and the output stream
function initMovie()
{
  client_cam = Camera.get();
  Live_video.attachVideo(client_cam);
  out_ns.attachVideo(client_cam);
}

// Button event handler for publishing and showing the thumbnail
function doRecord()
{
  if (recState == 0) {
```

```
    out_ns.publish("myRecording", "record");
    Record_btn.setLabel("Stop");
    recState = 1;
  } else {
    out_ns.publish(false);
    Record_btn.setLabel("Record");
    recState = 0;
    showThumb();
  }
}

// Show the thumbnail by attaching the stream to the ThumbView_vc
// video object and playing it
function showThumb()
{
  ThumbView_vc.attachVideo(thumb_ns);
  thumb_ns.play("myRecording", 0, 0, true);
}

// Connect to the server
doConnect();

// Initialize the streams
initStreams();

// Initialize the movie
initMovie();
```

Application object

This section includes recommendations to help you optimize your use of the server-side Application object, including tips on how and why to set up `application.OnConnect` and `application.OnDisconnect` functions.

Application.onConnect

Setting up methods in `application.onConnect` is a good approach when you want to set up different methods based on user login information. However, if you want to set up a method that is available to all clients, use the `prototype` property of the Client object:

```
// A user has connected
application.onConnect = function( newClient, userName )
{
  if (userName == "admin")
  {
    newClient.adminFunc= function(param)
    {
      // some code that's only useful to the admin
      newClient.myAdminProperty = param;
    }
  } else
  {
    // code for most cases
  }

  // Allow the logon
  application.acceptConnection( newClient );
}

// this part could be in a separate file

// Every client (including admin) is going to have this function
// (because of the way "prototype" works).
Client.prototype.commonFunction = function (myColor)
{
  // some code

  // use this to refer to the client instead of newClient
  this.color = myColor;
}
```

Also, if you want to use the `call` method on the client object that is connecting, make sure you call `application.acceptConnection` and know that the client is connected before issuing any additional commands:

```
application.onConnect = function(clientObj,name,passwd)
{
  // First accept the connection
  application.acceptConnection(clientObj);
  // After client is registered with the application instance
  // you can use "call" method
  clientObj.call("onWelcome", "You are now connected!!!");
  return;
  // Once you call acceptConnection or
  // rejectConnection within onConnect, return value is ignored.
}
```

Application.onDisconnect

The server calls the `application.onDisconnect` method when the NetConnection is closed. You cannot use `client.call` on the object being passed inside `onDisconnect`. However, you can send a message to all other clients about this event:

```
// On the server side you would have the following
application.onConnect = function(newClient, name)
{
  newClient.name = name;
  return true;
}

application.onDisconnect = function(client)
{
  for (var i = 0; i < application.clients.length; i++)
  {
    application.clients[i].call("userDisconnects", client,name);
  }
}

// On the client side you would have the following

nc = new NetConnection();
nc.userDisconnects= function (name) {
    trace(name + "quits");
}
nc.connect ("rtmp:/app_name", userName);
```

Camera object

This section includes recommendations to help you optimize your use of the Camera object, including tips for matching camera settings to available bandwidth and using one camera in multiple applications.

Turning the camera off

If your application uses a Camera object attached to a NetStream object to record data, the camera will stay on after you finish recording. To turn off the camera, use `NetStream.attachVideo(false)` when you have finished recording.

Suggested settings for different bandwidth speeds

The default camera settings provide a good viewing experience for all bandwidth settings. However, you can experiment with different settings for different bandwidths.

The code for setting the camera settings is as follows:

```
my_cam = Camera.get();
my_cam.setQuality(bandwidthSpeed,quality)
```

Use the following table as a starting point if you want to experiment with camera settings at different bandwidth speeds.

Bandwidth	Effect	Code
Modem	Lower image quality, higher motion quality	`my_cam.setQuality(4000,0)`
	Higher image quality, lower motion quality	`my_cam.setQuality(0,65)`
DSL	Lower image quality, higher motion quality	`my_cam.setQuality(12000,0)`

Bandwidth	Effect	Code
	Higher image quality, lower motion quality	`my_cam.setQuality(0,90)`
LAN	Lower image quality, higher motion quality	`my_cam.setQuality(400000,0)`
	Higher image quality, lower motion quality	`my_cam.setQuality(0,100)`

Using one camera in multiple applications

Multiple applications (SWFs) can use the same camera at the same time, provided that they are running in the same process. Generally, multiple browser windows are all in the same process, so in the browser environment this capability works well.

However, a camera cannot be shared between applications running in two different processes—for example, one in the browser and one in a stand-alone player.

Client object

When attaching methods to the Client object in server-side scripts, remember that all methods on the client object can be called by a script in the SWF file on the client. You should not include any methods on the client object that you would not want a remote computer to invoke. For example, you wouldn't want a client to be able to call a method that could disconnect an application.

NetConnection object (client-side)

If an HTML page containing a movie is accessed differently (with regard to domain names) from the way the movie itself accesses the Flash Communication Server, then the connection will not be successful. This is a security feature of the Flash Player. But in some cases, this may be inconvenient.

For example, if a web page containing a movie is served on an intranet from, say, http://deptserver.mycorp.com, it can also be accessed simply by http://deptserver. If the page is accessed via, say, http://deptServer/tcpage.htm, but the movie specifies deptServer.mycorp.com in as *`targetURI`*, then the movie will not make a successful connection to the server. Similarly, if the web page and movie are accessed as http://deptserver.mycorp.com/tcpage.htm, but the movie specifies rtmp://deptserver as *`targetURI`*, it will not connect.

There are a few things you can do to prevent the security policies from inconveniencing you or your users. First, and easiest, is not to include a server name in *`targetURI`*. (This is applicable only if the Flash Communication Server and web server are running on the same machine.) To do so, leave off the second slash in *`targetURI`*. For example, the following commands will make the Flash Player attempt to connect to the same host and domain as the web server the SWF file was served from.

```
nc = new NetConnection();
nc.connect("rtmp:/myApp");
```

Second, there is a bit of JavaScript you can use in your HTML page to avoid the security problem. Assuming the movie uses a fully qualified domain name URL to access the Flash Communication Server, this JavaScript redirects the web page to an explicitly named full URL, like this:

```
<SCRIPT language="javascript">
// if the URL didn't have the domain on it
if (document.URL.indexOf("mycorp.com") == -1) {
    // redirect to a version that does
    document.URL="http://deptServer.mycorp.com/tcpage.htm";
}
</script>
```

Finally, if you own a domain name, have access to the DNS records of that domain name, and have a static IP address for your Flash Communication Server, you can create address ("A") records to point a host name to that IP address. For instance, flashcom.mycorp.com could map to the machine running the Flash Communication Server and having an IP address provided by your IT department or ISP. Your web pages can continue to be hosted by whatever means you are currently using. ("CNAME" records are recommended if you need to forward traffic to a server that has a DNS-accessible host name but may or may not have a static IP address.)

NetStream object

This section includes recommendations to help you optimize your use of the NetStream object, including tips on incorporating data into a stream and managing a stream's buffer.

Multiple data types in a stream

In addition to streaming audio and video, you can include data in a stream. To do so, use the `NetStream.send` and `NetStream.call` commands.

Getting the stream time length in ActionScript

If you are buffering your streams, you can use the `NetStream.bufferLength` property to get the number of seconds currently in the buffer. Sometimes, however, you may want to get the total length of a stream; in this case, the Flash Player doesn't know the length of the stream, but the server does. The server has a `Stream.length` property that the client can request through a message to the server.

You could write client-side ActionScript such as the following to request the stream length:

```
function getInfo()
{
 nc.call("sendInfo", new MyResultSetName(), myStream);
}
function MyResultSetName()
{
 this.onResult = function(retVal)
 {
  _root.streamlength = retVal;
 };
 this.onStatus = function(info)
 {
  trace("Level: " + info.level + "   Code: " +  info.code);
  // process error object
 };
}
```

Then, in the corresponding server-side ActionScript, you would write the following in the main.asc file:

```
application.onAppStart = function()
{
  trace("::: Application has started :::");
}

application.onConnect = function(client)
{
  application.acceptConnection(client);

  // Add methods
  client.prototype.sendInfo = function(name) {
    var slen = Stream.length(name);
    trace("slen: " + slen);
    return slen;
  };
}
```

NetStream.time

Although it is not explicitly stated in the *Client-Side Communication ActionScript Dictionary*, the `NetStream.time` property returns a value that is internally accurate to a few hundredths of a second, and not just whole seconds. Therefore, you can use this command to return values at a more granular level. For example, you can multiply the value returned by `NetStream.time` by 1000 to determine the time to the nearest millisecond.

NetStream.bufferTime

For playback streams, the value returned by `NetStream.bufferTime` specifies how much of the stream Flash Communication Server will buffer before the Flash Player starts playing it back. For example, if your recorded stream is 50 seconds long and your playback speed is twice as fast as your download speed, you might consider setting this value to 25 seconds. You will thus be able to play all of the stream without any stalls.

For publishing streams, this value specifies how long the outgoing queue can grow before the Flash Player considers dropping messages; to determine how much data is currently in the queue, use `NetStream.bufferLength`. For a fast connection, the value returned by `NetStream.bufferLength` will never approach the value of `NetStream.bufferTime`, but on a slow connection it might.

Therefore, if you know your application is running over a slow connection and you want to minimize dropped messages or stalled playback, you might want to use `NetStream.setBufferTime` to increase the value of `NetStream.bufferTime`.

SharedObject object

Shared objects can be used for a wide number of purposes, and can be designed and used in a number of ways. This section provides some items to consider as you begin using shared objects in your applications.

SharedObject.onSync

Before attempting to work with a remote shared object, you should first check that `SharedObject.connect` returned `true`, indicating a successful connection, and then wait until you receive a result from the function you have assigned to `SharedObject.onSync`. If you fail to do so, any changes you make to the object locally—before `SharedObject.onSync` is invoked—may be lost.

The `SharedObject.onSync` handler is invoked when any of the `SharedObject.data` properties of the remote shared object are changed, and also the first time a client uses the `SharedObject.getRemote` command to connect to a remote shared object that is persistent locally and/or on the server. In the latter case, all the properties of the object are set to empty strings, and `SharedObject.onSync` in invoked with the value of `code` set to `"clear"`. Then `SharedObject.onSync` is invoked again, this time with the value of `code` set to `"change"`, and the properties of the client's instance of the remote shared object will be set to match those on the server.

If you are having problems understanding how your shared object is behaving, it helps to put some debug code in your `SharedObject.onSync` handler:

```
so.onSync = function(list) {
  for (var k in list) {
    trace("name = " + list[k].name + ", event = " + list[k].code);
  }
  // do whatever else you want to do here
}
```

Using shared object slots effectively

The decision to encapsulate shared object data in a single slot (`SharedObject.data` property) or to spread it among multiple slots depends partially on how your application posts changes to the object. For example, if your application needs to send an entire array of strings to all of the connected clients at specific intervals, you can store the entire array in a single slot.

On the other hand, if your application needs to send only information that has changed, then you should divide the data among multiple slots. This implementation reduces network traffic and thus enhances the performance of your application. It also minimizes the need for conflict resolution code, as multiple slots can be updated simultaneously without data collision.

Flushing remote shared objects

Flash Communication Server automatically flushes remote shared objects to the disk, on both the client and the server, when all users disconnect from the shared object or when the server shuts down. At any other time, if you want the shared object to be updated on disk, you must call the client-side `SharedObject.flush` method.

However, calling `SharedObject.flush` in the client-side ActionScript flushes only the local copy of the shared object. To manually flush the server copy of the shared object, you must call `SharedObject.flush` in a server-side script:

```
// Sample server-side code for flushing a persistent shared object
// to the server

// Get the shared object when the application is loaded.
application.onAppStart = function()
{
  application.mySO = SharedObject.get("SharedObjName", true);
}

// When a user disconnects, flush the shared object.
application.onDisconnect = function(client)
{
  application.mySO.flush();
}
```

Avoiding shared object synchronization problems

If more than one client (or a server application) can change the data in a single slot of your shared object at the same time, you must implement a conflict resolution strategy. Here are some examples:

Use different slots The simplest strategy is to use a different slot for each user that might change data in the object. For example, in a shared object that keeps track of users in a chat room, provide one slot per user and have users modify only their own slots.

Assign an owner A more complex strategy is to define a single client as the owner of a property in a shared object for a limited period of time. You might write server code to create a "lock" object, where a client can request ownership of a slot. If the server reports that the request was successful, the client knows that it will be the only client changing the data in the shared object.

Here's some server-side ActionScript that locks and unlocks a shared object to make sure the true highest score is returned to the game. Suppose the most recent highest score was 95, and player 1's score increased to 105, while player 2's score increased to 110. If no locking occurred, both players' scores could be compared to the most recent highest score, 95, or a collision could take place if both clients call `updateHighScore` simultaneously. You'd want to make sure that each player was compared to the highest score, regardless of whether it was the most recent highest score or any score currently coming in from all other clients. If you lock and unlock the shared object used to store the highest score, you can compare each score sequentially, and thus ensure that no comparison is lost.

```
application.onAppStart = function()
{
  application.scoreSO = SharedObject.get("high_score_so", true);
  application.scoreSO.onSync = function(listVal)
  {
    trace("got an onSync on scoreSO");
  }
}

application.onConnect = function(newClient,name,passwd)
{
  newClient.updateHighScore = function(final_score)
  {
    application.scoreSO.lock();
    if (application.scoreSO.getProperty("high_score_so") < final_score)
    {
      application.scoreSO.setProperty("high_score_so", final_score);
    }
    application.scoreSO.unlock();
  }
}
```

Notify the client When the server rejects a client-requested change to a property of the shared object, the `SharedObject.onSync` event handler notifies the client that the change was rejected. Thus, an application can provide a user interface to let a user resolve the conflict. This technique works best if data is changed infrequently, as in a shared address book. If a synchronization conflict occurs, the user can decide whether to accept or reject the change.

Accept some changes and reject others Some applications can accept changes on a "first come, first served" basis. This works best when users can resolve conflicts by reapplying a change if someone else's change preceded theirs.

Use the send method to increase your level of control over changes to objects Rather than relying completely on `SharedObject.onSync` to manage synchronization activities, use the `SharedObject.send` command as appropriate. The `SharedObject.send` command broadcasts a message to all clients connected to a remote shared object, including the client that sent the message.

Stream object

If you want to delete the FLV and IDX files associated with a recorded stream, you must use server-side code:

```
s = Stream.get("foo");
if (s)
{
  s.clear();
}
```

Microphone object

This section includes recommendations to help you optimize your use of the Microphone object, including tips on avoiding audio feedback.

Avoiding audio feedback

If you're using a microphone with external speakers and a reasonably high gain, you're likely to incur audio feedback problems. To reduce feedback from speakers, Flash Communication Server implements echo suppression. To use echo suppression, use the following command:

```
myMicrophone.useEchoSuppression(true);
```

This should maintain a comfortable input level without transmitting too much echo from your speakers.

Because echo suppression removes only a portion of the output signal from the user's input, you might still experience feedback if your microphone is too close to your speaker. To avoid feedback, try following these guidelines:

- Lower your speaker volume.
- Move the microphone and speakers farther apart.
- Troubleshoot your hardware setup for proper installation and settings.
- Use a headset.

Keeping the microphone open

To save bandwidth, Flash Communication Server by default turns off the microphone when it is not being used. However, you might want to keep it on in your application—for example, to assure that there is never any delay when the microphone is activated. To do so, use the command `my_mic.setSilenceLevel(0)`.

Video object

This section includes recommendations to help you optimize your use of the Video object, including tips on dynamically creating video objects.

Creating video objects dynamically

You can add video objects to your application only from inside the Flash MX authoring environment, by dragging an embedded video object from the Library to the Stage. However, if you want to implement video objects from within your ActionScript code, you can do so by embedding them in a movie clip. This technique lets you create and remove video objects dynamically using `duplicateMovieClip()` and `removeMovieClip()`.

Understanding frame rates

If you embed an FLV file in a movie in a static SWF file, its frame rate will be the same as the frame's playback rate on the Timeline. When you stream the data in an FLV, the video played through Flash Communication Server can have a different frame rate than the SWF that contains it.

For example, suppose you use another application to output a Broadband FLV file with a 15 fps frame rate. If you import this FLV file into a 6 fps Flash MX movie, then the video will be off sync, because the two frame rates are different. However, if instead you use Flash Communication Server to stream the FLV file into the same 6 fps movie, it will be synchronized to 15 fps, because streaming files do not use frame-based playback.

CHAPTER 5
Application Server Connectivity

This chapter explains how to use Macromedia Flash Remoting services to add application server connectivity to your Macromedia Flash Communication Server MX application. Macromedia Flash Remoting is a gateway that connects your communication application to J2EE application servers and Microsoft Windows .NET servers. Flash Remoting relies on its own client-side ActionScript library, called NetServices, to link Macromedia Flash MX movies to a server-side gateway.

The samples in this chapter illustrate how you can make Flash Remoting calls in your server-side ActionScript to access NetServices. In the context, the Flash Communication Server acts as a client to Flash Remoting. These samples work with Macromedia ColdFusion MX, which includes Flash Remoting. To use Flash Remoting with other application servers, see the Flash Remoting site (http://www.macromedia.com/go/flashremoting).

Connecting through Flash Remoting

"Common client-server workflows" on page 23 describes the different ways you can use Flash Communication Server to connect clients and servers. The subsection "Connecting to external sources" shows the Flash Communication Server connecting to other services. The client invokes a method on the Flash Communication Server, which in turn invokes a method on additional servers. The results move from the application server to the Flash Communication Server, and finally back to the client.

Using the Flash Communication Server together with the Flash Remoting NetServices library, you'll invoke a Flash Communication Server method from the client, passing some parameters. The Flash Communication Server will then invoke a NetServices method. When the NetServices method passes the result to the Flash Communication Server, the server returns it to the client.

Re-creating the samples

The samples assume you're using the Flash MX authoring environment on the same local host that is running the Flash Communication Server and ColdFusion MX. Files associated with the samples (FLA, SWF, HTML, and ASC) are located in subdirectories of the \Macromedia\Flash MX\flashcom_help\help_collateral directory.

As with the samples in earlier chapters, you'll create the user interface in a FLA file using the client-side ActionScript. The client-side ActionScript in the FLA file will invoke a method in the server-side ASC file that you will also create.

To add Flash Remoting services to your application, you'll use server-side ActionScript in an ASC file that you will create. This server-side code will act as a client to the Flash Remoting service by invoking methods in the ColdFusion CFC file, which you will also create.

You'll place the FLA and ASC files in your application directory, and place in that same directory the netservices.asc file that enables NetServices. You'll place the CFC or CFM file in the default directory where you deploy your other ColdFusion script files.

Finally, you'll test your movie by publishing the SWF file and running it. Make sure the Flash Communication Server and the ColdFusion MX server are running before you attempt to test your sample.

Sample 1: Simple Remoting

In this sample, the client application requests some calculations to be done on the application server and the results to be returned in the string format. The client invokes calls to the Flash Communication Server. The Flash Communication Server, in turn, acts as a client of the Flash Remoting service—here, a CFC script—to request that the work be done by the back-end server and the results returned.

About the sample

When the user clicks the Run Test button, the screen is updated with a message from the server, a Boolean value, an array of months, and the result of an addition operation.

Re-creating the sample

The doc_remoting.fla file provides the user interface for testing connectivity between the client, the Flash Communication Server, and the ColdFusion MX server. The main.asc file accepts the connection from the client, and in turn, connects to ColdFusion using Flash Remoting. The simple.cfc file contains the scripts for getting a Boolean value, an array, and a sum.

See "Creating your working environment" on page 31 before you start to re-create the sample.

To create the user interface for this sample:

1. From the toolbox, select the Text tool and draw a dynamic text box. In the Property inspector (Window > Properties), select Dynamic Text for the type of text box, and give it the instance name `ResultBox`.
2. To add the button for running the tests, open the Components panel (Window > Components) and drag a push button onto the Stage. In the Property inspector, give it the instance name `Run_btn`, the label `Run Tests`, and the click handler `runTests`.
3. Create a directory named doc_remoting in your flashcom application directory, and save the file as doc_remoting.fla in this directory.

To write the client-side ActionScript for this sample:

1. Add the following debug code to trace all the status information coming back from the Flash Communication Server.

```
// Trace all the status information.
function traceStatus(info) {
  trace("Level: " + info.level + "   Code: " +  info.code);
}

// Create onStatus prototypes for the objects that
// will return status.
NetConnection.prototype.onStatus = traceStatus;
NetStream.prototype.onStatus = traceStatus;
SharedObject.prototype.onStatus = traceStatus;
```

2 Create the event handler for the `Run_btn` button. Notice the call to `runTests`. This invokes the function you'll define later in the server-side code. The second parameter, `new Result()`, provides the functionality for receiving the results of the call to `runTests`.

```
// Run the simple remoting tests.
function runTests() {

  // Get the return value from the Flash Communication Server and
  // display it in the ResultBox. In this sample, the server
  // is returning the string "Ran the service on the server".
  function Result() {
    this.onResult = function(str) {
      _root.ResultBox.text = str;
    }
  }

  // Call the "runTests" function on the Flash Communication Server,
  // and pass in an instance of the Result function to receive
  // the return value from the server.
  main_nc.call("runTests", new Result());
}
```

3 Create a new network connection and connect to the application.

```
// Create a new connection and connect to the application
// instance on the Flash Communication Server.
main_nc = new NetConnection();
main_nc.connect("rtmp:/doc_remoting/room_01");
```

4 Provide a handler function that the Flash Communication Server can call to return the results of the tests.

```
// Handle the server's update of ResultBox with
// the result of each test.
NetConnection.prototype.postResults = function(result) {
  _root.ResultBox.text += "\n" + result;
}
```

To write the server-side ActionScript for this sample:

1 Create a new file using your server-side ActionScript editor, and load the netservices.asc file to enable Flash Remoting through the Flash Communication Server.

```
load("netservices.asc");
```

2 In the `onAppStart` function, define the location of the Flash Remoting service, and connect to it.

```
application.onAppStart = function() {
  trace("***** on app start");

  // Set the default gateway URL
  NetServices.setDefaultGatewayUrl("http://localhost:8500/flashservices/
  gateway");

  // Connect to the gateway
  this.gatewayConnnection = NetServices.createGatewayConnection();
}
```

3 In the `onConnect` function, accept the client's connection.

```
application.onConnect = function (clientObj) {

  trace("***** on connect");

  // Accept the connection for this client
  this.acceptConnection(clientObj);

  return true;
}
```

4 Provide a prototype function that the client can call to invoke the tests.

```
Client.prototype.runTests = function() {
  trace("***** runTests");
```

5 In the same function, create an instance of the Flash Remoting service, `testService`. The second parameter, `new TestResult(this)`, is a handler you'll define farther down in this file to catch the data coming back from the Flash Remoting service.

```
  // Get a reference to the service. "simple.simple" refers
  // to the ColdFusion file, simple.cfc, found in the "simple"
  // directory under the deployed CF directory.
  var testService =
  application.gatewayConnection.getService("simple.simple",
                                           new TestResult(this));
```

6 Call `testService` methods to get the results from the Flash Remoting methods `getBoolean`, `getArray`, and `addNumbers`, and close the function.

```
  // Call the "testService" function on Flash Remoting
  // to get a Boolean, an array, and a sum.
  testService.getBoolean(true);
  testService.getArray();
  testService.addNumbers(1,3);

  return "Ran the service on the server";
}
```

7 Provide the `TestResult` function as a handler for data coming from the Flash Remoting service.

```
// Create a TestResult function
function TestResult(client) {
  this.client = client;
}
```

8 For each test, receive the result, `result`. Then call the client-defined function `postResults` and pass the client the `result` data.

```
// Get result of Boolean test and pass the result to the
// client with a call to postResults
TestResult.prototype.getBoolean_Result = function(result)
{
  trace("***** getBoolean_Result: " + result);
  this.client.call("postResults", null, result);
}

// Get result of addition test and pass the result to the
// client with a call to postResults
TestResult.prototype.addNumbers_Result = function(result) {
  trace("***** addNumbers_Result: " + result);
  this.client.call("postResults", null, result);
}

// Get the array and pass it back to the client
// with a call to postResults
TestResult.prototype.getArray_Result = function(result) {
  trace("***** getArray_Result: " + result);
  this.client.call("postResults", null, result);
}
```

Note: In the samples in this chapter, you subscribe to the remoting service by including netservices.asc in your main.asc file. You need to provide a result method to handle any result value coming back from the remoting service in the main.asc file as well. The samples in this chapter use the `[methodName]_Result` callback convention from Flash Remoting. For example, for the call to `getBoolean`, you provide a call back to the `getBoolean_Result` method.

9 Save the file as main.asc in a doc_remoting directory under the flashcom applications directory.

Note: Save this main.asc file where you've chosen to store your server-side application files. For more information see Chapter 1, "The flashcom application directory," on page 15.

To write the ColdFusion component for this sample:

1 Using your standard editor, create a new file and add code to name the application and indicate how to access it.

```
<cfcomponent name="simple" access="remote">
```

2 Create the `addNumbers` method that the Flash Communication Server will invoke.

```
<cffunction name="addNumbers" output="false"
                description ="add two numbers" access="remote">
    <cfargument name="num1" required="true" type="numeric"
                        description="the first number">
    <cfargument name="num2" required="true" type="numeric"
                        description="the second number">
    <cfreturn num1+num2>
</cffunction>
```

3 Create the `getBoolean` method that the Flash Communication Server will invoke.

```
  <cffunction name="getBoolean" output="false" description="Returns a
  boolean that you specify." access="remote">
    <cfargument name="bool" required="true" type="boolean" description="The
  boolean to return">

    <cfreturn bool>
  </cffunction>
```

4 Create the `getArray` method that the Flash Communication Server will invoke.

```
    <cffunction name="getArray" output="false" description="Creates and
    returns an array of 3 items" access="remote">
      <cfset months = ArrayNew(1)>
      <cfset months[1] = "January">
      <cfset months[2] = "February">
      <cfset months[3] = "March">

      <cfreturn months>
    </cffunction>
</cfcomponent>
```

5 Save the file as simple.cfc in the simple directory under the directory where you publish all of your ColdFusion MX files.

Sample 2: Sending Mail

This sample illustrates how to send mail by means of the versatile `CFMAIL` tag. It shows how valuable this tag is for the distribution of Flash Communication Server data. Before re-creating this sample, make sure that you have configured your mail server in ColdFusion. To do so, select Server Settings > Mail Server, and specify the IP address of the SMTP server you want to use.

About the sample

The user fills out four fields: To, From, Subject, and a message body field. When the user clicks the Send button, the Flash Player sends a `sendMail` command to the Flash Communication Server along with the user's input in the four fields as parameters. The Flash Communication Server then calls on the Flash Remoting service to send the mail.

Re-creating the sample

The doc_sendmail.fla file provides a simple user interface for sending a mail message. The client-side ActionScript requests the message be sent, but no result is returned to the client.

See "Creating your working environment" on page 31 before you start to re-create the sample.

To create the user interface for this sample:

1 In the Flash MX authoring environment, select File > New to open a new file.

2 From the toolbox, select the Text tool and draw four text boxes.

3 For each text box, in the Property inspector (Window > Properties), select Input Text for the kind of text box, and type one of the following instance names: `FromText`, `ToText`, `SubjectText`, and `BodyText`.

4 To add the button for sending the mail, open the Components panel (Window > Components) and drag a push button onto the Stage. In the Property inspector, give it the instance name `Send_btn`, the label `Send`, and the click handler `sendMail`.

5 Create a directory named doc_mailto in your flashcom application directory, and save the file as doc_mailto.fla in this directory.

To write the client-side ActionScript for this sample:

1 Add the following debug code to trace all the status information coming back from the Flash Communication Server.

```
// Trace all the status information.
function traceStatus(info) {
  trace("Level: " + info.level + "   Code: " +  info.code);
}

// Create onStatus prototypes for the objects that
// will return status.
NetConnection.prototype.onStatus = traceStatus;
NetStream.prototype.onStatus = traceStatus;
SharedObject.prototype.onStatus = traceStatus;
```

2 Create the event handler for the `send_btn` button. Notice the call to `sendMail`. This invokes the function you'll define later in the server-side code. The second parameter, `null`, tells the Flash Communication Server that the client doesn't expect a result to be returned.

```
// Send the mail. The second parameter, null, tells the
// Flash Communication Server not to return a value. The remaining
// parameters provide the data to send.
function sendMail() {
  main_nc.call("sendMail", null, ToText.text, FromText.text,
                         SubjectText.text, BodyText.text);
}
```

3 Create a new network connection and connect to the application.

```
// Create a new connection and connect to the application
// instance on the Flash Communication Server.
main_nc = new NetConnection();
main_nc.connect("rtmp:/doc_mailto/room_01");
```

To write the server-side ActionScript for this sample:

1 Create a new file using your server-side ActionScript editor, and load the netservices.asc file to enable Flash Remoting through the Flash Communication Server. Remember to add a copy of this file in the doc_remoting directory.

```
load("netservices.asc");
```

2 In the `onAppStart` function, define the location of the Flash Remoting service, and connect to it.

```
application.onAppStart = function() {
  trace("***** on app start");

  // Set the default gateway URL.
  NetServices.setDefaultGatewayUrl("http://localhost:8500/flashservices/
  gateway");

  // Connect to the gateway.
  var gatewayConnnection = NetServices.createGatewayConnection();

  // Get a reference to the service. "mail.sendMail" refers
  // to the ColdFusion file, sendMail.cfc, found in the mail
  // application directory under the deployed ColdFusion directory.
  this.mailSendService = gatewayConnnection.getService("mail.sendMail",
                                                       this);
}
```

3 In the `onConnect` function, accept the client's connection.

```
application.onConnect = function (clientObj) {

  trace("***** on connect");

  // Accept the connection for this client.
  this.acceptConnection(clientObj);

  return true;
}
```

4 Provide a prototype function that the client can call to send the mail.

```
// Handle the client's call to sendMail.
Client.prototype.sendMail = function(to, from, subject, body) {
  trace("***** sending mail");
  // Call the sendMail function of the Flash Remoting instance
  // created in application.onAppStart, above.
  application.mailSendService.sendMail(to, from, subject, body);
}
```

5 Save the file as main.asc in a doc_mailto directory under the flashcom applications directory.

Note: Save this main.asc file where you've chosen to store your server-side application files. For more information see Chapter 1, "The flashcom application directory," on page 15.

To write the ColdFusion component for this sample:

1 Using your standard editor, create a new file and add code to name the application and indicate how to access it.

```
<cfcomponent name="sendMail" access="remote">
```

2 Create the `sendMail` function and define each parameter.

```
  <cffunction name="sendMail" output="false"
              description="send mail to a client" access="remote">
    <cfargument name="to" required="true" type="string"
              description="recipient of the email">
    <cfargument name="from" required="true" type="string"
              description="sender of the email">
    <cfargument name="subject" required="true" type="string"
              description="subject heading">
    <cfargument name="body" required="true" type="string"
              description="body text of the email">
```

3 Call the ColdFusion method `cfmail` to send the message.

```
    <cfmail to = "#to#" from = "#from#"subject = "#subject#">#body#</cfmail>
    <cftrace category="UDF End" inline = "True"
              text = "Email was sent" var = "MyStatus">
  </cffunction>
</cfcomponent>
```

4 Save the file as sendmail.cfc in the mail application directory under the directory where you publish all of your ColdFusion MX files.

Sample 3: Recordset

Once you have easy access to a database, you add data storage and retrieval to your Flash Communication Server. This simple test retrieves all the recordsets from a database. The work is done by one SQL statement inside a CFM file.

About the sample

When the user clicks the Get Records button, all the data in the database appears in the list box.

Re-creating the sample

The doc_rset.fla file provides an interface in which the user simply selects the Get Records button and the record set is returned.

See "Creating your working environment" on page 31 before you start to re-create the sample.

To create the user interface for this sample:

1. In the Flash MX authoring environment, select File > New to open a new file.
2. To add an element for listing records, open the Components panel (Windows > Components), drag the List Box component onto the Stage, and give it the instance name `records_list`.
3. To add the button for connecting to the server, drag a push button from the Components panel onto the Stage. In the Property inspector, give it the instance name `GetRecs_btn`, the label `Get Records`, and the click handler `doGetRecords`.
4. Create a directory named doc_rset in your flashcom application directory, and save the file as doc_rset.fla in this directory.

To write the client-side ActionScript for this sample:

1. Create a new network connection and connect to the Flash Communication Server.

```
// Create a network connection and connect
nc = new NetConnection();
nc.onStatus = function(info) {
  trace(info.level + ": " + info.code + " " + info.description);
}
nc.connect("rtmp:/doc_rset/room_01");
```

2. Get a shared object, and update the list box (`records_list`) with the data from the shared object.

```
// Get the records from the records shared object
recset_so = SharedObject.getRemote("records", nc.uri, false);

recset_so.onSync = function(list) {

  // Clear the list box
  records_list.removeAll();

  // Fill in the records, with column headers first. Use
  // the getColumnString function, defined below, to get
  // all of the column information.
  records_list.addItem(getColumnString(this.data.__COLUMNS__), -1);
```

3 In the same method, assign a variable name, `recstr`, for the data coming from the call to `getRecordString` and populate the list box with the data.

```
  for (var i in this.data) {
    if (i == "__COLUMNS__")
      continue;
    var recstr = getRecordString(this.data[i], this.data.__COLUMNS__);
    records_list.addItem(recstr, i);
  }

  records_list.sortItemsBy("data", "ASC");
}
```

4 Connect to the shared object.

```
recset_so.connect(nc);
```

5 Create the `getColumnString` function to get all the column data.

```
// Get a string out of all column headers
function getColumnString(cols) {
  var colstr = "";
  if (cols.length > 0)
    colstr += cols[0];
  for (var i = 1; i < cols.length; i++)
    colstr += ", " + cols[i];
  return colstr;
}
```

6 Create the `getRecordString` function.

```
// Get a string containing all records in column order
function getRecordString(inx, recs, cols) {
  var recstr = "";
  if (cols.length > 0)
    recstr += recs[cols[0]];
  for (var i = 1; i < cols.length; i++)
    recstr += ", " + recs[cols[i]];
  return recstr;
}
```

7 Create the event handler for the `GetRecs_btn` button. When the user clicks the button, the `doGetRecords` method is called; this function contains the `getRecords` call defined in the server-side ActionScript.

```
// Call the server to initiate a database query and place
// the recordset data in 'records' shared object
function doGetRecords() {
  nc.call("getRecords", null);
}
```

To write the server-side ActionScript for this sample:

1 Create a new file using your server-side ActionScript editor, and load the netservices.asc file to enable Flash Remoting through the Flash Communication Server.

```
load("netservices.asc");
```

2 Get the `records` shared object.

```
gRecords = SharedObject.get("records", false);

  // Set the default gateway URL
  NetServices.setDefaultGatewayUrl("http://localhost:8500/flashservices/
  gateway");
```

3 Create a global object to hold the recordset.

```
// An object to hold your service and recordset
gFoo = {};
```

4 Get a reference to the `foo` service.

```
// Get a named service
gFoo.service = gRemotingGateway.getService("foo", gFoo);
```

5 Create the `onResult` callback, which the Flash Remoting service expects.

```
// Set up the onResult callback and call it bar_Result.
// The function must be named such that if you call
// xxx method on the foo service, it will result in
// xxx_Result method being called. You set the data in
// the shared object so the Flash client can display it.
gFoo.bar_Result = function(result) {
  var cols = result.getColumnNames();
  trace("Columns: " + cols);
  gRecords.setProperty("__COLUMNS__", cols);

  var reclen = result.getLength();
  trace("number of records " + reclen);

  for (var i = 0; i < reclen; i++) {
    trace(i + "] " + result.getItemAt(i));
    gRecords.setProperty(i, result.getItemAt(i));
  }
}
```

6 In the `onConnect` function, accept the client's connection.

```
application.onConnect = function(client) {
  trace(application.name + " connect from " + client.ip);
  application.acceptConnection(client);
}
```

7 Provide a prototype function that the client can call to get the records.

```
Client.prototype.getRecords = function() {
  // Call the bar method on foo service
  var result = gFoo.service.bar();
  trace("gFoo.service.bar returned " + result);
}
```

8 Save the file as main.asc in a doc_rset directory under the flashcom applications directory.

Note: Save this main.asc file where you've chosen to store your server-side application files. For more information see Chapter 1, "The flashcom application directory," on page 15.

To write the ColdFusion component for this sample:

1 Using your standard editor, create a new file and add code to query the database for all records.

```
<cfquery name="flash.result" datasource="ExampleApps">

    SELECT *  FROM tblItems

</cfquery>
```

2 Save the file as bar.cfm in the foo directory under the directory where you publish all of your ColdFusion MX files.

APPENDIX
Flash Communication Server Management Tools

As an application developer, one of your most important tasks is to monitor and debug your applications while they are in use. Macromedia Flash Communication Server MX provides three windows that display a variety of details and statistics regarding your running applications.

- The Administration Console lets you view a variety of information about server responsiveness. It also lets you start and shut down the server, virtual hosts, and applications. To open the Administration Console, from the Windows Start menu choose Programs > Macromedia Flash Communication Server MX > Server Administrator. For more information, see *Managing Flash Communication Server*.
- The Communication App inspector lets you unload or reload individual application instances. It also displays information about an application instance that is currently running, including log messages, stream data, and application usage statistics. For more information, see "Using the Communication App inspector" below.
- The NetConnection Debugger lets you monitor debugging events that are related to NetConnection objects. For more information, see "Using the NetConnection Debugger" on page 105.

Using the Communication App inspector

The Communication App inspector displays a list of the application instances currently running on the server. For any instance that you select, you can view detailed information about its status, including the following:

- A running list of log messages that are generated by the application instance on the server
- Information about the streams and shared objects associated with the instance
- Information about the overall state of the selected application instance, such as total uptime, number of users, and so on

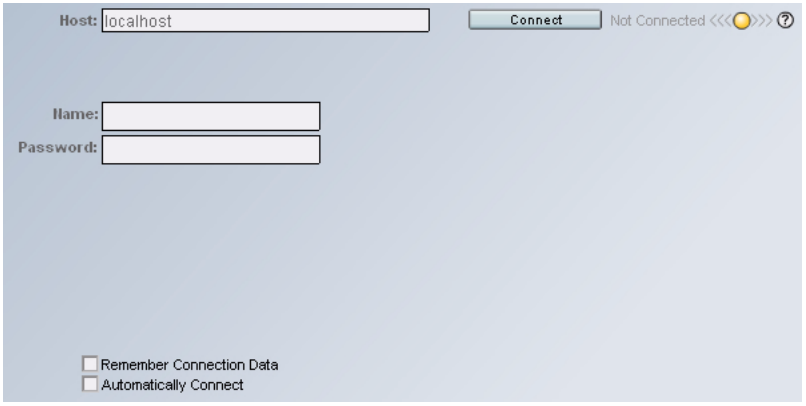
You can also use the App inspector to load and unload application instances.

To open the App inspector, choose Window > Communication App Inspector from within Macromedia Flash MX. On a server machine that doesn't have Flash MX installed, open the app_inspector.html file located in the admin subdirectory of the flashcom application directory.

To use the App inspector, you must have full server administator privileges or vhost administrator privileges.

Connecting the App inspector to a server

When you open the App inspector, you use the log-on screen to connect as an administrator to the server that is running the applications you want to manage.



The light icon in the upper right corner indicates whether the App inspector is connected to a server. When you first start up the App inspector, the light is yellow, indicating that you are not connected.

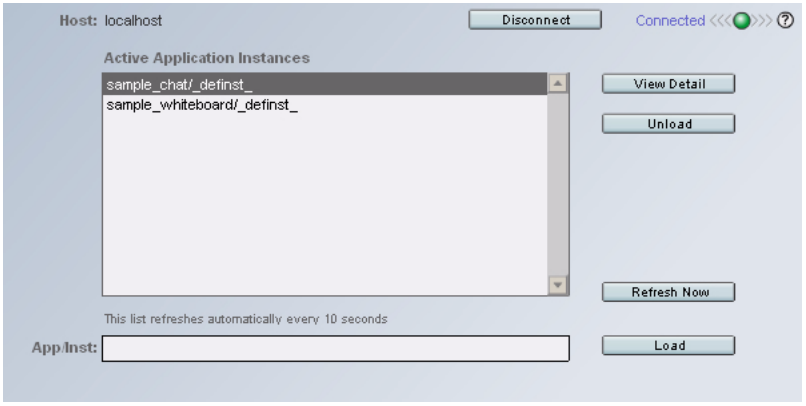
To connect to a server:

1. Type the server URL in the Host text field, or type **localhost** if the server and the App inspector are running on the same computer. If your server is installed on a port other than 1111 (the default), you must enter the port number as well, for example **localhost:1234**.
2. Enter your administrator user name and password.
3. If you want your user name and password to be saved across sessions, select Remember Connection Data. If you also want to connect automatically whenever you open the App inspector, select Automatically Connect.
4. Click Connect.

   If the connection is successful, the light icon changes to green and the words “Not Connected” change to “Connected.”

The Application Instance panel

After you have connected to the server, the App inspector displays a panel that lists the currently running application instances. This list is automatically refreshed every 10 seconds; to force an immediate refresh, click Refresh Now.



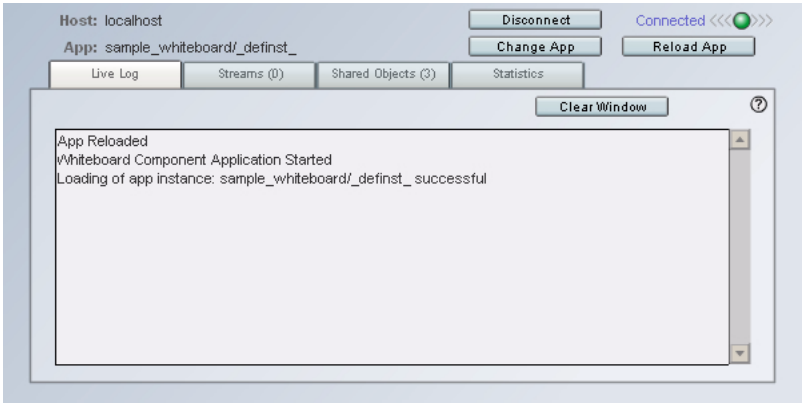
If the App inspector is not able to display an application instance on the list—most likely because a server-side ActionScript error prevented the application from loading—an alert icon appears at the bottom right of the panel. Click the icon to display a panel that contains server-side log messages; these messages can help you determine what might be preventing the application from loading. When you close the panel, you return to the Application Instance panel.

This Application Instance panel lets you perform the following tasks:

- To view information about a running application instance, select it and click View Detail. The Live Log panel will be displayed (see "The Live Log panel").
- To terminate an application instance, disconnect all its users, and free any resources it was using, select it and click Unload.
- To manually load an application instance, type its name in the text box at the bottom of the panel and click Load. The application must already be configured on the server.
- To disconnect the App inspector from the server, click Disconnect. You'll return to the log-on screen (see "Connecting the App inspector to a server" on page 98).

The Live Log panel

The Live Log panel displays the log messages that are generated by the selected application instance on the server and sent from the server to the App inspector. The information in this panel is updated whenever the application instance generates a log message, and is selectable for copying into another application.

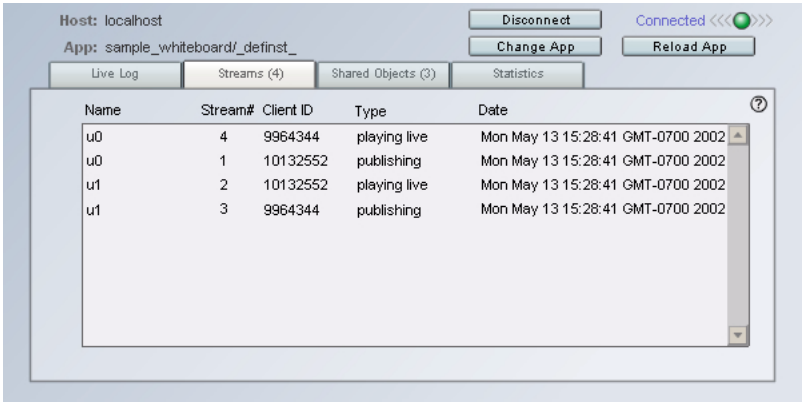


This panel lets you perform the following tasks.

- To clear the contents of the log, click Clear Window.
- To return to the list of currently running application instances (so that you can view information about another application instance), click Change App. You'll return to the application instance panel (see "The Application Instance panel" on page 99.)
- To reload the application instance—for example, if you changed one of the server-side scripts used by the application or want to disconnect all users—click Reload App.
- To disconnect the App inspector from the server, click Disconnect. You'll return to the log-on screen (see "Connecting the App inspector to a server" on page 98).
- To view a different panel, click the corresponding panel name (Streams, Shared Objects, or Statistics).

The Streams panel

The Streams panel displays information about the streams associated with the selected application instance. The information is automatically refreshed every 15 seconds; to force an immediate refresh, click the Streams panel name again.



This panel displays the following information.

Name indicates the stream name, as specified in the `NetStream.publish` or `NetStream.play` command.

Stream# indicates the stream ID number; this is simply a number representing the order in which streams were loaded.

Client ID indicates the internal ID of the client; this represents an internal number Flash Communication Server uses to identify each client.

Type indicates a server-provided string that describes what is happening on this stream.

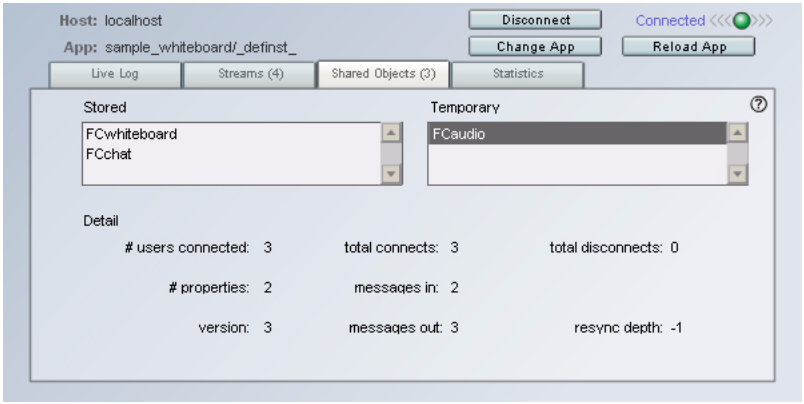
Date indicates the date and the time the stream began publishing or playing.

The Streams panel lets you perform the following tasks:

- To return to the list of currently running application instances (so that you can view information about another application instance), click Change App. You'll return to the application panel (see "The Application Instance panel" on page 99.)
- To reload the application instance, click Reload App.
- To disconnect the App inspector from the server, click Disconnect. You'll return to the log-on screen (see "Connecting the App inspector to a server" on page 98).
- To view a different panel, click the corresponding panel name (Live Log, Shared Objects, or Statistics).

The Shared Objects panel

This panel shows information about the shared objects used by the application instance (and resident on the server). The information is automatically refreshed every 15 seconds; to force an immediate refresh, click the Shared Objects panel name again.



Shared objects can be remotely persistent (they are stored on the server and are still available after an application instance or server is stopped and restarted) or available only for the life of the instance (they are temporary, and are deleted when the instance stops running). This panel displays information on both types of shared objects used by the application instance.

To display information about a particular shared object, click the object to select it. The panel then displays the following information.

 # Users Connected indicates the number of users currently connected to and using this shared object.

 # Properties indicates the number of `data` properties assigned to the shared object.

Version indicates the version number of the shared object. When any property of the shared object changes, the version is incremented.

Total Connects and Total Disconnects indicates the total number of connections to and disconnections from the shared object since the object was created.

Messages In and Messages Out indicates the number of messages that have been sent to or from the shared object; "messages in" reflect update requests sent from clients to the server, and "messages out" reflect notification of successful updates sent from the server to clients that are connected to the shared object.

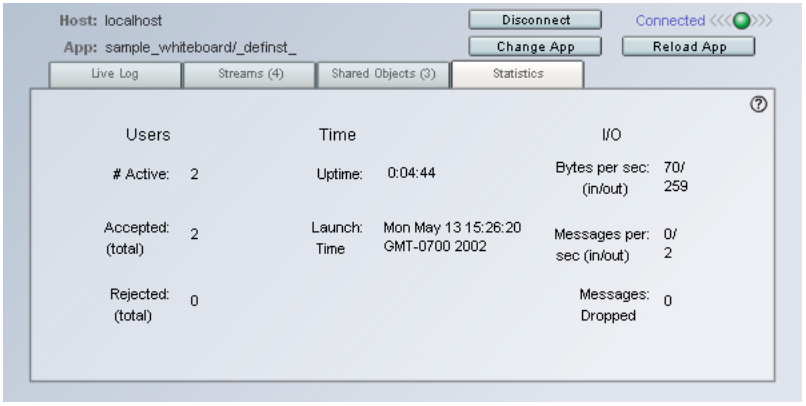
Resync Depth is used by Flash Communication Server to determine if a shared object's slot should be permanently deleted or if the client version of a shared object should be cleared and repopulated. For more information, see the `SharedObject.resyncDepth` entry in the *Server-Side Communication ActionScript Dictionary*.

This panel lets you perform the following tasks:

- To return to the list of currently running application instances (so that you can view information about another application instance), click Change App. You'll return to the application panel (see "The Application Instance panel" on page 99.)
- To reload the application instance, click Reload App.
- To disconnect the App inspector from the server, click Disconnect. You'll return to the log-on screen (see "Connecting the App inspector to a server" on page 98).
- To view a different panel, click the corresponding panel name (Live Log, Streams, or Statistics).

The Statistics panel

This panel shows information about the overall state of the application instance. The information is updated automatically every 15 seconds; to force an immediate refresh, click the Statistics panel name again.



This panel displays the following information.

 # Active indicates the number of users currently connected to the application instance.

Accepted (Total) indicates the number of users who have connected to the application instance since it started.

Rejected (Total) indicates the number of users whose attempts to connect to the application instance since it started were rejected. To determine why connections might have failed, look at the Live Log panel in the App inspector (see "The Live Log panel" on page 100) and the Access Log in the Administration Console (see *Managing Flash Communication Server*).

Uptime indicates the length of time the application instance has been running.

Launch Time indicates the date and time the application instance began running.

Bytes per Sec (In/Out) indicates the average bytes per second being sent to and from the server. The App inspector calculates this ratio by dividing the total number of bytes received in the most recent 15 seconds and dividing that value by 15. When the panel first appears, these figures appear as "pending" because there is only one data point to start with; figures will appear after the panel is open for 15 seconds.

Messages per Sec (In/Out) indicates the average number of messages (video frames from cameras, audio packets, and command messages) per second being sent to and from the server.

Messages Dropped indicates the number of messages that have been dropped since the application instance started because the client has fallen too far behind in receiving data that the server is sending. For live streams, audio and video messages may be dropped; for recorded streams, only video messages are dropped. Command messages are never dropped.

Using the NetConnection Debugger

The NetConnection Debugger provides Flash MX developers with a tool to report and diagnose processing and communication problems between the Flash client, Flash Communication Server, Flash Remoting, and supported application servers.

To use the NetConnection Debugger to trace Flash Communication Server events:

1. Add the statement `#include "NetDebug.as"` to a layer on the first keyframe of your movie.

   Note: To avoid unnecessary code in your movie and disable remote debugging, delete this line when you finish debugging and are ready to publish your movie.

2. Choose Window > NetConnection Debugger from within Flash MX to open the debugger.
3. Click Filters to display the Filters UI (discussed in more detail later in this document).
4. Enter the user name and password of the admin user of the server your application is connecting to. Also, if your server is installed on a port other than 1111 (the default), you must enter the port number.

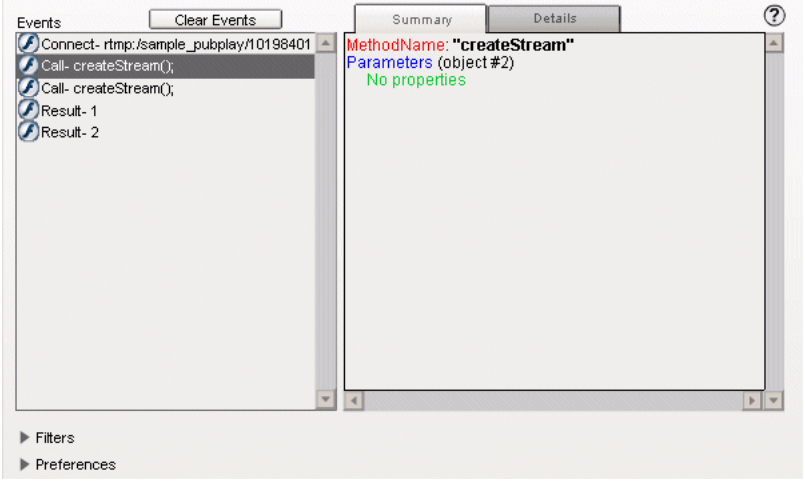
   Note: If you are using the NetConnection Debugger to track non-Flash Communication Server applications, such as a Flash Remoting implementation, you don't need to perform this step.

5. Close the Filters UI to make room for more events to be displayed. (Optional.)
6. Test your movie using Control > Test Movie in the Flash authoring environment or opening the SWF file in a browser.

If you close and then reopen the NetConnection Debugger, you must repeat steps 3 and 4.

NetConnection Debugger user interface

The NetConnection Debugger user interface (UI) contains the event display. To customize the debugger, use the Filters menu and the Preferences menu. The following figure shows the debugger UI:



This window displays the following information:

Events shows a list of individual debug events. Each debug event contains an icon that represents the debug event source, the type of debug event, and a summary description of the event.

Summary panel shows a brief version of the debugging information for the selected debug event.

Details panel shows detailed debugging information for the selected debug event. Colors and punctuation marks are used to distinguish types of debugging information displayed.

The following colors and information are supported.

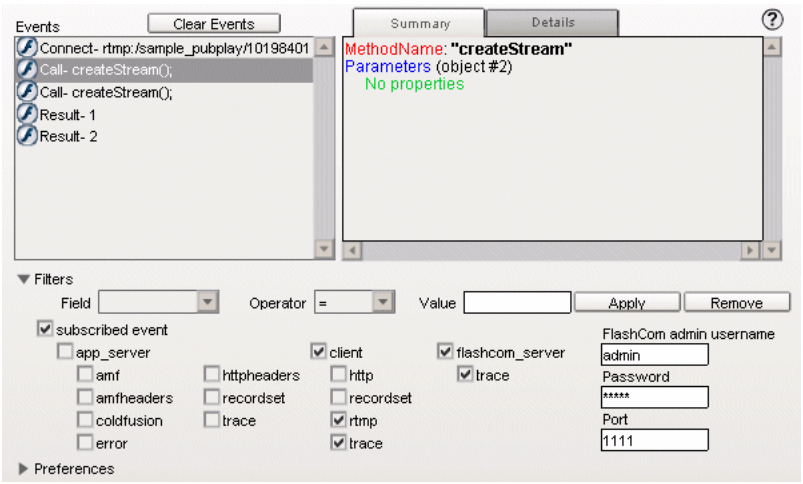
- Red: property names
- Blue: property objects
- Black: property values
- Green: debugger error messages

Property values use punctuation marks to convey data types. The following data types are supported:

- Strings: double quotation marks ("string")
- Numbers: no special formatting
- Numbered arrays: brackets around array indexes (array[1])
- Other types: string representation followed by type name in italicized parentheses, such as `true (boolean)`.

Filters menu

The Filters menu lets you filter the debugging events by any debug event field and decide which event types to monitor. The following figure shows the Filters menu:



The Field, Operator, and Value entries work together to specify a criterion for inclusion in the Events list. (You must click Apply for your selections to be implemented.)

Field lets you select or type the name of the field to filter.

Operator lets you select the comparison criterion that must be met for an event to appear in the Events list. The contains operator only works with strings, and specifies that the event field must compare the value as a substring.

Value lets you enter a value to compare using the selected operator. Only events meeting the criteria specified by the filter, operator, and value boxes will appear in the Events list.

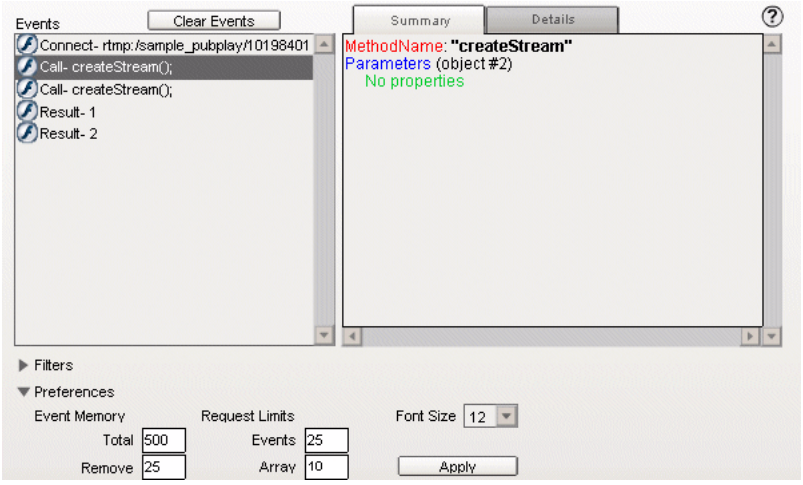
Subscribed Event lets you specify which debug events are reported to the debugger, by selecting and clearing check boxes next to the event type. After you click Apply, these changes take effect as new debug events arrive. The following check boxes are specifically related to Flash Communication Server:

- subscribed event (if this is not selected, no debug events are recorded to the debugger)
- client (if this is not selected, no client events are recorded to the debugger)
- rtmp (this is the protocol used to connect to the server)
- flashcom_server (if this is not selected, no server events are recorded to the debugger)
- trace (if this is not selected, no traces are recorded to the debugger)

For information on the user name, password, and port, see "Using the NetConnection Debugger" on page 105.

Preferences menu

The Preferences menu lets you set select various display options and select NetDebug performance limiters. The following figure shows the Preferences menu:



The principal elements of the Preferences menu are Event Memory, Request Limits, and Font Size. (You must click Apply for your selections to be implemented.)

Event Memory controls the number of total events that the debugger stores in the Events list. To discard stored events as new events arrive, adjust the increment rate for the debugger. Total specifies the maximum number of events stored in memory. Remove specifies how many events to remove when the total number of events in memory has been exceeded. If you experience debugger performance problems, you can adjust these settings.

Request Limits controls the maximum number of events that are displayed from an application server per transaction, and the maximum number of array elements per nested array from a application server. To see more debug events, or if you are experiencing debugger performance problems, you can adjust these settings.

Font Size controls the size of the text that appears in the Summary and Details panels.

INDEX

D

E

F

G

I

J

Client-Side Communication ActionScript Dictionary

Macromedia Flash™ Communication Server MX

macromedia®

Acknowledgments

Director: Erick Vera

Producer: JuLee Burdekin

Writing: Jay Armstrong, Jody Bleyle, JuLee Burdekin, Barbara Herbert, and Barbara Nelson

Editing: Zawadi Olatunji, Anne Szabla

Multimedia Design and Production: Aaron Begley, Benjamin Salles

Print Design and Production: Chris Basmajian

First Edition: May 2002

Macromedia, Inc.
600 Townsend St.
San Francisco, CA 94103

CONTENTS

Client-Side Communication ActionScript

This document is designed to be used in conjunction with the information in the online Flash ActionScript Dictionary in the Flash MX Help menu. To write Macromedia Flash Communication Server MX applications, you must be familiar with writing ActionScript in general. Refer to that document for general scripting information, and use this document to add Flash Communication Server functionality to your Flash applications.

For an overview of the Flash Communication Server objects, see *Developing Applications with Flash Communication Server*.

Entries in this document are alphabetical by class name and then by method, property, or event handler name. The following table lists all classes, methods, properties, and event handlers individually in alphabetical order.

ActionScript element	See entry
activityLevel	Camera.activityLevel, Microphone.activityLevel
allowDomain	LocalConnection.allowDomain
attachAudio	MovieClip.attachAudio, NetStream.attachAudio
attachVideo	NetStream.attachVideo, Video.attachVideo
bandwidth	Camera.bandwidth
bufferLength	NetStream.bufferLength
bufferTime	NetStream.bufferTime
call	NetConnection.call
Camera	Camera (object)
clear	Video.clear
close	LocalConnection.close, NetConnection.close, NetStream.close, SharedObject.close
connect	LocalConnection.connect, NetConnection.connect, SharedObject.connect
currentFps	Camera.currentFps, NetStream.currentFps
data	SharedObject.data
deblocking	Video.deblocking
domain	LocalConnection.domain
flush	SharedObject.flush
fps	Camera.fps

ActionScript element	See entry
gain	Microphone.gain
get	Camera.get, Microphone.get
getLocal	SharedObject.getLocal
getRemote	SharedObject.getRemote
getSize	SharedObject.getSize
height	Camera.height, Video.height
index	Camera.index, Microphone.index
keyFrameInterval	Camera.keyFrameInterval
LocalConnection	LocalConnection (object)
loopback	Camera.loopback
Microphone	Microphone (object)
motionLevel	Camera.motionLevel
motionTimeOut	Camera.motionTimeOut
MovieClip	MovieClip (object)
muted	Camera.muted, Microphone.muted
name	Camera.name, Microphone.name
names	Camera.names, Microphone.names
NetConnection	NetConnection (object)
NetStream	NetStream (object)
onActivity	Camera.onActivity, Microphone.onActivity
onStatus	Camera.onStatus, Microphone.onStatus, NetConnection.onStatus, NetStream.onStatus, SharedObject.onStatus
onSync	SharedObject.onSync
pause	NetStream.pause
play	NetStream.play
publish	NetStream.publish
quality	Camera.quality
rate	Microphone.rate
receiveAudio	NetStream.receiveAudio
receiveVideo	NetStream.receiveVideo
seek	NetStream.seek
send	LocalConnection.send, NetStream.send, SharedObject.send
setBufferTime	NetStream.setBufferTime
setFps	SharedObject.setFps
setGain	Microphone.setGain
setKeyFrameInterval	Camera.setKeyFrameInterval

ActionScript element	See entry
setLoopback	Camera.setLoopback
setMode	Camera.setMode
setMotionLevel	Camera.setMotionLevel
setQuality	Camera.setQuality
setRate	Microphone.setRate
setSilenceLevel	Microphone.setSilenceLevel
setUseEchoSuppression	Microphone.setUseEchoSuppression
SharedObject	SharedObject (object)
showSettings	System.showSettings
silenceLevel	Microphone.silenceLevel
silenceTimeout	Microphone.silenceTimeout
smoothing	Video.smoothing
time	NetStream.time
useEchoSuppression	Microphone.useEchoSuppression
Video	Video (object)
width	Camera.width, Video.width

Camera (object)

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

The Camera object lets you capture video from a video camera attached to the computer that is running the Macromedia Flash Player. When used with Flash Communication Server, this object lets you transmit, display, and optionally record the video being captured. With these capabilities, you can develop communications applications such as videoconferencing, instant messaging with video, and so on. (Flash provides similar audio capabilities; for more information, see the "Microphone (object)" entry.)

You can also use a Camera object without a server—for example, to monitor a video feed from a webcam attached to your local system.

To create or reference a Camera object, use `Camera.get`.

Method summary for the Camera object

Method	Description
`Camera.get`	Returns a default or specified Camera object, or `null` if the camera is not available.
`Camera.setKeyFrameInterval`	Specifies which video frames are transmitted in full instead of being interpolated by the video compression algorithm.
`Camera.setLoopback`	Specifies whether to use a compressed video stream for a local view of what the camera is transmitting.
`Camera.setMode`	Sets aspects of the camera capture mode, including height, width, and frames per second.
`Camera.setMotionLevel`	Specifies how much motion is required to invoke `Camera.onActivity(true)` and how much time should elapse without motion before `Camera.onActivity(false)` is invoked.
`Camera.setQuality`	Sets the maximum amount of bandwidth per second or the required picture quality of the current outgoing video feed.

Property summary for the Camera object

Property (read-only)	Description
`Camera.activityLevel`	The amount of motion the camera is detecting.
`Camera.bandwidth`	The maximum amount of bandwidth the current outgoing video feed can use, in bytes.
`Camera.currentFps`	The rate at which the camera is capturing data, in frames per second.
`Camera.fps`	The rate at which you would like the camera to capture data, in frames per second.
`Camera.height`	The current capture height, in pixels.
`Camera.index`	The index of the camera, as reflected in the array returned by `Camera.names`.
`Camera.keyFrameInterval`	A number that specifies which video frames are transmitted in full instead of being interpolated by the video compression algorithm.
`Camera.loopback`	A Boolean value that specifies whether a local view of what the camera is capturing is compressed or uncompressed.
`Camera.motionLevel`	The amount of motion required to invoke `Camera.onActivity(true)`.
`Camera.motionTimeOut`	The number of milliseconds between the time the camera stops detecting motion and the time `Camera.onActivity(false)` is invoked.
`Camera.muted`	A Boolean value that specifies whether the user has allowed or denied access to the camera.
`Camera.name`	The name of the camera as specified by the camera hardware.
`Camera.names`	Class property; an array of strings containing the names of all available video capture devices, including video cards and cameras.
`Camera.quality`	A number that specifies the current level of picture quality based on the amount of compression being applied to each video frame.
`Camera.width`	The current capture width, in pixels.

Event handler summary for the Camera object

Method	Description
`Camera.onActivity`	Invoked when the camera starts or stops detecting motion.
`Camera.onStatus`	Invoked when the user allows or denies access to the camera.

Constructor for the Camera object

See `Camera.get`.

Camera.activityLevel

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

`activeCamera``.activityLevel`

Description

Read-only property; a numeric value that specifies the amount of motion the camera is detecting. Values range from 0 (no motion is being detected) to 100 (a large amount of motion is being detected). The value of this property can help you determine if you need to pass a setting to `Camera.setMotionLevel`.

If the camera is available but is not yet being used because neither `Video.attachVideo` nor `NetStream.attachVideo` has been called, this property is set to -1.

If you are streaming only uncompressed local video—that is, you are not streaming the video within a NetStream object and you have not called `Camera.setLoopback(true)`—this property is set only if you have assigned a function to the `Camera.onActivity` event handler. Otherwise, it is undefined.

See also

`Camera.motionLevel`, `Camera.setMotionLevel`

Camera.bandwidth

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

`activeCamera``.bandwidth`

Description

Read-only property; an integer that specifies the maximum amount of bandwidth the current outgoing video feed can use, in bytes. A value of 0 means that Flash video can use as much bandwidth as needed to maintain the desired frame quality.

To set this property, use `Camera.setQuality`.

Example

The following example loads another movie if the camera's bandwidth is 32 kilobytes or greater.

```
if(myCam.bandwidth >= 32768){
  loadMovie("splat.swf",_root.hiddenvar);
}
```

See also

`Camera.setQuality`

Camera.currentFps

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

`activeCamera``.currentFps`

Description

Read-only property; the rate at which the camera is capturing data, in frames per second. This property cannot be set; however, you can use `Camera.setMode` to set a related property—`Camera.fps`—which specifies the maximum frame rate at which you would like the camera to capture data.

See also

`Camera.fps`, `Camera.setMode`

Camera.fps

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

`activeCamera``.fps`

Description

Read-only property; the maximum rate at which you want the camera to capture data, in frames per second. The maximum rate possible depends on the capabilities of the camera; that is, if the camera doesn't support the value you set here, this frame rate will not be achieved.

- To set a desired value for this property, use `Camera.setMode`.
- To determine the rate at which the camera is currently capturing data, use `Camera.currentFps`.

Example

The following example sets the fps rate of the active camera, `myCam.fps`, to the value provided by the user's text box, `this.config.txt_fps`.

```
if (this.config.txt_fps != undefined) {
    myCam.setMode(myCam.width, myCam.height, this.config.txt_fps, false);
}
```

Note: The setMode function does not guarantee the requested fps setting; it sets the fps you requested or the fastest fps available.

See also

`Camera.currentFps`, `Camera.setMode`

Camera.get

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

`Camera.get([`*`index`*`])`

Note: The correct syntax is `Camera.get()`. To assign the Camera object to a variable, use syntax like `activeCamera = Camera.get()`.

Parameters

`index` An optional zero-based integer that specifies which camera to get, as determined from the array returned by `Camera.names`. To get the default camera (which is recommended for most applications), omit this parameter.

Returns

- If *`index`* is not specified, this method returns a reference to the default camera or, if it is in use by another application, to the first available camera. (If there is more than one camera installed, the user may specify the default camera in the Flash Player Camera Settings panel.) If no cameras are available or installed, the method returns `null`.
- If *`index`* is specified, this method returns a reference to the requested camera, or `null` if it is not available.

Description

Method; returns a reference to a Camera object for capturing video. To actually begin capturing the video, you must attach the Camera object either to a Video object (see `Video.attachVideo`) or to a NetStream object (see `NetStream.attachVideo`). (The NetStream object is available only with Flash Communication Server.)

Unlike objects that you create using the `new` constructor, multiple calls to `Camera.get` reference the same camera. Thus, if your script contains the lines `cam1 = Camera.get()` and `cam2 = Camera.get()`, both `cam1` and `cam2` reference the same (default) camera.

In general, you shouldn't pass a value for *`index`*; simply use `Camera.get()` to return a reference to the default camera. By means of the Camera settings panel (discussed later in this section), the user can specify the default camera Flash should use. If you pass a value for *`index`*, you might be trying to reference a camera other than the one the user prefers. You might use *`index`* in rare cases—for example, if your application is capturing video from two cameras at the same time.

When a movie tries to access the camera returned by `Camera.get`—for example, when you issue `NetStream.attachVideo` or `Video.attachVideo`—the Flash Player displays a Privacy dialog box that lets the user choose whether to allow or deny access to the camera. (Make sure your Stage size is at least 215 by 138 pixels; this is the minimum size Flash requires to display the dialog box.)

When the user responds to this dialog box, the `Camera.onStatus` event handler returns an information object that indicates the user's response. To determine whether the user has denied or allowed access to the camera without processing this event handler, use `Camera.muted`.

The user can also specify permanent privacy settings for a particular domain by right-clicking (Windows) or Control-clicking (Macintosh) while a movie is playing, choosing Settings, opening the Privacy panel, and selecting Remember.

You can't use ActionScript to set the Allow or Deny value for a user, but you can display the Privacy panel for the user by using `System.showSettings(0)`. If the user selects Remember, the Flash Player no longer displays the Privacy dialog box for movies from this domain.

If `Camera.get` returns `null`, either the camera is in use by another application, or there are no cameras installed on the system. To determine whether any cameras are installed, use `Camera.names.length`. To display the Flash Player Camera Settings panel, which lets the user choose the camera to be referenced by `Camera.get`, use `System.showSettings(3)`.

Note that scanning the hardware for cameras takes time. Once Flash finds at least one camera, the hardware is not scanned again for the lifetime of the player instance. However, if Flash doesn't find any cameras, it will scan each time `Camera.get` is called. This is helpful if a user has forgotten to connect the camera; if your movie provides a Try Again button that calls `Camera.get`, Flash can find the camera without the user having to restart the movie.

Example

The following example captures and displays video locally within a Video object named myVid on the Stage.

```
myCam = Camera.get();
myVid.attachVideo(myCam);
```

See also

`Camera.index`, `Camera.muted`, `Camera.names`, `Camera.onStatus`, `Camera.setMode`, `NetStream.attachVideo`, `System.showSettings`, `Video.attachVideo`

Camera.height

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

`activeCamera``.height`

Description

Read-only property; the current capture height, in pixels. To set a value for this property, use `Camera.setMode`.

Example

The following line of code updates a text box in the user interface with the current height value.

```
_root.txt_height = myCam.height;
```

See also the example for `Camera.setMode`.

See also

`Camera.setMode`, `Camera.width`

Camera.index

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

`activeCamera``.index`

Description

Read-only property; a zero-based integer that specifies the index of the camera, as reflected in the array returned by `Camera.names`.

Example

The following example gets the camera that has the value of `index`.

```
myCam = Camera.get(index);
```

See also

`Camera.get`, `Camera.names`

Camera.keyFrameInterval

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

activeCamera.keyFrameInterval

Description

Read-only property; a number that specifies which video frames are transmitted in full (called *keyframes*) instead of being interpolated by the video compression algorithm. The default value is 15 (every 15th frame is a keyframe).

See also

Camera.setKeyFrameInterval

Camera.loopback

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

activeCamera.loopback

Description

Read-only property; a Boolean value that specifies whether a local view of what the camera is capturing is compressed and decompressed as it would be for live transmission using Flash Communication Server (`true`) or uncompressed (`false`). The default value is `false`.

To set this value, use `Camera.setLoopback`. To set the amount of compression used when this property is `true`, use `Camera.setQuality`.

Example

See the example for `Camera.setLoopback`.

See also

`Camera.setLoopback`, `Camera.setQuality`

Camera.motionLevel

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

activeCamera.motionLevel

Description

Read-only property; a numeric value that specifies the amount of motion required to invoke Camera.onActivity(true). Acceptable values range from 0 to 100. The default value is 50.

Video can be displayed regardless of the value of the motionLevel property. For more information, see Camera.setMotionLevel.

See also

Camera.activityLevel, Camera.onStatus, Camera.setMotionLevel

Camera.motionTimeOut

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

activeCamera.motionTimeOut

Description

Read-only property; the number of milliseconds between the time the camera stops detecting motion and the time Camera.onActivity(false) is invoked. The default value is 2000 (2 seconds).

To set this value, use Camera.setMotionLevel.

Example

The following example sets the number of milliseconds between the time the camera stops detecting motion and the time Camera.onActivity(false) is invoked to 1000 milliseconds, or one second.

```
if(myCam.motionTimeOut >= 1000){
  myCam.setMotionLevel(myCam.motionLevel, 1000);
}
```

See also

Camera.onActivity, Camera.setMotionLevel

Camera.muted

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

activeCamera.muted

Description

Read-only property; a Boolean value that specifies whether the user has denied access to the camera (`true`) or allowed access (`false`) in the Flash Player Privacy Settings panel. When this value changes, `Camera.onStatus` is invoked. For more information, see `Camera.get`.

Example

In the following example, when the user clicks the button, Flash publishes and plays a live stream if the camera is not muted.

```
on (press)
{
  // If the user mutes camera, display offline notice.
  // Else, publish and play live stream from camera.
  if(myCam.muted) {
    _root.debugWindow+="Camera offline." + newline;
  } else {

    // Publish the camera data by calling
    // the root function pubLive().
    _root.pubLive();

    // Play what is being published by calling
    // the root function playLive().
    _root.playLive();
  }
}
```

See also

`Camera.get`, `Camera.onStatus`

Camera.name

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

activeCamera.name

Description

Read-only property; a string that specifies the name of the current camera, as returned by the camera hardware.

Example

The following example displays the name of the default camera in the Output window. In Windows, this name is the same as the device name listed in the Scanners and Cameras properties sheet.

```
myCam = Camera.get();
trace("The camera name is: " + myCam.name);
```

See also

`Camera.get`, `Camera.names`

Camera.names

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

```
Camera.names
```

Note: The correct syntax is `Camera.names`. To assign the return value to a variable, use syntax like *`camArray`* `= Camera.names`. To determine the name of the current camera, use *`activeCamera`*`.name`.

Description

Read-only class property; retrieves an array of strings reflecting the names of all available cameras without displaying the Flash Player Privacy Settings panel. This array behaves the same as any other ActionScript array, implicitly providing the zero-based index of each camera and the number of cameras on the system (by means of `Camera.names.length`). For more information, see the "Array (object)" entry in the online Flash ActionScript Dictionary in the Flash MX Help menu.

Calling `Camera.names` requires an extensive examination of the hardware, and it may take several seconds to build the array. In most cases, you can just use the default camera.

Example

The following example uses the default camera unless more than one camera is available, in which case the user can choose which camera to set as the default camera.

```
camArray = Camera.names;
if (camArray.length == 1){
  Camera.get();
}
else
  System.showSettings(3);
  Camera.get();
```

See also

`Camera.get`, `Camera.index`, `Camera.names`

Camera.onActivity

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

```
activeCamera.onActivity = function(activity) {
  // Your code here
}
```

Parameters

activity A Boolean value set to `true` when the camera starts detecting motion, `false` when it stops.

Returns

Nothing.

Description

Event handler; invoked when the camera starts or stops detecting motion. If you want to respond to this event handler, you must create a function to process its *activity* value.

To specify the amount of motion required to invoke `Camera.onActivity(true)` and the amount of time that must elapse without activity before invoking `Camera.onActivity(false)`, use `Camera.setMotionLevel`.

Example

The following example displays `true` or `false` in the Output window when the camera starts or stops detecting motion.

```
// Assumes a Video object named "myVideoObject" is on the Stage
c = Camera.get();
myVideoObject.attachVideo(c);
c.setMotionLevel(10, 500);
c.onActivity = function(mode)
{
  trace(mode);
};
```

See also

`Camera.setMotionLevel`

Camera.onStatus

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

```
activeCamera.onStatus = function(infoObject) {
  // Your code here
}
```

Parameters

infoObject A parameter defined according to the status message. For details about this parameter, see "Camera information objects" on page 106.

Returns

Nothing.

Description

Event handler; invoked when the user allows or denies access to the camera. If you want to respond to this event handler, you must create a function to process the information object generated by the camera. For more information, see the Appendix, "Client-Side Information Objects," on page 105.

When a movie tries to access the camera, the Flash Player displays a Privacy dialog box that lets the user choose whether to allow or deny access.

- If the user allows access, the `Camera.muted` property is set to `false`, and this handler is invoked with an information object whose `code` property is `Camera.Unmuted`.
- If the user denies access, the `Camera.muted` property is set to `true`, and this handler is invoked with an information object whose `code` property is `Camera.Muted`.

To determine whether the user has denied or allowed access to the camera without processing this event handler, use `Camera.muted`.

Note: If the user chooses to permanently allow or deny access for all movies from a specified domain, this handler is not invoked for movies from that domain unless the user later changes the privacy setting. For more information, see `Camera.get`.

Example

The following callback function displays a message whenever the user allows or denies access to the camera.

```
myCam = Camera.get();
myVideoObject.attachVideo(myCam);
myCam.onStatus = function(infoMsg) {

  if(infoMsg.code == "Camera.Muted"){
    trace("User denies access to the camera");
  }
  else
    trace("User allows access to the camera");
}
// Change the Allow or Deny value to invoke the function
System.showSettings(0);
```

See also

`Camera.get`, `Camera.muted`, `System.showSettings`

Camera.quality

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

```
activeCamera.quality
```

Description

Read-only property; an integer specifying the required level of picture quality, as determined by the amount of compression being applied to each video frame. Acceptable quality values range from 1 (lowest quality, maximum compression) to 100 (highest quality, no compression). The default value is 0, which means that picture quality can vary as needed to avoid exceeding available bandwidth.

See also

`Camera.setQuality`

Camera.setKeyFrameInterval

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

```
activeCamera.setKeyFrameInterval(keyframeInterval)
```

Parameters

`keyframeInterval` A numeric value that specifies which video frames are transmitted in full (called *keyframes*) instead of being interpolated by the video compression algorithm. A value of 1 means that every frame is a keyframe, a value of 3 means that every third frame is a keyframe, and so on. Acceptable values are 1 through 48. The default value is 15.

Returns

Nothing.

Description

Method; specifies which video frames are transmitted in full (called *keyframes*) instead of being interpolated by the video compression algorithm. This method is generally applicable only if you are transmitting video using Flash Communication Server.

The Flash video compression algorithm compresses video by transmitting only what has changed since the last frame of the video; these portions are considered to be interpolated frames. It may help to compare this concept with how tweening and keyframes interact within the Flash authoring environment: the frames between keyframes are created (interpolated) based on the contents of the previous frame. Similarly, frames of a video can be interpolated according to the contents of the previous frame. A keyframe, however, is a video frame that is complete; it is not interpolated from prior frames.

To determine how to set a value for *keyframeInterval*, consider both bandwidth use and video playback accessibility. For example, specifying a higher value for *keyframeInterval* (sending keyframes less frequently) reduces bandwidth use. However, this may increase the amount of time required to position the playhead at a particular point in the video; more prior video frames may have to be interpolated before the video can resume.

Conversely, specifying a lower value for *keyframeInterval* (sending keyframes more frequently) increases bandwidth use, because entire video frames are transmitted more often, but may decrease the amount of time required to seek a particular video frame within a recorded video.

See also

`Camera.keyFrameInterval`

Camera.setLoopback

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

activeCamera`.setLoopback(`*compressLocalStream*`)`

Parameters

compressLocalStream A Boolean value that specifies whether to use a compressed video stream (`true`) or an uncompressed stream (`false`) for a local view of what the camera is receiving. The default value is `false`.

Returns

Nothing.

Description

Method; specifies whether to use a compressed video stream for a local view of the camera. This method is generally applicable only if you are transmitting video using the Flash Communication Server; setting *compressLocalStream* to `true` lets you see more precisely how the video will appear to users when they view it in real time.

Although a compressed stream is useful for testing purposes, such as previewing video quality settings, it has a significant processing cost, because the local view is not simply compressed; it is compressed, edited for transmission as it would be over a live connection, and then decompressed for local viewing.

To set the amount of compression used when you set *compressLocalStream* to `true`, use `Camera.setQuality`.

Example

In the following example, if the user presses a loopback button, the loopback value is set to `true`.

```
on (press) {

  if (_root.myCam.loopback==false) {
    _root.myCam.setLoopback(true);
  } else {
    debugWindow+="You're already compressing the stream." + newline;
  }
```

See also

`Camera.loopback`, `Camera.setQuality`

Camera.setMode

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

`activeCamera``.setMode(`*`width`*`, `*`height`*`, `*`fps`*` [,`*`favorSize`*`])`

Parameters

`width` The requested capture width, in pixels. The default value is 160.

`height` The requested capture height, in pixels. The default value is 120.

`fps` The requested rate at which the camera should capture data, in frames per second. The default value is 15.

`favorSize` An optional Boolean parameter that specifies how to manipulate the width, height, and frame rate if the camera does not have a native mode that meets the specified requirements. The default value is `true`, which means that maintaining capture size is favored; the mode that most closely matches *`width`* and *`height`* is selected, even if doing so adversely affects performance by reducing the frame rate. To maximize frame rate at the expense of camera height and width, pass `false` for *`favorSize`*.

Returns

Nothing.

Description

Method; sets the camera capture mode to the native mode that best meets the specified requirements. If the camera does not have a native mode that matches all the parameters you pass, Flash selects a capture mode that most closely synthesizes the requested mode. This manipulation may involve cropping the image and dropping frames.

By default, Flash drops frames as needed to maintain image size. To minimize the number of dropped frames, even if this means reducing the size of the image, pass `false` for *`favorSize`*.

When choosing a native mode, Flash tries to maintain the requested aspect ratio whenever possible. For example, if you issue the command *`activeCamera`*`.setMode(400, 400, 30)`, and the maximum width and height values available on the camera are 320 and 288, Flash sets both the width and height at 288; by setting these properties to the same value, Flash maintains the 1:1 aspect ratio you requested.

To determine the values assigned to these properties after Flash selects the mode that most closely matches your requested values, use `Camera.width`, `Camera.height`, and `Camera.fps`.

If you are using Flash Communication Server, you can also capture single frames or create time-lapsed photography. For more information, see `NetStream.attachVideo`.

Example

The following example sets the width, height, and fps based on the user's input if the user clicks the button. The optional argument, *favorSize* is not included, because the default value, `true`, will provide the settings closest to the user's preference without sacrificing the picture quality, although the fps may then be sacrificed. The user interface is then updated with the new settings.

```
on (press)
{
  // Sets width, height, and fps to user's input.
  _root.myCam.setMode(txt_width, txt_height, txt_fps);

  // Update the user's text fields with the new settings.
  _root.txt_width = myCam.width;
  _root.txt_height = myCam.height;
  _root.txt_fps = myCam.fps;
}
```

See also

`Camera.currentFps`, `Camera.fps`, `Camera.height`, `Camera.width`, `NetStream.attachVideo`

Camera.setMotionLevel

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

activeCamera`.setMotionLevel(`*sensitivity* `[, `*timeout*`])`

Parameters

sensitivity A numeric value that specifies the amount of motion required to invoke `Camera.onActivity(true)`. Acceptable values range from 0 to 100. The default value is 50.

timeout An optional numeric parameter that specifies how many milliseconds must elapse without activity before Flash considers activity to have stopped and invokes `Camera.onActivity(false)`. The default value is 2000 (2 seconds).

Returns

Nothing.

Description

Method; specifies how much motion is required to invoke `Camera.onActivity(true)`. Optionally sets the number of milliseconds that must elapse without activity before Flash considers motion to have stopped and invokes `Camera.onActivity(false)`.

Note: Video can be displayed regardless of the value of the *sensitivity* parameter. This parameter only determines when and under what circumstances `Camera.onActivity` is invoked, not whether video is actually being captured or displayed.

- To prevent the camera from detecting motion at all, pass a value of 100 for *sensitivity*; `Camera.onActivity` is never invoked. (You would probably use this value only for testing purposes—for example, to temporarily disable any actions set to occur when `Camera.onActivity` is invoked.)
- To determine the amount of motion the camera is currently detecting, use `Camera.activityLevel`.

Motion sensitivity values correspond directly to activity values. Complete lack of motion is an activity value of 0. Constant motion is an activity value of 100. Your activity value is less than your motion sensitivity value when you're not moving; when you are moving, activity values frequently exceed your motion sensitivity value.

This method is similar in purpose to `Microphone.setSilenceLevel`; both methods are used to specify when the `onActivity` event handler should be invoked. However, these methods have a significantly different impact on publishing streams:

- `Microphone.setSilenceLevel` is designed to optimize bandwidth. When an audio stream is considered silent, no audio data is sent. Instead, a single message is sent, indicating that silence has started.
- `Camera.setMotionLevel` is designed to detect motion and does not affect bandwidth usage. Even if a video stream does not detect motion, video is still sent.

Example

The following example sends messages to the Output window when video activity starts or stops. Change the motion sensitivity value of 30 to a higher or lower number to see how different values affect motion detection.

```
// Assumes a Video object named "myVideoObject" is on the Stage
c = Camera.get();
x = 0;
function motion(mode)
{
  trace(x + ": " + mode);
  x++;
}
c.onActivity = function(mode) {motion(mode);};
c.setMotionLevel(30, 500);
myVideoObject.attachVideo(c);
```

See also

`Camera.activityLevel`, `Camera.motionLevel`, `Camera.motionTimeOut`, `Camera.onActivity`

Camera.setQuality

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

`activeCamera``.setQuality(`*`bandwidth, frameQuality`*`)`

Parameters

`bandwidth` An integer that specifies the maximum amount of bandwidth the current outgoing video feed can use, in bytes per second. To specify that Flash video can use as much bandwidth as needed to maintain the value of *`frameQuality`*, pass 0 for *`bandwidth`*. The default value is 16384.

`frameQuality` An integer that specifies the required level of picture quality, as determined by the amount of compression being applied to each video frame. Acceptable values range from 1 (lowest quality, maximum compression) to 100 (highest quality, no compression). To specify that picture quality can vary as needed to avoid exceeding *`bandwidth`*, pass 0 for *`frameQuality`*. The default value is 0.

Returns

Nothing.

Description

Method; sets the maximum amount of bandwidth per second or the required picture quality of the current outgoing video feed. This method is generally applicable only if you are transmitting video using Flash Communication Server.

Use this method to specify which element of the outgoing video feed is more important to your application—bandwidth used or picture quality.

- To indicate that bandwidth use takes precedence, pass the desired value for *`bandwidth`* and 0 for *`frameQuality`*. Flash will transmit video at the highest quality possible within the specified bandwidth. If necessary, Flash will reduce picture quality to avoid exceeding the specified bandwidth. In general, as motion increases, quality decreases.
- To indicate that quality takes precedence, pass 0 for *`bandwidth`* and a numeric value for quality. Flash will use as much bandwidth as required to maintain the specified quality. If necessary, Flash will reduce the frame rate to maintain picture quality. In general, as motion increases, bandwidth use also increases.
- To specify that both bandwidth and quality are equally important, pass numeric values for both parameters. Flash will transmit video that achieves the specified quality and that doesn't exceed the specified bandwidth. If necessary, Flash will reduce the frame rate to maintain picture quality without exceeding the specified bandwidth.

Example

The following examples illustrate how to use this method to control bandwidth use and picture quality.

```
// Ensure that no more than 8192 (8K/second) is used to send video
activeCamera.setQuality(8192,0);

// Ensure that no more than 8192 (8K/second) is used to send video
// with a minimum quality of 50
activeCamera.setQuality(8192,50);

// Ensure a minimum quality of 50, no matter how much bandwidth it takes
activeCamera.setQuality(0,50);
```

See also

`Camera.bandwidth`, `Camera.quality`

Camera.width

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

`activeCamera``.width`

Description

Read-only property; the current capture width, in pixels. To set a desired value for this property, use `Camera.setMode`.

Example

The following line of code updates a text box in the user interface with the current width value.

```
myTextField.text=myCam.width;
```

See also the example for `Camera.setMode`.

See also

`Camera.height`, `Camera.setMode`

LocalConnection (object)

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

The LocalConnection object lets you develop Flash movies that can send instructions to each other without the use of `FSCommand` or JavaScript. LocalConnection objects can communicate only between movies that are running on the same client machine, but they can be running in two different applications—for example, a Flash movie running in a browser and a Flash movie running in a projector. You can use LocalConnection objects to send and receive within a single movie, but this is not a standard implementation; all the examples in this section illustrate communication between different movies.

The primary methods used to send and receive data are `LocalConnection.send` and `LocalConnection.connect`. At its most basic, your code will implement the following commands; note that both the `LocalConnection.send` and `LocalConnection.connect` commands specify the same connection name, `lc_name`:

```
// Code in the receiving movie
receivingLC = new LocalConnection();
receivingLC.methodToExecute = function(param1, param2)
{
  // Code to be executed
}
receivingLC.connect("lc_name");

// Code in the sending movie
sendingLC = new LocalConnection();
sendingLC.send("lc_name", "methodToExecute", dataItem1, dataItem2)
```

The simplest way to use the LocalConnection object is to allow communication only between LocalConnection objects located in the same domain, since you won't have to address issues related to security. However, if you need to allow communication between domains, you have a number of ways to implement security measures. For more information, see the discussion of the *`connectionName`* parameter in `LocalConnection.send`, and also the `LocalConnection.allowDomain` and `LocalConnection.domain` entries.

Method summary for the LocalConnection object

Method	Description
`LocalConnection.close`	Closes (disconnects) the LocalConnection object.
`LocalConnection.connect`	Prepares the LocalConnection object to receive commands from a `LocalConnection.send` command.
`LocalConnection.domain`	Returns a string representing the subdomain of the location of the current movie.
`LocalConnection.send`	Invokes a method on a specified LocalConnection object.

Event handler summary for the LocalConnection object

Method	Description
`LocalConnection.allowDomain`	Invoked whenever the current (receiving) LocalConnection object receives a request to invoke a method from a sending LocalConnection object.
`LocalConnection.onStatus`	Invoked after a sending LocalConnection object tries to send a command to a receiving LocalConnection object.

Constructor for the LocalConnection object

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

```
myLC = new LocalConnection()
```

Parameters

None.

Returns

A reference to a LocalConnection object.

Description

Constructor; creates a LocalConnection object.

Example

The following example shows how a receiving and sending movie create LocalConnnection objects. Note that the two movies can use the same name or different names for their respective LocalConnection objects. In this example, they use the same name—`LC`.

```
// code in the receiving movie
LC = new LocalConnection();
LC.someMethod = function()
{
  // your code here
}
LC.connect("connectionName");

// code in the sending movie
LC = new LocalConnection();
LC.send("connectionName", "someMethod");
```

See also

`LocalConnection.connect`, `LocalConnection.send`

LocalConnection.allowDomain

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

```
receivingLC.allowDomain = function([sendingDomain]) {
  // Your code here returns true or false
}
```

Parameters

`sendingDomain` An optional parameter specifying the subdomain of the movie containing the sending LocalConnection object.

Returns

Nothing.

Description

Event handler; invoked whenever *`receivingLC`* receives a request to invoke a method from a sending LocalConnection object. Flash expects the code you implement in this handler to return a Boolean value of `true` or `false`. If the handler doesn't return `true`, the request from the sending object is ignored, and the method is not invoked.

Use this command to explicitly permit LocalConnection objects from specified domains, or from any domain, to execute methods of the receiving LocalConnection object. If you don't pass a value for *`sendingDomain`*, you probably want to accept commands from any domain, and the code in your handler would simply be `return true`. If you do pass a value for *`sendingDomain`*, you probably want to compare the value of *`sendingDomain`* with domains from which you want to accept commands. Both of these implementations are illustrated in the following examples.

Example

The following example shows how a LocalConnection object in a receiving movie can permit movies from any domain to invoke its methods. Compare this to the example in `LocalConnection.connect`, in which only movies from the same domain can invoke the `Trace` method in the receiving movie. For a discussion of the use of the underscore (_) in the connection name, see `LocalConnection.send`.

```
var aLocalConnection = new LocalConnection();
aLocalConnection.Trace = function(aString)
{
  aTextField = aTextField + aString + newline;
}

aLocalConnection.allowDomain = function() {
  // any domain can invoke methods on this LocalConnection object
  return true;
}

aLocalConnection.connect("_trace");
```

In the following example, the receiving movie accepts commands only from movies located in thisDomain.com or thatDomain.com.

```
var aLocalConnection = new LocalConnection();
aLocalConnection.Trace = function(aString)
{
  aTextField = aTextField + aString + newline;
}

aLocalConnection.allowDomain = function(sendingDomain)
{
  return(sendingDomain=="thisDomain.com" || sendingDomain=="thatDomain.com");
}

aLocalConnection.connect("_trace");
```

See also

`LocalConnection.connect`, `LocalConnection.domain`, `LocalConnection.send`

LocalConnection.close

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

`receivingLC``.close`

Parameters

None.

Returns

Nothing.

Description

Method; closes (disconnects) a LocalConnection object. Issue this command when you no longer want the object to accept commands—for example, when you want to issue a `LocalConnection.connect` command using the same *`connectionName`* parameter in another movie.

See also

`LocalConnection.connect`

LocalConnection.connect

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

`receivingLC``.connect(`*`connectionName`*`)`

Parameters

connectionName A string that corresponds to the connection name specified in the LocalConnection.send command that wants to communicate with *receivingLC*.

Returns

A Boolean value of true if no other process running on the same client machine has already issued this command using the same value for *connectionName*, false otherwise.

Description

Method; prepares a LocalConnection object to receive commands from a LocalConnection.send command (called the *sending LocalConnection object*). The object used with this command is called the *receiving LocalConnection object*. The receiving and sending objects must be running on the same client machine.

Be sure to define the methods attached to *receivingLC* before issuing this command, as shown in all the examples in this section.

By default, the Flash Player resolves *connectionName* into a value of "*subdomain*:connectionName", where *subdomain* is the subdomain of the movie containing the LocalConnection.connect command. For example, if the movie containing the receiving LocalConnection object is located at www.someDomain.com, *connectionName* resolves to "someDomain.com:connectionName". (If a movie is located on the client machine, the value assigned to subdomain is "localhost".)

Also by default, the Flash Player lets the receiving LocalConnection object accept commands only from sending LocalConnection objects whose connection name also resolves into a value of "*subdomain*:connectionName". In this way, Flash makes it very simple for movies located in the same domain to communicate with each other.

If you are implementing communication only between movies in the same domain, specify a string for *connectionName* that does not begin with an underscore (_) and that does not specify a domain name (for example, "myDomain:connectionName"). Use the same string in the LocalConnection.connect(*connectionName*) command.

If you are implementing communication between movies located in different domains, see the discussion of *connectionName* in LocalConnection.send, and also the LocalConnection.allowDomain and LocalConnection.domain entries.

Example

The following example shows how a movie in a particular domain can invoke a method named Trace in a receiving movie in the same domain. The receiving movie functions as a trace window for the sending movies; it contains two methods that other movies can call—Trace and Clear. Buttons pressed in the sending movies call these methods with specified parameters.

```
// receiving movie
var aLocalConnection = new LocalConnection();
aLocalConnection.Trace = function(aString)
{
  aTextField = aTextField + aString + newline;
}
aLocalConnection.Clear = function()
{
  aTextField = "";
}
aLocalConnection.connect("trace");
stop();
```

Movie 1 contains the following code attached to a button labeled PushMe. When you push the button, you see "The button was pushed." in the receiving movie.

```
on (press)
{
  var lc = new LocalConnection();
  lc.send("trace", "Trace", "The button was pushed.");
  delete lc;
}
```

Movie 2 contains an input text box with a var name of `myText`, and the following code attached to a button labeled Copy. When you type some text and then push the button, you see the text you typed in the receiving movie.

```
on (press)
{
  _parent.lc.send("trace", "Trace", _parent.myText);
  _parent.myText = "";
}
```

Movie 3 contains the following code attached to a button labeled Clear. When you push the button, the contents of the trace window in the receiving movie are cleared (erased).

```
on (press)
{
  var lc = new LocalConnection();
  lc.send("trace", "Clear");
  delete lc;
}
```

See also

`LocalConnection.send`

LocalConnection.domain

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

`myLC``.domain()`

Parameters

None.

Returns

A string representing the subdomain of the location of the current movie.

Description

Method; returns a string representing the subdomain of the location of the current movie. For example, if the current movie is located at www.macromedia.com, this command returns `"macromedia.com"`. If the current movie is a local file residing on the client machine, this command returns `"localhost"`.

The most common use of this command is to include the domain name of the sending LocalConnection object as a parameter to the method you plan to invoke in the receiving LocalConnection object, or in conjunction with `LocalConnection.allowDomain` to accept commands from a specified domain. If you are enabling communication only between LocalConnection objects that are located in the same domain, you probably don't need to use this command.

Example

In the following example, a receiving movie accepts commands only from movies located in the same domain or at macromedia.com.

```
LC = new LocalConnection();
LC.allowDomain = function(sendingDomain)
{
  return (sendingDomain==this.domain() || sendingDomain=="macromedia.com");
}
```

In the following example, a sending movie located at yourdomain.com invokes a method in a receiving movie located at mydomain.com. The sending movie includes its domain name as a parameter to the method it invokes, so the receiving movie can return a reply value to a LocalConnection object in the correct domain. The sending movie also specifies that it will accept commands only from movies at mydomain.com.

Line numbers are included for reference purposes. The sequence of events is as follows:

- The receiving movie prepares to receive commands on a connection named `"sum"` (line 11). The Flash Player resolves the name of this connection to `"mydomain.com:sum"` (see `LocalConnection.connect`).
- The sending movie prepares to receive a reply on the LocalConnection object named `"result"` (line 58). It also specifies that it will accept commands only from movies at mydomain.com (lines 51 to 53).
- The sending movie invokes the `aSum` method of a connection named `"mydomain.com:sum"` (line 59), and passes the following parameters: its domain (`lc.domain()`), the name of the connection to receive the reply (`"result"`), and the values to be used by `aSum` (123 and 456).
- The `aSum` method (line 6) is invoked with the following values: sender = `"mydomain.com:result"`, `replyMethod` = `"aResult"`, `n1` = 123, and `n2` = 456. It therefore executes the following line of code:

  ```
  this.send("mydomain.com:result", "aResult", (123 + 456));
  ```

- The `aResult` method (line 54) displays the value returned by `aSum` (579).

```
// The receiving movie at http://www.mydomain.com/folder/movie.swf
// contains the following code

1    var aLocalConnection = new LocalConnection();
2    aLocalConnection.allowDomain = function()
3    {
     // allow connections from any domain
4      return true;
5    }
6    aLocalConnection.aSum = function(sender, replyMethod, n1, n2)
7    {
8      this.send(sender, replyMethod, (n1 + n2));
9    }
10
11   aLocalConnection.connect("sum");

// The sending movie at http://www.yourdomain.com/folder/movie.swf
// contains the following code

50   var lc = new LocalConnection();
51   lc.allowDomain = function(aDomain) {
       // allow connections only from mydomain.com
52     return (aDomain == "mydomain.com");
53   }
54   lc.aResult = function(aParam) {
55     trace("The sum is " + aParam);
56   }
57
58   lc.connect("result");
59   lc.send("mydomain.com:sum", "aSum", lc.domain() + ':' + "result",
       "aResult", 123, 456);
```

See also

`LocalConnection.allowDomain`

LocalConnection.onStatus

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

```
sendingLC.onStatus = function(infoObject) {
  // Your code here
}
```

Parameters

`infoObject` A parameter defined according to the status message. For details about this parameter, see the description below.

Returns

Nothing.

Description

Event handler; invoked after a sending LocalConnection object tries to send a command to a receiving LocalConnection object. If you want to respond to this event handler, you must create a function to process the information object sent by the LocalConnection object. For more information, see the Appendix, "Client-Side Information Objects," on page 105 and "LocalConnection information objects" on page 106.

If the information object returned by this handler contains a `level` value of `"status"`, Flash successfully sent the command to a receiving LocalConnection object. This does not mean that Flash successfully invoked the specified method of the receiving LocalConnection object, only that Flash was able to send the command. For example, the method is not invoked if the receiving LocalConnection object doesn't allow connections from the sending domain, or if the method does not exist. The only way to know for sure if the method was invoked is to have the receving object send a reply to the sending object.

If the information object returned by this handler contains a `level` value of `"error"`, Flash was unable to send the command to a receiving LocalConnection object, most likely because there is no receiving LocalConnection object connected whose name corresponds to the name specified in the *`sendingLC`*`.send` command that invoked this handler.

In most cases, you will implement this handler only to respond to error conditions, as shown in the following example.

Example

The following example displays information about a failed connection in a trace window.

```
sendingLC = new LocalConnection();
sendingLC.onStatus = function(infoObject)
{
  if (infoObject.level == "error")
  {
    trace("Connection failed.");
  }
}
sendingLC.send("receivingLC", "methodName");
```

See also

`LocalConnection.send`

LocalConnection.send

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

`sendingLC``.send (`*`connectionName`*`, `*`method`*` [, `*`p1,...,pN`*`])`

Parameters

connectionName A string that corresponds to the connection name specified in the LocalConnection.connect command that wants to communicate with *sendingLC*.

method A string specifying the name of the method to be invoked in the receiving LocalConnection object. The following method names cause the command to fail: send, connect, close, domain, onStatus, and allowDomain.

p1,...pN Optional parameters to be passed to the specified method.

Returns

A Boolean value of true if Flash can carry out the request, false otherwise.

Note: A return value of true does not necessarily mean that Flash successfully connected to a receiving LocalConnection object, only that the command is syntactically correct. To determine whether the connection succeeded, see LocalConnection.onStatus.

Description

Method; invokes the method named *method* on a connection opened with the LocalConnection.connect(*connectionName*) command (called the *receiving LocalConnection object*). The object used with this command is called the *sending LocalConnection object*. The movies that contain the sending and receiving objects must be running on the same client machine.

There is a limit to the amount of data you can pass as parameters to this command. If the command returns false but your syntax is correct, try breaking up the LocalConnection.send requests into multiple commands.

As discussed in LocalConnection.connect, Flash adds the current subdomain to *connectionName* by default. If you are implementing communication between different domains, you need to define *connectionName* in both the sending and receiving LocalConnection objects in such a way that Flash does not add the current subdomain to *connectionName*. There are two ways you can do so:

- Use an underscore (_) at the beginning of *connectionName* in both the sending and receiving LocalConnection objects. In the movie containing the receiving object, use LocalConnection.allowDomain to specify that connections from any domain will be accepted. This implementation lets you store your sending and receiving movies in any domain.
- Include the subdomain in *connectionName* in the sending LocalConnection object—for example, myDomain.com:myConnectionName. In the receiving object, use LocalConnection.allowDomain to specify that connections from the specified subdomain will be accepted (in this case, myDomain.com), or that connections from any domain will be accepted.

Note: You cannot specify a subdomain in *connectionName* in the receiving LocalConnection object, only in the sending LocalConnection object.

Example

For an example of communicating between LocalConnection objects located in the same domain, see LocalConnection.connect. For an example of communicating between LocalConnection objects located in any domain, see LocalConnection.allowDomain. For an example of communicating between LocalConnection objects located in specified domains, see LocalConnection.allowDomain and LocalConnection.domain.

See also

`LocalConnection.allowDomain`, `LocalConnection.connect`, `LocalConnection.domain`, `LocalConnection.onStatus`

Microphone (object)

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

The Microphone object lets you capture audio from a microphone attached to the computer that is running the Macromedia Flash Player. When used with Flash Communication Server, this object lets you transmit, play, and optionally record the audio being captured. With these capabilities, you can develop communications applications such as instant messaging with audio, recording presentations so others can replay them at a later date, and so on. (Flash provides similar video capabilities; for more information, see the "Camera (object)" entry.)

You can also use a Microphone object without a server—for example, to transmit sound from your microphone through the speakers on your local system.

To create or reference a Microphone object, use `Microphone.get`.

Method summary for the Microphone object

Method	Description
`Microphone.get`	Returns a default or specified Microphone object, or `null` if the microphone is not available.
`Microphone.setGain`	Specifies the amount by which the microphone should boost the signal.
`Microphone.setRate`	Specifies the rate at which the microphone should capture sound, in kHz.
`Microphone.setSilenceLevel`	Specifies the amount of sound required to activate the microphone.
`Microphone.setUseEchoSuppression`	Specifies whether to use the echo suppression feature of the audio codec.

Property summary for the Microphone object

Property (read-only)	Description
`Microphone.activityLevel`	The amount of sound the microphone is detecting.
`Microphone.gain`	The amount by which the microphone boosts the signal before transmitting it.
`Microphone.index`	The index of the current microphone.
`Microphone.muted`	A Boolean value that specifies whether the user has allowed or denied access to the microphone.
`Microphone.name`	The name of the current sound capture device, as returned by the sound capture hardware.
`Microphone.names`	Class property: an array of strings reflecting the names of all available sound capture devices, including sound cards and microphones.
`Microphone.rate`	The sound capture rate, in kHz.

Property (read-only)	Description
`Microphone.silenceLevel`	The amount of sound required to activate the microphone.
`Microphone.silenceTimeout`	The number of milliseconds between the time the microphone stops detecting sound and the time `Microphone.onActivity(false)` is called.
`Microphone.useEchoSuppression`	A Boolean value that specifies whether echo suppression is being used.

Event handler summary for the Microphone object

Method	Description
`Microphone.onActivity`	Invoked when the microphone starts or stops detecting sound.
`Microphone.onStatus`	Invoked when the user allows or denies access to the microphone.

Constructor for the Microphone object

See `Microphone.get`.

Microphone.activityLevel

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

`activeMicrophone``.activityLevel`

Description

Read-only property; a numeric value that specifies the amount of sound the microphone is detecting. Values range from 0 (no sound is being detected) to 100 (very loud sound is being detected). The value of this property can help you determine a good value to pass to `Microphone.setSilenceLevel`.

If the microphone is available but is not yet being used because neither `MovieClip.attachAudio` nor `NetStream.attachAudio` has been called, this property is set to -1.

Example

The following examples sets the variable `level` to the activity level of the current microphone, `myMic.activityLevel`.

```
var level = myMic.activityLevel;
```

See also

`Microphone.setGain`

Microphone.gain

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

activeMicrophone.gain

Description

Read-only property; the amount by which the microphone boosts the signal. Valid values are 0 to 100. The default value is 50.

Example

The following example is attached to the nib of a slide bar. When this clip is loaded, Flash checks for the value `myMic.gain` and provides a default value if this value is undefined. The `_x` position is then used to set the gain on the microphone to the user's preference.

```
onClipEvent (load) {
  if (_root.myMic.gain == undefined) {
    _root.myMic.setGain = 75;
  }

  this._x = _root.myMic.gain;
  _root.txt_micgain = this._x;

  left = this._x;
  right = left+50;
  top = this._y;
  bottom = top;
}

on (press) {
  startDrag(this, false, left, top, right, bottom);
  this._xscale = 100;
  this._yscale = 100;
}

on (release, releaseOutside) {
  stopDrag();
  g = (this._x-50)*2;
  _root.myMic.setGain(g);
  _root.txt_micgain = g;
  this._xscale = 100;
  this._yscale = 100;
}
```

See also

`Microphone.setGain`

Microphone.get

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

```
Microphone.get([index])
```

Note: The correct syntax is `Microphone.get()`. To assign the Microphone object to a variable, use syntax like `activeMicrophone = Microphone.get()`.

Parameters

index An optional zero-based integer that specifies which microphone to get, as determined from the array returned by `Microphone.names`. To get the default microphone (which is recommended for most applications), omit this parameter.

Returns

- If *index* is not specified, this method returns a reference to the default microphone or, if it is not available, to the first available microphone. If no microphones are available or installed, the method returns `null`.
- If *index* is specified, this method returns a reference to the requested microphone, or `null` if it is not available.

Description

Method; returns a reference to a Microphone object for capturing audio. To actually begin capturing the audio, you must attach the Microphone object either to a MovieClip object (see `MovieClip.attachAudio`) or to a NetStream object (see `NetStream.attachAudio`). (The NetStream object is available only with Flash Communication Server.)

Unlike objects that you create using the `new` constructor, multiple calls to `Microphone.get` reference the same microphone. Thus, if your script contains the lines `mic1 = Microphone.get()` and `mic2 = Microphone.get()`, both `mic1` and `mic2` reference the same (default) microphone.

In general, you shouldn't pass a value for *index*; simply use `Microphone.get()` to return a reference to the default microphone. By means of the Microphone settings panel (discussed later in this section), the user can specify the default microphone Flash should use. If you pass a value for *index*, you might be trying to reference a microphone other than the one the user prefers. You might use *index* in rare cases—for example, if your application is capturing audio from two microphones at the same time.

When a movie tries to access the microphone returned by `Microphone.get`—for example, when you issue `NetStream.attachAudio` or `MovieClip.attachAudio`—the Flash Player displays a Privacy dialog box that lets the user choose whether to allow or deny access to the microphone. (Make sure your Stage size is at least 215 by 138 pixels; this is the minimum size Flash requires to display the dialog box.)

When the user responds to this dialog box, the `Microphone.onStatus` event handler returns an information object that indicates the user's response. To determine whether the user has denied or allowed access to the camera without processing this event handler, use `Microphone.muted`.

The user can also specify permanent privacy settings for a particular domain by right-clicking (Windows) or Control-clicking (Macintosh) while a movie is playing, choosing Settings, opening the Privacy panel, and selecting Remember.

You can't use ActionScript to set the Allow or Deny value for a user, but you can display the Privacy panel for the user by using `System.showSettings(0)`. If the user selects Remember, the Flash Player no longer displays the Privacy dialog box for movies from this domain.

If `Microphone.get` returns `null`, either the microphone is in use by another application, or there are no microphones installed on the system. To determine whether any microphones are installed, use `Microphones.names.length`. To display the Flash Player Microphone Settings panel, which lets the user choose the microphone to be referenced by `Microphone.get`, use `System.showSettings(2)`.

Example

The following example lets the user specify the default microphone, then captures audio and plays it back locally. To avoid feedback, you may want to test this code while wearing headphones.

```
System.showSettings(2);
myMic = Microphone.get();
_root.attachAudio(myMic);
```

See also

`Microphone.index`, `Microphone.muted`, `Microphone.names`, `Microphone.onStatus`, `MovieClip.attachAudio`, `NetStream.attachAudio`

Microphone.index

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

`activeMicrophone``.index`

Description

Read-only property; a zero-based integer that specifies the index of the microphone, as reflected in the array returned by `Microphone.names`.

See also

`Microphone.get`, `Microphone.names`

Microphone.muted

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

`activeMicrophone``.muted`

Description

Read-only property; a Boolean value that specifies whether the user has denied access to the microphone (`true`) or allowed access (`false`). When this value changes, `Microphone.onStatus` is invoked. For more information, see `Microphone.get`.

Example

In the following example, when the user clicks the button, Flash publishes and plays a live stream if the microphone is not muted.

```
on (press)
{
  // If the user mutes microphone, display offline notice.
  // Else, publish and play live stream from microphone.
  if(myMic.muted) {
    _root.debugWindow+="Microphone offline." + newline;
  } else {

    // Publish the microphone data by calling
    // the root function pubLive().
    _root.pubLive();

    // Play what is being published by calling
    // the root function playLive().
    _root.playLive();
  }
}
```

See also

`Microphone.get`, `Microphone.onStatus`

Microphone.name

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

`activeMicrophone``.name`

Description

Read-only property; a string that specifies the name of the current sound capture device, as returned by the sound capture hardware.

Example

The following example displays the name of the default microphone in the Output window.

```
myMic = Microphone.get();
trace("The microphone name is: " + myMic.name);
```

See also

`Microphone.get`, `Microphone.names`

Microphone.names

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

```
Microphone.names
```

Note: The correct syntax is `Microphone.names`. To assign the return value to a variable, use syntax like *`micArray`* `= Microphone.names`. To determine the name of the current microphone, use *`activeMicrophone`*`.name`.

Description

Read-only class property; retrieves an array of strings reflecting the names of all available sound capture devices without displaying the Flash Player Privacy Settings panel. This array behaves the same as any other ActionScript array, implicitly providing the zero-based index of each sound capture device and the number of sound capture devices on the system (by means of `Microphone.names.length`). For more information, see the "Array (object)" entry in the online Flash ActionScript Dictionary in the Flash MX Help menu.

Calling `Microphone.names` requires an extensive examination of the hardware, and it may take several seconds to build the array. In most cases, you can just use the default microphone.

Example

The following code returns information on the array of audio devices.

```
allMicNames = Microphone.names;
_root.debugWindow += "Microphone.names() located these device(s):" + newline;

for(i=0; i < allMicNames.length; i++){
  debugWindow += "[" + i + "]: " + allMicNames[i] + newline;
}
```

For example, the following information could be displayed:

```
Microphone.names() located these device(s):
[0]: Crystal SoundFusion(tm)
[1]: USB Audio Device
```

See also

Array (object) in the online Flash ActionScript Dictionary in the Flash MX Help menu,
`Microphone.name`

Microphone.onActivity

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

```
activeMicrophone.onActivity = function(activity) {
  // Your code here
}
```

Parameters

activity A Boolean value set to `true` when the microphone starts detecting sound, `false` when it stops.

Returns

Nothing.

Description

Event handler; invoked when the microphone starts or stops detecting sound. If you want to respond to this event handler, you must create a function to process its *activity* value.

To specify the amount of sound required to invoke `Microphone.onActivity(true)`, and the amount of time that must elapse without sound before `Microphone.onActivity(false)` is invoked, use `Microphone.setSilenceLevel`.

Example

The following example displays `true` or `false` in the Output window when the microphone starts or stops detecting sound.

```
m = Microphone.get();
_root.attachAudio(m);
m.onActivity = function(mode)
{
  trace(mode);
};
```

See also

`Microphone.setSilenceLevel`

Microphone.onStatus

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

```
activeMicrophone.onStatus = function(infoObject) {
  // Your code here
}
```

Parameters

infoObject A parameter defined according to the status message. For details about this parameter, see "Microphone information objects" on page 106.

Returns

Nothing.

Description

Event handler; invoked when the user allows or denies access to the microphone. If you want to respond to this event handler, you must create a function to process the information object generated by the microphone. For more information, see the Appendix, "Client-Side Information Objects," on page 105.

When a movie tries to access the microphone, the Flash Player displays a Privacy dialog box that lets the user choose whether to allow or deny access.

- If the user allows access, the `Microphone.muted` property is set to `false`, and this event handler is invoked with an information object whose `code` property is `Microphone.Unmuted`.
- If the user denies access, the `Microphone.muted` property is set to `true`, and this event handler is invoked with an information object whose `code` property is `Microphone.Muted`.

To determine whether the user has denied or allowed access to the microphone without processing this event handler, use `Microphone.muted`.

Note: If the user chooses to permanently allow or deny access for all movies from a specified domain, this method is not invoked for movies from that domain unless the user later changes the privacy setting. For more information, see `Microphone.get`.

Example

See the example for `Camera.onStatus`.

See also

`Microphone.get`, `Microphone.muted`, `System.showSettings`

Microphone.rate

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

`activeMicrophone``.rate`

Description

Read-only property; the rate at which the microphone is capturing sound, in kHz. The default value is 8 kHz if your sound capture device supports this value. Otherwise, the default value is the next available capture level above 8 kHz that your sound capture device supports, usually 11 kHz.

To set this value, use `Microphone.setRate`.

Example

The following example saves the current rate to the variable `original`.

```
original = myMic.rate;
```

See also

`Microphone.setRate`

Microphone.setGain

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

activeMicrophone.setGain(*gain*)

Parameters

gain An integer that specifies the amount by which the microphone should boost the signal. Valid values are 0 to 100. The default value is 50; however, the user may change this value in the Flash Player Microphone Settings panel.

Returns

Nothing.

Description

Method; sets the microphone gain—that is, the amount by which the microphone should multiply the signal before transmitting it. A value of 0 tells Flash to multiply by 0; that is, the microphone transmits no sound.

You can think of this setting like a volume knob on a stereo: 0 is no volume and 50 is normal volume; numbers below 50 specify lower than normal volume, while numbers above 50 specify higher than normal volume.

Example

The following example ensures that the microphone gain setting is less than or equal to 55.

```
var myMic = Microphone.get();
if (myMic.gain > 55){
  myMic.setGain(55);
}
```

See also

Microphone.gain, Microphone.setUseEchoSuppression

Microphone.setRate

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

activeMicrophone.setRate(*kHz*)

Parameters

kHz The rate at which the microphone should capture sound, in kHz. Acceptable values are 5, 8, 11, 22, and 44. The default value is 8 kHz if your sound capture device supports this value. Otherwise, the default value is the next available capture level above 8 kHz that your sound capture device supports, usually 11 kHz.

Returns

Nothing.

Description

Method; sets the rate, in kHz, at which the microphone should capture sound.

Example

The following example sets the microphone rate to the user's preference (which you have assigned to the `userRate` variable) if it is one of the following values: 5, 8, 11, 22, or 44. If it is not, the value is rounded to the nearest acceptable value that the sound capture device supports.

```
myMic.setRate(userRate);
```

See also

`Microphone.rate`

Microphone.setSilenceLevel

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

`activeMicrophone``.setSilenceLevel(`*`level`*` [, `*`timeout`*`])`

Parameters

`level` An integer that specifies the amount of sound required to activate the microphone and invoke `Microphone.onActivity(true)`. Acceptable values range from 0 to 100. The default value is 10.

`timeout` An optional integer parameter that specifies how many milliseconds must elapse without activity before Flash considers sound to have stopped and invokes `Microphone.onActivity(false)`. The default value is 2000 (2 seconds).

Returns

Nothing.

Description

Method; sets the minimum input level that should be considered sound and (optionally) the amount of silent time signifying that silence has actually begun.

- To prevent the microphone from detecting sound at all, pass a value of 100 for *`level`*; `Microphone.onActivity` is never invoked.
- To determine the amount of sound the microphone is currently detecting, use `Microphone.activityLevel`.

Activity detection is the ability to detect when audio levels suggest that a person is talking. When someone is not talking, bandwidth can be saved because there is no need to send the associated audio stream. This information can also be used for visual feedback so that users know they (or others) are silent.

Silence values correspond directly to activity values. Complete silence is an activity value of 0. Constant loud noise (as loud as can be registered based on the current gain setting) is an activity value of 100. After gain is appropriately adjusted, your activity value is less than your silence value when you're not talking; when you are talking, the activity value exceeds your silence value.

This method is similar in purpose to `Camera.setMotionLevel`; both methods are used to specify when the `onActivity` event handler should be invoked. However, these methods have a significantly different impact on publishing streams:

- `Camera.setMotionLevel` is designed to detect motion and does not affect bandwidth usage. Even if a video stream does not detect motion, video is still sent.
- `Microphone.setSilenceLevel` is designed to optimize bandwidth. When an audio stream is considered silent, no audio data is sent. Instead, a single message is sent, indicating that silence has started.

Example

The following example changes the silence level based on the user's input. The button has the following code attached:

```
on (press)
{
  this.makeSilenceLevel(this.silenceLevel);
}
```

The `makeSilenceLevel()` function called by the button continues:

```
function makeSilenceLevel(s)
{
  this.obj.setSilenceLevel(s);
  this.SyncMode();
  this.silenceLevel= s;
}
```

See also the example for `Camera.setMotionLevel`.

See also

`Microphone.activityLevel`, `Microphone.onActivity`, `Microphone.setGain`, `Microphone.silenceLevel`, `Microphone.silenceTimeout`

Microphone.setUseEchoSuppression

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

`activeMicrophone``.setUseEchoSuppression(`*`suppress`*`)`

Parameters

`suppress` A Boolean value indicating whether echo suppression should be used (`true`) or not (`false`).

Returns

Nothing.

Description

Method; specifies whether to use the echo suppression feature of the audio codec. The default value is `false` unless the user has selected Reduce Echo in the Flash Player Microphone Settings panel.

Echo suppression is an effort to reduce the effects of audio feedback, which is caused when sound going out the speaker is picked up by the microphone on the same computer. (This is different from echo cancellation, which completely removes the feedback.)

Generally, echo suppression is advisable when the sound being captured is played through speakers—instead of a headset—on the same computer. If your movie allows users to specify the sound output device, you may want to call `Microphone.setUseEchoSuppression(true)` if they indicate they are using speakers and will be using the microphone as well.

Users can also adjust these settings in the Flash Player Microphone Settings panel.

Example

The following example turns on echo suppression.

```
_root.myMic.setUseEchoSuppression(true);
```

See also

`Microphone.setGain`, `Microphone.useEchoSuppression`

Microphone.silenceLevel

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

`activeMicrophone``.silenceLevel`

Description

Read-only property; an integer that specifies the amount of sound required to activate the microphone and invoke `Microphone.onActivity(true)`. The default value is 10.

Example

See the example for `Microphone.silenceTimeout`.

See also

`Microphone.gain`, `Microphone.setSilenceLevel`

Microphone.silenceTimeout

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

activeMicrophone.silenceTimeout

Description

Read-only property; a numeric value representing the number of milliseconds between the time the microphone stops detecting sound and the time `Microphone.onActivity(false)` is invoked. The default value is 2000 (2 seconds).

To set this value, use `Microphone.setSilenceLevel`.

Example

The following example sets the timeout to two times its current value.

```
myMic.setSilenceLevel(myMic.silenceLevel, myMic.silenceTimeOut * 2);
```

See also

`Microphone.setSilenceLevel`

Microphone.useEchoSuppression

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

activeMicrophone.useEchoSuppression

Description

Read-only property; a Boolean value of `true` if echo suppression is enabled, `false` otherwise. The default value is `false` unless the user has selected Reduce Echo in the Flash Player Microphone Settings panel.

Example

The following example checks for echo suppression and turns it on if it is off.

```
_root.myMic.onActivity = function(active) {
  if (active == true) {
    if (_root.myMic.useEchoSuppression == false) {
      _root.myMic.setUseEchoSuppression(true);
    }
  }
}
```

See also

`Microphone.setUseEchoSuppression`

MovieClip (object)

This object is discussed in detail in the online Flash ActionScript Dictionary in the Flash MX Help menu. Only the method used by Flash Communication Server is discussed in this section.

Method summary for the MovieClip object

Method	Description
`MovieClip.attachAudio`	Starts or stops playback of an audio source.

MovieClip.attachAudio

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

`anyMovieClip``.attachAudio(`*`source`*`)`

Parameters

`source` The object containing the audio to play. Valid values are a Microphone object, a NetStream object (requires Flash Communication Server), and `false` (stops playing the audio).

Returns

Nothing.

Description

Method; specifies the audio source to be either played locally (Microphone object) or streamed from the Flash Communication Server (NetStream object). To stop playing the audio source, pass `false` for *`source`*.

- To play local audio, pass a Microphone object as `source`. This captures and plays local audio from the microphone hardware.
- To play live or recorded audio streaming from the Flash Communication Server, pass a NetStream object as `source`. (The same NetStream object can contain both audio and video information. To play back video from a NetStream object, use the `Video.attachVideo` method.)

You don't have to use this method to play back incoming streamed audio; audio sent through a stream is played through the subscriber's standard audio output device by default when the subscriber issues `NetStream.play`. However, if you use this method to route streaming audio to a movie clip, you can then create a Sound object to control some aspects of the sound.

Example

The following code attaches a microphone to a movie clip.

```
myMic = Microphone.get();
this.attachAudio(myMic);
```

See also

Microphone (object), NetStream (object), `NetStream.attachAudio`, Sound (object) in the online Flash ActionScript Dictionary in the Flash MX Help menu

NetConnection (object)

Availability

- Flash Player 6.Flash Communication Server MX.
- The NetConnection object manages a bidirectional connection between the Flash Player and a server, which lets you connect to Flash Remoting or to the Flash Communication Server. The Flash Communication Server enables you to share audio, video, and data using the Macromedia Real-Time Messaging Protocol (RTMP).

For information on using Flash with an application server, see *Using Flash Remoting*. For information on using Flash with Flash Communication Server, see the following entries in addition to NetConnection:

- NetStream (object)—for any RTMP communication
- Camera (object)—for capturing and transmitting video
- Microphone (object)—for capturing and transmitting audio
- SharedObject (object)—for sharing data
- Camera (object)—for displaying video

For information on creating a NetConnection object, see "Constructor for the NetConnection object" on page 54.

Method summary for the NetConnection object

Method	Description
`NetConnection.call`	Invokes a command or method on the server.
`NetConnection.close`	Closes the connection with the server.
`NetConnection.connect`	Connects to an application on the Flash Communication Server.

Event handler summary for the NetConnection object

Method	Description
`NetConnection.onStatus`	Invoked when a status change or error is posted for the NetConnection object.

Constructor for the NetConnection object

Availability

- Flash Player 6.
- Flash Communication Server MX.

Usage

```
new NetConnection()
```

Parameters

None.

Returns

A NetConnection object.

Description

Constructor; creates an object that can be used to connect the Flash Player to the Flash Communication Server or to an application server. After creating the NetConnection object, use `NetConnection.connect` to make the actual connection.

For information on using Flash with an application server, see *Using Flash Remoting*.

Example

The following `doConnect()` function uses the NetConnection constructor to create a new connection and connect to the server.

```
function doConnect() {

  // Make a new connection object
  connection = new NetConnection();

  // Get the name of the server from user input
  // and assign it to a variable named myURL
  myURL=serverName;

  // Connect to the service
  connection.connect("rtmp://" + myURL + "/someApp/someInstance");
}
```

See also

`NetConnection.connect`

NetConnection.call

Availability

- Flash Player 6.
- Flash Communication Server MX.

Usage

`myConnection``.call(`*`remoteMethod, resultObject`* `| null [,` *`p1,...,pN`*`])`

Parameters

`remoteMethod` A parameter in the form `[/`*`objectPath`*`/]`*`method`*; if you are calling a method on a NetConnection object, you can omit *`objectPath`*. For example, the parameter `/someObj/doSomething` means the server must call the `someObj.doSomething` method of the application passed to `NetConnection.connect` in its *`targetURI`* parameter, passing the specified *`p1,...,pN`* parameters.

For security reasons, certain *`remoteMethod`* names are reserved at the application level; do not use this event handler to call those methods. The reserved names are `/onConnect`, `/onDisconnect`, `/onStatus`, `/onAppStop`, and `/onAppStart`.

`resultObject` An object parameter that is needed only when the sender is expecting a result. The result object can be any user-defined object. For it to be of use, a method named `onResult` must be called when the result arrives. If you don't need a result object, pass `null`.

`p1,...pN` Optional parameters to be passed to the specified method.

Returns

Nothing.

Description

Method; invokes a command or method on the server. You must create a server-side function to define this method. This method is also used when connecting to an application server. For information on using Flash with an application server, see *Using Flash Remoting*.

Example

The following function checks for a message, sends it, then clears the local string.

```
function mySend()
{
  if (length(msg) > 0) {
    connection.call("message", null, msg);
  }
  msg = "";
}
```

NetConnection.close

Availability

- Flash Player 6.
- Flash Communication Server MX.

Usage

myConnection.close()

Parameters

None.

Returns

Nothing.

Description

Method; closes the connection with the server and invokes `NetConnection.onStatus` with a `code` property of `"NetConnection.Connect.Close"`. For more information, see `NetConnection.onStatus`.

This method disconnects all NetStream objects running over this connection; any queued data that has not been sent is discarded. (To terminate server streams without closing the connection, use `NetStream.close`.) If you want to reconnect, you must recreate the NetStream object (see "Constructor for the NetStream object" on page 64).

This method also disconnects all remote shared objects running over this connection. However, you don't need to recreate the shared object to reconnect. Instead, you can just call `SharedObject.connect` to re-establish the connection to the shared object. Also, any data in the shared object that was queued when you issued `NetConnection.close` will be sent after you reestablish a connection to the shared object.

Example

The following `disconnect()` function stops the published stream, then calls `NetConnection.close` to delete the source connection. With no source stream to play, the destination stream automatically ends and is deleted.

```
function disconnect() {

  // Stops publishing the stream.
  srcStream.close();

  // Deletes the source stream connection.
  connection.close();
}
```

See also

`NetConnection.connect`, `NetConnection.onStatus`, `NetStream.close`, `SharedObject.connect`

NetConnection.connect

Availability

- Flash Player 6.
- Flash Communication Server MX.

Usage

myConnection.connect(*targetURI*, [, *p1 ... pN*])

Parameters

targetURI The Uniform Resource Identifier (URI) of the application on the Flash Communication Server that should run when the connection is made. To specify *targetURI*, use one of the following formats (items in brackets are optional):

- `rtmp:[`*port*`]/`*appName*`[/`*instanceName*`]` (acceptable if the movie and the Flash Communication Server are on the same machine)
- `rtmp://`*host*`[:`*port*`]/`*appName*`[/`*instanceName*`]`

For example, the following URIs are formatted correctly:

- rtmp://www.myCompany.com/myMainDirectory/groupChatApp/HelpDesk
- rtmp:/sharedWhiteboardApp/June2002

p1 ... pN Optional parameters of any type to be passed to the application specified in *targetURI*. If the application is unable to process the parameters in the order in which they are received, NetConnection.onStatus is invoked with the code property set to NetConnection.Connect.Rejected.

Returns

A Boolean value of true if you passed in a valid URI, false otherwise. (To determine if the connection was successfully completed, use NetConnection.onStatus.).

Description

Method; connects to an application on the Flash Communication Server. This method can also be used to communicate with an application server. For information, see *Using Flash Remoting*.

If you want to use this connection for publishing or playing audio or video in real time, or to publish or play previously recorded audio or video streams, you must connect to the Flash Communication Server and then create a NetStream object within this NetConnection object. For more information, see the "NetStream (object)" entry.

If you want to use this connection for synchronizing data among multiple clients or between the client and a server, you must connect to the Flash Communication Server and then create a remote shared object within this NetConnection object. For more information, see the "SharedObject (object)" entry.

When you call this method, the NetConnection.onStatus event handler is invoked with an information object that specifies whether the connection succeeded or failed. For more information, see the example below and NetConnection.onStatus. If the connection is successful, NetConnection.isConnected is set to true.

Because of network and thread timing issues, it is better to place a NetConnection.onStatus handler in a script before a NetConnection.connect method. Otherwise, the connection might complete before the script executes the onStatus handler initialization. Also, all security checks are made within the connect method, and notifications will be lost if the onStatus handler is not yet set up.

If the specified connection is already open when you call this method, an implicit NetConnection.close method is invoked, and then the connection is reopened.

During the connection process, any server responses to subsequent NetConnection.call, NetStream.send, or SharedObject.send methods are queued until the server authenticates the connection and NetConnection.onStatus is invoked. The call or send methods are then processed in the order received. Any pending updates to remote shared objects are also queued until the connection is successful, at which point they are transmitted to the server.

Video and audio, however, are not queued during the connection process. Any video or audio that is streaming from the server is ignored until the connection is successfully completed. For example, confirm that the connection was successful before enabling a button that calls the NetStream.publish method.

If your connection fails, make sure you have met all the requirements for connecting successfully:

- You are specifying the correct protocol name for connecting to the server (`rtmp` for the Flash Communication Server).
- You are connecting to a valid application on the correct server.
- You have a subdirectory in the FlashCom application directory with the same name as the application.
- The server is running.

To distinguish among different instances of a single application, pass a value for *`instanceName`* as part of *`targetURI`*. For example, you may want to give different groups of people access to the same application without having them interact with each other. To do so, you can open multiple chat rooms at the same time, as shown below.

```
nc.connect("rtmp://www.myserver.com/chatApp/peopleWhoSew")
nc.connect("rtmp://www.myserver.com/chatApp/peopleWhoKnit")
```

In another case, you may have an application named "lectureSeries" that records and plays back classroom lectures. To save individual lectures, pass a different value for *`instanceName`* each time you record a lecture, as shown below.

```
// Record Monday's lecture
nc.connect("rtmp://www.myserver.com/lectureSeries/Monday");
...
ns.connect(nc);
ns.publish("lecture", "record");

// Record Tuesday's lecture
nc.connect("rtmp://www.myserver.com/lectureSeries/Tuesday");
...
ns.connect(nc);
ns.publish("lecture", "record");
// and so on

// Play back one of the lectures
nc.connect("rtmp://www.myserver.com/lectureSeries/Monday");
...
ns.connect(nc);
ns.play("lecture")
```

You can also nest instance names, as shown below.

```
nc.connect("rtmp://www.myserver.com/chatApp/peopleWhoSew/Monday")
nc.connect("rtmp://www.myserver.com/chatApp/peopleWhoSew/Tuesday")
```

For information on where recorded streams are stored on the server, see `NetStream.publish`.

Understanding file naming and domains used with this method

If an HTML page containing a movie is accessed differently (with regards to domain names) from the way the movie itself accesses the Flash Communication Server, then the connection will not be successful. This is a security feature of the Flash Player. But in some cases, this may be inconvenient.

For example, if a web page containing a movie is served on an intranet from, say, http://deptserver.mycorp.com, it can also be accessed simply by http://deptserver. If the page is accessed via, say, http://deptServer/tcpage.htm, but the movie specifies deptServer.mycorp.com in the *targetURI*, then the movie will not make a successful connection to the server. Similarly, if the web page and movie are accessed as http://deptserver.mycorp.com/tcpage.htm, but the movie specifies rtmp://deptserver in the *targetURI*, it will not connect.

There are a few things you can do to prevent the security policies from inconveniencing you or your users. First, and easiest, is to use a *targetURI* that doesn't specify a server name. (This is applicable only if the Flash Communication Server and web server are running on the same machine.) To do so, leave off the second slash in the *targetURI*. For example, the following commands will make the Flash Player attempt to connect to the same host and domain as the web server the SWF file was served from.

```
nc = new NetConnection();
nc.connect("rtmp:/myApp");
```

Second, there is a bit of JavaScript you can use in your HTML page to avoid the security problem. Assuming the movie uses a fully qualified domain name URL to access the Flash Communication Server, this JavaScript redirects the web page to an explicitly named full URL, like this:

```
<SCRIPT language="javascript">
//if the URL didn't have the domain on it
if (document.URL.indexOf("mycorp.com") == -1) {
    //redirect to a version that does
    document.URL="http://deptServer.mycorp.com/tcpage.htm";
}
</script>
```

Finally, if you own a domain name, have access to the DNS records of that domain name, and have a static IP address for your Flash Communication Server, you can create address ("A") records to point a host name to that IP address. For instance, flashcom.mycorp.com could map to the machine running the Flash Communication Server and having an IP address provided by your IT department or ISP. Your web pages can continue to be hosted by whatever means you are currently using. ("CNAME" records are recommended if you need to forward traffic to a server that has a DNS-accessible host name but may or may not have a static IP address.)

Example

The following example connects to the `funAndGames` application on the `macromedia` server.

```
con = new NetConnection();
con.connect("rtmp://real.macromedia.com/funAndGames");
```

See also

`NetConnection.close`, `NetConnection.onStatus`

NetConnection.isConnected

Availability

- Flash Player 6.
- Flash Communication Server MX.

Usage

```
myConnection.isConnected
```

Description

Read-only property; a Boolean value indicating whether the Flash Player is connected to the server (`true`) or not (`false`) through the specified connection. Whenever a connection is made or closed, this property is set.

Example

The following example is attached to a toggle push button. When the user clicks the button, if the user is connected to the server, the connection is closed. If the user is not connected, a connection is established.

```
on (release) {
  if (_root.connection.isConnected == true)
    _root.connection.close();
  else
    _root.connection.connect(_root.myURI);
}
```

See also

`NetConnection.close`, `NetConnection.connect`, `NetConnection.onStatus`

NetConnection.onStatus

Availability

- Flash Player 6.
- Flash Communication Server MX.

Usage

```
myConnection.onStatus = function(infoObject) {
  // Your code here
}
```

Parameters

`infoObject` A parameter defined according to the status message. For details about this parameter, see "NetConnection information objects" on page 107.

Returns

Nothing.

Description

Event handler; invoked when a status change or error is posted for the NetConnection object. If you want to respond to this event handler, you must create a function to process the information object sent by the server. For more information, see the Appendix, "Client-Side Information Objects," on page 105.

Example

The following example writes data about the connection to a log file.

```
reconnection.onStatus = function(info)
{
  _root.log += "Recording stream status.\n";
  _root.log += "Event: " + info.code + "\n";
  _root.log += "Type: " + info.level + "\n";
  _root.log += "Message:" + info.description + "\n";
}
```

See also

`NetConnection.call`, `NetConnection.close`, `NetConnection.connect`

NetConnection.uri

Availability

- Flash Player 6.
- Flash Communication Server MX.

Usage

`myConnection``.uri`

Description

Read-only property; a string representing the target URI that was passed in with `NetConnection.connect`. If `NetConnection.connect` hasn't yet been called for *`myConnection`*, this property is undefined.

See also

`NetConnection.connect`

NetStream (object)

The NetStream object opens a one-way streaming connection between the Flash Player and the Flash Communication Server through a connection made available by a NetConnection object. A NetStream object is like a channel inside a NetConnection object; this channel can either publish audio and/or video data, using `NetStream.publish`, or subscribe to a published stream and receive data, using `NetStream.play`. You can publish or play live (real-time) data and play previously recorded data.

You can also use NetStream objects to send text messages to all subscribed clients (see `NetStream.send`).

The following steps summarize the sequence of actions required for publishing real-time audio and video using Flash Communication Server and the Real-Time Messaging Protocol (RTMP):

1. Use `new NetConnection` to create a NetConnection object.
2. Use `NetConnection.connect("rtmp://serverName/appName/appInstanceName")` to connect the application to the Flash Communication Server.
3. Use `new NetStream(connection)` to create a data stream over the connection.
4. Use `NetStream.attachAudio(audioSource)` to capture and send audio over the stream, and `NetStream.attachVideo(videoSource)` to capture and send video over the stream.
5. Use `NetStream.publish(publishName)` to give this stream a unique name and send data over the stream to the Flash Communication Server, so others can receive it. You can also record the data as you publish it, so that users can play it back later.

   Movies that subscribe to this stream will use the name specified here; that is, they will call the same `NetConnection.connect` method as the publisher, and then call a `NetStream.play(publishName)` method. They will also have to call `Video.attachVideo` to display the video.

Multiple streams can be open simultaneously over one connection, but each stream either publishes or plays. To publish and play over a single connection, open two streams over the connection, as shown in the following example. This example publishes audio and video data in real time on one stream and plays it back on another stream on the same client, through the same connection.

```
// These lines begin broadcasting
nc = new NetConnection(); // create connection object
nc.connect("rtmp://mySvr.myDomain.com/App"); // connect to server
ns = new NetStream(nc);             // open stream within connection
ns.attachAudio(Microphone.get());   // capture audio
ns.attachVideo(Camera.get());       // capture video
ns.publish("todays_news");          // begin broadcasting

// These lines open a stream to play the video portion of the broadcast
// inside a Video object named myVideoArea.
// The audio is played through the standard output device--you don't
// need to issue a separate command to hear the audio.
ns2 = new NetStream(nc);    // open another stream over the same connection
myVideoArea.attachVideo(ns2); // specify where to display video
ns2.play("todays_news"); // play uses the same name as publish, above
```

In the previous example, note that both the publisher and subscriber call an `attachVideo` method. The publisher calls `NetStream.attachVideo` to connect a video feed to a stream. The subscriber calls `Video.attachVideo` to connect a video feed to a Video object on the Stage; the incoming video is displayed inside this object.

Note also that although the publisher calls an `attachAudio` method, the subscriber does not. This is because audio sent through a stream is played through the subscriber's standard audio output device by default; the subscriber doesn't have to attach the incoming audio to an object on the Stage. However, you can use `MovieClip.attachAudio` to route audio from a NetStream object to a movie clip. If you do this, you can then create a Sound object to control the volume of the sound. For more information, see `MovieClip.attachAudio`.

Method summary for the NetStream object

Method	Description
NetStream.attachAudio	Publisher method; specifies whether audio should be sent over the stream.
NetStream.attachVideo	Publisher method; starts transmitting video or a snapshot from the specified source.
NetStream.close	Stops publishing or playing all data on the stream and makes the stream available for another use.
NetStream.pause	Subscriber method; pauses or resumes playback of a stream.
NetStream.play	Subscriber method; feeds streaming audio, video, and text messages being published on the Flash Communication Server, or a recorded file stored on the server, to the client.
NetStream.publish	Publisher method; sends streaming audio, video and text messages from the client to the Flash Communication Server, optionally recording the stream during transmission.
NetStream.receiveAudio	Subscriber method; specifies whether incoming audio plays on the stream.
NetStream.receiveVideo	Subscriber method; specifies whether incoming video will play on the stream, or specifies the frame rate of the video.
NetStream.seek	Subscriber method; seeks to a position in the recorded stream currently playing.
NetStream.send	Publisher method; broadcasts a message to all subscribing clients.
NetStream.setBufferTime	Method; For a publishing stream, this number indicates how long the outgoing buffer can grow before Flash starts dropping frames. For a subscribing stream, this number indicates how long to buffer incoming data before starting to displaying the stream.

Property summary for the NetStream object

Property (read-only)	Description
NetStream.bufferLength	The number of seconds of data currently in the buffer.
NetStream.bufferTime	The number of seconds assigned to the buffer by NetStream.setBufferTime.
NetStream.currentFps	The number of frames per second being sent or received on the publishing or subscribing stream.
NetStream.time	The number of seconds a stream has been playing or publishing.

Event handler summary for the NetStream object

Method	Description
NetStream.onStatus	Invoked every time a status change or error is posted for the NetStream object.

Constructor for the NetStream object

Availability

- Flash Player 6.
- Flash Communication Server MX.

Usage

```
new NetStream(myRTMPConnection)
```

Parameters

myRTMPConnection A NetConnection object that is using the Real-Time Messaging Protocol (RTMP) to communicate with the Flash Communication Server.

Returns

A NetStream object.

Description

Constructor; creates a stream that can be used for publishing (sending) or playing (receiving) data through the specified server connection.

You can't publish and play data over the same stream at the same time. For example, if you are publishing on a stream and then call `NetStream.play`, an implicit `NetStream.close` method is called; the publishing stream then becomes a subscribing stream.

However, you can create multiple streams that run simultaneously over the same connection: one stream publishes and another stream plays.

Example

The following example shows how a publishing client and a subscribing client can connect to the Flash Communication Server and then open an application stream for sending (publishing) or receiving (playing) data over this connection.

```
// Publishing client contains this code.
connection = new NetConnection();         // create NetConnection object
connection.connect("rtmp://myRTMPServer.myDomain.com/app");   // connect to
  server

myStream = new NetStream(connection);     // open app stream within connection
myStream.publish("myWeddingVideo");       // publish data over this stream

// Subscribing client contains this code.
// Note that the connection and stream names are the same as those
// used by the publishing client. This is neither required nor prohibited,
// because the scripts are running on different machines.
// However, the parameters used with connect() and play() below
// must be the same as those used with connect() and publish() above.
connection = new NetConnection();
connection.connect("rtmp://myRTMPServer.myDomain.com/app");

myStream = new NetStream(connection);
myStream.play("myWeddingVideo");
```

For more examples, see "`NetStream (object)`" on page 62 and `Video.attachVideo`.

See also

NetConnection (object), `NetStream.attachAudio`, `NetStream.attachVideo`, `NetStream.play`, `NetStream.publish`, `Video.attachVideo`

NetStream.attachAudio

Availability

- Flash Player 6.
- Flash Communication Server MX.

Usage

myStream`.attachAudio(`*source*`)`

Parameters

source The source of the audio to be transmitted. Valid values are a Microphone object and null.

Returns

Nothing.

Description

Method; specifies whether audio should be sent over the stream (from a Microphone object passed as *source*) or not (null passed as *source*). This method is available only to the publisher of the specified stream.

You can call this method before or after you call the NetStream.publish method and actually begin transmitting. Subscribers who want to hear the audio must call a NetStream.play method.

Subscribers can also attach their incoming audio to a movie clip and then create a Sound object to control some aspects of the sound. For more information, see MovieClip.attachAudio.

Example

The following code attaches a microphone to a network stream.

```
srcStream.attachAudio(myMic);
```

See also

Microphone (object), MovieClip.attachAudio, NetStream.attachVideo, NetStream.publish, NetStream.receiveAudio

NetStream.attachVideo

Availability

- Flash Player 6.
- Flash Communication Server MX.

Usage

myStream.attachVideo(*source* | null [, *snapShotMilliseconds*])

Parameters

source The source of the video transmission. Valid values are a Camera object (which starts capturing video) and null. If you pass null, Flash stops capturing video, and any additional parameters you send are ignored.

snapShotMilliseconds An optional integer that specifies whether the video stream is continuous, a single frame, or a series of single frames used to create time-lapse photography.

- If this argument is omitted, Flash captures all video until you issue *myStream*.attachVideo(null).
- If you pass 0, Flash captures only a single video frame. Use this value to transmit "snapshots" within a preexisting stream.

  Note: Flash interprets invalid, negative, or nonnumeric arguments as 0.

- If you pass a positive number, Flash captures a single video frame and then appends a pause of length *snapShotMilliseconds* as a "trailer" on the snapshot. Use this value to create time-lapse photography effects (see the description below.)

Returns

Nothing.

Description

Method; starts capturing video from the specified source, or stops capturing if *source* is `null`. This method is available only to the publisher of the specified stream.

After attaching the video source, you must call `NetStream.publish` to actually begin transmitting. Subscribers who want to display the video must call the `NetStream.play` and `Video.attachVideo` methods to display the video on the Stage.

You can use *snapShotMilliseconds* to send a single snapshot (by providing a value of 0) or a series of snapshots—in effect, time-lapse footage—by providing a positive number that adds a trailer of the specified number of milliseconds to the video feed. The trailer extends the length of time the video message is displayed. By repeatedly calling `attachVideo` with a positive value for *snapShotMilliseconds*, the snapshot/trailer/snapshot/trailer... sequence creates time-lapse footage. For example, you could capture one frame per day and append it to a video file. When a subscriber plays back the file, each frame remains onscreen for the specified number of milliseconds and then the next frame is displayed.

The *snapShotMilliseconds* parameter serves a different purpose from the *fps* parameter you can set with `Camera.setMode`. When you specify the *snapShotMilliseconds*, you are controlling how much time elapses *during playback* between recorded frames. When you specify the *fps* using `Camera.setMode`, you are controlling how much time elapses *during recording and playback* between recorded frames.

For example, suppose you want to take a snapshot every five minutes for a total of 100 snapshots. You can do this in two different ways:

- You can issue a `NetStream.attachVideo(`*source*`,500)` command 100 times, once every five minutes. This takes 500 minutes to record, but the resulting file will play back in 50 seconds (100 frames with 500 milliseconds between frames).
- You can issue a `Camera.setMode` command with an *fps* value of 1/300 (1 per 300 seconds, or 1 each 5 minutes), and then issue a `NetStream.attachVideo(`*source*`)` command, letting the camera capture continuously for 500 minutes. The resulting file will play back in 500 minutes—the same length of time that it took to record—with each frame being displayed for 5 minutes.

Both techniques capture the same 500 frames, and both approaches are useful; which approach to use depends primarily on your playback requirements. For example, in the second case, you could be recording audio the entire time. Also, both files would be approximately the same size.

Example

The following function publishes a stream containing the camera output.

```
function pubLive()
{

  // Create a new source stream.
  srcStream = new NetStream(connection);

  // Attach the camera activity to the source stream. This
  // call causes a warning message to show which service is
  // requesting access. It also gives the user the option of
  // not sending the camera activity to the server.
  srcStream.attachVideo(myCam);

  // Get the stream name from the user input.
  mySubj=subject;

  // Assuming the user named the stream 'webCamStream',
  // publish the live camera activity as 'webCamStream'.
  srcStream.publish(mySubj, "live");
}
```

See also example for `MovieClip.attachAudio`.

See also

Camera (object), `Camera.setMode`, `NetStream.publish`, `NetStream.receiveVideo`, `Video.attachVideo`

NetStream.bufferLength

Availability

- Flash Player 6.
- Flash Communication Server MX.

Usage

`myStream``.bufferLength`

Description

Read-only property; the number of seconds of data currently in the buffer. You can use this property in conjunction with `NetStream.bufferTime` to estimate how close the buffer is to being full—for example, to display feedback to a user who is waiting for data to be loaded into the buffer.

See also

`NetStream.bufferTime`

NetStream.bufferTime

Availability

- Flash Player 6.
- Flash Communication Server MX.

Usage

`myStream``.bufferTime`

Description

Property; the number of seconds assigned to the buffer by `NetStream.setBufferTime`. The default value is 0. To determine the number of seconds currently in the buffer, use `NetStream.bufferLength`.

See also

`NetStream.bufferLength`, `NetStream.setBufferTime`

NetStream.close

Availability

- Flash Player 6.
- Flash Communication Server MX.

Usage

`myStream``.close()`

Parameters

None.

Returns

Nothing.

Description

Method; stops publishing or playing all data on the stream, sets the `NetStream.time` property to 0, and makes the stream available for another use. This method is invoked implicitly whenever you call `NetStream.play` from a publishing stream, or `NetStream.publish` from a subscribing stream.

- If this method is called from a publishing stream, all pending `NetStream.play` calls on the stream are cleared on the server; subscribers no longer receive anything that was being published on the stream.
- If this method is called from a subscribing stream, publishing continues and other subscribing streams may still be playing, but the subscriber can now use the stream for another purpose.
- To stop play on a subscribing stream without closing the stream or changing the stream type, use *`myStream`*`.play(false)`.

Example

The following `onDisconnect()` function closes a stream.

```
function onDisconnect() {

  // Stops publishing the stream.
  srcStream.close();

  // Deletes the source stream connection. With no source
  // to play, the destination stream also ends and can be
  // deleted.
  connection.close();
}
```

See also

`NetStream.pause`, `NetStream.play`, `NetStream.publish`, `NetStream.time`

NetStream.currentFps

Availability

- Flash Player 6.
- Flash Communication Server MX.

Usage

```
myStream.currentFps
```

Description

Read-only property; the number of frames per second being sent or received on the specified publishing or subscribing stream.

NetStream.onStatus

Availability

- Flash Player 6.
- Flash Communication Server MX.

Usage

```
myStream.onStatus = function(infoObject) {
  // Your code here
}
```

Parameters

infoObject A parameter defined according to the status or error message. For details about this parameter, see "NetStream information objects" on page 107.

Returns

Nothing.

Description

Event handler; invoked every time a status change or error is posted for the NetStream object. If you want to respond to this event handler, you must create a function to process the information object sent by the server. For more information, see the Appendix, "Client-Side Information Objects," on page 105.

NetStream.pause

Availability

- Flash Player 6.
- Flash Communication Server MX.

Usage

```
myStream.pause([pauseResume])
```

Parameters

pauseResume An optional Boolean parameter specifying whether to pause play (`true`) or resume play (`false`). If you omit this parameter, `pause` acts as a toggle: the first time `pause` is called on a specified stream, it pauses play, and the next time it is called, it resumes play.

Returns

Nothing.

Description

Method; pauses or resumes playback of a stream. This method is available only to clients subscribed to the specified stream, not to the stream's publisher.

The first time you call this method on a given playlist (without sending a parameter), it pauses the playlist; the next time, it resumes play. You might want to attach this method to a button that the user presses to pause or resume playback.

Example

The following examples illustrate some uses of this method.

```
myStream.pause(); // pauses play first time issued
myStream.pause(); // resumes play
myStream.pause(false); // no effect, play continues
myStream.pause(); // pauses play
```

Suppose you have a playlist of three recorded streams.

```
connection = new NetConnection();
connection.connect("rtmp://localhost/appName/appInstance");

// Create a NetStream for playing
dstStream = new NetStream(connection);
myVideoObject.attachVideo(dstStream);

// To play record1
dstStream.play("record1", 0, -1, false);

// To play record2
dstStream.play("record2", 0, -1, false);

// To play record3
dstStream.play("record3", 0, -1, false);

// You click a button to pause while record2 is playing
dstStream.pause();

// Later, you want to resume the play
dstStream.pause();

// Later, you want to start a new playlist

// To play record4
dstStream.play("record4", 0, -1, true);

// To play record5
dstStream.play("record5", 0, -1, false);

// To play record6
dstStream.play("record6", 0, -1, false);
```

See also

NetStream.play

NetStream.play

Availability

- Flash Player 6.
- Flash Communication Server MX.

Usage

```
mystream.play(whatToPlay | false [,start [, length [, flushPlaylists]]])
```

Parameters

whatToPlay An identifying name for live data published by `NetStream.publish`, a recorded file name for playback, or `false`. If you pass `false`, the stream stops playing and any additional parameters you send are ignored.

start An optional numeric parameter that specifies the start time, in seconds. This parameter can also be used to indicate whether the stream is live or recorded.

- The default value for *start* is -2, which means that Flash first tries to play the live stream specified in *whatToPlay*. If a live stream of that name is not found, Flash plays the recorded stream specified in *whatToPlay*. If neither a live nor a recorded stream is found, Flash opens a live stream named *whatToPlay* even though no one is publishing on it; when someone does begin publishing on that stream, Flash begins playing it.
- If you pass -1 for *start*, Flash plays only the live stream specified in *whatToPlay*. If no live stream is found, Flash waits for it indefinitely if *length* is set to -1; if *length* is set to a different value, Flash waits for *length* seconds before it begins playing the next item in the playlist.
- If you pass 0 or a positive number for *start*, Flash plays only a recorded stream named *whatToPlay*, beginning *start* seconds from the beginning of the stream. If no recorded stream is found, Flash begins playing the next item in the playlist immediately.
- If you pass a negative number other than -1 or -2 for *start*, Flash interprets the value as if it were -2.

length An optional numeric parameter that specifies the duration of the playback, in seconds.

- The default value for *length* is -1, which means that Flash plays a live stream until it is no longer available or plays a recorded stream until it ends.
- If you pass 0 for *length*, Flash plays the single frame that is *start* seconds from the beginning of a recorded stream (assuming *start* is equal to or greater than 0).
- If you pass a positive number for *length*, Flash plays a live stream for *length* seconds after it becomes available, or plays a recorded stream for *length* seconds. (If a stream ends before *length* seconds, playback ends when the stream ends.)
- If you pass a negative number other than -1 for `length`, Flash interprets the value as if it were -1.

flushPlaylists An optional Boolean parameter that specifies whether to flush any previous playlist.

- The default value for *flushPlaylists* is `true`, which means that any previous `play` calls are cleared and *whatToPlay* is played immediately.
- If you pass `false` for *flushPlaylists*, *whatToPlay* is added (queued) in the current playlist; that is, *whatToPlay* plays only after previous streams have completed playing.

Description

Method; feeds streaming audio, video, and text messages being published on the Flash Communication Server, or a recorded file stored on the server, to the client. This method is available only to clients subscribed to the specified stream, not to the stream's publisher.

To view video data, you must call a `Video.attachVideo` method; audio being streamed with the video will be played automatically. If audio-only data is being streamed, you must call a `MovieClip.attachAudio` method to hear the audio.

You can use the optional parameters of this method to control various aspects of playback behavior. The following table shows a few ways these values interact.

start	length	Flash Player behavior
(Default)	(Default)	Plays the live stream until it is no longer available. If a live stream of the specified name is not found, the Flash Player plays a recorded stream until it ends.
-2	19	Plays a live stream for up to 19 seconds after it becomes available. If a live stream of the specified name is not found, the Flash Player plays a recorded stream for 19 seconds.
15	19	Plays a recorded stream for 19 seconds, beginning 15 seconds from the beginning of the stream.
15	(Default)	Plays a recorded stream, beginning 15 seconds from the beginning of the stream, until the stream ends.
-1	(Default)	Plays a live stream until it is no longer available.

This method can invoke `NetStream.onStatus` with a number of different information objects. For example, if the specified stream isn't found, `NetStream.onStatus` is called with a `code` property of `"NetStream.Play.StreamNotFound"`. For more information, see `NetStream.onStatus`.

If you want to create a dynamic playlist that switches among different live or recorded streams, call `play` more than once and pass `false` for *`flushPlaylists`* each time. Conversely, if you want to play the specified stream immediately, clearing any other streams that are queued for play, pass `true` for *`flushPlaylists`*.

Example

The following examples show some ways to use this method to play back live or recorded streams.

Example 1:

```
myConnection = new NetConnection();
myConnection.connect("rtmp://localhost/appName/appInstance");

dstStream = new NetStream(myConnection);
myVideoObject.attachVideo(dstStream);

// To play a live stream named "stephen" being published elsewhere
// using the default values -- start time is -2, length is -1,
// and flushPlaylists is true -- don't pass any optional parameters.
dstStream.play("stephen");

// To immediately play a recorded stream named record1
// starting at the beginning, for up to 100 seconds.
dstStream.play("record1", 0, 100, true);
```

Example 2:

```
// To play and switch between live and recorded streams:
// Suppose we have two live streams, live1 and live2,
// and three recorded streams, record1, record2, and record3.
// The play order is record1, live1, record2, live2, and record3.
myConnection = new NetConnection();
myConnection.connect("rtmp://localhost/appName/appInstance");

// Create a NetStream for playing
dstStream = new NetStream(myConnection);
myVideoObject.attachVideo(dstStream);

// Play record1
dstStream.play("record1", 0, -1, false);

// Switch from record1 to live1.
// live1 will start to play after record1 is done
dstStream.play("live1", -1, 5, false);

// Switch from live1 to record2.
// record2 will start to play after live1 plays for 5 seconds.
dstStream.play("record2", 0, -1, false);


// Interrupt the current play and play a segment in record1 again
// (we can implement a seek by this)
dstStream.play("record1", 1, 5, true);
```

See also

`NetStream.close`, `NetStream.pause`, `NetStream.publish`

NetStream.publish

Availability

- Flash Player 6.
- Flash Communication Server MX.

Usage

`mystream``.publish(`*`whatToPublish`*` | false [, `*`howToPublish`*`])`

Parameters

`whatToPublish` A string that identifies the stream. If you pass `false` or an empty string, the publish operation stops. Subscribers to this stream must pass this same name when they call `NetStream.play`.

`howToPublish` An optional string that specifies how to publish the stream. Valid values are `"record"`, `"append"`, and `"live"`. The default value is `"live"`.

- If you pass `"record"` for *`howToPublish`*, Flash publishes and records live data, saving the recorded data to a new file named *`whatToPublish`*`.flv`. The file is stored on the server in a subdirectory within the directory containing the server application. If the file already exists, it is overwritten. For more information on where recorded streams are stored, see the description below.

- If you pass "append" for *howToPublish*, Flash publishes and records live data, appending the recorded data to a file named *whatToPublish*.flv, stored on the server in a subdirectory within the directory containing the server application. If no file named *whatToPublish*.flv is found, it is created.
- If you omit this parameter or pass "live", Flash publishes live data without recording it. If *whatToPublish*.flv exists, it will be deleted.

Returns

Nothing.

Description

Method; sends streaming audio, video and text messages from the client to the Flash Communication Server, optionally recording the stream during transmission. This method is available only to the publisher of the specified stream.

You don't use this command when you want to let a subscriber play a stream that has already been published and recorded. For example, assume you have recorded a stream named "allAboutMe." To enable someone to play it back, you need only open a stream for the subscriber to use:

```
publishStream = new NetStream(someConnection);
subscribeStream = new NetStream(someConnection);
subscribeStream.play("allAboutMe");
```

When you record a stream, Flash creates an FLV file and stores it in a subdirectory of the FlashCom application directory on the server. Each stream is stored in a directory whose name is the same as the *instanceName* passed to NetConnection.connect. Flash creates these directories automatically; you don't have to create one for each instance name. For example:

```
// Connect to a specific instance of an app that is stored in
// a directory named "lectureSeries" in your applications directory
nc = new NetConnection();
nc.connect("rtmp://server.domain.com/lectureSeries/Monday")
ns = new NetStream(nc);
ns.publish("lecture", "record")

// a file named "lecture.flv" is stored in a subdirectory named
// "...\yourAppsFolder\lectureSeries\streams\Monday"

// Connect to a different instance of the same app
// but issue an identical publish command
nc = new NetConnection();
nc.connect("rtmp://server.domain.com/lectureSeries/Tuesday")
ns = new NetStream(nc);
ns.publish("lecture", "record")

// a file named "lecture.flv" is stored in a subdirectory named
// "...\yourAppsFolder\lectureSeries\streams\Tuesday"
```

If you don't pass a value for *instanceName*, *whatToPublish*.flv is stored in a subdirectory named "...\yourAppsFolder\appName\streams_definst_" (for "default instance"). For more information on using instance names, see NetConnection.connect. For information on playing back FLV files, see NetStream.play.

This method can invoke NetStream.onStatus with a number of different information objects. For example, if someone is already publishing on a stream with the specified name, NetStream.onStatus is called with a code property of "NetStream.Publish.BadName". For more information, see NetStream.onStatus.

Example

The following example shows how to publish and record a video, and then play it back.

```
connection = new NetConnection();
connection.connect("rtmp://myServer.myDomain.com/appName/appInstance");
srcStream = new NetStream(connection);
srcStream.publish("stephen", "record");
srcStream.attachVideo(Camera.get());

// To stop publishing and recording
srcStream.publish(false);

// To play the recorded stream
srcStream.play("stephen");
```

See also

`NetConnection.connect`, `NetStream.play`, `Video.attachVideo`

NetStream.receiveAudio

Availability

- Flash Player 6.
- Flash Communication Server MX.

Usage

`myStream``.receiveAudio(`*`receive`*`)`

Parameters

`receive` A Boolean value that specifies whether incoming audio plays on the specified stream (`true`) or not (`false`). The default value is `true`.

Returns

Nothing.

Description

Method; specifies whether incoming audio plays on the specified stream. This method is available only to clients subscribed to the specified stream, not to the stream's publisher.

You can call this method before or after you call the `NetStream.play` method and actually begin receiving the stream. For example, you can attach these methods to a button the user clicks to mute and unmute the incoming audio stream.

See also

`NetStream.receiveVideo`

NetStream.receiveVideo

Availability

- Flash Player 6.
- Flash Communication Server MX.

Usage

`myStream``.receiveVideo(`*`receive | FPS`*`)`

Parameters

receive A Boolean value that specifies whether incoming video plays on the specified stream (true) or not (false). The default value is true.

FPS A number that specifies the frame rate per second of the incoming video. The default value is the frame rate of the movie.

Returns

Nothing.

Description

Method; specifies whether incoming video will play on the specified stream, or specifies the frame rate of the video. This method is available only to clients subscribed to the specified stream, not to the stream's publisher.

You can call this method before or after you call the NetStream.play method and actually begin receiving the stream. For example, you can attach these methods to a button the user presses to show or hide the incoming video stream.

To stop receiving video, pass 0 for *FPS*. (This has the same effect as passing false.) To determine the current frame rate, use NetStream.currentFps.

If you call NetStream.receiveVideo with a frame rate after calling NetStream.receiveVideo(false), an implicit call to NetStream.receiveVideo(true) is issued.

Example

The following example opens a stream and specifies that the video play at a specified rate.

```
myStream = new NetStream(myConnection);
myStream.receiveVideo(false);   // don't display video being published
// Later....
myStream.receiveVideo(12);      // display video at 12 FPS
```

See also

NetStream.currentFps, NetStream.receiveAudio

NetStream.seek

Availability

- Flash Player 6.
- Flash Communication Server MX.

Usage

myRecordedStream.seek(*numberOfSeconds*)

Parameters

numberOfSeconds The number of seconds to move forward or backward in a recorded stream or playlist.

- To return to the beginning of the stream or playlist, pass 0 for *numberOfSeconds*.
- To seek forward from the beginning of the stream or playlist, pass the number of seconds you want to advance. For example, to position the playhead at 15 seconds from the beginning, use *myStream*.seek(15).
- To seek relative to the current position, pass *mystream*.time + *n* or *mystream*.time - *n* to seek *n* seconds forward or backward, respectively, from the current position. For example, to rewind 20 seconds from the current position, use *myStream*.seek(*mystream*.time - 20).

Returns

Nothing.

Description

Method; seeks the specified number of seconds into the recorded stream that is currently playing, either from the beginning of the stream or from the current position. This method is available only to clients subscribed to the specified stream, not to the stream's publisher.

If you require an accurate return value from seeking, you may need to change the Application.xml file's "Enhanced seeking" flag at the server.

"Enhanced seeking" is a Boolean flag in the Application.xml file. By default, this flag is set to false. When a seek occurs, the server seeks to the closest video keyframe possible and starts from that keyframe. For example, if you want to seek to time 15, and there are keyframes only at time 11 and time 17, seeking actually starts from time 17 instead of time 15. This is an approximate seeking method that works well with compressed streams.

If the flag is set to true, some compression is invoked on the server. Using the example above, if the flag is set to true, then the server creates a keyframe—based on the preexisting keyframe at time 11—for each keyframe from 11 through 15. Even though a keyframe does not exist at the seek time, the server generates a keyframe. This, of course, involves some processing time on the server.

See also

NetStream.play, NetStream.time

NetStream.send

Availability

- Flash Player 6.
- Flash Communication Server MX.

Usage

myStream.send(*handlerName* [,*p1, ...,pN*])

Parameters

handlerName A string that identifies the message; also the name of the ActionScript handler to receive the message. The handler name can be only one level deep (that is, it can't be of the form *parent/child*) and is relative to the stream object.

Note: Do not use a reserved term for a handler name. For example, *myStream*.send("close") will fail.

p1, ...,pN Optional parameters that can be of any type. They are serialized and sent over the connection, and the receiving handler receives them in the same order. If a parameter is a circular object (for example, a linked list that is circular), the serializer handles the references correctly.

Returns

Nothing.

Description

Method; broadcasts a message on the specified stream to all subscribing clients. This method is available only to the publisher of the specified stream.

To process and respond to the message, create a handler in the format *myStream*.HandlerName.

The Flash Player does not serialize methods or their data, object prototype variables, or non-enumerable variables. Also, for movie clips, the player serializes the path but none of the data.

The sending client has the following script:

```
myConnection = new NetConnection();
myConnection.connect("rtmp://myServer.myDomain.com/appName/appInstance");
tStream = new NetStream(myConnection);
tStream.publish("slav", "live");
tStream.send("Fun", "this is a test");//Fun is the handler name
```

The receiving client's script looks something like this:

```
myConnection = new NetConnection();
myConnection.connect("rtmp://myServer.myDomain.com/appName");
tStream = new NetStream(myConnection);
tStream.play("slav", -1, -1);

tStream.Fun = function(str) { //Fun is the handler name
    trace (str);
}
```

NetStream.setBufferTime

Availability

- Flash Player 6.
- Flash Communication Server MX.

Usage

myStream.setBufferTime(*numberOfSeconds*)

Parameters

numberOfSeconds The number of seconds to be buffered before Flash stops sending data (on a publishing stream) or begins displaying data (on a subscribing stream). The default value is 0.

Description

Method; behavior depends on whether this method is called on a publishing or a subscribing stream.

- For a publishing stream, this method specifies how long the outgoing message queue can grow before Flash starts dropping frames. On a high-speed connection, buffer time shouldn't be a concern; data will be sent almost as quickly as Flash can buffer it. On a slow connection, however, there might be a significant difference between how fast Flash buffers the data and how fast it can be sent to the client.

  For example, suppose you set *numberOfSeconds* to 30, but after 30 seconds, only 5 seconds of data have been sent over the connection. Flash may stop sending data to the buffer until more data has been sent to the client. The client will receive the initial 30 seconds that were buffered but might lose some intervening frames before the next set of buffered data is displayed.

- For a subscribing stream, this method specifies how long to buffer messages before starting to display the stream. For example, if you want to make sure that the first 15 seconds of the stream play without interruption, set *numberOfSeconds* to 15; Flash will begin playing the stream only after 15 seconds of data have been buffered.

  When a recorded stream is played, if *numberOfSeconds* is zero, Flash sets it to a small value (approximately 10 milliseconds). If live streams are later played (for example, from a playlist), this buffer time persists—that is, *numberOfSeconds* remains non-zero for the stream.

See also

`NetStream.bufferTime`

NetStream.time

Availability

- Flash Player 6.
- Flash Communication Server MX.

Usage

myStream`.time`

Description

Read-only property; for a subscriber stream, the number of seconds the stream has been playing; for a publishing stream, the number of seconds the stream has been publishing.

This property is set to 0 when `NetStream.play` is called with *flushPlaylists* set to `true`, or when `NetStream.close` is called.

For a publishing stream, if you stop sending data but don't close the stream, this value stops incrementing. When you resume publishing, this value continues incrementing from where it left off.

For a subscribing stream, if the server stops sending data but the stream remains open, this value stops incrementing. When the server begins sending data again, this value continues incrementing from where it left off.

Example

The following example shows how this value increments for a publishing stream.

```
myStream.publish("someData", "live");
// After 10 seconds, myStream.time = 10

// You then stop publishing for a while
myStream.publish(false);

// Later you resume publishing on the same stream
// either the same feed or a different feed
myStream.publish("otherData", "live");
// After 10 seconds, myStream.time = 20
```

See also

`NetStream.close`, `NetStream.play`, `NetStream.publish`

SharedObject (object)

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Shared objects are quite powerful: they offer real-time data sharing between multiple client movies and objects that are persistent on the local or remote location. You can think of local shared objects as "cookies" and remote shared objects as real-time data transfer devices. Common ways to use shared objects are summarized below.

- Maintaining local persistence

  This is the simplest way to use a shared object, and does not require Flash Communication Server. For example, you can call `SharedObject.getLocal` to create a shared object, such as a calculator with memory, in the player. Because the shared object is locally persistent, Flash saves its data attributes on the user's machine when the movie ends. The next time the movie runs, the calculator contains the values it had when the movie ended. Alternatively, if you set the shared object's properties to `null` before the movie ends, the calculator opens without any prior values the next time the movie runs.

- Storing and sharing data on a server

  A shared object can store data on the Flash Communication Server for other clients to retrieve. For example, you can open a remote shared object, such as a phone list, that is persistent on the server. Whenever a client makes any changes to the shared object, the revised data is available to all clients that are currently connected to the object or who later connect to it. If the object is also persistent locally and a client changes the data while not connected to the server, the changes are copied to the remote shared object the next time the client connects to the object.

- Sharing data in real time

  A shared object can share data among multiple clients in real time. For example, you can open a remote shared object that stores real-time data, such as a list of users connected to a chat room, that is visible to all clients connected to the object. When a user enters or leaves the chat room, the object is updated and all clients that are connected to the object see the revised list of chat room users.

The following examples show a few ways shared objects are called within ActionScript programs. Note that in order to create a remote shared object, you must first connect to the Flash Communication Server with the RTMP protocol.

```
// Create a local shared object
so = SharedObject.getLocal("foo");

// Create a remote shared object that is not persistent on the server
nc = new NetConnection();
nc.connect("rtmp://server.domain.com/chat/room3";
so = SharedObject.getRemote("users", nc.uri);
so.connect(nc);

// Create a remote shared object that is persistent on the server
// but not on the client
nc = new NetConnection();
nc.connect("rtmp://server.domain.com/chat/room3";
so = SharedObject.getRemote("users", nc.uri, true);
so.connect(nc);

// Create a remote shared object that is persistent on the server
// and on the client
nc = new NetConnection();
nc.connect("rtmp://server.domain.com/chat/room3";
so = SharedObject.getRemote("users", nc.uri, "/chat");
so.connect(nc);
```

Designing remote shared objects

When designing remote shared objects, develop a model for how the data will be managed. Take into account issues of data design and management, conflict resolution, and storage (persistence) requirements, both locally and on the server. These issues are discussed briefly in this section.

When using a locally persistent remote shared object, make sure your Stage size is at least 215 by 138 pixels. The Flash Player needs at least this much space to display the Settings panels.

Data design and management

Data associated with shared objects is stored in attributes of the object's `data` properties; each set of attributes constitutes one slot. For example, the following lines assign values to three slots of a shared object:

```
so.data.userID = "myLogonName";
so.data.currentStatus = "in a meeting";
so.data.lastLogon = "February 27, 2002";
```

Each time a client changes an attribute, all the attributes for that slot are sent to the server and then propagated to all clients attached to the object. Thus, the more information a slot contains, the more network traffic is generated when any attribute in that slot is changed.

For example, consider a shared object with the following attributes occupying a single slot:

```
so.data.year.month.dayOfMonth = someValue;
```

If a client changes the value of the `year`, `month`, or `dayOfMonth` attribute, the entire slot is updated, even though only one data item was changed.

Compare this data structure to a shared object with the same attributes, but with a flat design that occupies three slots instead of one:

```
so.data.year = someValue;
so.data.month = someValue;
so.data.dayOfMonth = someValue;
```

In this case, because each slot contains only one piece of information, less bandwidth is required to update all connected clients when a single data attribute is changed.

You can use this information when designing your remote shared objects. For example, if an object is designed to be updated frequently by multiple clients in real time, minimizing the amount of data per slot can improve performance. This design can also help minimize data collisions (multiple clients trying to change a single slot at the same time).

Conflict resolution

If more than one client (or a server application) can change the data in a single slot of your shared object at the same time, you must implement a conflict resolution strategy. Here are some examples:

Use different slots The simplest strategy is to use a different slot for each player or server that might change data in the object. For example, in a shared object that keeps track of users in a chat room, provide one slot per user and have users modify only their own slots.

Assign an owner A more sophisticated strategy is to define a single client as the owner of a property in a shared object for a limited period of time. You might write server code to create a "lock" object, where a client can request ownership of a slot. If the server reports that the request was successful, the client knows that it will be the only client changing the data in the shared object.

Notify the client When the server rejects a client-requested change to a property of the shared object, the `SharedObject.onSync` event handler notifies the client that the change was rejected. Thus, an application can provide a user interface to let a user resolve the conflict. This technique works best if data is changed infrequently, as in a shared address book. If a synchronization conflict occurs, the user can decide whether to accept or reject the change.

Accept some changes and reject others Some applications can accept changes on a "first come, first served" basis. This works best when users can resolve conflicts by reapplying a change if someone else's change preceded theirs.

Local disk space considerations

You can choose to make remote shared objects persistent on the client, the server, or both. (Local shared objects are always persistent on the client, up to available memory and disk space.)

By default, Flash can save locally persistent remote shared objects up to 100 K in size. When you try to save a larger object, the Flash Player displays a Local Storage dialog box, which lets the user allow or deny local storage for the domain that is requesting access. (Make sure your Stage size is at least 215 by 138 pixels; this is the minimum size Flash requires to display the dialog box.)

If the user chooses Allow, the object is saved and `SharedObject.onStatus` is invoked with a code property of `SharedObject.Flush.Success`; if the user chooses Deny, the object is not saved and `SharedObject.onStatus` is invoked with a code property of `SharedObject.Flush.Failed`.

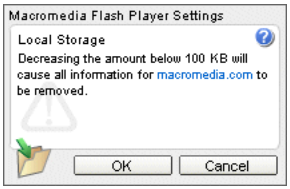
The user can also specify permanent local storage settings for a particular domain by right-clicking (Windows) or Control-clicking (Macintosh) while a movie is playing, choosing Settings, and then opening the Local Storage panel.

You can't use ActionScript to specify local storage settings for a user, but you can display the Local Storage panel for the user by using `System.showSettings(1)`.

The following list summarizes how the user's disk space choices interact with remote shared objects from a specified domain that request local persistence.

- If the user selects Never, objects are never saved locally, and all `SharedObject.flush` commands issued for the object return `false`.
- If the user selects Unlimited (moves the slider all the way to the right), objects are saved locally up to available disk space.
- If the user selects None (moves the slider all the way to the left), all `SharedObject.flush` commands issued for the object return `"pending"` and cause Flash to ask the user if additional disk space can be allotted to make room for the object, as explained above.
- If the user selects 10 KB, 100 KB, 1 MB, or 10 MB, objects are saved locally and `SharedObject.flush` returns `true` if the object fits within the specified amount of space. If more space is needed, `SharedObject.flush` returns `"pending"`, and Flash asks the user if additional disk space can be allotted to make room for the object, as explained above.

Additionally, if the user selects a value that is less than the amount of disk space currently being used for locally persistent data, Flash warns the user that any shared objects that have already been saved locally will be deleted.



Note: There is no size limit in the Flash Player that runs from the Authoring environment; the limit applies only to the stand-alone player.

Method summary for the SharedObject object

Method	Description
SharedObject.close	Closes the connection between a remote shared object and the Flash Communication Server.
SharedObject.connect	Connects to a remote shared object on the Flash Communication Server.
SharedObject.flush	Immediately writes a locally persistent shared object to a local file.
SharedObject.getLocal	Returns a reference to a locally persistent shared object that is available only to the current client.
SharedObject.getRemote	Returns a reference to a shared object that is available to multiple clients by means of the Flash Communication Server.
SharedObject.getSize	Gets the current size of the shared object, in bytes.
SharedObject.send	Broadcasts a message to all clients connected to the remote shared object, including the client that sent the message.
SharedObject.setFps	Specifies the number of times per second that a client's changes to a shared object are sent to the server.

Property summary for the SharedObject object

Property (read-only)	Description
SharedObject.data	The collection of attributes assigned to the data property of the object, which will be shared and/or stored.

Event handler summary for the SharedObject object

Method	Description
SharedObject.onStatus	Invoked every time an error, warning, or informational note is posted for a shared object.
SharedObject.onSync	Initially invoked when the client and server shared object are synchronized after a successful call to SharedObject.connect, and later invoked whenever any client changes the attributes of the data property of the remote shared object.

Constructor for the SharedObject object

For information on creating objects that do not require Flash Communication Server, see SharedObject.getLocal. For all other objects, see SharedObject.getRemote.

SharedObject.close

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

myRemoteSharedObject.close()

Parameters

None.

Returns

Nothing.

Description

Method; closes the connection between a remote shared object and the Flash Communication Server.

If a remote shared object is locally persistent, the user can make changes to the local copy of the object after this method is called. Any changes made to the local object are sent to the server the next time the user connects to the remote shared object.

See also

SharedObject.connect, SharedObject.flush

SharedObject.connect

Availability

- Flash Player 6.
- Flash Communication Server MX.

Usage

myRemoteSharedObject.connect(*myRTMPConnection*)

Parameters

myRTMPConnection A NetConnection object that is using the Real-Time Messaging Protocol (RTMP) to communicate with the Flash Communication Server.

Returns

A Boolean value of true if the connection was successfully completed, false otherwise.

Description

Method; connects to a remote shared object on the Flash Communication Server through the specified connection. Use this method after issuing SharedObject.getRemote. After a successful connection, the SharedObject.onSync event handler is invoked.

Before attempting to work with a remote shared object, you should first check for a return value of true, indicating a successful connection, and then wait until you receive a result from the function you have assigned to SharedObject.onSync. If you fail to do so, any changes you make to the object locally—before SharedObject.onSync is invoked—may be lost.

Note: SharedObject.onSync is not invoked if this call returns false.

Example

The following example connects to a shared object and initializes it.

```
function getMaster()
{
  trace("getMaster called");
  master = SharedObject.getRemote("master", con.uri, true);
  connVal = master.connect(con);
  if (connVal) print("Connection was successful");
  else print("Unable to connect the shared object with the given NetConnection
  object");

  master.onSync = function (listVal) {
    getPlayList();
    trace("SO: " +  so.data[currentPlaylist]);
  }
}
```

See also

NetConnection (object), `SharedObject.getRemote`, `SharedObject.onSync`

SharedObject.data

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

`myLocalOrRemoteSharedObject``.data`

Description

Read-only property; the collection of attributes assigned to the `data` property of the object; these attributes can be shared and/or stored. Each attribute can be an object of any of the basic ActionScript or JavaScript types—Array, Number, Boolean, and so on. For example, the following lines assign values to various aspects of a shared object:

```
itemsArray = new Array(101,346,483);
currentUserIsAdmin = true;
currentUserName = "Ramona";
so.data.itemNumbers = itemsArray;
so.data.adminPrivileges = currentUserIsAdmin;
so.data.userName = currentUserName;
```

All attributes of a shared object's `data` property are available to all clients connected to the shared object, and all of them are saved if the object is persistent.

Note: Do not assign values directly to the `data` property of a shared object, as in `so.data = someValue`; Flash ignores these assignments.

If you assign `null` or `undefined` to the attribute of a remote shared object, Flash deletes the attribute, and `SharedObject.onSync` is invoked with a `code` property of `"delete"`. To delete attributes for local shared objects, use code like `delete so.data.attributeName`; setting an attribute to `null` or `undefined` for a local shared object does not delete the attribute.

To create "private" values for a shared object—values that are available only to the client instance while the object is in use and are not stored with the object when it is closed—create properties that are not named `data` to store them, as shown in the following example.

```
so.favoriteColor = "blue";
so.favoriteNightClub = "The Bluenote Tavern";
so.favoriteSong = "My World is Blue";
```

Example

The following example sets the current stream to the user's selection.

```
curStream = _root.so.data.msgList[selected].streamName;
```

See also

`SharedObject.onSync`

SharedObject.flush

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

`myLocalOrRemoteSharedObject``.flush([`*`minimumDiskSpace`*`])`

Parameters

`minimumDiskSpace` An optional integer specifying the number of bytes that must be allotted for this object. The default value is 0.

Returns

A Boolean value of `true` or `false`, or a string value of `"pending"`.

- If the user has permitted local information storage for objects from this domain, and the amount of space allotted is sufficient to store the object, this method returns `true`. (If you have passed a value for *`minimumDiskSpace`*, the amount of space allotted must be at least equal to that value for `true` to be returned).
- If the user has permitted local information storage for objects from this domain, but the amount of space allotted is not sufficient to store the object, this method returns `"pending"`.
- If the user has permanently denied local information storage for objects from this domain, or if Flash is unable to save the object for any reason, this method returns `false`.

Description

Method; immediately writes a locally persistent shared object to a local file. The shared object can be remote or local; however, this method only writes the file locally. If you don't use this method, Flash writes the shared object to a file when the shared object session ends—that is, when the SWF movie is closed, when the shared object is garbage-collected because it no longer has any references to it, or when you call `SharedObject.close`.

If this method returns `"pending"`, the Flash Player displays a dialog box asking the user to increase the amount of disk space available to objects from this domain (see "Local disk space considerations" on page 83). To allow space for the shared object to "grow" when it is saved in the future, thus avoiding return values of `"pending"`, pass a value for *`minimumDiskSpace`*. When Flash tries to write the file, it looks for the number of bytes passed to *`minimumDiskSpace`*, instead of looking for just enough space to save the shared object at its current size.

For example, if you expect a shared object to grow to a maximum size of 500 bytes, even though it may start out much smaller, pass 500 for *minimumDiskSpace*. If Flash asks the user to allot disk space for the shared object, it will ask for 500 bytes. After the user allots the requested amount of space, Flash won't have to ask for more space on future attempts to flush the object (as long as its size doesn't exceed 500 bytes).

After the user responds to the dialog box, this method is called again and returns either `true` or `false`; also, `SharedObject.onStatus` is invoked with a `code` property of `SharedObject.Flush.Success` or `SharedObject.Flush.Failed`.

Example

The following function gets a shared object, `SO`, and fills writable properties with user-provided `settings`. Finally, `flush` is called to save the settings and allot a minimum of 1000 bytes of disk space.

```
this.SyncSettingsCore=function(soname, override, settings)
{
  var SO=SharedObject.getLocal(soname, "http://www.mydomain.com/app/sys");

  // settings list index
  var i;

  // For each specified value in settings:
  // If override is true, set the persistent setting to the provided value.
  // If override is false, fetch the persistent setting, unless there
  // isn't one, in which case, set it to the provided value.
  for (i in settings) {
    if (override || (SO.data[i] == null)) {
      SO.data[i]= settings[i];
    } else {
      settings[i]= SO.data[i];
    }
  }
  SO.flush(1000);
}
```

For a remote shared object, calling `SharedObject.flush` in the client-side ActionScript file flushes the object only on the client, not the server. The following example shows how a server-side script can flush a remote shared object on the server.

```
// This is a SERVER-SIDE script, not ActionScript
// Get the shared object when the application is loaded.
application.onAppStart = function()
{
  application.mySO = SharedObject.get("SharedObjName", true);
}

// When a user disconnects, flush the shared object.
application.onDisconnect = function(client)
{
  application.mySO.flush();
}

// You can also set a timer to periodically flush the shared object
// onto the hard disk on the server
application.onAppStart = function()
{
  application.mySO = SharedObject.get("SharedObjName", true);
  setInterval(function() { application.mySO.flush(); }, 60000);
}
```

See also

Local disk space considerations, `SharedObject.close`

SharedObject.getLocal

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

`SharedObject.getLocal(`*`objectName`* `[, `*`localPath`*`])`

Note: The correct syntax is `SharedObject.getLocal`. To assign the object to a variable, use syntax like *`myLocalSO`* `= SharedObject.getLocal`.

Parameters

`objectName` The name of the object. The name can include forward slashes (`/`); for example, `work/addresses` is a legal name. Spaces are not allowed in a shared object name, nor are the following characters:

`~ % & \ ; : " ' , < > ? #`

`localPath` An optional string parameter that specifies the full or partial path to the SWF file that created the shared object, and that determines where the shared object will be stored locally. The default value is the full path. For more information on using this parameter, see `SharedObject.getRemote`.

Returns

A reference to a shared object that is persistent locally and is available only to the current client. If Flash can't create or find the shared object (for example, if *`localPath`* was specified but no such directory exists), returns `null`.

Description

Method; returns a reference to a locally persistent shared object that is available only to the current client. To create a shared object that is available to multiple clients by means of the Flash Communication Server, use `SharedObject.getRemote`.

Note: If the user has chosen to never allow local storage for this domain, the object will not be saved locally, even if a value for `localPath` is specified. For more information, see "Local disk space considerations" on page 83.

Because local shared objects are available only to a single client, the `SharedObject.onSync` method is not called when the object is changed, and there is no need to implement conflict-resolution techniques.

To avoid name collisions, Flash looks at the location of the movie that is creating the shared object. For example, if a movie at www.myCompany.com/apps/stockwatcher.swf creates a shared object named `portfolio`, that shared object will not conflict with another object named `portfolio` that was created by a movie at www.yourCompany.com/photoshoot.swf, because the movies originate from two different directories.

Example

The following example saves the last frame a user entered to a local shared object `kookie`.

```
// Get the kookie
so = sharedobject.getlocal("kookie");

// Get the user of the kookie and go to the frame number saved for this user.
if (so.data.user != undefined) {
  this.user = so.data.user;
  this.gotoAndStop(so.data.frame);
}
```

The following code block is placed on each movie frame.

```
// On each frame, call the rememberme function to save the frame number.
function rememberme() {
  so.data.frame=this._currentFrame;
  so.data.user="John";
}
```

See also

`SharedObject.close`, `SharedObject.flush`, `SharedObject.getRemote`

SharedObject.getRemote

Availability

- Flash Player 6.
- Flash Communication Server MX.

Usage

`SharedObject.getRemote(`*`objectName, URI`* `[, persistence])`

Note: The correct syntax is `SharedObject.getRemote`. To assign the object to a variable, use syntax like *`myRemoteSO`* `= SharedObject.getRemote`.

Parameters

`objectName` The name of the object. The name can include forward slashes (`/`); for example, `work/addresses` is a legal name. Spaces are not allowed in a shared object name, nor are the following characters: ~ % & \ ; : " ' , < > ? #

`URI` The URI of the server on which the shared object will be stored. This URI must be identical to the URI of the NetConnection object to which the shared object will be connected. For more information and an example, see the "SharedObject (object)" entry.

`persistence` An optional value that specifies whether the attributes of the shared object's `data` property are persistent locally, remotely, or both, and that may specify where the shared object will be stored locally. Acceptable values are as follows:

- `null` (default) or `false` specifies that the shared object is not persistent on the client or server. (These values have the same effect as omitting the *`persistence`* parameter.)
- `true` specifies that the shared object is persistent only on the server.
- A full or partial local path to the shared object, which indicates that the shared object is persistent on the client and the server; on the client, it is stored in the specified path. On the server, it is stored in a subdirectory within the FlashCom application directory. For more information, see the description below.

Note: If the user has chosen to never allow local storage for this domain, the object will not be saved locally, even if a local path is specified for *`persistence`*. For more information, see "Local disk space considerations" on page 83.

Returns

A reference to an object that can be shared across multiple clients. If Flash can't create or find the shared object (for example, if a local path was specified for *persistence* but no such directory exists), returns `null`.

Description

Method; returns a reference to an object that can be shared across multiple clients by means of the Flash Communication Server. To create a shared object that is available only to the current client, use `SharedObject.getLocal`.

After issuing this command, use `SharedObject.connect` to connect the object to the Flash Communication Server, as shown below.

```
con = new NetConnection();
con.connect("rtmp://somedomain.com/applicationName");

myObject = SharedObject.getRemote("mo", con.uri, false);
myObject.connect(con);
```

To confirm that the local and remote copies of the shared object are in sync, use the `SharedObject.onSync` event handler.

All clients that want to share this object must pass the same values for *objectName* and *URI*.

Understanding persistence for remote shared objects. By default, the shared object is not persistent on the client or server; that is, when all clients close their connections to the shared object, it is deleted. To create a shared object that is saved locally or on the server, pass a value for *persistence*.

Once a value has been passed for the local persistence of a remote shared object, it is valid for the life of the object. In other words, once you have gotten a remote shared object which is not locally persistent, you cannot get the same shared object with local persistence while the shared object is active.

For example, the second line of code in the following example does not get a locally persistent remote shared object.

```
// Get a remote shared object (so1) that is persistent
// on the server but not on the client
so1 = SharedObject.getRemote("someObject", nc_uri, true);

// Get a remote shared object (so2) with the same name and path
// as so1, but with local persistence.
// so2 will just point to the same object as so1, and an onStatus
// message will be invoked for so2 with the "code" value of the
// information object set to "SharedObject.BadPersistence".
so2 = SharedObject.getRemote("someObject", nc.uri, "somePath");
```

Also, remote shared objects that are not persistent on the server are created in a different namespace from remote shared objects that are persistent on the server. Therefore, if the following line of code is added to the above example, no SharedObject.BadPersistence error will result because `so3` does not point to the same object as `so1`.

```
so3 = SharedObject.getRemote("someObject", nc.uri, false);
```

Understanding naming conventions for remote shared objects. To avoid name collisions, Flash looks at the location of the movie that is creating the shared object. For example, if a movie at www.myCompany.com/apps/stockwatcher.swf creates a shared object named `portfolio`, that shared object will not conflict with another object named `portfolio` that was created by a movie at www.yourCompany.com/photoshoot.swf, because the movies originate from two different directories.

However, if two different movies located in the same directory create objects with identical names and the same location for *`persistence`*, the names will conflict, and one object can overwrite the other without warning. Implemented properly, however, this feature lets movies in the same directory read each other's shared objects.

Similarly, you can use *`persistence`* to let movies in different directories in the same domain read and write each other's shared objects. For example, if the full path to the SWF file is www.macromedia.com/a/b/c/d/foo.swf, *`persistence`* can be any of the following:

- "/"
- "/a/"
- "/a/b/"
- "/a/b/c/"
- "/a/b/c/d/"
- "/a/b/c/d/foo.swf/"

By specifying a partial path for *`persistence`*, you can let several movies from the same domain access the same shared objects. For example, if you specify "/a/b/" for the movie named above and also for a movie whose full path is www.macromedia.com/a/b/foo2.swf, each movie can read shared objects created by the other movie. When specifying *`persistence`*, do not include a domain name.

To specify that the path for *`persistence`* should be the same as the movie, without having to explicitly specify its value, you can use `MovieClip._url`:

```
myRemoteSharedObject = (name, uri, _root._url);
```

Example

The following example illustrates the sequence of steps required to create a nonpersistent remote shared object.

```
// open connection to server
nc = new NetConnection();
nc.connect("rtmp://myServer.myCompany.com/someApp");
//
// the URI for the shared object must be the same as
// the URI of the NetConnection it's using
mySO = SharedObject.getRemote("myObject", nc.uri);
mySO.connect(nc);
```

See also

NetConnection (object), SharedObject (object), `SharedObject.connect`, `SharedObject.getLocal`, `SharedObject.onSync`

SharedObject.getSize

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

```
myLocalOrRemoteSharedObject.getSize()
```

Parameters

None.

Returns

A numeric value specifying the size of the shared object, in bytes.

Description

Method; gets the current size of the shared object, in bytes.

Flash calculates the size of a shared object by stepping through each of its data properties; the more data properties the object has, the longer it takes to estimate its size. For this reason, estimating object size can have significant processing cost. Therefore, you may want to avoid using this method unless you have a specific need for it.

Example

The following example gets the size of the shared object `so`.

```
var soSize= this.so.getSize();
```

SharedObject.onStatus

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

```
myLocalOrRemoteSharedObject.onStatus = function(infoObject) {
  // Your code here
}
```

Parameters

infoObject A parameter defined according to the status message. For details about this parameter, see "SharedObject information objects" on page 109.

Returns

Nothing.

Description

Event handler; invoked every time an error, warning, or informational note is posted for a shared object. If you want to respond to this event handler, you must create a function to process the information object generated by the shared object. For more information, see the Appendix, "Client-Side Information Objects," on page 105.

See also

`SharedObject.getLocal`, `SharedObject.getRemote`, `SharedObject.onSync`

SharedObject.onSync

Availability

- Flash Player 6.
- Flash Communication Server MX.

Usage

```
myRemoteSharedObject.onSync = function(objArray)
{
  // Your code here
}
```

Parameters

objArray An array of objects; each object contains properties that describe the changed members of a remote shared object. (For more information, see "Description" below.)

Returns

Nothing.

Description

Event handler; initially invoked when the client and server shared object are synchronized after a successful call to `SharedObject.connect`, and later invoked whenever any client changes the attributes of the `data` property of the remote shared object. You must create a function to override this handler and process the information object sent by this method. The properties of each object are `code`, `name`, and `oldValue`.

When you initially connect to a remote shared object that is persistent locally and/or on the server, all the properties of this object are set to empty strings. Otherwise, Flash sets `code` to `"clear"`, `"success"`, `"reject"`, `"change"`, or `"delete"` as explained below.

- A value of `"clear"` means either that you have successfully connected to a remote shared object that is not persistent on the server or the client, or that all the properties of the object have been deleted—for example, when the client and server copies of the object are so far out of sync that Flash resynchronizes the client object with the server object. In the latter case, `SharedObject.onSync` is invoked again, this time with the value of `code` set to `"change"`.
- A value of `"success"` means the client changed the shared object.
- A value of `"reject"` means the client tried unsuccessfully to change the object; instead, another client changed the object.
- A value of `"change"` means another client changed the object or the server resynchronized the object.
- A value of `"delete"` means the attribute was deleted.

The `name` property contains the name of the property that has been changed.

The `oldValue` property contains the former value of the changed property. This parameter is `null` unless `code` has a value of `"reject"` or `"change"`.

To minimize network traffic, this method is not called when a client "changes" a property to the same value it currently has. That is, if a property is set to the same value multiple times in a row, this method is invoked the first time the property is set, but not during subsequent settings, as shown in the following example:

```
so.data.x = 15;
// The following line invokes onSync
so.data.x = 20;
// The following line doesn't invoke onSync,
// even if issued by a different client
so.data.x = 20;
```

Example

```
// Create or get a remote shared object named 'position',
// nc is the NetConnection created earlier in code,
// false means do not make this a persistent so.
so = SharedObject.getRemote("position", nc.uri, false);

// Update ball position when another participant moves the ball
// sharedBall_mc is a movie clip on the stage.
so.onSync = function(list) {
     sharedBall_mc._x= so.data.x;
     sharedBall_mc._y= so.data.y;
}

// You must always call connect() in order to successfully
// connect to the shared object and share data.
so.connect(nc);
```

See also

`SharedObject.data`

SharedObject.send

Availability

- Flash Player 6.
- Flash Communication Server MX.

Usage

myRemoteSharedObject`.send(`*handlerName* `[,`*p1, ...,pN*`])`

Parameters

handlerName A string that identifies the message; also the name of the ActionScript handler to receive the message. The handler name can be only one level deep (that is, it can't be of the form *parent/child*) and is relative to the shared object.

Note: Do not use a reserved term for a handler name. For example, *mySO*`.send("close")` will fail.

p1, ...,pN Optional parameters that can be of any type. They are serialized and sent over the connection, and the receiving handler receives them in the same order. If a parameter is a circular object (for example, a linked list that is circular), the serializer handles the references correctly.

Returns

Nothing.

Description

Method; broadcasts a message to all clients connected to *myRemoteSharedObject*, including the client that sent the message. To process and respond to the message, create a function named *handlerName* attached to the shared object.

Example

The following example shows how to use `send` to display a message in the Output window.

```
// Create a remote shared object called remoteSO
// Place an Input Text text box named inputMsgTxt on the Stage
// Attach this code to a button labeled "Send Message"
on (release) {
  _root.remoteSO.send("testMsg",inputMsgTxt);
}
// Attach this code to the frame containing the button
_root.remoteSO.testMsg = function(recvStr)
{
  trace(recvStr);
}
// Type data in the text box and press the button to see the results
```

SharedObject.setFps

Availability

- Flash Player 6.
- Flash Communication Server MX.

Usage

myRemoteSharedObject.setFps(*updatesPerSecond*)

Parameters

updatesPerSecond A number that specifies how often a client's changes to a remote shared object are sent to the server. The default value is the frame rate of the movie.

- To send changes immediately and then stop sending changes, pass 0 for *updatesPerSecond*.
- To reset *updatesPerSecond* to its default value, pass a value less than 0.

Returns

A Boolean value of `true` if the update was accepted, `false` otherwise.

Description

Method; specifies the number of times per second that a client's changes to a shared object are sent to the server.

Use this method when you want to control the amount of traffic between the client and the server. For example, if the connection between the client and server is relatively slow, you may want to set *updatesPerSecond* to a relatively low value. Conversely, if the client is connected to a multiuser game in which timing is important, you may want to set *updatesPerSecond* to a relatively high value.

If you want to manually control when updates are sent, issue this command with *updatesPerSecond* set to `0` when you want to send changes to the server. For example, if you want to let the user push a button that sends updates to the server, attach `myRemoteSharedObject.setFps(0)` to the button.

Regardless of the value you pass for *updatesPerSecond*, changes are not sent to the server until `SharedObject.onSync` has returned a value for the previous update. That is, if the response time from the server is slow, updates may be sent to the server less frequently than the value specified in *updatesPerSecond*.

See also

`SharedObject.onSync`

System (object)

This is a top-level object that contains the Capabilities object and the `showSettings` method. For information on the Capabilities object, see `System.capabilities` in the online Flash ActionScript Dictionary (in the Flash MX Help menu).

System.showSettings

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

`System.showSettings([`*panel*`])`

Parameters

panel An optional number that specifies which Flash Player Settings panel to display, as illustrated in the following table.

Value passed for *panel*	Settings panel displayed
none (parameter is omitted)	Whichever panel was open the last time the user closed the Player Settings panel
0	Privacy
1	Local storage
2	Microphone
3	Camera

Returns

Nothing.

Description

Method; displays the specified Flash Player Settings panel, which lets user do any of the following:

- allow or deny access to their camera and microphone
- specify settings for local disk space available for shared objects
- select a default camera and microphone
- specify microphone gain and echo suppression settings

For example, if your application requires the use of a camera, you can inform the user that they must choose "Allow" in the Privacy Settings panel, and then issue a `System.showSettings(0)` command. (Make sure your Stage size is at least 215 by 138 pixels; this is the minimum size Flash requires to display the panel.)

See also

`Camera.get`, `Microphone.get`, "Local disk space considerations" on page 83

Video (object)

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

The Video object lets you display live or recorded streaming video on the Stage without embedding it in your SWF file. The video may be a live video stream being captured with the `Camera.get` command, or a live or recorded video stream being displayed through the use of a `NetStream.play` command (requires Flash Communication Server).

To display the video stream, first place a Video object on the Stage. Then use `Video.attachVideo` to attach the video stream to the Video object.

To place a Video object on the Stage:

1. If the Library panel isn't visible, select Window >Library to display it.
2. Add an embedded Video object to the library by clicking the Options menu on the right side of the Library panel title bar and choosing New Video.
3. Drag the Video object to the stage and use the Property inspector to give it a unique instance name. (Do not name it Video.)

Note: You can also embed recorded streams (FLV files) using the File › Import or File › Import to Library commands. For more information on embedding video files, see *`Using Flash`*.

Method summary for the Video object

Method	Description
`Video.attachVideo`	Specifies a video stream to be displayed within the boundaries of the Video object on the Stage.
`Video.clear`	Clears the image currently displayed in the Video object.

Property summary for the Video object

Property	Description
`Video.deblocking`	Specifies the behavior for the deblocking filter that the video compressor applies as needed when streaming the video.
`Video.height`	Read-only; the height in pixels of the video stream.
`Video.smoothing`	Specifies whether the video should be smoothed (interpolated) when it is scaled.
`Video.width`	Read-only; the width in pixels of the video stream.

Video.attachVideo

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

myVideoObject.attachVideo(*source* | null)

Parameters

source A NetStream or Camera object that is playing or capturing video data, respectively. To drop the connection to the Video object, pass null for *source*.

Returns

Nothing.

Description

Method; specifies a video stream (*source*) to be displayed within the boundaries of the Video object on the Stage. The video stream is either a NetStream object being displayed by means of the NetStream.play command (requires Flash Communication Server), a Camera object, or null. If *source* is null, video is no longer played within the Video object.

Example

The following example plays live video locally, without the need for Flash Communication Server.

```
myCam = Camera.get();
myVid.attachVideo(myCam); // myVid is a Video object on the Stage
```

The following example shows how to publish and record a video, and then play it back.

```
// This script publishes and records video
// The recorded file will be named "allAboutMe.flv"
connection = new NetConnection();
connection.connect("rtmp://localhost/allAboutMe/mySpeech");
publishStream = new NetStream(connection);
publishStream.publish("allAboutMe", "record");
publishStream.attachVideo(Camera.get());

// This script plays the recorded file.
// Note that no publishing stream is required to play a recorded file.
connection = new NetConnection();
connection.connect("rtmp://localhost/allAboutMe/mySpeech");
subscribeStream = new NetStream(connection);
subscribeStream.play("allAboutMe");
myVid.attachVideo(subscribeStream);// myVid is a Video object on the Stage
```

See also

Camera (object), NetStream.play, NetStream.publish

Video.clear

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

```
myVideoObject.clear()
```

Parameters

None.

Returns

Nothing.

Description

Method; clears the image currently displayed in the Video object. This is useful when, for example, the connection breaks and you want to display standby information without having to hide the Video object.

See also

`Video.attachVideo`

Video.deblocking

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

```
myVideoObject.deblocking
myVideoObject.deblocking = setting
```

Description

Property; specifies the behavior for the deblocking filter that the video compressor applies as needed when streaming the video. The following are acceptable values for *setting*:

- 0 (the default): Let the video compressor apply the deblocking filter as needed.
- 1: Never use the deblocking filter.
- 2: Always use the deblocking filter.

The deblocking filter has an effect on overall playback performance, and it is usually not necessary for high-bandwidth video. If your system is not powerful enough, you might experience difficulties playing back video with this filter enabled.

Video.height

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

myVideoObject.height

Description

Read-only property; an integer specifying the height of the video stream, in pixels. This value is the same as the `Camera.height` property of the Camera object that is capturing (or previously captured) the video stream. You may want to use this property, for example, to ensure that the user is seeing the video at the same size at which it was captured, regardless of the actual size of the Video object on the Stage.

Example

The following example lets the user press a button to set the height and width of a video stream being displayed in the Flash Player to be the same as the height and width at which the video stream was captured.

```
// First attach the stream to the Video object
myVid.attachVideo(videoSource);
// Then attach code like the following to a button
on (release) {
  _root.myVid._width = _root.myVid.width
  _root.myVid._height = _root.myVid.height
}
```

See also

`Video.width`

Video.smoothing

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

myVideoObject.smoothing
myVideoObject.smoothing = true | false

Description

Property; specifies whether the video should be smoothed (interpolated) when it is scaled. The player has to be in high-quality mode for this to work. The default value is `false`.

Video.width

Availability

- Flash Player 6.
- Flash Communication Server MX (not required).

Usage

myVideoObject.width

Description

Read-only property; an integer specifying the width of the video stream, in pixels. This value is the same as the `Camera.width` property of the Camera object that is capturing (or previously captured) the video stream. You may want to use this property, for example, to ensure that the user is seeing the video at the same size at which it was captured, regardless of the actual size of the Video object on the Stage.

Example

See the example for `Video.height`.

APPENDIX
Client-Side Information Objects

The Camera, Microphone, LocalConnection, NetConnection, NetStream, and SharedObject objects provide an `onStatus` event handler that uses an information object for providing information, status, or error messages. To respond to this event handler, you must create a function to process the information object, and you must know the format and contents of the information object returned.

In addition to the specific `onStatus` methods provided for the objects listed above, Flash also provides a "super" function called `System.onStatus`. If `onStatus` is invoked for a particular object with a `level` property of `"Error"` and there is no function assigned to respond to it, Flash processes a function assigned to `System.onStatus` if it exists.

The following example illustrates how you can create generic and specific functions to process information objects sent by the `onStatus` method.

```
// Create generic function
System.onStatus = function(genericError)
{
  // Your script would do something more meaningful here
  trace("An error has occurred. Please try again.");
};

// Create connection functions
// If the connection attempt returns a different information object
// from those listed below, with a level property of "Error",
// System.onStatus will be invoked

nConn.onStatus = function(infoObject)
{
  if (infoObject.code == "NetConnection.Connect.Success")
  {
    trace("Successful connection.");
  }
  if (infoObject.code == "NetConnection.Connect.Failed")
  {
    trace("Connection failed.");
  }
};

// Attempt to open connection
nConn = new NetConnection();
nConn.connect("rtmp://myServer.myDomain.com/myRTMPapp");
```

The following tables show the default properties of each information object and the circumstances under which `onStatus` is invoked with each information object. When referring to the tables, note the following:

- By default, every information object has a `code` property containing a string that describes the result of the `onStatus` method, and a `level` property containing a string that is either `"status"`, `"warning"`, or `"error"`. Some information objects have additional default properties, which provide more information about the reason `onStatus` was invoked. These properties are noted as footnotes in the tables.
- For NetStream, NetConnection, and remote shared objects, which are available only with Macromedia Flash Communication Server MX, the properties of the information objects are determined by the methods available in server applications and should be documented by the developers of your server-side application. The properties listed here are the ones available by default; that is, these are the properties available if your server-side application doesn't specify other information object properties. For information on using Flash with an application server, see *Using Flash Remoting*.
- For objects that do not require Flash Communication Server (Camera, Microphone, LocalConnection, and local shared objects), the properties listed here are the only ones available to `onStatus`, and no server-side application is required.

Camera information objects

The following events notify you when the user denies or allows access to a camera. To determine whether access to a camera is currently denied or allowed, use the `Camera.muted` property.

Code property	Level property	Meaning
`Camera.Muted`	Status	The user denied access to a camera.
`Camera.Unmuted`	Status	The user allowed access to a camera.

LocalConnection information objects

The following events notify you when an attempt to send to a receiving LocalConnection object has succeeded or failed.

Code property	Level property	Meaning
`(none)`	Status	Flash successfully sent a command to a receiving LocalConnection object.
`(none)`	Status	Flash was unable to send to a receiving LocalConnection object.

Microphone information objects

The following events notify you when the user denies or allows access to a microphone. To determine whether access to a microphone is currently denied or allowed, use the `Microphone.muted` property.

Code property	Level property	Meaning
`Microphone.Muted`	Status	The user denied access to a microphone.
`Microphone.Unmuted`	Status	The user allowed access to a microphone.

NetConnection information objects

The following events notify you when certain NetConnection activities occur.

Code property	Level property	Meaning
`NetConnection.Call.Failed`	Error	The `NetConnection.call` method was not able to invoke the server-side method or command.*
`NetConnection.Connect.AppShutdown`	Error	The application has been shut down (for example, if the application is out of memory resources and must be shut down to prevent the server from crashing) or the server has been shut down.
`NetConnection.Connect.Closed`	Status	The connection was successfully closed.
`NetConnection.Connect.Failed`	Error	The connection attempt failed; for example, the server is not running.
`NetConnection.Connect.InvalidApp`	Error	The application name specified during the connection attempt was not found on the server.
`NetConnection.Connect.Rejected`	Error	The client does not have permission to connect to the application, or the application expected different parameters from those that were passed, or the application specifically rejected the client.**
`NetConnection.Connect.Success`	Status	The connection attempt succeeded.

* This information object also has a `description` property, which is a string that provides a more specific reason for the failure.

** This information object also has an `application` property, which contains the value returned by the `application.rejectConnection` server-side method.

NetStream information objects

The following events notify you when certain NetStream activities occur.

Code property	Level property	Meaning
`NetStream.Buffer.Empty`	Status	Data is not being received quickly enough to fill the buffer. Data flow will be interrupted until the buffer refills, at which time a `NetStream.Buffer.Full` message will be sent and the stream will begin playing again.
`NetStream.Buffer.Full`	Status	The buffer is full and the stream will begin playing.
`NetStream.Failed`	Error	An error has occurred for a reason other than those listed elsewhere in this table, such as the subscriber trying to use the `seek` command to move to a particular location in the recorded stream, but with invalid parameters.*
`NetStream.Pause.Notify`	Status	The subscriber has paused playback.
`NetStream.Play.Failed`	Error	An error has occurred in playback for a reason other than those listed elsewhere in this table, such as the subscriber not having read access.*
`NetStream.Play.PublishNotify`	Status	Publishing has begun; this message is sent to all subscribers.

Code property	Level property	Meaning
NetStream.Play.Reset	Status	The playlist has reset (pending play commands have been flushed).
NetStream.Play.Start	Status	Playback has started.**
NetStream.Play.Stop	Status	Playback has stopped.
NetStream.Play.StreamNotFound	Error	The client tried to play a live or recorded stream that does not exist.
NetStream.Play.UnpublishNotify	Status	Publishing has stopped; this message is sent to all subscribers.
NetStream.Publish.BadName	Error	The client tried to publish a stream that is already being published by someone else.
NetStream.Publish.Idle	Status	The publisher of the stream has been idling for too long.
NetStream.Publish.Start	Status	Publishing has started.
NetStream.Record.Failed	Error	An error has occurred in record for a reason other than those listed elsewhere in this table, such as the disk is full.*
NetStream.Record.NoAccess	Error	The client tried to record a stream that is still playing, or the client tried to record (overwrite) a stream that already exists on the server with read-only status.
NetStream.Record.Start	Status	Recording has started.
NetStream.Record.Stop	Status	Recording has stopped.
NetStream.Seek.Failed	Error	The subscriber tried to use the seek command to move to a particular location in the recorded stream, but failed.
NetStream.Seek.Notify	Status	The subscriber has used the seek command to move to a particular location in the recorded stream.
NetStream.Unpause.Notify	Status	The subscriber has resumed playback.
NetStream.Unpublish.Success	Status	Publishing has stopped.

* This information object also has a description property, which is a string that provides a more specific reason for the failure.

** This information object also has a details property, which is a string that provides the name of the stream currently playing on the NetStream. If you are streaming a playlist that contains multiple streams, this information object will be sent each time you begin playing a different stream in the playlist.

SharedObject information objects

The following events notify you when certain SharedObject activities occur.

Code property	Level property	Meaning
`SharedObject.BadPersistence`	Error	The *`persistence`* parameter passed to `SharedObject.getRemote` is different from the one used when the shared object was created.
`SharedObject.Flush.Failed`	Error	A `SharedObject.flush` command that returned `"pending"` has failed (the user did not allot additional disk space for the shared object when the Flash Player displayed the Local Storage Settings dialog box).
`SharedObject.Flush.Success`	Status	A `SharedObject.flush` command that returned `"pending"` has been successfully completed (the user allotted additional disk space for the shared object).
`SharedObject.UriMismatch`	Error	The *`URI`* parameter passed to `SharedObject.connect` is different from the one passed to `SharedObject.getRemote` when the shared object was created.

Server-Side Communication ActionScript Dictionary

Macromedia Flash™ Communication Server MX

macromedia®

Acknowledgments

Director: Erick Vera

Producer: JuLee Burdekin

Writing: Jay Armstrong, Jody Bleyle, JuLee Burdekin, Barbara Herbert, and Barbara Nelson

Editing: Anne Szabla

Multimedia Design and Production: Aaron Begley, Benjamin Salles

Print Design, Production, and Illustrations: Chris Basmajian

First Edition: May 2002

Macromedia, Inc.
600 Townsend St.
San Francisco, CA 94103

CONTENTS

Server-Side Communication ActionScript

Server-Side Communication ActionScript is a scripting language on the server that lets you develop efficient and flexible client-server Macromedia Flash Communication Server MX applications. For example, you can use server-side ActionScript to control login procedures, control events in connected Flash movies, determine what users see in their Flash movies, and communicate with other servers. You can also use server-side scripting to allow and disallow users access to various server-side application resources and to allow users to update and share information.

Server-side ActionScript is based on the ECMA-262 specification (ECMAScript 1.5) derived from JavaScript and lets you access the core JavaScript server object model. (For more information, see the Netscape DevEdge website at http://developer.netscape.com/docs/manuals/index.html?content=ssjs.html.) Server-side ActionScript provides global methods and objects and exposes a rich object model for developing communication applications. You can also create your own objects, properties, and methods. This dictionary provides detailed information about the objects and their properties, methods, and events.

Client-Side Communication ActionScript is based on the ECMA-262 specification, but there are some differences in its implementation. Server-side ActionScript, however, does not deviate from the ECMA-262 specification. To learn how client-side ActionScript and server-side ActionScript differ, see "Differences between ActionScript and JavaScript" in Using Flash Help. For information about the relationship between server-side ActionScript and client-side ActionScript, see *Developing Communication Applications*.

Using server-side ActionScript

To use server-side ActionScript with a Flash Communication Server application, you write the code, copy the script into the appropriate server directory, and run the SWF file that connects to the server. To understand Flash Communication Server applications, see *Developing Communication Applications*.

Create the server-side ActionScript file and name it main.asc. All ActionScript code that is embedded in the script file and not inside a function body executes once when the application is loaded but before the `application.onAppStart` event handler is called.

Note: Any double-byte characters (including characters of all Asian languages) in the server-side ActionScript file must be UTF-8-encoded. For more information, see "Writing double-byte language applications" in the "Application Development Tips and Tricks" chapter in *Developing Communication Applications*.

To install and test the server-side ActionScript file, do the following:

1. Locate the flashcom application directory.

   During installation, you can choose either a Developer Install or a Production Install of the product. If you choose Developer Install, you can run the samples and test your applications from the \flashcom\applications directory under the directory you specify. For convenience during development, client-side application files (SWFs and HTMLs) are stored in the same directory with your server-side application files (ASCs, FLVs, FLAs).

   When you deploy applications, you'll need to separate client files from your server-side source files. While your SWF and HTML files should be accessible through a web server, your server-side ASC files, your audio/video FLV files, and your ActionScript FLA source files should not be accessible to a user browsing your Web site. You can either install the server again on your production machine and choose Production Install, or you can change the configuration settings in the administration XML files as described in the Managing Flash Communication Server manual.

   If you choose Production Install, you can specify both the location of your client-side application files (SWFs and HTMLs) and the location of your server-side application files (ASCs, FLVs, and FLAs). The server will look for your client-side files under \flashcom\applications in the Web server's root directory and will look for your server-side application files under \applications under the directory you specify.If you did not accept the default installation settings and you aren't sure where the application directory is located, the location is specified in the `<AppsDir>` tag of the Vhost.xml file, which is located at \Flash Communication Server MX\conf_defaultRoot__defaultVhost_\. For information about configuring a different application directory, see *Managing Flash Communication Server*.

2. Create a subdirectory in the server-side application directory called *appName*, where *appName* is a name you choose as the filename of your Flash Communication Server application. You must pass this name as a parameter to the `NetConnection.connect` method in the client-side ActionScript.

3. Place the main.asc file in the *appName* directory or in a subdirectory called scripts in the *appName* directory.

4. Open the Flash application (the SWF) in a browser or in the stand-alone Flash Player.

   The SWF must contain ActionScript code that passes *appName* to the `connect` method of the NetConnection object, as shown in the following example:

   ```
   nc = new NetConnection();
   nc.connect("rtmp://flashcomsvr.mydomain.com/myFlashComAppName");
   ```

   Note: You can use the Communication App inspector or the Administration Console to check if the application loaded successfully.

Using naming conventions

When you write server-side ActionScript code, there are certain naming conventions that you must use to name your applications, methods, properties, and variables. These rules let you logically identify objects so your code executes properly.

Naming applications

Flash Communication Server application names must follow the Uniform Resource Identifier (URI) RFC 2396 convention (see http://www.w3.org/Addressing/). This convention supports a hierarchical naming system where a forward slash (/) separates the elements in the hierarchy. The first element specifies the application name. The element following the application name specifies the application instance name. Each instance of the application has its own script environment.

Specifying instances

By specifying a unique application instance name after an application name, you can run multiple instances of a single application. For example, rtmp:/support/session215 specifies a customer support application named "support" and refers to a specific session of that application named "session215". All users who connect to the same instance name can communicate with each other by referencing the same streams or shared objects.

Using JavaScript syntax

You must follow all syntax rules of JavaScript. For example, JavaScript is case-sensitive and does not allow punctuation other than underscores (_) and dollar signs ($) in names. You can use numbers in names, but names cannot begin with a number.

Avoiding reserved commands

Flash Communication Server has reserved commands that you cannot use in a script. These commands are either that methods belong to the client-side NetConnection object or methods that belong to the server-side Client object. This means that if you have a NetConnection object on the client (player), you cannot make the following call:

```
nc.call( "reservedCmd", ... );
```

In this call, `"reservedCmd"` is any of the following commands: `closeStream`, `connect`, `createStream`, `deleteStream`, `onStatus`, `pause`, `play`, `publish`, `receiveAudio`, `receiveVideo`, or `seek`. It also cannot be any of the server-side Client object methods: `getBandwidthLimit`, `setBandwidthLimit`, `getStats`, and `ping`.

Contents of the dictionary

All dictionary entries are listed alphabetically. However, methods, properties, and event handlers that are associated with an object are listed along with the object's name—for example, the `name` property of the Application object is listed as `Application.name`. The following table helps you locate these elements.

ActionScript element	See entry
`acceptConnection`	`Application.acceptConnection`
`addHeader`	`NetConnection.addHeader`
`agent`	`Client.agent`
`application`	Application (object)
`bufferTime`	`Stream.bufferTime`
`call`	`Client.call`, `NetConnection.call`
`clear`	`SharedObject.clear`, `Stream.clear`

clearInterval	clearInterval
clearSharedObject	Application.clearSharedObjects
clearStreams	Application.clearStreams
Client	Client (object)
clients	Application.clients
close	NetConnection.close, SharedObject.close
"commandName"	Client."commandName"
connect	NetConnection.connect
disconnect	Application.disconnect
flush	SharedObject.flush
get	SharedObject.get, Stream.get
getBandwidthLimit	Client.getBandwidthLimit
getProperty	SharedObject.getProperty
getPropertyNames	SharedObject.getPropertyNames
handlerName	SharedObject.handlerName
ip	Client.ip
isConnected	NetConnection.isConnected
length	Stream.length
load	load
lock	SharedObject.lock
name	Application.name, SharedObject.name, Stream.name
NetConnection	NetConnection (object)
onAppStart	Application.onAppStart
onAppStop	Application.onAppStop
onConnect	Application.onConnect
onDisconnect	Application.onDisconnect
onStatus	Application.onStatus, NetConnection.onStatus, SharedObject.onStatus, Stream.onStatus
onSync	SharedObject.onSync
play	Stream.play
purge	SharedObject.purge
readAccess	Client.readAccess
record	Stream.record
referrer	Client.referrer
registerClass	Application.registerClass
registerProxy	Application.registerProxy
rejectConnection	Application.rejectConnection

`__resolve`	`Client.__resolve`
`resyncDepth`	`SharedObject.resyncDepth`
`send`	`SharedObject.send`, `Stream.send`
`setBandwidthLimit`	`Client.setBandwidthLimit`
`setBufferTime`	`Stream.setBufferTime`
`setInterval`	`setInterval`
`setProperty`	`SharedObject.setProperty`
SharedObject	SharedObject (object)
`size`	`SharedObject.size`
`server`	`Application.server`
Stream	Stream (object)
`trace`	`trace`
`unlock`	`SharedObject.unlock`
`uri`	`NetConnection.uri`
`version`	`SharedObject.version`
`writeAccess`	`Client.writeAccess`

Application (object)

The Application object contains information about a Flash Communication Server application instance that lasts until the application instance is unloaded. A Flash Communication Server application is a collection of stream objects, shared objects, and clients (connected users). Each application has a unique name, and you can use the naming scheme described in "Using naming conventions" on page 6 to create multiple instances of an application.

The Application object lets you accept and reject client connection attempts, register and unregister classes and proxies, and create functions that are invoked when an application starts or stops or when a client connects or disconnects.

Besides the built-in properties of the Application object, you can create other properties of any legal ActionScript type, including references to other ActionScript objects. For example, the following lines of code create a new property of type `array` and a new property of type `number`:

```
application.myarray = new Array();
application.num_requests = 1;
```

Method summary for the Application object

Method	Description
`Application.acceptConnection`	Accepts a connection to an application from a client.
`Application.clearSharedObjects`	Clears all shared objects associated with the current instance.
`Application.clearStreams`	Clears all stream objects associated with the current instance.
`Application.disconnect`	Disconnects a client from the server.
`Application.registerClass`	Registers or unregisters a constructor that is called during object deserialization.
`Application.registerProxy`	Registers a NetConnection or Client object to fulfill a method request.
`Application.rejectConnection`	Rejects a connection to an application.

Property summary for the Application object

Property (read-only)	Description
`Application.clients`	An object containing a list of all clients currently connected to the application.
`Application.name`	The name of an application instance.
`Application.server`	The platform and version of the server.

Event handler summary for the Application object

Event handler	Description
`Application.onAppStart`	Invoked when the application is loaded by the server.
`Application.onAppStop`	Invoked when the application is unloaded by the server.
`Application.onConnect`	Invoked when a client connects to the application.
`Application.onDisconnect`	Invoked when a client disconnects from the application.
`Application.onStatus`	Invoked when a script generates an error.

Application.acceptConnection

Availability

Flash Communication Server MX.

Usage

`application.acceptConnection(`*`clientObj`*`)`

Parameters

`clientObj` A client to accept.

Returns

Nothing.

Description

Method; accepts the connection call from a client to the server. The `application.onConnect` event handler is invoked on the server side to notify a script when `NetConnection.connect` is called from the client side. You can use the `application.acceptConnection` method inside an `application.onConnect` event handler to accept a connection from a client. You can use the `application.acceptConnection` method outside an `application.onConnect` event handler to accept a client connection that had been placed in a pending state (for example, to verify a user name and password).

Example

The following example uses the `application.acceptConnection` method to accept the connection from `client1`:

```
application.onConnect = function (client1){
  // insert code here
  application.acceptConnection(client1);
  client1.call("welcome");
};
```

See also

`Application.onConnect`, `Application.rejectConnection`

Application.clearSharedObjects

Availability

Flash Communication Server MX.

Usage

```
application.clearSharedObjects(soPath);
```

Parameters

`soPath` A string that indicates the URI of a shared object.

Returns

Nothing.

Description

Method; removes persistent shared objects specified by the *`soPath`* parameter and clears all properties from active shared objects (both persistent and nonpersistent). You can use the SharedObject object to create shared objects in a Flash Communication Server application instance. The Flash Communication Server stores persistent shared objects for each application. You can use `application.clearSharedObjects` to handle one shared object at a time, so you must specify the name of the shared object. You can also use `application.clearStreams` to remove all the recorded streams based on a stream path.

The *`soPath`* parameter specifies the name of a shared object, which can include a slash (/) as a delimiter between directories in the path. The last element in the path can contain wildcard patterns (for example, a question mark [?] and an asterisk [*]) or a shared object name. The `application.clearSharedObjects` method traverses the shared object hierarchy along the specified path and clears all the shared objects. Specifying the a slash clears all the shared objects associated with an application instance.

The following are possible values for the *soPath* parameter:

- / clears all local and persistent shared objects associated with the instance.
- /foo/bar clears the shared object /foo/bar; if bar is a directory name, no shared objects are deleted.
- /foo/bar/* clears all shared objects stored under the instance directory /foo/bar. The bar directory is also deleted if no persistent shared objects are in use within this name space.
- /foo/bar/XX?? clears all shared objects that begin with XX, followed by any two characters. If a directory name matches this specification, all the shared objects within this directory are cleared.

If you call the clearSharedObjects method and the specified path matches a shared object that is currently active, all its properties are deleted, and a "clear" event is sent to all subscribers of the shared object. If it is a persistent shared object, the persistent store is also cleared.

Example

The following example clears all the shared objects for an instance:

```
function onApplicationStop(clientObj){
  application.clearSharedObjects("/");
}
```

Application.clearStreams

Availability

Flash Communication Server MX.

Usage

```
application.clearStreams(streamPath);
```

Parameters

streamPath A string that indicates the URI of a stream.

Returns

Nothing.

Description

Method; clears recorded streams from the hard disk. You can use the Stream object to create recorded streams in a Flash Communication Server application instance. The server stores recorded files for each application instance. You can use application.clearStreams to handle one stream at a time, so you must specify the name of the steam. You can also use application.clearStreams to remove all the recorded streams based on a stream path.

The *streamPath* parameter specifies the name of a stream, which can include a slash (/) as a delimiter between directories in the path. The last element in the path can contain wildcard patterns (for example, a question mark [?] and an asterisk [*]) or a stream name. The application.clearStreams method traverses the stream hierarchy along the specified path and clears all the recorded streams that match the given wildcard pattern. Specifying a slash clears all the streams associated with an application instance.

The following are possible values for the *streamPath* parameter:

- / clears all recorded streams associated with the instance.
- /foo/bar clears recorded streams /foo/bar; if bar is a directory name, no streams are deleted.
- /foo/bar/* clears all streams stored in the instance directory /foo/bar. The bar directory is also deleted if no streams are in use within this name space.
- /foo/bar/XX?? clears all streams that begin with XX, followed by any two characters. If there are directories within the given directory listing, the directories are cleared of any streams that match XX??.

If an application.clearStreams method is invoked on a stream that is currently recording, the recorded file is set to length 0 (cleared), and the internal cached data is also cleared.

Note: You can also use the Administration API removeApp method to delete all the resources for a single instance.

Examples

The following example clears all recorded streams:

```
function onApplicationStop(clientObj){
  application.clearStreams("/");
}
```

Application.clients

Availability

Flash Communication Server MX.

Usage

```
application.clients
```

Description

Property (read-only); an object containing all the Flash clients or other Flash Communication Servers currently connected to the application. The object is a custom object like an array, but with only one property, length. Each element in the object is a reference to a Client object instance, and you can use the length property to determine the number of users connected to the application. You can use the array access operator ([]) with the application.clients property to access elements in the object.

The object used for the clients property is not an array, but it acts the same except for one difference: you can't use the following syntax to iterate through the object:

```
for(var i in application.clients) {
  // insert code here
}
```

Instead, use the following code to loop through each element in a clients object:

```
for (var i = 0; i < application.clients.length; i++) {
  // insert code here
}
```

Example

This example uses a `for` loop to iterate through each member of the `application.clients` array and calls the method `serverUpdate` on each client:

```
for (i = 0; i < application.clients.length; i++){
  application.clients[i].call("serverUpdate");
}
```

Application.disconnect

Availability

Flash Communication Server MX.

Usage

`application.disconnect(`*`clientObj`*`)`

Parameters

`clientObj` The client to disconnect. The object must be a Client object from the `application.clients` array.

Returns

A Boolean value of `true` if the disconnect was successful; otherwise, `false`.

Description

Method; causes the server to terminate a client connection to the application. When this method is called, `NetConnection.onStatus` is invoked on the client side with a status message of `NetConnection.Connection.Closed`. The `application.onDisconnect` method is also invoked.

Example

This example calls the `application.disconnect` method to disconnect all users of an application instance:

```
function disconnectAll(){
  for (i=0; i < application.clients.length; i++){
    application.disconnect(application.clients[i]);
  }
}
```

Application.name

Availability

Flash Communication Server MX.

Usage

`application.name`

Description

Property (read-only); contains the name of the Flash Communication Server application instance.

Example

The following example checks the `name` property against a specific string before it executes some code:

```
if (application.name == "videomail/work"){
  // insert code here
}
```

Application.onAppStart

Availability

Flash Communication Server MX.

Usage

```
application.onAppStart = function (info){
  // insert code here
};
```

Parameters

None.

Returns

Nothing.

Description

Event handler; invoked when the server first loads the application instance. You use this handler to initialize an application state. You can use `application.onAppStop` and `application.onAppStop` to initialize and clean up global variables in an application because each of these events is invoked only once during the lifetime of an application instance.

Example

The following example defines an anonymous function for the `application.onAppStart` event handler that sends a `trace` message:

```
application.onAppStart = function () {
  trace ("onAppStart called");
};
```

Application.onAppStop

Availability

Flash Communication Server MX.

Usage

```
application.onAppStop = function (info){
  // insert code here
};
```

Parameters

`info` An information object that explains why the application stopped running. See the Appendix, "Server-Side Information Objects," on page 67.

Returns

The value returned by the function you define, if any, or `null`. To refuse to unload the application, return `false`. To unload the application, return `true` or any non-`false` value.

Description

Event handler; invoked when the application is about to be unloaded by the server. You can define a function that executes when the event handler is invoked. If the function returns `true`, the application unloads. If the function returns `false`, the application doesn't unload. If you don't define a function for this event handler, or if the return value is not a Boolean value, the application is unloaded when the event is invoked.

The Flash Communication Server application passes an information object to the `application.onAppStop` event. You can use server-side ActionScript to look at this information object to decide what to do in the function you define. You could also define the `application.onAppStop` event to notify users before shutdown.

If you use the Administration Console or the Administration API to unload a Flash Communication Server application, `application.onAppStop` is not invoked. Therefore you cannot use the `application.onAppStop` event, for example, to tell users that the application is exiting.

Example

This example defines a function to perform the shutdown operations on the application. The function is then assigned to the event handler so that it executes when the handler is invoked.

```
function onMyApplicationEnd(info){
  // Do all the application-specific shutdown logic...
  // insert code here
}

application.onAppStop = onMyApplicationEnd;
```

Application.onConnect

Availability

Flash Communication Server MX.

Usage

```
application.onConnect = function (clientObj [, p1, ..., pN]){
  // insert code here to call methods that do authentication
  // returning null puts client in a pending state
  return null;
};
(usage 2)
application.onConnect = function (clientObj [, p1, ..., pN]){
  // insert code here to call methods that do authentication
  // accepts the connection
  application.acceptConnection(clientObj);
}
(usage 3)
application.onConnect = function (clientObj [, p1, ..., pN])
{
  // insert code here to call methods that do authentication
  // accepts the connection by returning true
  return true;
}
```

Parameters

`clientObj` The client connecting to the application.

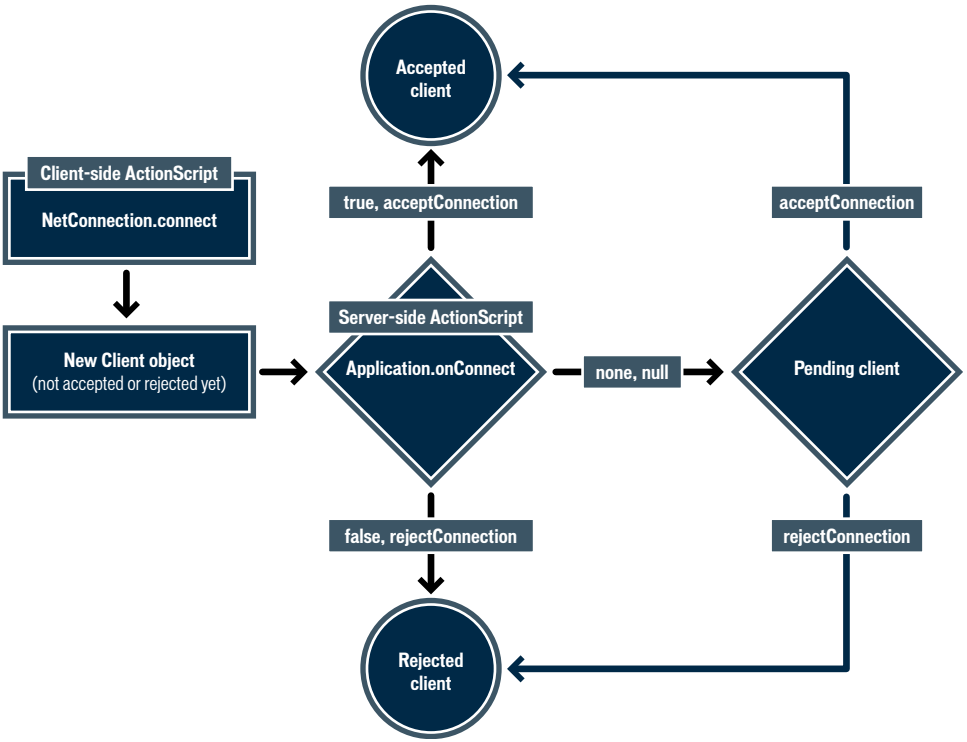
p1 ..., pN Optional parameters passed to the `application.onConnect` method. These parameters are passed from the client-side `NetConnection.connect` method when a client connects to the application.

Returns

The value you provide. If you return a Boolean value of `true`, the server accepts the connection; if the value is `false`, the server rejects the connection. If you return `null` or no return value, the server puts the client in a pending state and the client can't receive or send messages. If the client is put in a pending state, you must call `application.acceptConnection` or `application.rejectConnection` at a later time to accept or reject the connection. For example, you can perform external authentication by making a NetConnection call in your `application.onConnect` event handler to an application server, and having the reply handler call `application.acceptConnection` or `application.rejectConnection`, depending on the information received by the reply handler.

You can also call `application.acceptConnection` or `application.rejectConnection` inside the `application.onConnect` event handler. If you do, any value returned by the function is ignored.

Note: Returning 1 or 0 is not the same as returning `true` or `false`. The values 1 and 0 are treated the same as any other integers and do not accept or reject a connection.



How to use `application.onConnect` to accept, reject, or put a client in a pending state

Description

Event handler; invoked on the server side when `NetConnection.connect` is called from the client side and a client attempts to connect to an application instance. You can define a function for the `application.onConnect` event handler. If you don't define a function, connections are accepted by default. If the server accepts the new connection, the `application.clients` object is updated.

You can use the `application.onConnect` event in server-side scripts to perform authentication. All the information required for authentication should be sent to the server by the client as parameters (*p1* ..., *pN*) that you define. In addition to authentication, the script can set the access rights to all server-side objects that this client can modify by setting the `Client.readAccess` and `Client.writeAccess` properties.

If there are several simultaneous connection requests for an application, the server serializes the requests so there is only one `application.onConnect` handler executing at a time. It is a good idea to write code for the `application.onConnect` function that executes quickly to prevent a long connect time for clients.

Example

This example verifies that the user has sent the password "XXXX". If the password is sent, the user's access rights are modified and the user can complete the connection. In this case, the user can create or write to streams and shared objects in the user's own directory and can read or view any shared object or stream in this application instance.

```
// This code should be placed in the global scope

application.onConnect = function (newClient, userName, password){
  // Do all the application-specific connect logic
  if (password == "XXXX"){
    newClient.writeAccess = "/" + userName;
    this.acceptConnection(newClient);
  }
  var err = new Object();
  err.message = "Invalid password";
  this.rejectConnection(newClient, err);
};
```

If the password is incorrect, the user is rejected and an information object with a `message` property set to "Invalid password" is returned to the client side. The object is assigned to `infoObject.application`. To access the `message` property, use the following code on the client side:

```
ClientCom.onStatus = function (info){
  trace(info.application.message);
  // it will print "Invalid password"
  // in the Output window on the client side
};
```

See also

`Application.acceptConnection`, `Application.rejectConnection`

Application.onDisconnect

Availability

Flash Communication Server MX.

Usage

```
application.onDisconnect = function (clientObj){
  // insert code here
};
```

Parameters

clientObj A client disconnecting from the application.

Returns

The server ignores any return value.

Description

Event handler; invoked when a client disconnects from the application. You can use this event handler to flush any client state information or to notify other users of this event. This event handler is optional.

Example

This example uses an anonymous function and assigns it to the `application.onDisconnect` event handler:

```
// This code should be placed in the global scope.
application.onDisconnect = function (client){
  // Do all the client-specific disconnect logic...
  // insert code here
  trace("user disconnected");
};
```

Application.onStatus

Availability

Flash Communication Server MX.

Usage

```
application.onStatus = function (infoObject){
  // insert code here
};
```

Parameters

infoObject An object that contains the error level, code, and sometimes a description. See the Appendix, "Server-Side Information Objects," on page 67.

Returns

Any value that the callback function returns.

Description

Event handler; invoked when the server encounters an error while processing a message that was targeted at this application instance. The `application.onStatus` event handler is the root for any `Stream.onStatus` or `NetConnection.onStatus` messages that don't find handlers. Also, there are a few status calls that come only to `application.onStatus`. This event handler can be used for debugging messages that generate errors.

Example

The following example defines a function that sends a trace statement whenever the `application.onStatus` method is invoked. You can also define a function that gives users specific feedback about the type of error that occurred.

```
appInstance.onStatus = function(infoObject){
  trace("An application error occurred");
};
```

Application.registerClass

Availability

Flash Communication Server MX.

Usage

`application.registerClass(`*`className`*`, `*`constructor`*`)`

Parameters

`className` The name of an ActionScript class.

`constructor` A constructor function used to create an object of a specific class type during object deserialization. The name of the constructor function must be the same as *`className`*. During object serialization, the name of the constructor function is serialized as the object's type. To unregister the class, pass the value `null` as the *`constructor`* parameter. Serialization is the process of turning an object into something you can send to another computer over the network.

Returns

Nothing.

Description

Method; registers a constructor function that is used when deserializing an object of a certain class type. If the constructor for a class is not registered, you cannot call the deserialized object's methods. This method is also used to unregister the constructor for a class. This is an advanced use of the server and is necessary only when sending ActionScript objects between a client and a server.

The client and the server communicate over a network connection. Therefore, if you use typed objects, each side must have the prototype of the same objects they both use. In other words, both the client-side and server-side ActionScript must define and declare the types of data they share so that there is a clear, reciprocal relationship between an object, method, or property on the client and the corresponding element on the server. You can use `application.registerClass` to register the object's class type on the server side so that you can use the methods defined in the class.

Constructor functions should be used to initialize properties and methods; they should not be used for executing server code. Constructor functions are called automatically when messages are received from the client and need to be "safe" in case they are executed by a malicious client. You shouldn't define procedures that could result in negative situations such as filling up the hard disk or consuming the processor.

The constructor function is called before the object's properties are set. A class can define an `onInitialize` method, which is called after the object has been initialized with all its properties. You can use this method to process data after an object is deserialized.

If you register a class that has its prototype set to another class, you must set the prototype constructor back to the original class after setting the prototype. The second example below illustrates this point.

Example

This example defines a `Color` constructor function with properties and methods. After the application connects, the `registerClass` method is called to register a class for the objects of type `Color`. When a typed object is sent from the client to the server, this class is called to create the server-side object. After the application stops, the `registerClass` method is called again and passes the value `null` to unregister the class.

```
function Color(){
  this.red = 255;
  this.green = 0;
  this.blue = 0;
}
Color.prototype.getRed = function(){
  return this.red;
}
Color.prototype.getGreen = function(){
  return this.green;
}
Color.prototype.getBlue = function(){
  return this.blue;
}
Color.prototype.setRed = function(){
  this.red = value;
}
Color.prototype.setGreen = function(){
  this.green = value;
}
Color.prototype.setBlue = function(){
  this.blue = value;
}
application.onAppStart = function(){
  application.registerClass("Color", Color);
};
application.onAppStop = function(){
  application.registerClass("Color", null);
};
```

The following example shows how to use the `application.registerClass` method with the `prototype` property:

```
function A(){}
function B(){}

B.prototype = new A();
B.prototype.constructor = B; // set constructor back to that of B
// insert code here
application.registerClass("B", B);
```

Application.registerProxy

Availability

Flash Communication Server MX.

Usage

```
application.registerProxy(methodName, proxyConnection [, proxyMethodName])
```

Parameters

methodName The name of a method. All requests to execute *methodName* for this application instance are forwarded to the *proxyConnection* object.

proxyConnection A Client or NetConnection object. All requests to execute the remote method specified by *methodName* are sent to the Client or NetConnection object that is specified in the *proxyConnection* parameter. Any result that is returned is sent back to the originator of the call. To unregister, or remove, the proxy, provide a value of `null` for this parameter.

proxyMethodName An optional parameter. The server calls this method on the object specified by the *proxyConnection* parameter if *proxyMethodName* is different from the method specified by the *methodName* parameter.

Returns

A value that is sent back to the client that made the call.

Description

Method; maps a method call to another function. You can use this method to communicate between different application instances that can be on the same Flash Communication Server (or different Flash Communication Servers). Clients can execute server-side methods of any application instances to which they are connected. Server-side scripts can use this method to register methods to be proxied to other application instances on the same server or a different server. You can remove, or unregister the proxy by calling this method and passing `null` for the *proxyConnection* parameter, which results in the same behavior as never registering the method at all.

Example

In the following example, the `application.registerProxy` method is called in a function in the `application.onAppStart` event handler and executes when the application starts. Inside the function block, a new NetConnection object called `myProxy` is created and connected. The `application.registerProxy` method is then called to assign the method `getXyz` to the `myProxy` object.

```
application.onAppStart = function(){
  var myProxy = new NetConnection();
  myProxy.connect("rtmp://xyz.com/myApp");
  application.registerProxy("getXyz", myProxy);
};
```

Application.rejectConnection

Availability

Flash Communication Server MX.

Usage

`application.rejectConnection(`*clientObj*`, `*errObj*`)`

Parameters

clientObj A client to reject.

errObj An object of any type that is sent to the client, explaining the reason for rejection. The *errObj* object is available in client-side scripts as the `application` property of the information object that is passed to the `application.onStatus` call when the connection is rejected. For more information, see the Appendix, "Client-Side Information Objects," in the *Client-Side Communication ActionScript Dictionary*.

Returns

Nothing.

Description

Method; rejects the connection call from a client to the server. The `application.onConnect` event handler notifies a script when a new client is connecting. In the function assigned to `application.onConnect`, you can either accept or reject the connection. You can also define a function for `application.onConnect` that calls an application server for authentication. In that case, an application could call `application.rejectConnection` from the application server's response callback to disconnect the client from the server.

Example

In the following example, the client specified by `client1` is rejected and provided with the error message contained in `err.message`. The message "Too many connections" appears on the server side.

```
function onConnect(client1){
  // insert code here
  var err = new Object();
  err.message = "Too many connections";
  application.rejectConnection(client1, err);
}
```

The following code should appear on the client side:

```
clientConn.onStatus = function (info){
  if (info.code == "NetConnection.Connect.Rejected"){
    trace(info.application.message);
    // this sends the message
    // "Too many connections" to the Output window
    // on the client side
  }
};
```

See also

`Application.onConnect`, `Application.acceptConnection`

Application.server

Availability

Flash Communication Server MX.

Usage

```
application.server
```

Description

Property (read-only); contains the platform and the server-version information.

Example

The following example checks the `server` property against a string before executing the code inside the `if` statement:

```
if (application.server == "Flash Communication Server-Windows/1.0"){
  // insert code here
}
```

clearInterval

Availability

Flash Communication Server MX.

Usage

`clearInterval(`*`intervalID`*`)`

Parameters

`intervalID` A unique ID returned by a previous call to the `setInterval` method.

Returns

Nothing.

Description

Method (global); cancels a time-out that was set with a call to the `setInterval` method.

Example

The following example creates a function named `callback` and passes it to the `setInterval` method, which is called every 1000 milliseconds and sends the message "interval called" to the Output window. The `setInterval` method returns a unique identifier that is assigned to the variable `intervalID`. The identifier allows you to cancel a specific `setInterval` call. In the last line of code, the `intervalID` variable is passed to the `clearInterval` method to cancel the `setInterval` call:

```
function callback(){
  trace("interval called");
}
var intervalID;
intervalID = setInterval(callback, 1000);
// sometime later
clearInterval(intervalID);
```

Client (object)

The Client object lets you handle each user, or *client*, connection to a Flash Communication Server application instance. The server automatically creates a Client object when a user connects to an application; the object is destroyed when the user disconnects from the application. Users have unique Client objects for each application to which they are connected. Thousands of Client objects can be active at the same time.

You can use the properties of the Client object to determine the version, platform, and IP address of each client. You can also set individual read and write permissions to various application resources such as Stream objects and shared objects. Use the methods of the Client object to set bandwidth limits and call methods in client-side scripts.

When you call `NetConnection.call` from a client-side ActionScript script, the method that executes in the server-side script must be a method of the Client object. In your server-side script, you must define any method that you want to call from the client-side script. You can also call any methods you define in the server-side script directly from the Client object instance in the server-side script.

If all instances of the Client object (each client in an application) require the same methods or properties, you can add those methods and properties to the class itself instead of adding them to each instance of a class. This process is called *extending* a class. You can extend any server-side or client-side ActionScript class. To extend a class, instead of defining methods inside the constructor function of the class or assigning them to individual instances of the class, you assign methods to the `prototype` property of the constructor function of the class. When you assign methods and properties to the `prototype` property, the methods are automatically available to all instances of the class.

Extending a class lets you define the methods of a class separately, which makes them easier to read in a script. And more importantly, it is more efficient to add methods to `prototype`, otherwise the methods are re-interpreted each time an instance is created.

The following code shows how to assign methods and properties to an instance of a class. During `application.connect`, a client instance `clientObj` is passed to the server-side script as a parameter. You can then assign a property and method to the client instance:

```
application.onConnect = function(clientObj){
}
clientObj.birthday = myBDay;
clientObj.calculateDaysUntilBirthday = function(){
  // insert code here
}
```

The above example works, but must be executed every time a client connects. If you want the same methods and properties to be available to all clients in the `application.clients` array without defining them every time, you must assign them to the `prototype` property of the Client object There are two steps to extending a built-in class using the `prototype` method. You can write the steps in any order in your script. The following example extends the built-in Client object, so the first step is to write the function that you will assign to the `prototype` property:

```
// first step: write the functions

function Client_getWritePermission(){
// "writeAccess" property is already built-in to the client class
return this.writeAccess;
}

function Client_createUniqueID(){
  var ipStr = this.ip;
// "ip" property is already built-in to the client class
  var uniqueID = "re123mn"
// you would need to write code in the above line
// that creates a unique ID for each client instance
  return uniqueID;
}

// second step: assign prototype methods to the functions

Client.prototype.getWritePermission = Client_getWritePermission;
Client.prototype.createUniqueID = Client_createFriendlyUniqueID;

// a good naming convention is to start all class method
// names with the name of the class, followed by an underscore
```

You can also add properties to `prototype`, as shown in the following example:

```
Client.prototype.company = "Macromedia";
```

The methods are available to any instance, so within `application.onConnect`, which is passed a `clientObj` argument, you can write the following code:

```
application.onConnect(clientObj){
  var clientID = clientObj.createUniqueID();
  var clientWritePerm = clientObj.getWritePermission();
};
```

Method summary for the Client object

Method	Description
`Client.call`	Executes a method on the Flash client asynchronously and returns the value from the Flash client to the server.
`Client.getBandwidthLimit`	Returns the maximum bandwidth the client or the server can attempt to use for this connection.
`Client.__resolve`	Provides values for undefined properties.
`Client.setBandwidthLimit`	Sets the maximum bandwidth for the connection.

Property summary for the Client object

Property	Description
`Client.agent`	The version and platform of the Flash client.
`Client.ip`	The IP address of the Flash client.
`Client.readAccess`	A list of access levels to which the client has read access.
`Client.referrer`	The URL of the SWF file or server where this connection originated.
`Client.writeAccess`	A list of access levels to which the client has write access.

Event handler summary for the Client object

Event handler	Description
`Client."commandName"`	Invoked when `NetConnection.call(commandName)` is called in a client-side script.

Client.agent

Availability

Flash Communication Server MX.

Usage

`Client.agent`

Description

Property (read-only); contains the version and platform information of the Flash client.

Example

The following example checks the `agent` property against the string `"WIN"` and executes different code depending on whether they match. This code is written inside an `onConnect` function.

```
function onConnect(newClient, name){
  if (newClient.agent.indexOf("WIN") > -1){
    trace ("Window user");
  } else {
    trace ("non Window user.agent is" + newClient.agent);
  }
}
```

Client.call

Availability

Flash Communication Server MX.

Usage

`Client.call(`*`methodName`*`, [`*`resultObj`*`, [`*`p1, ..., pN`*`]])`

Parameters

`methodName` A method specified in the form `[`*`objectPath/`*`]`*`method`*. For example, the command `someObj/doSomething` tells the client to invoke the `NetConnection.someObj.doSomething` method on the client.

`resultObj` An optional parameter that is required when the sender expects a return value from the client. If parameters are passed but no return value is desired, pass the value `null`. The result object can be any object you define and, in order to be useful, should have two methods that are invoked when the result arrives: `onResult` and `onStatus`. The *`resultObj`*`.onResult` event is triggered if the invocation of the remote method is successful; otherwise, the *`resultObj`*`.onStatus` event is triggered.

`p1, ..., pN` Optional parameters that can be of any ActionScript type, including a reference to another ActionScript object. These parameters are passed to the *`methodName`* parameter when the method executes on the Flash client. If you use these optional parameters, you must pass in some value for *`resultObject`*; if you do not want a return value, pass `null`.

Returns

A Boolean value of `true` if a call to *`methodName`* was successful on the client; otherwise, `false`.

Description

Method; executes a method on the originating Flash client or on another server. The remote method may optionally return data, which is returned as a result to the *`resultObj`* parameter, if it is provided. The remote object is typically a Flash client connected to the server, but it can also be another server. Whether the remote agent is a Flash client or another server, the method is called on the remote agent's NetConnection object.

Example

The following example shows a client-side script that defines a function called `random`, which generates a random number:

```
nc = new NetConnection();
nc.connect ("rtmp://someserver/someApp/someInst");
nc.random = function(){
  return (Math.random());
};
```

The following server-side script uses the `Client.call` method inside the `application.onConnect` handler to call the `random` method that was defined on the client side. The server-side script also defines a function called `randHander`, which is used in the `Client.call` method as the *`resultObj`* parameter.

```
application.onConnect = function(clientObj){
  trace("we are connected");
  application.acceptConnection(clientObj);
  clientObj.call("random", new randHandler());
};
randHandler = function(){
  this.onResult = function(res){
    trace("random num: " + res):
  }
  this.onStatus = function(info){
    trace("failed and got:" + info.code);
  }
};
```

Client."commandName"

Availability

Flash Communication Server MX.

Usage

```
function onMyClientCommand([p1, ..., pN])
{
  // insert code here
  return val;
}
```

Parameters

`p1, ..., pN` Optional parameters passed to the command message handler if the message contains parameters you defined. These parameters are the ActionScript objects passed to the `NetConnection.call` method.

Returns

Any ActionScript object you define. This object is serialized and sent to the client as a response to the command only if the command message supplied a response handler.

Description

Event handler; invoked when a Flash client or another server calls the `NetConnection.call` method. A command name parameter is passed to `NetConnection.call` on the client side, which causes Flash Communication Server to search the Client object instance on the server side for a function that matches the command name parameter. If the parameter is found, the method is invoked and the return value is sent back to the client.

Example

This example creates a method called `sum` as a property of the Client object `newClient` on the server side:

```
newClient.sum = function sum(op1, op2){
  return op1 + op2;
};
```

The sum method can then be called from NetConnection.call on the Flash client side, as shown in the following example:

```
nc = new NetConnection();
nc.connect("rtmp://myServer/myApp");
nc.call("sum", new result.sum(), 20, 50);
function result.sum(){
  this.onResult = function (retVal){
    output += "sum is " + retVal;
  };
  this.onStatus = function(errorVal){
  output += errorVal.code + " error occurred";
  };
}
```

The sum method can also be called on the server side, as shown here:

```
newClient.sum();
```

The following example creates two functions that you can call from either a client-side or server-side script:

```
application.onConnect = function(clientObj) {
  // Add a callable function called "foo"; foo returns the number 8
  clientObj.foo = function() {return 8;};
  // Add a remote function that is not defined in the onConnect call
  clientObj.bar = application.barFunction;
};
// The bar function adds the two values it is given
application.barFunction = function(v1,v2) {
  return (v1 + v2);
};
```

You can call either of the two functions that were defined in the previous examples (foo and bar) by using the following code in a client-side script:

```
c = new NetConnection();
c.call("foo");
c.call("bar", null, 1, 1);
```

You can call either of the two functions that were defined in the previous examples (foo and bar) by using the following code in a server-side script:

```
c = new NetConnection();
c.onStatus = function(info) {
  if(info.code == "NetConnection.Connect.Success") {
    c.call("foo");
    c.call("bar", null, 2, 2);
  }
};
```

Client.getBandwidthLimit

Availability

Flash Communication Server MX.

Usage

```
Client.getBandwidthLimit(iDirection)
```

Parameters

iDirection An integer specifying the connection direction: 0 indicates a client-to-server direction, 1 indicates a server-to-client direction.

Returns

An integer indicating bytes per second.

Description

Method; returns the maximum bandwidth that the client or the server can use for this connection. Use the *iDirection* parameter to get the value for each direction of the connection. The value returned indicates bytes per second and can be changed with `Client.setBandwidthLimit`. The default value for a connection is set for each application in the Application.xml file.

Example

The following example uses `Client.getBandwidthLimit` with the *iDirection* parameter to set two variables, `clientToServer` and `serverToClient`:

```
application.onConnect(newClient){
  var clientToServer= newClient.getBandwidthLimit(0);
  var serverToClient= newClient.getBandwidthLimit(1);
}
```

Client.ip

Availability

Flash Communication Server MX.

Usage

```
Client.ip
```

Description

Property (read-only); contains the IP address of the Flash client.

Example

The following example uses the `Client.ip` property to verify whether a new client has a specific IP address. The result determines which block of code runs.

```
function application.onConnect(newClient, name){
  if (newClient.ip == "127.0.0.1"){
    // insert code here
  } else {
    // insert code here
  }
}
```

Client.readAccess

Availability

Flash Communication Server MX.

Usage

```
Client.readAccess
```

Description

Property; provides read-access rights to application resources (shared objects and streams) for this client. To give a client read access to directories containing application resources, list directories in a string delimited by semicolons.

By default, all clients have full read access, and the `readAccess` property is set to slash (`/`). To give a client read access, specify a list of access levels (in URI format), delimited by semicolons. Any files or directories within a specified URI are also considered accessible. For example, if `myMedia` is specified as an access level, then any files or directories in the myMedia directory are also accessible (for example, myMedia/mp3s). Similarly, any files or directories in the myMedia/mp3s directory are also accessible, and so on.

Clients with read access to streams can play streams in the specified access levels. Clients with read access to shared objects can subscribe to shared objects in the specified access levels and receive notification of changes in the shared objects.

- For streams, `readAccess` controls which streams can be played by the connection.
- For shared objects, `readAccess` controls if the connection can listen to shared object changes.

Example

The following `onConnect` function gives a client read access to myMedia/mp3s, myData/notes, and any files or directories within them:

```
function application.onConnect(newClient, name){
  newClient.readAccess = "myMedia/mp3s;myData/notes";
}
```

See also

`Client.writeAccess`

Client.referrer

Availability

Flash Communication Server MX.

Usage

```
Client.referrer
```

Description

Property (read-only); a string object whose value is set to the URL of the SWF file or the server in which this connection originated.

Example

The following example defines an `onConnect` callback function that sends a trace to the Output window indicating the origin of the new client when that client connects to the application:

```
function application.onConnect(newClient, name){
  trace("New user connected to server from" + newClient.referrer);
}
```

Client.__resolve

Availability

Flash Communication Server MX.

Usage

```
Client.__resolve = function(propName){
  // insert code here
};
```

Parameters

propName The name of an undefined property.

Returns

The value of the undefined property, which is specified by the *propName* parameter.

Description

Method; provides values for undefined properties. When an undefined property of a Client object is referenced by server-side ActionScript code, that object is checked for a __resolve method. If the object has a __resolve method, the __resolve method is invoked and passed the name of the undefined property. The return value of the __resolve method is the value of the undefined property. In this way, __resolve can supply the values for undefined properties and make it appear as if they are defined.

Example

The following example defines a function that is called whenever an undefined property is referenced:

```
Client.prototype.__resolve = function (name) {
  return "Hello, world!";
};
function onConnect(newClient){
  trace (newClient.property1); // this will print "Hello World"
}
```

Client.setBandwidthLimit

Availability

Flash Communication Server MX.

Usage

```
Client.setBandwidthLimit(iServerToClient, iClientToServer)
```

Parameters

iServerToClient The bandwidth from server to client, in bytes per second. Use 0 if you don't want to change the current setting.

iClientToServer The bandwidth from client to server, in bytes per second. Use 0 if you don't want to change the current setting.

Returns

Nothing.

Description

Method; sets the maximum bandwidth for this client from client to server, server to client, or both. The default value for a connection is set for each application in the Application.xml file. The value specified cannot exceed the bandwidth cap value specified in the Application.xml file.

Example

The following example sets the bandwidth limits for each direction, based on values passed to the onConnect function:

```
application.onConnect(newClient, serverToClient, clientToServer){
  newClient.setBandwidthLimit(serverToClient, clientToServer);
  application.acceptConnection(newClient);
}
```

Client.writeAccess

Availability

Flash Communication Server MX.

Usage

```
Client.writeAccess
```

Description

Property; provides write-access rights to application resources (shared objects, streams, and so on) for this client. To give a client write access to directories containing application resources, list directories in a string delimited by semicolons. By default, all clients have full write access, and the `writeAccess` property is set to slash (`/`). For example, if `myMedia` is specified as an access level, then any files or directories in the myMedia directory are also accessible (for example, myMedia/mp3s). Similarly, any files or directories in the myMedia/mp3s directory are also accessible, and so on.

- For shared object, `writeAccess` provides control over who can create and update the shared objects.
- For streams, `writeAccess` provides control over who can publish and record a stream.

Example

The following example provides write access to the /myMedia/mp3s and myData/notes directories.

```
function application.onConnect(newClient, name){
  newClient.writeAccess = "/myMedia/mp3s;myData/notes";
  application.acceptConnection();
}
```

See also

`Client.readAccess`

load

Availability

Flash Communication Server MX.

Usage

```
load(filename);
```

Parameters

`filename` The relative path to an ActionScript file in relation to the main.asc file.

Returns

Nothing.

Description

Method (global); loads an ActionScript file inside the main.asc file. This method executes only when the ActionScript file is first loaded. The loaded file is compiled and executed after the main.asc file is successfully loaded, compiled, and executed, and before `application.onAppStart` is executed. The path of the specified file is resolved relative to main.asc. This method is useful for loading ActionScript libraries.

Note: For security reasons, your server-side applications directory, which contains ASC files, audio/video FLV files, and ActionScript FLA source files, should not be accessible to a user browsing your Web site.

Example

The following example loads the myLoadedFile.as file:

```
load("myLoadedFile.as");
```

NetConnection (object)

The server-side NetConnection object lets you create a two-way connection between a Flash Communication Server application instance and an application server, another Flash Communication Server, or another Flash Communication Server application instance on the same server. You can use NetConnection objects to create powerful applications; for example, you can get weather information from an application server or share an application load with other Flash Communication Servers or application instances.

You can use Macromedia Flash Remoting with the Flash Communication Server to communicate with application servers such as Macromedia ColdFusion MX, Macromedia JRun, Microsoft .NET, and J2EE servers using Action Message Format (AMF) over HTTP. AMF lets you transfer light-weight binary data between a Flash Communication Server or a Flash client and a web application server. For more information, see http://www.macromedia.com/go/flashremoting.

You can also connect to an application server for server-to-server interactions using standard protocols (such as HTTP) or connect to another Flash Communication Server for sharing audio, video, and data using the Macromedia Real-Time Messaging Protocol (RTMP).

To create a NetConnection object, use the constructor function described below.

Method summary for the NetConnection object

Method	Description
`NetConnection.addHeader`	Adds a context header.
`NetConnection.call`	Invokes a method or operation on a remote server.
`NetConnection.close`	Closes a server connection.
`NetConnection.connect`	Establishes connection to a server.

Property summary for the NetConnection object

Property	Description
`NetConnection.isConnected`	A Boolean value indicating whether a connection has been made.
`NetConnection.uri`	The URI that was passed by the `NetConnection.connect` method.

Event handler summary for the NetConnection object

Event handler	Description
`NetConnection.onStatus`	Called when there is a change in connection status.

Constructor for the NetConnection object

Availability

Flash Communication Server MX.

Usage

```
new NetConnection()
```

Parameters

None.

Returns

A NetConnection object.

Description

Constructor; creates a new instance of the NetConnection object.

Example

The following example creates a new instance of the NetConnection object:

```
newNC = new NetConnection();
```

NetConnection.addHeader

Availability

Flash Communication Server MX.

Usage

```
myNetConn.addHeader(name, mustUnderstand, object)
```

Parameters

name A string that identifies the header and the ActionScript object data associated with it.

mustUnderstand A Boolean value; `true` indicates that the server must understand and process this header before it handles any of the following headers or messages.

object Any ActionScript object.

Returns

Nothing.

Description

Method; adds a context header to the AMF packet structure. This header is sent with every future AMF packet. If you call `NetConnection.addHeader` using the same name, the new header replaces the existing header, and the new header persists for the duration of the NetConnection object. You can remove a header by calling `NetConnection.addHeader` with the name of the header to remove and an undefined object.

Example

The following example creates a new NetConnection instance, `nc`, and connects to an application at web server www.foo.com that is listening at port 1929. This application dispatches the service / blag/SomeCoolService. The last line of code adds a header called `foo`:

```
nc=new NetConnection();
nc.connect("http://www.foo.com:1929/blag/SomeCoolService");
nc.addHeader("foo", true, new Foo());
```

NetConnection.call

Availability

Flash Communication Server MX.

Usage

myNetConnection.call(*methodName*, [*resultObj*, *p1*, ..., *pN*])

Parameters

methodName A method specified in the form [*objectPath*/]*method*. For example, the command `someObj/doSomething` tells the remote server to invoke the `clientObj.someObj.doSomething` method, with all the *p1, ..., pN* parameters. If the object path is missing, `clientObj.doSomething()` is invoked on the remote server.

resultObj An optional parameter that is used to handle return values from the server. The result object can be any object you defined and can have two defined methods to handle the returned result: `onResult` and `onStatus`. If an error is returned as the result, `onStatus` is invoked; otherwise, `onResult` is invoked.

p1, ..., pN Optional parameters that can be of any ActionScript type, including a reference to another ActionScript object. These parameters are passed to the *methodName* specified above when the method is executed on the remote application server.

Returns

For RTMP connections, returns a Boolean value of `true` if a call to *methodName* is sent to the client; otherwise, `false`. For application server connections, it always returns `true`.

Description

Method; invokes a command or method on a Flash Communication Server or an application server to which the application instance is connected. The `NetConnection.call` method on the server works the same way as the `NetConnection.call` method on the client: it invokes a command on a remote server.

Note: If you want to call a method on a client from a server, use the `Client.call` method.

Example

This example uses RTMP to execute a call from one Flash Communication Server to another Flash Communication Server. The code makes a connection to the App1 application on server 2 and then invokes the method `Sum` on server 2:

```
nc1.connect("rtmp://server2.mydomain.com/App1", "svr2",);
nc1.call("Sum", newResult(), 3, 6);
```

The following server-side ActionScript code is on server 2. When the client is connecting, this code checks to see whether it has an argument that is equal to `svr1`. If the client has that argument, the `Sum` method is defined so that when the method is called from svr1, svr2 can respond with the appropriate method:

```
application.onConnect = function(clientObj){
  if(arg1 == "svr1"){
    clientObj.Sum = function(p1, p2){
      return p1 + p2;
    }
  }
  return true;
};
```

The following example uses an AMF request to make a call to an application server. This allows Flash Communication Server to connect to an application server and then invoke the `quote` method. The Java adaptor dispatches the call by using the identifier to the left of the dot as the class name and the identifier to the right of the dot as a method of the class.

```
nc = new NetConnection;
nc.connect("http://www.xyz.com/java");
nc.call("myPackage.quote", newResult());
```

NetConnection.close

Availability

Flash Communication Server MX.

Usage

```
myNetConnection.close()
```

Parameters

None.

Returns

Nothing.

Description

Method; closes the connection with the server. After you close the connection, you can reuse the NetConnection instance and reconnect to an old application or connect to a new one.

Note: The `NetConnection.close` method has no effect on HTTP connections.

Example

The following code closes the NetConnection instance `myNetConn`:

```
myNetConn.close();
```

NetConnection.connect

Availability

Flash Communication Server MX.

Usage

```
myNetConnection.connect(URI, [p1, ..., pN])
```

Parameters

`URI` A URI to connect to.

`p1, ..., pN` Optional parameters that can be of any ActionScript type, including references to other ActionScript objects. These parameters are sent as connection parameters to the `application.onConnect` event handler for RTMP connections. For AMF connections to application servers, any RTMP parameters are ignored.

Returns

For RTMP connections, a Boolean value of `true` for success; `false` otherwise. For AMF connections to application servers, `true` is always returned.

Description

Method; connects to the host. The host URI has the following format:

[protocol://]host[:port]/appName[/instanceName]

For example, the following are legal URIs:

```
http://appServer.mydomain.com/webApp
rtmp://rtserver.mydomain.com/realtimeApp
```

It is good practice to write an `application.onStatus` callback function and check the `NetConnection.isConnected` property for RTMP connections to see whether a successful connection was made. For Action Message Format connections, check `NetConnection.onStatus`.

Example

This example creates an RTMP connection to another Flash Communication Server for the `myConn` instance of NetConnection:

```
myConn = new NetConnection();
myConn.connect("rtmp://tc.foo.com/myApp/myConn");
```

The following example creates an AMF connection to an application server for the `myConn` instance of NetConnection:

```
myConn = new NetConnection();
myConn.connect("http://www.xyz.com/myApp/");
```

NetConnection.isConnected

Availability

Flash Communication Server MX.

Usage

```
myNetConnection.isConnected
```

Description

Property (read-only); a Boolean value that indicates whether a connection has been made. It is set to `true` if there is a connection to the server. It's a good idea to check this property value in the `onStatus` callback function. This property is always true for AMF connections to application servers.

Example

This example uses `NetConnection.isConnected` inside an `onStatus` definition to check if a connection has been made:

```
nc = new NetConnection();
nc.connect("rtmp://tc.foo.com/myApp");
nc.onStatus = function(infoObj){
  if (info.code == "NetConnection.Connect.Success" && nc.isConnected){
    trace("We are connected");
  }
};
```

NetConnection.onStatus

Availability

Flash Communication Server MX.

Usage

```
myNetConnection.onStatus = function(infoObject) {
  // Your code here
}
```

Parameters

`infoObject` An information object. For details about this parameter, see the Appendix, "Server-Side Information Objects," on page 67.

Returns

Nothing.

Description

Event handler; invoked every time the status of the NetConnection object changes. For example, if the connection with the server is lost in an RTMP connection, the `NetConnection.isConnected` property is set to `false`, and `NetConnection.onStatus` is invoked with a status message of `NetConnection.Connect.closed`. For AMF connections, `NetConnection.onStatus` is used only to indicate a failed connection. Use this event handler to check for connectivity.

Example

This example defines a function for the `onStatus` handler that outputs messages to indicate whether the NetConnection was successful:

```
nc = new NetConnection();
nc.onStatus = function(info){
  if (info.code == "NetConnection.Connect.Success") {
    _root.gotoAndStop(2);
  } else {
    if (! nc.isConnected){
      _root.gotoAndStop(1);
    }
  }
};
```

NetConnection.uri

Availability

Flash Communication Server MX.

Usage

myNetConnection.uri

Description

Property (read-only); A string indicating the URI that was passed by the `NetConnection.connect` method. This property is set to `null` before a call to `NetConnection.connect` or after `NetConnection.close` is called.

setInterval

Availability

Flash Communication Server MX.

Usage

`setInterval(`*function*`, `*interval*`[, `*p1*`, ..., `*pN*`]);`

`setInterval(`*object*`, `*methodName*`, `*interval*`[, `*p1*`, ..., `*pN*`]);`

Parameters

function The name of a defined ActionScript function or a reference to an anonymous function.

object An object derived from the ActionScript Object object.

methodName The name of the method to call on *object*.

interval The time (interval) between calls to *function*, in milliseconds.

p1, ..., pN Optional parameters passed to *function*.

Returns

A unique ID for this call. If the interval is not set, the method returns -1.

Description

Method (global); continually calls a function or method at a specified time interval until the `clearInterval` method is called. This method allows a server-side script to run a generic routine. The `setInterval` method returns a unique ID that you can pass to the `clearInterval` method to stop the routine.

Note: Standard JavaScript supports an additional usage for the `setInterval` method, `setInterval(stringToEvaluate, timeInterval)`, which is not supported by Server-Side Communication ActionScript.

Example

The following example uses an anonymous function to send the message "interval called" to the server log every second:

```
setInterval(function(){trace("interval called");}, 1000);
```

The following example also uses an anonymous function to send the message "interval called" to the server log every second, but it passes the message to the function as a parameter:

```
setInterval(function(s){trace(s);}, 1000, "interval called");
```

The following example uses a named function, `callback1`, to send the message "interval called" to the server log:

```
function callback1(){
  trace("interval called");
}
setInterval(callback1, 1000);
```

The following example also uses a named function, `callback2`, to send the message "interval called" to the server log, but it passes the message to the function as a parameter:

```
function callback2(s){
    trace(s);}
setInterval(callback2, 1000, "interval called");
```

SharedObject (object)

Shared objects let you share data between multiple client movies in real time. Shared objects can be persistent on the server and you can think of these objects as real-time data transfer devices. You can also use the client-side ActionScript SharedObject object to create shared objects on the client. For more information, see the SharedObject entry in the *Client-Side Communication ActionScript Dictionary*. The following list describes common ways to use remote shared objects:

- Storing and sharing data on a server

  A shared object can store data on the server for other clients to retrieve. For example, you can open a remote shared object, such as a phone list, that is persistent on the server. Whenever a client makes a change to the shared object, the revised data is available to all clients that are currently connected to the object or that connect to it later. If the object is also persistent locally and a client changes the data while not connected to the server, the changes are copied to the remote shared object the next time the client connects to the object.

- Sharing data in real time

  A shared object can share data among multiple clients in real time. For example, you can open a remote shared object that stores real-time data (such as a list of users connected to a chat room) that is visible to all clients connected to the object. When a user enters or leaves the chat room, the object is updated and all clients that are connected to the object see the revised list of chat room users.

Every shared object is identified by a unique name and contains a list of name-value pairs, called *properties,* just like any other ActionScript object. A name must be a unique string and a value can be any ActionScript data type. (For more information about data types, see *Using Flash MX*.) All shared objects have a data property. Any property of the data property can be shared and is called a *slot.*

A shared object can be owned by the current (local) application instance or by a different (remote) application instance. The remote application instance can be on the same server or on a different server. References to shared objects that are owned by a remote application instance are called *proxied shared objects*.

The slot of a shared object owned by the local instance can be modified by multiple clients or by the server simultaneously; there is no conflict on the server side when a shared object is modified. For example, a call to `SharedObject.getProperty` returns the latest value and setting a new value assigns a new value for the named slot and updates the object version. If you write a server-side script that modifies multiple properties, you can prevent other clients from modifying the object during the update, by calling the `SharedObject.lock` method before updating the object. Then you can call `SharedObject.unlock` to commit the changes and allow other changes to be made. Any change to a shared object results in notification to all the clients that are currently subscribed to the shared object.

When you get a reference to a shared object owned by a remote application instance, any changes made to the object are sent to the instance that owns the object. The success or failure of any changes are sent using the `SharedObject.onSync` event handler, if it is defined. Also, the `SharedObject.lock` and `SharedObject.unlock` methods cannot be used to lock or unlock proxied shared objects.

Method summary for the SharedObject object

Method	Description
SharedObject.clear	Deletes all properties of a persistent shared object.
SharedObject.close	Unsubscribes from a shared object.
SharedObject.flush	Causes the server to save the current state of a shared object.
SharedObject.get	Returns a reference to a shared object.
SharedObject.getProperty	Gets the value of a shared object property.
SharedObject.getPropertyNames	Returns an array of all the current valid properties in the shared object.
SharedObject.lock	Locks the shared object instance. Prevents any changes to this object by clients until the SharedObject.unlock method is called.
SharedObject.purge	Causes the server to remove all deleted properties that are older than the specified version.
SharedObject.send	Sends a message to the client subscribing to this shared object.
SharedObject.setProperty	Sets a new value for a shared object property.
SharedObject.size	Returns the number of valid properties in a shared object.
SharedObject.unlock	Unlocks a shared object instance that was locked with SharedObject.lock.

Property summary for the SharedObject object

Property	Description
SharedObject.name	The name of a shared object.
SharedObject.resyncDepth	The depth that indicates when the deleted values of a shared object should be permanently deleted.
SharedObject.version	The current version number of a shared object.

Event summary for the SharedObject object

Property	Description
SharedObject.handlerName	A placeholder for a property name that specifies a function object that is invoked when a shared object receives a broadcast message whose method name matches the property name.
SharedObject.onStatus	Reports errors, warnings, and status messages for a shared object.
SharedObject.onSync	Invoked when a shared object changes.

SharedObject.clear

Availability

Flash Communication Server MX.

Usage

```
SharedObject.clear()
```

Parameters

None.

Returns

Returns `true` if successful; `false` otherwise.

Description

Method; deletes all properties and sends a "clear" event to all clients that subscribe to a persistent shared object. The persistent data object is also removed from persistent shared object. You can use `SharedObject.clear` to detach from a shared object immediately after `SharedObject.get` is invoked. You can use `SharedObject.clear` when you do not want to use a shared object anymore and want to remove it from the server completely. This method lets you create shared objects that persist only for a specified time.

Example

The following example calls the `clear` method on the shared object `myShared`:

```
var myShared = SharedObject.get("foo", true);
var len = myShared.clear();
```

SharedObject.close

Availability

Flash Communication Server MX.

Usage

```
SharedObject.close()
```

Parameters

None.

Returns

Nothing.

Description

Method; detaches a reference from a shared object. A call to the `SharedObject.get` method returns a reference to a shared object instance. The reference is valid until the variable that holds the reference is no longer in use and the script is garbage-collected. To destroy a reference immediately, you can call `SharedObject.close`. You can use `SharedObject.close` when you don't want to proxy a shared object any longer.

Example

In this example, `mySO` is attached as a reference to shared object `foo`. When you call `mySO.close` you detach the reference `mySO` from the shared object `foo`.

```
mySO = SharedObject.get("foo");
  // insert code here
mySO.close();
```

See also

`SharedObject.get`

SharedObject.flush

Availability

Flash Communication Server MX.

Usage

```
SharedObject.flush()
```

Parameters

None.

Returns

A Boolean value of `true` if successful, `false` otherwise.

Description

Method; causes the server to save the current state of the shared object instance. The shared object must have been created with the persistence option.

Example

The following example places a reference to the shared object `foo` in the variable `myShared`. It then locks the shared object instance so that no one can make any changes to it, and then saves the shared object by calling `myShared.flush`. After the shared object is saved, it is unlocked so that further changes can be made.

```
var myShared = SharedObject.get("foo", true);
myShared.lock();
// insert code here that operates on the shared object
myShared.flush();
myShared.unlock();
```

SharedObject.get

Availability

Flash Communication Server MX.

Usage

```
SharedObject.get(name, boolPersist [, netConnection])
```

Parameters

`name` Name of the shared object instance to return.

`boolPersist` A Boolean value: `true` for a persistent shared object; `false` for a nonpersistent shared object. If no value is specified, the default value is `false`.

`netConnection` A NetConnection object that represents a connection to an application instance. You can pass this parameter to get a reference to a shared object on another server or a shared object that is owned by another application instance. All update notifications for the shared object specified by the *`name`* parameter are proxied to this instance, and the remote instance notifies the local instance when a persistent shared object changes. The NetConnection object that is used as the *`netConnection`* parameter does not need to be connected when you call `SharedObject.get`. The server connects to the remote shared object when the NetConnection state changes to connected. This parameter is optional.

Returns

A reference to a shared object instance.

Description

Static method; returns a reference to a shared object instance. To perform any operation on a shared object, the server-side script must get a reference to the named shared object using the `SharedObject.get` method. If the object requested is not found, a new instance is created.

There are two types of shared objects, persistent and nonpersistent, and they are in separate name spaces. This means that a persistent and a local shared object can have the same name, but they are two distinct shared objects. Shared objects are scoped to the name space of the application instance and are identified by a string name. The shared object names should conform to the URI specification.

You can also call `SharedObject.get` to get a reference to a shared object that is in a name space of another application instance. This instance can be on the same server or on a different server and is called a *proxied shared object*. To get a reference to a shared object from another instance, create a NetConnection object and use the `NetConnection.connect` method to connect to the application instance that owns the shared object. Pass the NetConnection object as the *`netConnection`* parameter of the `SharedObject.get` method. The server-side script must get a reference to a proxied shared object before there is a request for the shared object from any client. To do this, call `SharedObject.get` in the `application.onAppStart` handler.

If you call `SharedObject.get` with a *`netConnection`* parameter and the local application instance already has a shared object with the same name, the shared object converts to a proxied shared object. All shared object messages for clients connected to a proxied shared object are sent to the master instance.

If the connection state of the NetConnection object that was used as the *`netConnection`* parameter changes state from connected to disconnected, the proxied shared object is set to idle and any messages received from subscribers are discarded. The `NetConnection.onStatus` handler is called when a connection is lost. You can then re-establish a connection to the remote instance and call `SharedObject.get`, which changes the state of the proxied shared object from idle to connected.

If you call `SharedObject.get` with a new NetConnection object on a proxied shared object that is already connected and if the URI of the new NetConnection object doesn't match the current NetConnection object, the proxied shared object unsubscribes from the previous shared object, sends a "clear" event to all subscribers, and subscribes to the new shared object instance. When a subscribe to a proxied shared object is successful, all subscribers are reinitialized to the new state. This process lets you migrate a shared object from one application instance to another without disconnecting the clients.

Updates received by proxied shared objects from subscribers are checked to see if the update can be rejected based on the current state of the proxied shared object version and the version of the subscriber. If the change can be rejected, the proxied shared object doesn't forward the message to the remote instance; the reject message is sent to the subscriber.

The corresponding client-side ActionScript method is `SharedObject.getRemote`.

Example

This example creates a shared object named `foo` inside the function `onProcessCmd`. The function is passed a parameter, `cmd`, that is assigned to a property in the shared object.

```
function onProcessCmd(cmd){
  // insert code here
  var shObj = SharedObject.get("foo", true);
  propName = cmd.name;
  shObj.getProperty (propName, cmd.newAddress);
}
```

The following example uses a proxied shared object. A proxied shared object resides on a server or in an application instance (called *master*) that is different than the server or application instance that the client connects to (called *proxy*). When the client connects to the proxy and gets a remote shared object, the proxy connects to the master and gives the client a reference to this shared object. The following code is in the main.asc file:

```
application.appStart = function() {
     nc = new NetConnection();
     nc.connect("rtmp://" + master_server + "/" + master_instance);
     proxySO = SharedObject.get("myProxy",true,nc);
     // Now, whenever the client asks for a persistent
     // shared object called myProxy they will receive myProxy
     // shared object from the master_server/master_instance
}
```

SharedObject.getProperty

Availability

Flash Communication Server MX.

Usage

mySharedObject`.getProperty(`*name*`)`

Parameters

name The name of the property in the shared object.

Returns

The value of a SharedObject property.

Description

Method; retrieves the value of a named property in a shared object. The returned value is a copy associated with the property, and any changes made to the returned value do not update the shared object. To update a property, use the `SharedObject.setProperty` method.

Example

The following example gets the value of the `name` property and passes it to the `value` variable:

```
value = sharedInfo.getProperty(name);
```

See also

`SharedObject.setProperty`

SharedObject.getPropertyNames

Availability

Flash Communication Server MX.

Usage

```
mySharedObject.getPropertyNames()
```

Parameters

None.

Returns

An array containing all the property names of a shared object.

Description

Method; enumerates all the property names for a given shared object. This method returns an array of strings that refer to the current properties.

Example

This example calls `getPropertyNames` on the `sharedInfo` shared object and places the names into the `names` variable. It then enumerates those property names in a `for` loop.

```
myInfo = SharedObject.get("foo");
var addr = myInfo.getProperty("address");
myInfo.setProperty("city", San Francisco");
var names = sharedInfo.getPropertyNames();
for (x in names){
  var propVal = sharedInfo.getProperty(names[x]);
  trace("Value of property " + names[x] + " = " + propVal);
}
```

SharedObject.handlerName

Availability

Flash Communication Server MX.

Usage

```
SharedObject.onBroadcastMsg = function([p1, ..., pN]){
  // insert code here
};
```

Parameters

p1, ..., pN Optional parameters passed to the handler method if the message contains user-defined parameters. These parameters are the user-defined JavaScript objects passed to the `SharedObject.send` method.

Returns

Any return value is ignored by the server.

Description

Event handler; a placeholder for a property name (`onBroadcastMsg` in the Usage example above) that specifies a function object that is invoked when the shared object receives a broadcast message whose method name matches the property name.

The `this` keyword used in the body of the function is set to the shared object instance returned by `SharedObject.get`.

If you don't want the server to receive a particular broadcast message, do not define this handler.

Example

The following example defines a handler function called `broadcastMsg`:

```
var mySO = SharedObject.get("userList", false);
mySO.broadcastMsg = function(msg1, msg2){
    trace(msg1 + " : " + msg2);
}
```

SharedObject.lock

Availability

Flash Communication Server MX.

Usage

```
SharedObject.lock()
```

Parameters

None.

Returns

An integer indicating the lock count: 0 or greater indicates success, -1 indicates failure. For proxied shared objects, always returns -1.

Description

Method; locks the shared object instance. This method gives the server-side script exclusive access to the shared object; when the `SharedObject.unlock` method is called, all changes are batched and one update message is sent to all the clients subscribed to this shared object. If you nest the `SharedObject.lock` and `SharedObject.unlock` methods, make sure there is an `unlock` for every `lock`; otherwise, clients are blocked from accessing the shared object.

You cannot use the `SharedObject.lock` method on proxied shared objects.

Example

This example locks the `myShared` shared object, executes the code that is to be inserted, and then unlocks the object:

```
var myShared = SharedObject.get("foo");
myShared.lock();
// insert code here that operates on the shared object
myShared.unlock();
```

SharedObject.name

Availability

Flash Communication Server MX.

Usage

```
SharedObject.name
```

Description

Property (read-only); the name of a shared object.

Example

This example outputs `foo` to the NetConnection Debugger:

```
mySO = SharedObject.get("foo");
trace(mySO.name);
```

SharedObject.onStatus

Availability

Flash Communication Server MX.

Usage

```
SharedObject.onStatus = function(info) {
  // insert code here
};
```

Parameters

`info` An information object. For more information, see the Appendix, "Client-Side Information Objects," in the *Client-Side Communication ActionScript Dictionary*.

Returns

Nothing.

Description

Event handler; reports errors, warnings, and status messages associated with either a local instance of a shared object or a persistent shared object.

Example

The following example defines an `onStatus` event handler for the shared object `soInstance`:

```
soInstance = SharedObject.get("foo", true);
soInstance.onStatus = function(infoObj){
  //Handle SO status messages
}
```

SharedObject.onSync

Availability

Flash Communication Server MX.

Usage

```
SharedObject.onSync = function(list){
  return;
};
```

Parameters

`list` An array of objects that contain information about the properties of a shared object that have changed since the last time the `onSync` method was called. The notifications for proxied shared objects are different than for shared objects that are owned by the local application instance. The following tables list the descriptions for each type of shared object.

Local shared objects

Code	Meaning
`change`	A property was changed by a subscriber.
`delete`	A property was deleted by a subscriber.
`name`	The name of a property that has changed or been deleted.
`oldValue`	The old value of a property. This is true for both `change` and `delete` messages; on the client, `oldValue` is not set for `delete`.

Note: Changing or deleting a property on the server side using the `SharedObject.setProperty` method always succeeds, so there is no notification of these changes.

Proxied shared objects

Code	Meaning
`success`	A server change of the shared object was accepted.
`reject`	A server change of the shared object was rejected. The value on the remote instance was not changed.
`change`	A property was changed by another subscriber.
`delete`	A property was deleted. This notification can occur when a server deletes a shared object or if another subscriber deletes a property.
`clear`	All the properties of a shared object are deleted. This can happen when the server's shared object is out of sync with the master shared object or when the persistent shared object migrates from one instance to the other. This event is typically followed by a `change` message to restore all the server's shared object properties.
`name`	The name of a property that has changed or been deleted.
`oldValue`	The old value of the property. This is only valid for the reject, change and delete codes.

Note: The `SharedObject.onSync` method is called when a shared object has been successfully synchronized with the server. The list object may be empty if there is no change in the shared object.

Returns

Nothing.

Description

Event handler; invoked when a shared object changes. You should set this method to point to a function you define in order to receive notification of changes made by other subscribers for shared objects owned by the local application instance. You should also set this method to get the status of changes made by the server as well as by other subscribers for proxied shared objects.

Example

The following example creates a function that is invoked whenever a property of the shared object `so` changes:

```
// create a new NetConnection object
nc = new NetConnection();
nc.connect("rtmp://server1.xyx.com/myApp");
// create the shared object
so = SharedObject.get("MasterUserList", true, nc);
// the list parameter is an array of objects containing information
// about successfully of unsuccessfully changed properties
// from the last time onSync() was called
so.onSync = function(list) {
  for (var i = 0; i < list.length; i++) {
    if (list[i].code == "success") {
      // deal with the success case
    } else if (list[i].code == "change"){
      // deal with the "change"
    } else if (list[i].code == "reject"){
      // deal with the "reject"
    } else if (list[i].code == "delete"){
      // deal with the "delete"
    } else if (list[i].code == "clear"){
      // deal with the "clear"
    }
  }
}
```

SharedObject.purge

Availability

Flash Communication Server MX.

Usage

`SharedObject.purge(`*`version`*`)`

Parameters

`version` A version number. All deleted data that is older than this version is removed.

Returns

Nothing.

Description

Method; causes the server to purge all deleted properties that are older than the specified version. Although you can also accomplish this task by setting the `SharedObject.resyncDepth` property, the `SharedObject.purge` method gives the script more control over which properties to delete.

Example

This example deletes all properties of the `myShared` shared object that are older than the value of `SharedObject.version - 3`.

```
var myShared = SharedObject.get("foo", true);
myShared.lock();
myShared.purge(myShared.version - 3);
myShared.unlock();
```

SharedObject.resyncDepth

Availability

Flash Communication Server MX.

Usage

```
SharedObject.resyncDepth
```

Description

Property; an integer that indicates when the deleted properties of a shared object should be permanently deleted. You can use this property in a server-side script to resynchronize shared objects and to control when shared objects are deleted. The default value is infinity.

If the current revision number of the shared object minus the revision number of the deleted property is greater than the value of `SharedObject.resyncDepth`, the property is deleted. Also, if a client connecting to this shared object has a client revision that, when added to the value of `SharedObject.resyncDepth` is less than the value of the current revision on the server, all the current elements of the client shared object are deleted and the valid properties are sent to the client and the client receives a "clear" message.

This method is useful when you add and delete many properties and you don't want to send too many messages to the Flash client. Suppose a client is connected to a shared object that has 12 properties and then disconnects. After that client disconnects, other clients that are connected to the shared object delete 20 properties and add 10 properties. When the client reconnects, it could, for example, receive a delete message for the 10 properties it previously had and then a change message on 2 properties. You could use `SharedObject.resyncDepth` to send a "clear" message, followed by a change message for 2 properties, which saves the client from receiving 10 delete messages.

Example

The following example resynchronizes the shared object `mySO` if the revision number difference is greater than 10:

```
mySo = SharedObject.get("foo");
mySo.resyncDepth = 10;
```

SharedObject.send

Availability

Flash Communication Server MX.

Usage

```
SharedObject.send(methodName, [p1, ..., pN])
```

Parameters

`methodName` The name of a method on a client shared object instance. For example, if you specify `doSomething`, the client must invoke the `SharedObject.doSomething` method, with all the *`p1, ..., pN`* parameters.

`p1, ..., pN` Parameters of any ActionScript type, including references to other ActionScript objects. These parameters are passed to the specified *`methodName`* when it executes on the Flash client.

Returns

A Boolean value of `true` if the message was sent to the client; `false` otherwise.

Description

Method; executes a method in a client-side script. You can use `SharedObject.send` to asynchronously execute a method on all the Flash clients subscribing to a shared object. The server does not receive any notification from the client on the success, failure, or return value in response to this message.

Example

This example calls the `SharedObject.send` method to execute the `doSomething` method in the client-side ActionScript and passes `doSomething` the string `"this is a test"`.

```
var myShared = SharedObject.get("foo", true);
myShared.send("doSomething", "this is a test");
```

The following example is the client-side ActionScript code that defines the `doSomething` method:

```
connection = new NetConnection();
connection.connect("rtmp://www.macromedia.com/someApp");
var x = SharedObject.getRemote("foo", connection.uri, true);
x.connect(connection);
x.doSomething = function(str) {
// process the str
};
```

SharedObject.setProperty

Availability

Flash Communication Server MX.

Usage

```
sharedInfo.setProperty(name, value);
```

Parameters

`name` The name of the property in the shared object.

`value` An ActionScript object associated with the property, or `null` to delete the property.

Returns

Nothing.

Description

Method; updates the value of a property in a shared object. A shared object property can be modified by another user of the shared object between successive calls to `SharedObject.getProperty` and `SharedObject.setProperty`. If you want to preserve transactional integrity, call the `SharedObject.lock` method before operating on the shared object; be sure to call `SharedObject.unlock` when the operations finish. If you don't call `SharedObject.lock` and the `SharedObject.setProperty` is called, the change is made to the shared object, and all subscribers of the object are notified before `SharedObject.setProperty` returns. If a call to the `SharedObject.lock` method precedes a call to `SharedObject.setProperty`, all changes are batched and sent when the `SharedObject.unlock` method is called.

If you call `SharedObject.setProperty` on the server side, it invokes a change message in the `SharedObject.onSync` method on the client side for any Flash Player client that is using the shared object. The *`name`* parameter on the server side is the same as an attribute of the `data` property on the client side. For example, the following two lines of code are equivalent: the first line is server-side ActionScript, and the second is client-side ActionScript:

```
sharedInfo.setProperty(nameVal, "foo");
clientSO.data[nameVal] = "foo";
```

Example

This example uses the `SharedObject.setProperty` method to create the property `city` with the value `San Francisco`. It then enumerates all the property values in a `for` loop and prints out the results in the Output window by using a `trace` action.

```
myInfo = SharedObject.get("foo");
var addr = myInfo.getProperty("address");
myInfo.setProperty("city", "San Francisco");
var names = sharedInfo.getPropertyNames();
for (x in names){
  var propVal = sharedInfo.getProperty(names[x]);
  trace("Value of property " + names[x] + " = " + propVal);
}
```

See also

`SharedObject.getProperty`

SharedObject.size

Availability

Flash Communication Server MX.

Usage

`mySharedObject``.size()`

Parameters

None.

Returns

An integer indicating the number of properties.

Description

Method; returns the total number of valid properties in a shared object.

Example

This example gets the number of properties of a shared object and assigns that number to the variable `len`:

```
var myShared = SharedObjecd.get(application, "foo", true);
var len = myShared.size();
```

SharedObject.unlock

Availability

Flash Communication Server MX.

Usage

mySharedObject.unlock()

Parameters

None.

Returns

An integer indicating the lock count: 0 or greater if successful, -1 otherwise. For proxied shared objects, this method always returns -1.

Description

Method; unlocks a shared object instance. This causes the script to relinquish exclusive access to the shared object and lets other clients update the instance. This method also causes the server to commit all changes made after the SharedObject.lock method is called and sends an update message to all clients.

You cannot use the SharedObject.unlock method on proxied shared objects.

Example

This example illustrates how easy it is to unlock a shared object.

```
var myShared = SharedObject.get("foo", true);
myShared.lock();
// insert code to manipulate the shared object
myShared.unlock();
```

See also

SharedObject.lock

SharedObject.version

Availability

Flash Communication Server MX.

Usage

SharedObject.version

Description

Property (read-only); the current version number of the shared object. Changes made to the shared object either by the Flash Player client or by the server-side script using the SharedObject.setProperty method increment the value of the version property.

Stream (object)

The Stream object lets you handle each stream in a Flash Communication Server application. A *stream* is a one-way connection between the Flash Player and the Flash Communication Server, or between two servers. The Flash Communication Server automatically creates a Stream object with a unique name when NetStream.play or NetStream.publish are called in a client-side script. You can also create a stream in server-side ActionScript by calling Stream.get. A user can access multiple streams at the same time, and there can be hundreds or thousands of Stream objects active at the same time.

You can use the property and methods of the Stream object to shuffle streams in a playlist, pull streams from other servers, and play and record streams.

You can create other Stream properties of any legal ActionScript type, including references to other ActionScript objects, for a particular instance of the Stream object. The properties are available until the stream is removed from the application.

For more information about streams, see the NetStream (object) entry in the *Client-Side Communication ActionScript Dictionary*.

Property summary for the Stream object

Property (read-only)	Description
`Stream.bufferTime`	Indicates how long to buffer messages before a stream is played.
`Stream.name`	The unique name of a live stream.

Method summary for the Stream object

Method	Description
`Stream.clear`	Deletes a stream previously recorded by the server.
`Stream.get`	Returns a reference to a Stream object. This is a static method.
`Stream.length`	Returns the length of a recorded stream in seconds. This is a static method.
`Stream.play`	Controls the data source of the Stream object.
`Stream.record`	Records all the data going into the stream.
`Stream.send`	Sends a call with parameters to all subscribers on a stream.
`Stream.setBufferTime`	Sets the length of the buffer time in seconds.

Event handler summary for the Stream object

Event handler	Description
`Stream.onStatus`	Called when there is a change in status.

Stream.bufferTime

Availability

Flash Communication Server MX.

Usage

```
Stream.bufferTime
```

Description

Property (read-only); indicates how long to buffer messages before a stream is played. This property applies only when playing a stream from a remote server or when playing a recorded stream locally.

A message is data that is sent back and forth between the Flash Communication Server and the Flash Player. The data is divided into small packets (messages), and each message has a type (audio, video, or data).

Stream.clear

Availability

Flash Communication Server MX.

Usage

```
Stream.clear()
```

Parameters

None.

Returns

A Boolean value of `true` if the call succeeds, `false` otherwise.

Description

Method; deletes a stream that uses previously recorded by the server.

Example

This example deletes a recorded stream called `foo`. Before the stream is deleted, the example defines an `onStatus` handler that uses two information object error codes, `NetStream.Clear.Success` and `NetStream.Clear.Failure`, to send status messages to the Output window.

```
s = Stream.get("foo");
if (s){
  s.onStatus = function(info){
    if(info.code == "NetStream.Clear.Success"){
      trace(info.description);
    }
    if(info.code == "NetStream.Clear.Failure"){
      trace(info.description);
    }
  };
  s.clear();
}
```

Note: The Stream information object is nearly identical to the client-side ActionScript NetStream information object. For more information, see the Appendix, "Server-Side Information Objects," on page 67.

Stream.get

Availability

Flash Communication Server MX.

Usage

```
Stream.get(name)
```

Parameters

name The name of the stream instance to return.

Returns

A reference to a stream instance.

Description

Method (static); returns a reference to a Stream object. If the requested object is not found, a new instance is created.

Example

This example gets the stream `foo` and assigns it to the variable `playStream`. It then calls the `Stream.play` method from `playStream`.

```
function onProcessCmd(cmd){
  var playStream = Stream.get("foo");
  playStream.play("file1", 0, -1);
}
```

Stream.length

Availability

Flash Communication Server MX.

Usage

`Stream.length(`*`name`*`)`

Parameters

`name` Name of a recorded stream.

Returns

The length of a recorded stream in seconds.

Description

Method (static); returns the length of a recorded stream in seconds. If the stream requested is not found, the return value is 0.

Example

This example gets the length of the stream `foo` and assigns it to the variable `streamLen`:

```
function onProcessCmd(cmd){
  var streamLen = Stream.length("foo");
  trace("Length: " + streamLen + "\n");
}
```

Stream.name

Availability

Flash Communication Server MX.

Usage

`Stream.name`

Description

Property (read-only); contains a unique string associated with a live stream. You can also use this as an index to find a stream within an application.

Stream.onStatus

Availability

Flash Communication Server MX.

Usage

```
myStream.onStatus = function([infoObject]) {
  // Insert code here
};
```

Parameters

infoObject An optional parameter defined according to the status message. For details about this parameter, see the Appendix, "Server-Side Information Objects," on page 67.

Returns

Nothing.

Description

Event handler; invoked every time the status of a Stream object changes. For example, if you play a file in a stream, `Stream.onStatus` is invoked. Use `Stream.onStatus` to check when play starts and ends, when recording starts, and so on.

Example

This example defines a function that executes whenever the `Stream.onStatus` event is invoked:

```
s = Stream.get("foo");
s.onStatus = function(info){
    // insert code here
};
```

Stream.play

Availability

Flash Communication Server MX.

Usage

```
Stream.play(streamName, [startTime, length, reset, remoteConnection])
```

Parameters

streamName The name of any published live stream or recorded stream.

startTime The start time of the stream playback, in seconds. If no value is specified, it is set to -2. If *startTime* is -2, the server tries to play a live stream with the name specified in *streamName*. If no live stream is available, the server tries to play a recorded stream with the name specified in *streamName*. If no recorded stream is found, the server creates a live stream with the name specified in *streamName* and waits for someone to publish to that stream. If *startTime* is -1, the server attempts to play a live stream with the name specified in *streamName* and waits for a publisher if no specified live stream is available. If *startTime* is greater than or equal to 0, the server plays the recorded stream with the name specified in *streamName*, starting from the time given. If no recorded stream is found, the `play` method is ignored. If a negative value other than -1 is specified, the server interprets it as -2. This is an optional parameter.

length The length of play, in seconds. For a live stream, a value of -1 plays the stream as long as the stream exists. Any positive value plays the stream for the corresponding number of seconds. For a recorded stream, a value of -1 plays the entire file, and a value of 0 returns the first video frame. Any positive number plays the stream for the corresponding number of seconds. By default, the value is -1. This is an optional parameter.

reset A Boolean value that flushes the playing stream. If *reset* is `false`, the server maintains a playlist, and each call to `Stream.play` is appended to the end of the playlist so that the next play does not start until the previous play finishes. You can use this technique to create a dynamic playlist. If *reset* is `true`, any playing stream stops, and the playlist is reset. By default, the value is `true`. This is an optional parameter.

remoteConnection A reference to a NetConnection object that is used to connect to a remote server. The requested stream plays from the remote server if this parameter is provided. This parameter is optional.

Returns

A Boolean value: `true` if the `Stream.play` call is accepted by the server and added to the playlist; `false` otherwise. The `Stream.play` method can fail if the server fails to find the stream or if an error occurs. To get information about the `Stream.play` call, you can define a `Stream.onStatus` handler to catch the play status or error.

If the *streamName* parameter is `false`, the stream stops playing. A Boolean value of `true` is returned if the stop succeeds; `false` otherwise.

Description

Method; controls the data source of a stream with an optional start time, duration, and reset flag to flush any previously playing stream. The `Stream.play` method also has a parameter that lets you reference a NetConnection object to play a stream from another server. The `Stream.play` method allows you to do the following:

- Chain streams between servers.
- Create a hub to switch between live streams and recorded streams.
- Combine different steams into a recorded stream.

You can combine multiple streams to create a playlist for clients. The server-side `Stream.play` method behaves a bit differently than the `NetStream.play` method on the client side. A `play` call on the server is similar to a `publish` call on the client. It controls the source of the data that is coming into a stream. When you call `Stream.play` on the server, the server becomes the publisher. Because the server has a higher priority than the client, the client is forced to unpublish from the stream if the server calls a `play` method on the same stream.

In general, if any recorded streams are included in a server playlist, you cannot play the server stream as a live stream.

Note: A stream that plays from a remote server by means of the NetConnection object is a live stream.

If you require a value to begin a stream, you may need to change the Application.xml file's "Enhanced seeking" flag at the server. "Enhanced seeking" is a Boolean flag in the Application.xml file. By default, this flag is set to `false`. When a play occurs, the server seeks to the closest video keyframe possible and starts from that keyframe. For example, if you want to play at time 15, and there are keyframes only at time 11 and time 17, seeking will start from time 17 instead of time 15. This is an approximate seeking method that works well with compressed streams.

If the flag is set to `true`, some compression is invoked on the server. Using the previous example, if the flag is set to `true`, the server creates a keyframe—based on the preexisting keyframe at time 11—for each keyframe from 11 through 15. Even though a keyframe does not exist at the seek time, the server generates a keyframe, which involves some processing time on the server.

Example

This example illustrates how streams can be chained between servers:

```
application.myRemoteConn = new NetConnection();
application.myRemoteConn.onStatus = function(info){
  trace("Connection to remote server status " + info.code + "\n");
  // tell all the clients
  for (var i = 0; i < application.clients.length; i++){
    application.clients[i].call("onServerStatus", null,
    info.code, info.description);
  }
};
// Use the NetConnection object to connect to a remote server
application.myRemoteConn.connect(rtmp://movie.com/movieApp);
// Setup the server stream
application.myStream = Stream.get("foo");
if (application.myStream){
  application.myStream.play("Movie1", 0, -1, true, application.myRemoteConn);
}
```

The following example shows `Stream.play` used as a hub to switch between live streams and recorded streams:

```
// Set up the server stream
application.myStream = Stream.get("foo");
if (application.myStream){
  // this server stream will play "Live1",
  // "Record1", and "Live2" for 5 seconds each
  application.myStream.play("Live1", -1, 5);
  application.myStream.play("Record1", 0, 5, false);
  application.myStream.play("Live2", -1, 5, false);
}
```

The following example combines different streams into a recorded stream:

```
// Set up the server stream
application.myStream = Stream.get("foo");
if (application.myStream){
  // Like the previous example, this server stream
  // will play "Live1", "Record1", and "Live2"
  // for 5 seconds each. But this time,
  // all the data will be recorded to a recorded stream "foo".
  application.myStream.record();
  application.myStream.play("Live1", -1, 5);
  application.myStream.play("Record1", 0, 5, false);
  application.myStream.play("Live2", -1, 5, false);
}
```

The following example uses `Stream.play` to stop playing the stream `foo`:

```
application.myStream.play(false);
```

Stream.record

Availability

Flash Communication Server MX.

Usage

`Stream.record(`*`flag`*`)`

Parameters

flag This parameter can have the value `record`, `append`, or `false`. If the value is `record`, the data file is overwritten if it exists. If the value is `append`, the incoming data is appended to the end of the existing file. If the value is `false`, any previous recording stops. By default, the value is `record`.

Returns

A Boolean value of `true` if the recording succeeds, `false` otherwise.

Description

Method; records all the data going through a Stream object.

Example

This example opens a stream `s` and, when it is open, plays `sample` and records it. Because no value is passed to the `record` method, the default value, `record`, is passed.

```
// To start recording
s = Stream.get("foo");
if (s){
  s.play("sample");
  s.record();
}
// To stop recording
s = Stream.get("foo");
if (s){
  s.record(false);
}
```

Stream.send

Availability

Flash Communication Server MX.

Usage

`Stream.send(`*`handlerName`*`, [`*`p1, ..., pN`*`])`

Parameters

handlerName Calls the specified handler in client-side ActionScript code. The *handlerName* value is the name of a method relative to the subscribing Stream object. For example, if *handlerName* is `doSomething`, the `doSomething` method at the stream level is invoked with all the *p1, ..., pN* parameters. Unlike the method names in `Client.call` and `NetConnection.call`, the handler name can be only one level deep (that is, it cannot be of the form *object/method*).

Note: Do not use a built-in method name for a handler name. For example, the subscribing stream will be closed if the handler name is `close`.

p1, ..., pN Parameters of any ActionScript type, including references to other ActionScript objects. These parameters are passed to the specified handler when it is executed on the Flash client.

Returns

A Boolean value of `true` if the message was sent to the client, `false` otherwise.

Description

Method; calls a method on all the clients subscribing to a stream. When you call `Stream.send` on the server side, any client publishing to that stream is stopped from publishing. Therefore, the best practice is to create a new stream before calling `Stream.send`. There should be one stream for every communication call in a Flash Communication Server application.

Example

This example calls the method `Test` on the client-side Stream object and sends it the string `"hello world"`:

```
application.streams["foo"].send("Test", "hello world");
```

The following example is the client-side ActionScript that receives the `Stream.send` call. The method `Test` is defined on the Stream object:

```
tStream.Test = function(str) {
  // insert code to process the str
}
```

Note: Only the subscriber can send messages on a stream. Therefore, if you use the `Stream.send` method on the server side to publish on a stream that is owned by a client, the server usurps the client's ownership of the stream and stops all play on that stream. Make sure that you safely own a stream before calling `Stream.send` on the server.

Stream.setBufferTime

Availability

Flash Communication Server MX.

Usage

```
Stream.setBufferTime()
```

Description

Method; increases the message queue length. When you play a stream from a remote server, the `Stream.setBufferTime` method sends a message to the remote server that adjusts the length of the message queue. The default length of the message queue is 2 seconds. You should set the buffer time higher when playing a high-quality recorded stream over a low-bandwidth network.

When a user clicks a seek button in an application, buffered packets are sent to the server. The buffered seeking in a Flash Communication Server application occurs on the server; the Flash Communication Server doesn't support client-side buffering. The seek time can be smaller or larger than the buffer size, and it has no direct relationship to the buffer size. Every time the server receives a seek request from the Flash Player, it clears the message queue on the server. The server tries to seek to the desired position and starts filling the queue again. At the same time, the Flash Player also clears its own buffer after a seek request, and the buffer is eventually filled after the server starts sending the new messages.

trace

Availability

Flash Communication Server MX.

Usage

```
trace("Hello world");
trace("Value of i = " + i);
```

Returns

Nothing.

Description

Method (global); displays the value of an expression in the Output window. The `trace` message is also published to the logs/application appname stream, which is available in the Administration Console or in the Communication App inspector. The values in the `trace` expression are converted to strings if possible before they are sent to the Output window. You can use the `trace` method to debug a script.

APPENDIX
Server-Side Information Objects

The Application, NetConnection, and Stream objects provide an `onStatus` event handler that uses an information object for providing information, status, or error messages. To respond to this event handler, you must create a function to process the information object, and you must know the format and contents of the information object returned.

You can define the following global function at the top of your main.asc file to display all the status messages for the parameters that you pass to the function. You need to place this code in the main.asc file only once.

```
function showStatusForClass(){
  for (var i=0;i<arguments.length;i++){
     arguments[i].prototype.onStatus = function(infoObj){
     trace(infoObj.code + " (level:" + infoObj.level + ")");
  }
}
showStatusForClass(Application, NetConnection, Stream)
```

For more information about information objects, see the appendix of the *Client-Side Communication ActionScript Dictionary*.

An information object has the following properties: `level`, `code`, `description`, and `details`. All information objects have `level` and `code` properties, but only some have the `description` and/or `details` properties. The following tables list the `code` and `level` properties as well as the meaning of each information object.

Application information objects

The following table lists the information objects for the Application object.

Code	Level	Meaning
`Application.Script.Error`	Error	The ActionScript engine has encountered a runtime error. In addition to the standard *`infoObject`* properties, the following properties are set: `filename`: name of the offending ASC file. `lineno`: line number where the error occurred. `linebuf`: source code of the offending line.
`Application.Script.Warning`	Warning	The ActionScript engine has encountered a runtime warning. In addition to the standard *`infoObject`* properties, the following properties are set: `filename`: name of the offending ASC file. `lineno`: line number where the error occurred. `linebuf`: source code of the offending line.

Code	Level	Meaning
Application.Resource.LowMemory	Warning	The ActionScript engine is low on runtime memory. This provides an opportunity for the application instance to free some resources or take suitable action. If the application instance runs out of memory, it is unloaded and all users are disconnected. In this state, the server will not invoke the Application.onDisconnect event handler or the Application.onAppStop event handler.
Application.Shutdown	Status	This information object is passed to the onAppStop handler when the application is being shut down.
Application.GC	Status	This information object is passed to the onAppStop event handler when the application instance is about to be destroyed by the server.

NetConnection information objects

The NetConnection object has the same information objects as the client-side NetConnection object.

Code	Level	Meaning
NetConnection.Call.Failed	Error	The NetConnection.call method was not able to invoke the server-side method or command.*
NetConnection.Connect.AppShutdown	Error	The application has been shut down (for example, if the application is out of memory resources and must shut down to prevent the server from crashing) or the server has shut down.
NetConnection.Connect.Closed	Status	The connection was closed successfully.
NetConnection.Connect.Failed	Error	The connection attempt failed.
NetConnection.Connect.InvalidApp	Error	The application name specified during the connection attempt was not found on the server.
NetConnection.Connect.Rejected	Error	The client does not have permission to connect to the application, or the application expected different parameters from those that were passed.**
NetConnection.Connect.Success	Status	The connection attempt succeeded.

* This information object also has a description property, which is a string that provides a specific reason for the failure.

** This information object also has an application property, which contains the value that the application.rejectConnection server-side method returns.

Stream information objects

The information objects of the Stream object are similar to those of the client-side NetStream object.

Code	Level	Meaning
NetStream.Clear.Success	Status	A recorded stream was deleted successfully.
NetStream.Clear.Failed	Error	A recorded stream failed to delete.
NetStream.Publish.Start	Status	An attempt to publish was successful.
NetStream.Publish.BadName	Error	An attempt was made to publish a stream that is already being published by someone else.

Code	Level	Meaning
NetStream.Failed	Error	An attempt to use a Stream method failed.*
NetStream.Unpublish.Success	Status	An attempt to unpublish was successful.
NetStream.Record.Start	Status	Recording was started.
NetStream.Record.NoAccess	Error	An attempt was made to record a read-only stream.
NetStream.Record.Stop	Status	Recording was stopped.
NetStream.Record.Failed	Error	An attempt to record a stream failed.
NetStream.Play.Start	Status	Play was started.**
NetStream.Play.StreamNotFound	Error	An attempt was made to play a stream that does not exist.
NetStream.Play.Stop	Status	Play was stopped.
NetStream.Play.Failed	Error	An attempt to play back a stream failed.* **
NetStream.Play.Reset	Status	A playlist was reset.
NetStream.Play.PublishNotify	Status	The initial publish to a stream was successful. This message is sent to all subscribers.
NetStream.Play.UnpublishNotify	Status	An unpublish from a stream was successful. This message is sent to all subscribers.

* This information object also has a `description` property, which is a string that provides a specific reason for the failure.

** This information object also has a `details` property, which is a string that provides the name of the streams being played. This is useful for multiple plays. The `details` property shows the name of the stream when switching from one element in the playlist to the next element.