Introducing Adobe® Media Server 5

Secure video experiences consistent across devices

By Lisa Larson-Kelley

Table of contents

The Adobe Media family of products revolutionizes media delivery, with support for secure, consistent streaming on the widest array of devices—tablets, mobile devices, IPTV, and the desktop. Deliver and now encrypt a single stream across multiple platforms and protocols, reaching iOS devices as well as platforms that support Flash technologies—so you can fully monetize your video, reaching the most people with the least hassle. Adobe Media Server (formerly Flash Media Server) continues to be the industry-leading solution for integrating streaming video and real-time communication with RTMP, RTMFP (peer-to-peer networking), HTTP Dynamic Streaming, and SIP support.

New content protection solutions

Providing content protection that is right for the situation, Adobe Media Server now supports enhanced stream encryption or more sophisticated protection with business rules applied through Adobe Access®. When simple content protection rules are needed, Protected HTTP Dynamic Streaming (PHDS) for Flash and AIR-based clients, and Protected HTTP Live Streaming (PHLS) for iOS enable easy, robust content encryption without an additional DRM license server. For mobile devices, Adobe Access or protected streaming can be used within AIR applications or native iOS applications.

Enhanced server management and media preparation

With the release of Adobe Media Server 5 software, customers benefit further from new features such as:

- More robust media origin services
- Advanced disk management for HTTP streaming
- Offline stream packaging
- Dynamic copy protection

Real-time data sharing, server-side plug-ins, logging, and monitoring APIs provide developers and IT teams with the tools they need to develop and administer rich media applications on a massive scale.

Adobe® Media Server 5 software provides a simplified HTTP publishing workflow that allows you to deliver video to iOS, AIR and Flash Player quickly and easily. Flexible delivery methods can save significant bandwidth costs and lighten network load. Enhancements in integrated real-time communication open up new business opportunities, with high quality voice and video capabilities providing access to a universe of SIP-enabled devices. From user-generated content to movies and television shows to corporate training and large-scale internal broadcasts, Adobe Media Server offers enterprise-level solutions for delivering content and communications. Improved performance and quality of service metrics enhance playback quality, while included prebuilt media players make deployment easier than ever.

This white paper outlines the powerful features of Adobe Media Server 5, explains protection options, introduces the various editions, and discusses the features available in each and how they can lower your total cost of delivery and simplify your content preparation workflows. You will learn about the multiple delivery protocols supported by Adobe Media Server, and gain the knowledge you need to make informed choices about how to deliver and monetize video and communication services to the largest online audience.

What's New in Adobe Media Server 5

Adobe Media Server 5 is a scalable, real-time media origin server that packages and delivers high quality (up to HD level), on-demand and live audio/video content with great efficiency and superior quality-of-service (QoS) to reach the largest possible audience, regardless of the client platform. It can deliver prerecorded video, live video, playlists, music, video blogging, video messaging, multimedia chat environments, real-time datacasting, multiuser gaming, and more, via multiple delivery protocols.

Adobe Media Server now streams securely to Apple iOS, Flash Player, and Adobe AIR across platforms, browsers, and devices, with multiple protocols available. Enhanced real-time communication now features SIP Gateway support in Flash Player and Adobe AIR, along with RTMP and RTMFP protocols.

Adobe Media Server 5 has many improvements and new features, including:

Expanded media streaming options

- Protected RTMP (pRTMP)
- 24/7 live streaming support
- Adobe Access key rotation and output protection (Adobe Access license required)
- Protected HTTP Dynamic Streaming for Adobe Flash and AIR (PHDS)
- Protected HTTP Live Streaming for Apple iOS (PHLS)
- Adaptive bitrate manifest support
- Multi-protocol manifest generator/pre-packaging tools (Flash and iOS)
- Adobe Access 4 DRM ready
- 608/708 closed captioning support

Enhanced communication features

- On-demand stream packaging for HTTP (Flash and iOS)
- Audio extraction for HLS (required for Apple App Store approval)
- SIP Gateway support with G711 coding in Flash Player
- High quality audio/video capture support
- Scalable P2P introduction services for Flash
- Multicast ingest and recording

Server platform

- Robust HTTP Media Origin services
- Advanced disk management for HTTP (Flash and iOS)
- Optimized Server configuration for live HDS
- Native 64-bit only

These improvements represent the continued evolution of Adobe Media Server, giving developers the advanced features they need to create effective rich media applications across platforms and devices. In addition, OSMF reduces the learning curve and speeds up your time to market.

Adobe Media Server 5 Family

There are four Adobe Media Server 5 editions available:

- Adobe Media Server 5 DevelopmentStarter (free from Adobe)
- Adobe Media Server 5 Standard
- Adobe Media Server 5 Professional
- Adobe Media Server 5 Extended

Adobe Media Server 5 Professional and Adobe Media Server 5 Extended can operate as either an origin or an edge server to distribute traffic load. Enhanced media origin services allow greater control over media publishing workflows for HTTP streaming to Adobe AIR, Flash Player and Apple iOS. For more details on origin and edge configurations, see the "Scaling the server" section of the Adobe Media Server 5 Technical Overview white paper (www.adobe.com/go/ams_techguide).

The following table provides a quick overview of supported features in each edition. Features supported in all editions are highlighted in bold.

Feature	Adobe Media Server 5 Extended	Adobe Media Server 5 Professional	Adobe Media Server 5 Standard	Adobe Media Server 5 Starter
HD live streaming				
24/7 Live streaming support using DRM key rotation	•	•	•	•
HTTP Live Streaming for iOS (HLS) ENHANCED	•	•	•	Limited to 10 min
Stream reconnect	•	•	•	•
Live stream metadata (data keyframes)	•	•	•	•
Live adaptive bitrate streaming (HTTP)	•	•	•	Limited to 10 min
Multicast ingest and recording NEW	•	•		•
Live 608/708 closed caption support NEW	•	•	•	•
High quality video capture	•	•	1 way only	•
Live stream splitting	•	•		•
Live adaptive bitrate streaming (RTMP)	•	•		Limited to 10 simultaneous connections
DVR functionality (HTTP)	•	•		Limited to 10 min
DVR functionality (RTMP)	•	•		•
Instant replay (RTMP)	•	•		•
Linear server playlists (VOD>live)	•	•		•
IP Multicast	•	•		Limited to 10 min
Application-level multicast	•	•		Limited to 10 min
Multicast fusion (peer assist)	•			Limited to 10 min
HD on-demand streaming				
Standalone offline packaging utilities (HDS and HLS)	•	•	•	•
Stream reconnect	Available in all versions of Adobe Media Server 5 to enable high quality streaming across the whole product offering			
In-buffering seeking (RTMP)				
Fast forward				
Slow motion				
Framestepping				
Back buffer for instant replay				
VOD adaptive bitrate streaming (HTTP)	•	•	•	Limited to 10 min
VOD 608/708 closed caption support NEW	•	•	•	•
VOD adaptive bitrate streaming (RTMP)	•	•	•	Limited to 10 simultaneous connections

Feature	Adobe Media Server 5 Extended	Adobe Media Server 5 Professional	Adobe Media Server 5 Standard	Adobe Media Server 5 Starter
Content Protection				
Offline packaging and encryption (HDS and HLS)	•	•	•	•
Protected RTMP (pRTMP) NEW	•	•	•	•
Protected HTTP Dynamic Streaming for Flash (PHDS) ENHANCED	•	•		Limited to 10 min
Protected HTTP Live Streaming for iOS (PHLS) ENHANCED	•	•		Limited to 10 min
Adobe Access 4DRM ready ENHANCED	•	•		•
Encrypted RTMP (RTMPe)	•	•	•	•
SWF verification	•	•	•	•
Adobe Access streaming	•	•	•	•
RTMFP (encrypted)	•	Limited to 500 peers		Limited to 50 peers
IP multicast (encrypted)	•	•		Limited to 10 min
Server platform and security				
64 bit Windows®, Linux only	•	•	•	•
White/Black list domains	•	•	•	•
IPV4, IPV6	•	•	•	•
C++ access control extensibility	•	•	Access C++ plug-in only	•
Pre-configured HTTP origin for HTTP Dynamic Streaming	•	•	•	•
LDAP Active Directory support	•	•		•
Scalable process scopes	•	•		•
RTMP edge caching	•	•		•
C++ file management extensibility	•	•		•
Quality of service				
Robust logging	•	•	•	•
Enhanced buffer control	•	•	•	•
Bandwidth detection	•	•	•	•
RTMP QoS (DiffServ)	Linux only	Linux only	Linux only	Linux only
Enhanced caching	•	•		•
Licensing				
Processor (CPU) limits	None	None	None	None
Bandwidth limits	None	None	None	None

Feature	Adobe Media Server 5 Extended	Adobe Media Server 5 Professional	Adobe Media Server 5 Standard	Adobe Media Server 5 Starter
Connection limits	• 25 SIP connections • 15,000 simultaneous RTMFP peers	• 5 SIP connections (development only) • 500 simultaneous RTMFP peers		• 10 simultaneous RTMP connections • 50 simultaneous RTMFP peers • 10 minutes of IP multicast • 10 minutes of HDS, HLS, pHDS, and pHLS • 5 SIP connections
Interactive programming				
Server-side record	•	•		•
Shared objects	•	•		•
Data push	•	•		•
Socket server ingest	•	•		•
Server proxy programming	•	•		•
Peer introduction forwarding	•	•		•
Peer-assisted networking (RTMFP)	Limited to 15,000 peers	Limited to 500 peers		Limited to 50 peers
Custom server-side programming	•	•		•
AMF3 support	•	•		•
Unified communications				
SIP gateway services	Limited to 25 simultaneous connections	Limited to 5 simultaneous connections		Limited to 5 simultaneous connections
VoIP	•	•		•
Webcam chat	•	•		•
RTMFP unicast	•	Limited to 500 peers		•
RTMFP peer introduction services	Limited to 15,000 peers	Limited to 500 peers		Limited to 50 peers
RTMFP object replication	•			Limited to 50 peers
RTMFP posting/directed routing	•			

The following sections explore the capabilities of each server to help you select the best solution for your specific application.

Adobe Media Server 5 Starter

Adobe Media Server 5 Starter enables developers to test and develop using the features of Adobe Media Server 5 Extended. Full functionality with a few connectivity limitations allows you to test drive features such as protected HTTP streaming, SIP gateway services, peer assisted networking, multicast fusion streaming, and new multicast ingest and recording. This free edition is available from www.adobe.com/go/tryadobemediaserver. It can be used in production for anyone who wants to implement basic low-volume streaming or social communication solutions. It has a capacity limit of 50 simultaneous inbound RTMP connections, 50 peer introductions, 30 minutes of IP multicast, 5 SIP ports, and 30 minutes of continuous HLS and HDS protected streaming.

Adobe Media Server 5 Standard

Adobe Media Server 5 Standard is an economical solution that enables you to start streaming live and on demand content quickly and easily to a wide variety of platforms and devices, including iOS. It provides all the features you need to stream video and audio, and works in unison with the Adobe Flash Media Live Encoder to stream live video. This edition is ideal for:

- Basic video on demand (VOD) and live streaming
- Publishers who wish to simplify their content preparation workflow
- Small to medium-size businesses that want to implement training or broadcast
- Bloggers who want to broadcast live or on-demand streams
- Videographers who need to allow clients to securely view their videos on the web
- Company-wide video messages
- Website owners who want to embed and protect high-quality streaming video
- One-way, secure video streaming

Adobe Media Streaming Server 5 ships with three services that make it easy to start streaming right out of the box:

Live video streaming—The included live video RTMP streaming application allows you to start publishing live video right away. It works with the Adobe Flash Media Live Encoder for live stream capture. You can use Flash Media Playback, Strobe Media Playback, and custom OSMF-based players for to play the streams.

Video on demand—The standard RTMP VOD application features server-to-client bandwidth detection, domain-based authentication, full support for Flash Media Playback and custom OSMF-based players. The server ships with sample media files for testing.

HTTP Live Packager—The HTTP Live Packager (livepkgr) application ingests streams, such as from Flash Media Live Encoder, packages them into fragments, and delivers the fragments to clients in real-time.

Both the live and VOD applications support the stream data access feature in Flash Media Server 3 and later (all editions), which allows you to access the bitmap data of a stream. This feature has a myriad of uses, such as taking snapshots from a webcam feed or creating thumbnails or video previews dynamically.

Adobe Media Server 5 Professional

Take advantage of even greater levels of content protection across more devices with Protected HTTP streaming – which takes advantage of Adobe Access 4 (a separate server purchase) – and deliver rich interactive experiences with added peer assisted networking support. Enhance your applications with custom functionality, record streams, utilize remote shared objects, leverage peer assisted networking, and access additional scalability features.

Adobe Media Server 5 Professional offers powerful network efficiencies with support for IP multicast, RTMFP, HTTP Dynamic Streaming for the Flash platform, and HTTP Live Streaming for Apple iOS. Automated packaging enables delivery to iOS, Flash Player 10.1 enabled browsers and devices, and AIR with no additional workflow complexity. This edition provides consistent, secure interactive playback experiences and real-time communication across the broadest range of platforms and devices. It is ideal for:

- Medium to large businesses that can benefit from flexible delivery methods
- Publishers who wish to simplify their content preparation workflow, with enhanced DRM protection
- Social media companies requiring multiuser experiences
- Companies that need to maximize delivery capacity while minimizing network costs
- Large-scale deployment
- Developing custom video solutions, including stream recording and DVR functionality
- Developing communication experiences

- Supplementing live or on-demand video streaming services with interactive features

Adobe Media Server Professional lets you include value-added multi-way solutions to help you socialize your streaming media with advanced real-time communication and collaboration services. It's the only high-performance and scalable server on the market that supports multi-way applications, including webcam video chat, recording, VoIP, and online games. Adobe Media Server Professional is the workhorse of the Adobe Media family, and even features support for peer assisted networking (RTMFP).

Adobe Media Server Professional can also be used to interact with specialty data servers such as LDAP for authentication, Simple Object Access Protocol (SOAP), or XML, and integrates with Adobe Flash Media Live Encoder. For even more customization, you can also implement custom server-side ActionScript and develop plug-ins in C++ that further extend the functionality of the server.

In addition to the features in the Adobe Media Server Standard edition, Adobe Media Server 5 Professional includes additional streaming and communication features such as:

- Application-level multicast
- IP multicast broadcast
- Multicast Fusion (for more information, see the "Benefits of Each Delivery Method" section later in this document)
- Scalable RTMFP peer introduction and routing services for Flash (500 peers)
- Protected HTTP streaming for Apple iOS, Android, Flash Player, and Adobe AIR.
- Scalability with Edge caching

Adobe Media Server 5 Extended

Adobe Media Server 5 Extended provides maximum reach with minimum network load through peer assisted networking support. Adobe Media Gateway functionality is integrated with this edition enabling connection between Flash and SIP-enabled devices. Designed to use the network more efficiently for large-scale media delivery and real-time communication, Adobe Media Server 5 Extended is ideal for:

- Large broadcasters who want to reach the widest audiences with protected content, including Apple iOS
- Large enterprises with large global networks
- Massive social media applications
- VoIP services that want to integrate traditional calls with Flash applications
- Companies that need to maximize delivery capacity while minimizing network costs
- Large enterprises with media requirements over multiple locations and networks
- Customer-facing marketing (such as press conferences or product demos)
- Enterprises that want complete control over their media delivery
- Companies that want to reach the widest range of platforms and devices and automate content preparation

In addition to the features in other editions, Adobe Media Server 5 Extended includes advanced streaming and communication features such as:

- Support for SIP-enabled devices (25 connections)
- Scalable RTMFP peer introduction and routing services for Flash Player and AIR (15,000 peers)

Multiprotocol Delivery

Adobe's traditional streaming protocol, RTMP, has served and protected millions of hours of video and enabled revolutionary interactive experiences. Adobe Media Server 5 introduces support for an even wider range of delivery protocols and formats, providing a consistent, secure playback experience across platforms and devices.

Video delivery and consumption is becoming increasingly fragmented and complex, with clients of differing protocols, screen sizes, and processor capabilities. Delivering video with Adobe Media Server reduces the complexity of media publishing, offering the publisher a very simple workflow to publish and encrypt video across Apple iOS, Android, connected TVs, and the desktop. With on demand packaging that will automatically convert streams for HTTP delivery, you can depend upon consistent codec support, protection, and a high-quality experience regardless of the device or platform.

The following table outlines supported transport protocols, delivery methods, and associated server versions.

Transport Protocol	Delivery Method	Adobe Media Server Standard	Adobe Media Server Professional	Adobe Media Server Extended	Adobe Media Server Starter
RTMFP	Unicast		Limited to 500 peers	●	Limited to 50 peers
	Native IP multicast		●	●	Limited to 30 min
	Peer-assisted (application-level multicast)		●	●	Limited to 30 min
	Multicast fusion		●	●	Limited to 30 min
	Multicast ingest and recording		●	●	●
HTTP	Progressive download	●	●	●	●
	HTTP Dynamic Streaming (HDS)	●	●	●	Limited to 30 min
	HTTP Live Streaming for Apple iOS (HLS)	●	●	●	Limited to 30 min
	Protected HTTP Dynamic Streaming (pHDS) for Flash Player and AIR		●	●	Limited to 30 min
	Protected HTTP Live Streaming (pHLS) for Apple iOS ENHANCED		●	●	Limited to 30 min
RTMP	pRTMP	●	●	●	●
	RTMP	●	●	●	●
	RTMPE	●	●	●	●
	RTMPT	●	●	●	●
	RTMPS (SSL)	●	●	●	●

The Flash Platform for video delivery

Flash Player has evolved along with Adobe Media Server. With Flash Player 10.3 and later, the client runtime supports an array of new video-related features. Coupled with Adobe Media Server 5, the Flash Platform now has the ability to stream video and enables communications to more screens than ever before. You can achieve maximum reach with the ubiquitous Flash Player in the browser, Flash Player 10.1 on select devices, and Adobe AIR on the desktop and devices.

Introduced in Flash Player 10.3, Media Measurement for Adobe® Flash® allows companies to measure video usage more easily. Get real-time, aggregated reporting of how video content is distributed, what the audience reach is, and how much video is played. With Adobe Flash Player 10.3 and Adobe SiteCatalyst®, powered by Omniture®, developers can implement video analytics for websites with as little as two lines of code. Analytics solution providers can use a set of new open APIs to easily implement consistent video analytics regardless of implementation or delivery protocol.

Flash Player 11 and AIR 3 now support major video enhancements, including multi-threaded video decoding and H.264/AVC video encoding. Multi-threaded video decoding enables improved playback performance and increased frame rates of high bitrate content, for both live streaming and real-time video chats on Windows, Mac OS, and Linux. Enjoy higher-quality video capture with H.264/AVC video encoding right in the browser.

Recent audio enhancements include G.711 audio compression for SIP Gateway communication in Flash Player 11 and later, and acoustic echo cancelation in the desktop version of Flash Player 10.3 and later. Support interoperability with legacy phone systems via the Adobe Media Gateway (AMG) and other third-party clients (through the open RTMP protocol) without the need for transcoding. Create real-time online collaboration experiences with high-quality audio, such as telephony, in-game voice chat, and group conferencing applications for desktop PCs. Developers can take advantage of acoustic echo cancellation, noise suppression, voice activity detection, and automatic compensation for various microphone input levels. End users will be able to experience higher quality audio, facilitating smoother conversation flow, without using a headset.

Adobe Media Server support for versions of Adobe Flash Player

Features	Versions 8 and 9	Versions 9,0,115,0	Version 10	Version 10.1	Version 10.2	Version 10.3	Version 11
G.711 audio compression for telephony (SIP Gateway support) NEW							•
H.264/AVC software encoding for cameras NEW							•
Multi-threaded video decoding NEW							•
Protected HTTP Dynamic Streaming (pHDS) NEW						•	•
Media Measurement (desktop only)						•	•
Acoustic echo cancellation (desktop only)						•	•
IP Multicast				•	•	•	•
HTTP Dynamic Streaming				•	•	•	•
RTMFP Groups				•	•	•	•
RTMFP			•	•	•	•	•
Multicast fusion				•	•	•	•
Adobe Access Protection				•	•	•	•
Stage Video GPU hardware acceleration (including Mac support)				•	•	•	•

Features	Versions 8 and 9	Versions 9,0,115,0	Version 10	Version 10.1	Version 10.2	Version 10.3	Version 11
Stream Reconnect/Buffer access/Trick modes (fast forward, rewind, back buffer)				•	•	•	•
Sorenson Video (H.263) with Nellymoser audio—play and capture	•	•	•	•	•	•	•
On2 VP6 video codec: play only	•	•	•	•	•	•	•
H.264 and High Efficiency AAC: play only		•	•	•	•	•	•
RTMPE / RTMPTE		•	•	•	•	•	•
SWF Verification		•	•	•	•	•	•
Limited GPU hardware acceleration		•	•	•	•	•	•
Multicore support		•	•	•	•	•	•
Smart buffering (in-buffer seeking)		•	•	•	•	•	•
RTMP Dynamic Streaming (Adaptive Bitrate)			•	•	•	•	•
XMP metadata			•	•	•	•	•
Speed audio codec			•	•	•	•	•

Flash Player support in versions of Adobe AIR

	Flash Player 9	Flash Player 10	Flash Player 10.1	Flash Player 10.3	Flash Player 11
AIR 1.0	•				
AIR 1.5	•	•			
AIR 2.0	•	•	•		
AIR 2.5	•	•	•		
AIR 2.7	•	•	•	•	
AIR 3.0	•	•	•	•	•

Adobe AIR (version 1.0 or later) for playback clients

Adobe AIR is a cross-operating system runtime that enables you to use your existing HTML, Ajax, Flex, or Flash web development skills and tools to build and deploy rich Internet applications (RIAs) across platforms and devices—including Android™, BlackBerry®, iOS devices, personal computers, and televisions.

Adobe AIR applications support native operating-system integration, including clipboard and drag-and-drop support, local file input and output, and system notification. AIR applications can connect to Adobe Media Server to stream audio and video or share data, just as SWF files do. Adobe Access content protection is supported as well.

Adobe AIR 3 compatibility

	Adobe AIR 3
Flash Player 11 features	•
Open Source Media Framework	• (External plug-ins not supported)
Adobe Access 4 Integration	•

For more information about Adobe AIR visit http://www.adobe.com/products/air/. For details about supported desktop and mobile operating systems and specifications, see http://www.adobe.com/products/air/systemreqs/.

Delivery Methods

Adobe Media Server 5 supports delivery to Flash Player, AIR, and iOS clients. There are two supported methods for delivering video over the Internet to iOS:

- HTTP Live Streaming (HLS)
- Protected HTTP Live Streaming for (PHLS)

There are seven methods for delivering video over the Internet to Adobe Flash Player and AIR clients:

- Embedded video
- HTTP progressive download
- RTMP streaming (pRTMP, RTMPe, RTMPS, RTMPT)
- HTTP Dynamic Streaming (HDS) for the Flash Platform
- Protected HTTP Dynamic Streaming (PHDS)
- Multicast streaming (native IP multicast, application-level multicast, multicast fusion)

Although this section focuses on delivering video files, these same methods can be used to deliver audio-only experiences.

Embedded video adds video directly to a SWF file and is used for very specialized applications with low-quality, short video clips.

In both progressive download and streaming delivery, the video content is external to the SWF file. To deploy on-demand video content to the web, the SWF file and the video files are uploaded to a server.

Keeping the video external and separate from the video player offers a number of benefits over the embedded video method:

- High quality experiences with multi-bitrate
- Protected experiences
- Reduced client memory usage
- Advanced streaming options that improve the experience, such as live video, enhanced seeking, large file support, and alternative delivery such as HTTP Dynamic Streaming
- Improved player performance overall
- Lower SWF size
- Faster playback startup time

HTTP Progressive download

Progressive download has been supported for video delivery since Flash Player 7 (released in 2004). This method allows developers to load external video files into a Flash Player or Flex interface and play them back during runtime. In this approach, the video is downloaded like any other file, and then played back. This can be accomplished using the ActionScript Video object, OSMF, or by setting parameters of feature-rich prebuilt players such as Strobe Media Playback, as shown in the following figure.

Adobe Media Server has a built-in Apache server with configurations that can make it very easy to transition from progressive download to streaming.

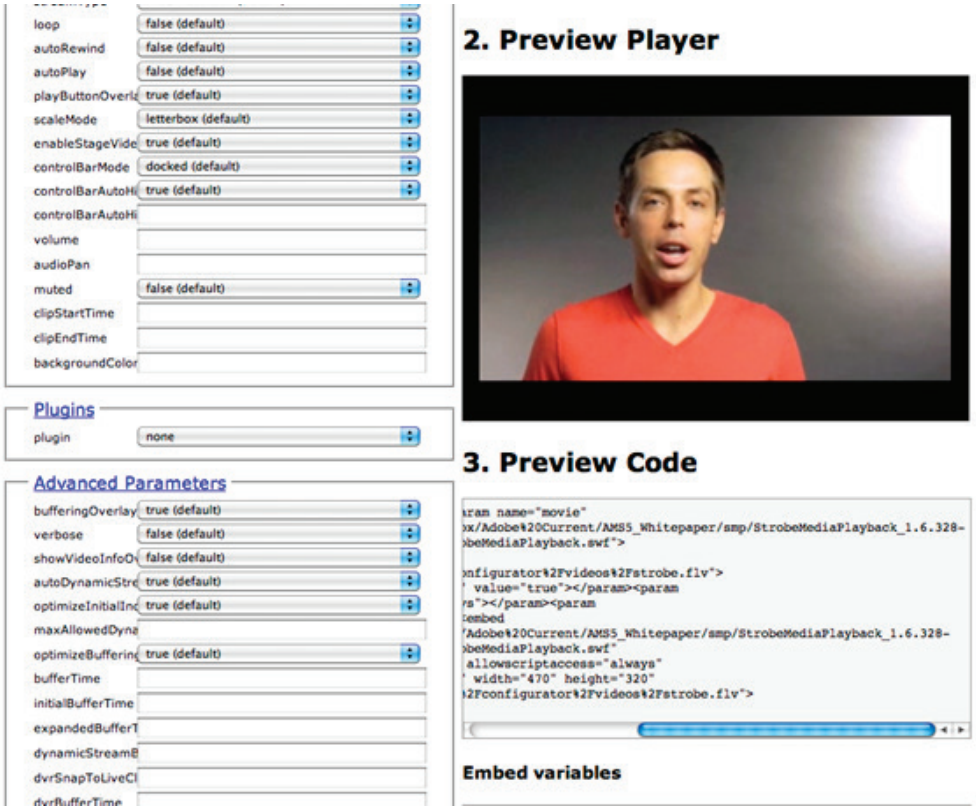


Figure 1

Strobe Media Playback is an open-source implementation of the Open Source Media Framework, offering support for set-level manifests and other OSMF 1.6 features. Configurable via ActionScript or flashvars.

With progressive download, when the video is played, the video file first begins to download to the user's hard drive, and playback starts when enough of it has been downloaded for buffering. The video file is served from a standard web server through an HTTP request, just like a regular web page or any other downloadable document.

In comparison to streaming video, progressive download has only one consistent benefit: You don't need a streaming server to deliver the video. It can be served from any typical web server.

While this can be convenient and potentially cost-effective, there are some potential issues:

- Limited seek and navigation capabilities
- Often the entire video file is downloaded, even if the viewer did not play back the entire file, wasting bandwidth
- Viewers can access and repurpose the content on the local hard disk.

When to choose progressive download

Progressive download is a good choice for hobbyists or websites that have low traffic requirements, if they don't mind their content being cached on a user's computer, they only need to deliver videos less than 3 minutes long, or their visitors cannot receive streaming video for some reason.

You should stream your video if you need to do the following:

- Take advantage of advanced features and control over video delivery
- Display higher quality video
- Deliver videos with long durations (more than 3 minutes)
- Deliver high volume
- Track and report usage or viewing statistics
- Offer viewers the best interactive playback experience.
- Avoid cache-raiding and content repurposing, due to the fact that progressive delivery leaves the video file in the browser cache.
- Deliver the highest quality possible with adaptive streaming.

Specific use cases for progressive delivery include:

- Publishers of short video clips, such as video blogs
- Publishers who don't need real-time content protection (Adobe Access can be used to protect content delivered via progressive delivery)
- Individuals or companies that have low-volume media delivery requirements

Streaming delivery also consumes less bandwidth than progressive delivery, because only the portion of the video that is watched is actually delivered.

RTMP streaming

The ability to stream video and audio was first available with Flash Player 6.

Publishers use video player applications such as Strobe Media Playback to deliver video. Strobe Media Playback supports RTMP streaming, HTTP Dynamic Streaming, and progressive download. Video files are stored external to the (Strobe) playback application SWF for these delivery methods. Plug-ins that enable simple integration with third-party APIs and add features such as in-stream advertising and analytics are available. Developers can use OSMF to take advantage of the latest Adobe Media Player features and further customize their player applications with ActionScript commands that extend functionality.

Flash Player manages streaming video in a similar way to progressive downloaded video. For example, video data is loaded into a video player application from an external source, is played back using NetStream class, and can be controlled via ActionScript. However, streaming video over RTMP requires a persistent connection to the server and cannot operate without a network connection. This connection provides additional benefits, including better memory management and no resident video files on the client computer.

This tight connection between the server and the client, and the server's ability to precisely control and deliver any portion of a stream as requested, enables the developer to take advantage of some advanced capabilities.

Large-scale live streaming—Creating webcast live or recorded events where all viewers access the same content at the same time.

QoS—Measuring and tracking the stream's quality of delivery and switching to a lower (or higher) bitrate stream if needed (for example, if network congestion increases).

Dynamic previews—Automatically generating thumbnails or playing short previews of your video clip without having to create separate images or video clips, and without downloading the entire video in the background.

Dynamic chapter navigation—Automatically creating "chapters" (with appropriate thumbnails) that can be used for navigation of longer videos, without having to break the video into smaller files.

Stream swapping—Seamlessly switching midstream from one camera angle or one stream to another.

On-the-fly editing—Piecing video clips together to create one continuous video for playback. For example, playing the first 10 seconds of clip 1, followed by the content between the 30- and 40-second marks of clip 2, followed by the last 20 seconds of clip 3.

Bandwidth detection—Determining the client bandwidth and serving a stream with an appropriate bitrate.

RTMP streaming benefits

RTMP streaming provides the publisher many more options for high-quality video and protected media delivery and interactive video experiences.

The advantages of streaming video from Adobe Media Server are numerous:

Real-time content protection—Simple workflow to encrypt and protect streams, with options to increase protection with Adobe Access file encryption.

Faster start—Fastest way to start playing any video on the web.

In-buffer seeking for fast response time—Instant seeking within the buffer with the new buffer access feature in Flash Player 10.1 and later.

Stream reconnect—Uninterrupted playback experiences when connectivity with the server is lost; play through the buffer while automatically reconnecting.

Simple content-protection workflows—Protect video with a wide range of solutions from encrypted RTMP (RTMPe) to Adobe Access encryption.

Low-latency live video—Deliver live video and audio from any connected webcam or DV camera, and even directly from some video cards, natively in Flash Player.

Advanced video control—Features such as bandwidth detection, QoS monitoring, automatic thumbnail creation, server-side playlists, and more.

Efficient use of network resources—Customers who pay for their video hosting or bandwidth by the number of bits that are transferred can reduce costs because only the bits that the client actually views are transferred.

More secure, protected media delivery—Because the media data is not saved to the client's cache when streamed, viewers can't retrieve the video or audio file from their temporary Internet file folder. Additional security features in Adobe Media Server 5 also prevent stream ripping and other risks.

Minimal use of client resources—Less memory and disk space used because the client doesn't need to download and store the entire file.

Tracking, reporting, and logging capabilities—Because progressive download is a simple download of a file, it's not easy to log relevant statistics such as how long the video was viewed, if the user navigated forward, backward, or paused the video, how many times the viewer played the video, if the viewer left the webpage before the video completed playing, and so on. Streaming enables you to easily capture this important data.

Full seek and navigation—Because viewers can seek to any point in the video and start playing immediately from that point, streaming is a great solution for longer-playing videos or uses such as video blogging, classroom lectures, and conference sessions, where viewers want to jump to a specific point rather than being required to watch from the beginning.

Deep interactivity—Streaming's precise control lets developers create extensive interaction in their video applications. For example, the ability to switch camera angles, have one video spawn another video, or seamlessly switch to alternate endings, are all enabled by streaming.

Video capture and record (Adobe Media Server Professional and Adobe Media Server Extended only)—Record video either in conjunction with the live stream, such as archiving an event, or on its own, such as video messaging.

Multiuser capabilities (Adobe Media Server Professional and Adobe Media Server Extended only)—In addition to live one-to-many streaming, Adobe Media Server enables multiuser streaming of audio, video, and data for the creation of video communication applications.

RTMP streaming and progressive download delivery methods are very similar to deploy. Streaming just gives the developer more power to create rich, interactive video applications. Flash Media Playback can be used for either delivery method. If more customization or the most current playback features are required, OSMF or Strobe Media Playback can be used.

Video publishers who have high-volume streaming needs, popular content, or critical uptime requirements but don't want to build their own infrastructure can get the benefits of streaming video in Flash Player by utilizing a content delivery network (CDN). These Adobe partners offer load-balanced, redundant deployment of Adobe Media Server over a reliable content-delivery network. For more information about cdn partners, visit www.adobe.com/go/ams_partners

When to choose RTMP streaming

You can use streaming with Adobe Media Server in situations where you need to do the following:

- Deliver files longer than 3 minutes or larger than 100Kbps
- Protect content in real time with RTMPe and SWF Verification, and PRMTP (with Adobe Media Server 5.1 Extended).
- Broadcast low-latency live streams
- Provide adaptive bitrate delivery, allowing you to deliver the best quality video for the available hardware and connection speed
- Monitor QoS
- Perform real-time tracking
- Integrate real-time data sharing and interactivity to your video experiences
- Stream live video and audio
- Record video and audio
- Serve more streams with less bandwidth
- Achieve massive scale delivery

If your website or blog relies heavily on video, audio, or real-time data sharing, you can give your user the best experience by using the features of Adobe Media Server. Examples of typical use cases for RTMP streaming include:

- Medium to large businesses that could benefit from complex deployment requirements such as edge, origin, C++, SSAS, ACL, or LDAP
- Social networks requiring real-time communication, such as video chat, VoIP, multiplayer games, or text chat alongside video content
- Educational institutions that want to create a virtual classroom or broadcast live, interactive experiences
- Government agencies that want to implement real-time communication or interactive training
- News broadcasters streaming live programming
- Podcasters who need to accurately measure viewership and interaction
- Sports broadcasters that want to enable DVR functionality
- Anyone seeking scalable, secure streaming with custom server-side application logic

HTTP Dynamic Streaming (HDS) for the Flash Platform [ENHANCED]

Flash Player 10.1 introduced support for HTTP Dynamic Streaming, enabling an adaptive-bitrate, protected streaming experience with common HTTP servers, caching devices, and networks. Functionality and performance are similar to RTMP streaming, but a streaming server is not required. Using a standard MPEG-4 fragment container format, HTTP Dynamic Streaming supports both live and on-demand media content that adjusts to the viewer's connection speed and processing power. It is compatible with standard HTTP protocol infrastructures that can scale efficiently and affordably.

A key enhancement in Adobe Media Server 5 is in the just-in-time packager, which now provides real-time packaging of content for HTTP streaming delivery from the same recording application. The Apache module (jithttp.module) efficiently handles the creation of fragments and manifests needed for both HTTP Dynamic Streaming and HTTP Live Streaming delivery simultaneously, enabling playback across a wide range of devices with a single media source. For PHDS/PHLS delivery, the fragments are now recorded unencrypted on disk, and then encrypted dynamically for HDS or HLS.

The following tools to process and deliver content via HTTP Dynamic Streaming are included in the Adobe Media Server 5 installation:

File Packager for VOD—Creates MP4-fragmented media (F4F) and the manifest file (F4M) from existing content encoded for Flash technology. The tool also optionally encrypts using Adobe Access. (in amsroot/tools)

Live Packager—Prebuilt service that converts any RTMP live stream into protected F4F files to create a streaming experience over HTTP. The tool also optionally encrypts using Adobe Access. (in amsroot/applications)

HTTP Origin Services built on Apache—The Apache web server has been preconfigured as an HTTP origin server, making it easy to serve F4F files to content delivery networks (CDNs) or your own HTTP infrastructure. (in amsroot/Apache2.2/modules)

Set-level F4M/M3U8 Generator (f4mconfig)—SWF file that assists in creating multi-level manifests for both HDS and HLS delivery. (in amsroot/tools)

Video players that are built using OSMF, such as Flash Media Playback and Strobe Media Playback, provide the player logic required to parse and play media sets and manifest files, request media, monitor QoS, and render playback. Strobe Media Playback supports the latest technologies such as multi-level manifests generated via the f4mconfig tool.

Benefits of HDS

HTTP Dynamic Streaming reproduces much of the functionality of RTMP delivery, providing the publisher a choice in delivery options. The primary benefit that HTTP offers is its ability to cache content, which is important for enterprise customers who deploy internal caching systems to optimize network usage to increase capacity of delivery over the public Internet without increasing cost (with optimized CDN configuration).

HTTP Dynamic Streaming can enable significant improvements over progressive delivery. Some of the benefits of HTTP Dynamic Streaming over HTTP progressive download include the following:

- Delivery cost reduction by using the Internet caching infrastructure
- Higher burstable capacity using standard CDN load-balanced networks and HTTP infrastructure caching
- Support for adaptive bitrate, DVR, and integrated content protection powered by Adobe Access on live streams
- Content protection throughout the distribution chain, closing some potential vulnerabilities
- Rapid, custom video player development through OSMF, which offers built-in logic and easy integration with advertising and analytics
- Bitrate throttling, adapting to available network and hardware capacity
- Saves bandwidth; ensuring that only what is watched is delivered
- More flexible media navigation, including enhanced seeking and start-anywhere

HTTP Dynamic Streaming considerations include:

- Flash Player 10.1 or later is required. For Flash Player penetration statistics, visit www.adobe.com/products/player_census/flashplayer/version_penetration.html.
- The F4F format is only compatible with HDS-compatible players or others that support the MPEG-4 fragment format. The same files cannot yet be delivered using RTMP streaming or progressive download.
- Additional workflow steps (i.e. real-time or pre-processing of fragments and manifests) are required to prepare content.
- Adobe Access 2 or later is required for content protection.
- Live streams experience increased latency when compared with RTMP streaming due to the media fragmen¬tation and encryption process before delivery.

When to choose HDS

Examples of use cases for HTTP Dynamic Streaming include the following:

- Adaptive streaming behind restrictive firewalls
- Massive-scale live broadcasting
- Enhanced seeking over standard HTTP connections
- Enterprise streaming on existing network infrastructure

HTTP Live Streaming for Apple iOS (HLS)

Flash Media Server 4.5 introduced support for streaming to Apple iOS devices such as iPhone and iPad via Apple's HTTP Live Streaming (HLS). HLS is simple to configure and requires no additional steps in your workflow. On demand and live streams are packaged when the user requests them, in the proper format for playback either natively in iOS or through HTML5 in the browser. If you wish to pre-process your files for HLS playback, a new tool included with Adobe Media Server 5 enables this, creating the required fragment and manifest files.

To use HLS to serve live streams to clients over HTTP, publish the streams to the HTTP Live Packager service on Adobe Media Server (rootinstall/applications/livepkgr). The livepkgr service ingests the streams, then the HLS module (mod_hlshttp) repackages the fragments into MPEG2-TS segments, and delivers them to iOS clients (via HLS). The Origin module (f4fhttp) delivers F4F fragments to Flash clients (via HDS). This is all done in real-time.

Benefits of HLS

With devices becoming more and more popular for media consumption, it is important for your content to be available on every device. Support for HLS packaging in Adobe Media Server 5 now enables you to reach those viewers using iOS without having to reencode your on demand content or create separate live streams.

When to choose HLS

Since no additional encoding steps are required, you can now easily deliver HLS streams alongside HDS and RTMP for full compatibility with every platform and device. Adobe Media Server even helps you comply with Apple App Store guidelines by producing the required audio-only file for each stream.

The HLS video stream can be played in HTML5 in the browser, or in a native iOS app written in Objective-C, or in AIR on iOS. When playing the streams using an HTML5 player, however, you will lose many features such as sophisticated interactivity, timed-text captioning, stream encryption, and other custom aspects you may have built into your Flash-based player application. Some of this interactivity can be rebuilt using JavaScript and HTML, but compatibility across browsers becomes an issue; for example, only Safari running on a Mac or on iOS will play HLS streams in HTML5. You can still protect your streams using file encryption with Protected HTTP Live Streaming (see following section) across all of these playback methods.

Examples of use cases for HLS include the following:

- Live streaming of events to devices
- On demand streaming to devices
- Adaptive streaming using a set-level variant playlist file

Protected HTTP streaming [ENHANCED]

Flash Media Server 4.5 introduced Protected HTTP Dynamic Streaming for Flash and AIR, enabling DRM protection without requiring a license server, and Protected HTTP Live Streaming for Apple iOS, enabling AES-128 wire protection (but no DRM support). It utilizes limited Adobe Access policies, built right into the server. Adobe Media Server 5 Professional and Extended now support this level of DRM protection for both HDS and HLS, for both on-demand and live streams. Protected HTTP streaming is an alternative to full-featured Adobe Access protection,

In addition to encrypting content for delivery to Flash Player and AIR, PHDS also supports SWF verification for HTTP Dynamic Streaming.

The real-time packaging process for on-demand and live Protected HTTP Streaming generates a license, embeds it in the DRM metadata, and delivers it with the media—eliminating the need for communication between the client and a License Server. This process is initiated when a player client requests the protected stream over HTTP; Adobe Media Server will then encrypt the fragments as they are sent and create the required license.

Benefits of Protected HTTP Streaming

What is unique about Adobe Media Server's approach is that the license is part of the video itself. This is a very scalable solution, since the keys are delivered and cached over HTTP. Encrypting your content with Protected HTTP Streaming is a relatively simple process, and it allows you to set specific viewing windows—even for offline playback and downloaded content. Content preparation tools are included with Adobe Media Server, giving you a straightforward workflow for delivering scalable protected content over HTTP to Flash, AIR, and iOS.

When to choose Protected HTTP Streaming

Examples of use cases for Protected HTTP Streaming include the following:

- Content supported by advertising
- Protected live broadcasts on the desktop and devices
- Protected live and on-demand playback on iOS
- Protected live and on-demand playback on the desktop in AIR
- Protected playback on Flash Player-enabled devices supporting Adobe Flash Player 11, or in-app playback in AIR on devices.

If your content requires more sophisticated DRM rules, you can also use Adobe Access 4 in conjunction with Adobe Media Server, for both HDS and HLS delivery.

Multicast streaming [ENHANCED]

Multicast streaming, introduced in Flash Player 10.1 and Flash Media Server 4, enables the distribution of NetStreams across peer-to-peer connections, and powers IP multicast over UDP. The stream can be audio, video, or even a data stream. Multicast is a network-efficient delivery method that uses existing multicast-enabled network hardware to deliver large internal broadcasts without overwhelming the network. The most common use case is live video, but it can be used to deliver on-demand video. Adobe Media Server ships with a Multicast configurator tool that assists in setting up multicast broadcasts.

Benefits over unicast (RTMP or HTTP)

Multicast can provide huge network efficiencies, dramatically reducing the use of bandwidth and server resources, resulting in lower total cost of delivery. It can also provide ultra-low latency for sharing video, audio, and data over networks enabled with multicast support. A major benefit is that RTMFP is an inherently secure protocol. It uses 128-bit DH keys for all communication and SHA256 hash of the client's DH key for peerIDs. For more information about RTMFP security, consult the following references:

- RTMFP FAQ: "How does RTMFP address security and end-user privacy?" http://www.adobe.com/products/adobe-media-enterprise/rtmfp-faq.html
- Best practices for real-time collaboration using Flash Media Server, by Joszef Vass (http://www.adobe.com/devnet/flashmediaserver/articles/real-time-collaboration.html)
- RTMFP sections in the Adobe Media Server 5 Developer's Guide.

When to choose multicast

Multicast is the obvious delivery solution for enterprise, especially those with networks enabled with multicast support. It can also be useful for multiplayer gaming, because it provides very low latency. Ultimately, it is useful for any application where multiple clients want to receive the same media at the same time, including:

- Inter-office videoconferencing
- Company-wide broadcasts
- Real-time financial or news tickers
- Medium to large companies that need to maximize delivery capacity while minimizing network costs
- Large enterprises with media requirements over multiple locations and networks

Key multicast concepts

Three types of multicast delivery are available:

- Application-level (P2P) multicast
- Native IP multicast
- Multicast fusion (An Adobe innovation that increases the quality, reach, and network efficiency of live video delivery.)

Application-level multicast, sometimes referred to as P2P multicast, provides an optimized stream distribution among peers, via RTMFP connections. This approach can be very cost-effective because the stream payload is distributed among the peers rather than taxing your servers and network. The original stream can be distributed either from a client or from Adobe Media Server. Application-level multicast can help reduce bandwidth costs for product marketing, user-generated content, or internal broadcasts. It is supported in Adobe Media Server Professional and Adobe Media Server Extended.

Native IP multicast enables businesses to use existing multicast-enabled networks to deliver large internal broadcasts without overwhelming the network. Adobe Media Server supports both SSM (source-specific) and ASM (any source) multicast. This approach is best for internal, enterprise, VPN, or LAN networks with multicast-enabled hardware in place.

Multicast fusion is an innovative combination of native IP and application-level multicast. Available in Adobe Media Server Professional and Adobe Media Server Extended, multicast fusion allows employees to receive live video via IP multicast and use those clients to help distribute to employees not connected to a multicast-enabled network. This approach is best for large organizations broadcasting both internally and externally. Figure 2 illustrates a multicast fusion deployment, where internal clients are receiving the stream via hardware-based Native IP multicast, and clients outside the network are receiving the stream via based Application-level multicast. The incoming live stream is published to Adobe Media Server over RTMP, and all clients are receiving streams over RTMFP. Notice that the clients are also communicating between each other, helping to share the load.

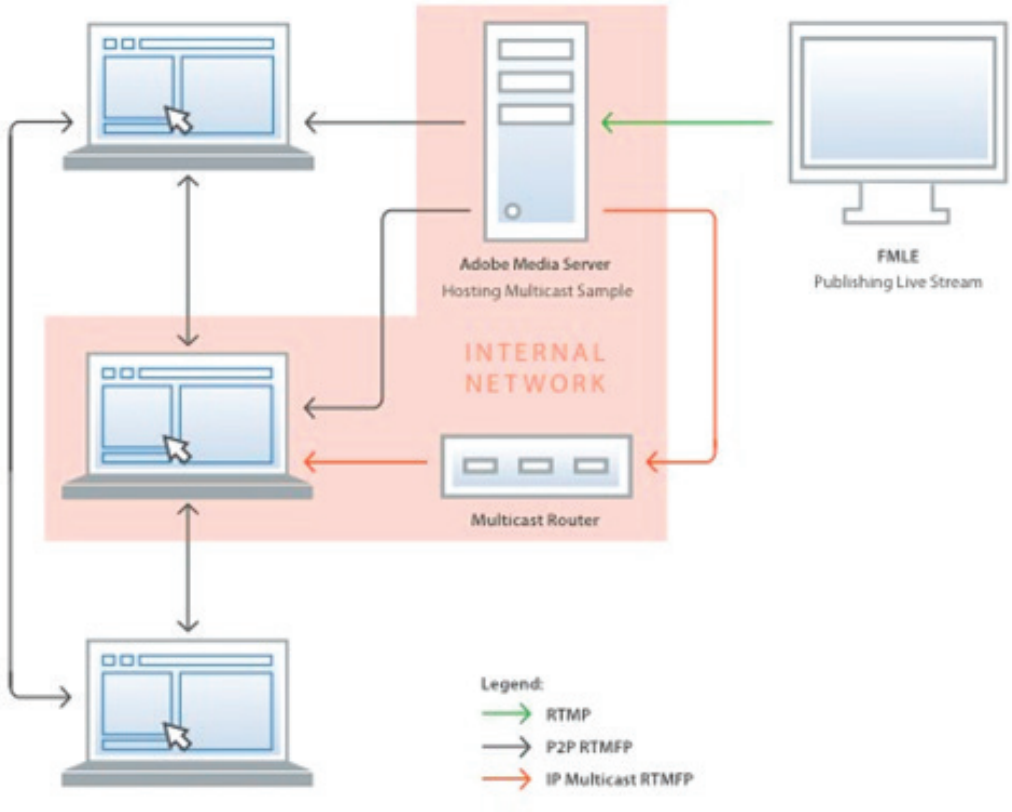


Figure 2
Multicast fusion overview

Adobe Media Server 5 ships with a Configurator tool that makes multicast publishing very simple. The tool lets you create an IP multicast, application-level multicast, or multicast fusion broadcast with the incoming stream being sent to the server via Flash Media Live Encoder. The Configurator generates a standard manifest (F4M) file that can be used with Flash Media Playback, Strobe Media Playback, or a custom OSMF player, so you can get started streaming high-quality video quickly.

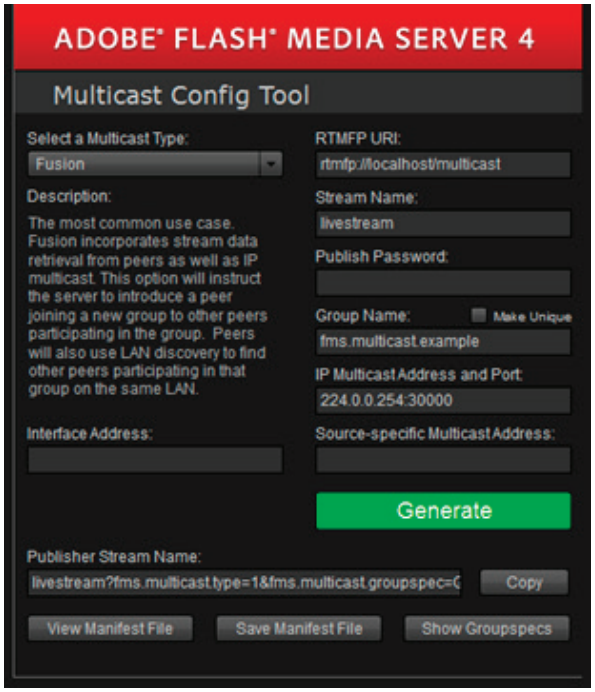


Figure 3
Multicast Configurator tool

RTMFP and peer-assisted networking [ENHANCED]

Adobe Media Server 5 enables peer introductions as well as support for the RTMFP Groups technology in Flash Player 10.1 and later. This technology reduces the demand for server bandwidth, opening up possibilities for new types of multiuser applications, such as video chat and other real-time media applications that may have been previously hindered by bandwidth costs. For more details about RTMFP Groups, see Peer-assisted networking using RTMFP groups in Flash Player 10.1, by David Hassoun and Jun Heider: http://www.adobe.com/devnet/flashmediaserver/articles/p2p_rtmfp_groups.html.

Peer-to-peer introductions enable Flash Player and AIR clients to establish a connection with other Flash/AIR clients to start sharing data and media over RTMFP. This introduction service, which had been available only via the Cirrus service (previously named Stratus), is now a feature of Adobe Media Server Professional and Adobe Media Server Extended. RTMFP Groups support is also available in both Adobe Media Server Professional and Adobe Media Server Extended.

Benefits of RTMFP and peer-assisted networking

The most significant benefit of peer-assisted networking is the offloading of network traffic from the server to the client, which results in significant bandwidth and infrastructure cost savings. While latency might be slightly higher than with RTMP streaming, it is lower than with HTTP Dynamic Streaming.

RTMFP Groups adds new posting and directed routing features to basic peer-assisted networking, allowing any client participating in a group to broadcast data to the rest of the group or even target a specific client. Object replication, another powerful feature of RTMFP Groups, allows all members of a group to maintain a consistent view of a potentially large set of objects. This provides low-latency data-sharing that can be used for applications such as social media and real-time games. The efficient topology of RTMFP Groups allows developers to achieve massive scale, because routing through a single peer or server cluster is not required.

Peer-assisted networking through Flash Player is a secure, managed communication solution. The client's peerID is generated as a SHA256 hash of their DH key, and is therefore guaranteed to be unique and available. For Internet-based applications, a server, such as Adobe Media Server or the Cirrus 2 service, is required to connect and authenticate clients for any communication to take place. After the clients have been authorized, data can be transmitted between peers via RTMFP, which is a 128-bit encrypted protocol. For additional security, RTMFP Groups can be configured to require authentication before allowing data to be posted to the group. Before allowing a P2P connection, Flash Player requests explicit authorization by the client.

When to use RTMFP and peer-assisted networking

RTMFP is a natural choice for real-time communication and streaming when massive scale is needed. It eliminates the need for huge server and network infrastructures to share large amounts of data. Examples of use cases include the following:

- Webcam chat rooms
- VoIP
- Live customer support
- Dating sites
- Company-wide communication
- Swarming file delivery (see http://en.wikipedia.org/wiki/Segmented_downloading)
- Massive multiplayer games

Key RTMFP concepts

RTMFP communication is based on User Datagram Protocol (UDP). It is always encrypted and can traverse NATs and firewalls. UDP supports a lossy transmission of data, which is useful for low-latency audio, video, and data delivery. RTMFP is a managed and controllable protocol that requires a server to always be present to perform client introductions and eliminate network probing. RTMFP has unique IP mobility functionality that allows a connection to be maintained even if the client changes networks, such as Wi-Fi networks or mobile towers. RTMFP can be used to support unicast communication as well as IP multicast and multicast fusion broadcasts.

Comparing RTMP and RTMFP

To clarify when it is best to use RTMFP rather than RTMP, it can be useful to examine their differences and similarities. The following figure illustrates the basic topology of RTMP, basic RTMFP peer-assisted networking, and RTMFP Groups.

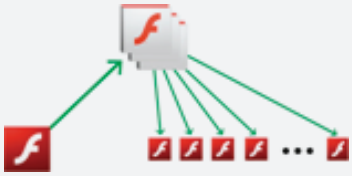
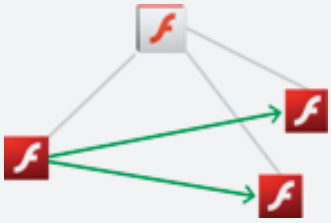
RTMP	RTMFP P2P Networking	RTMFP Groups
Traditional RTMP streaming and communication with unicast model	RTMFP in Flash Player 10.0 or Cirrus 1	RTMFP in Flash Player 10.1 or Cirrus 2
		
Traditional RTMP streaming requires a client to receive all data from a centralized server cluster. Scale is achieved by adding more servers.	First generation of RTMFP in Flash Player 10.0 supported rendezvous, with Flash Media Enterprise Server 4.5 for introduction services. Media was always sourced from the publishing peer.	Second generation of RTMFP supporting groups in Flash Player 10.1 and later, with Adobe Media Server 5 Extended for introduction services. Supports application-level multicast and reduces the load on the source publisher.

Figure 4

Evolution of media and communication delivery on the Flash Platform

Key differences between RTMP and RTMFP

RTMP is a unicast delivery method. It simply delivers streams from a server to individual connected clients. Unicast consumes a large amount of network resources. For example, a 1 MBps stream delivered to 1,000 clients requires 1GB upstream from the server, which is very CPU- and network-intensive.

While RTMFP does support unicast delivery, its benefit lies in its multicast support. Native IP multicast reduces the network load in the enterprise by distributing the data using customized network hardware. However, reducing network load in this way does require a hardware investment. Flash Media Server 4 introduced multicast fusion support, which eliminates this hardware investment by offloading the data delivery to peer-assisted networking, enabling clients consuming a stream to help distribute it to others on the network.

RTMP is based on Transmission Control Protocol (TCP), whereas RTMFP is based on UDP. TCP is lossless; each data packet is guaranteed to arrive in the same order it was sent. UDP has no ordering of packets and no guarantee that the data will arrive at all, which makes RTMFP more lightweight and faster but less reliable than RTMP. However, some routers do not allow UDP traffic, so it might be necessary for developers to fall back to RTMP.

RTMP is not encrypted by default, but it can be encrypted using RTMPe (128-bit) or RTMPS (SSL encrypted). RTMFP communication is always 128-bit encrypted. RTMP can utilize additional content protection, such as Adobe Access file encryption along with SWF verification.

Similarities between RTMP and RTMFP

Both RTMP and RTMFP can be used to deliver live and on-demand video, audio and data streams. They both provide low-latency real-time communication, powering applications such as videoconferencing, text chat, live broadcasts, multiplayer gaming, and live support. They both offer stream encryption.

Comparing video delivery methods

The following tables provide an at-a-glance reference to the various delivery methods available with Adobe Media Server, to help guide you to the best solution for your specific application.

Delivery comparison for video on demand

The following table compares the video delivery techniques for VOD with Adobe Media Server.

	Embedded Video	Progressive download	RTMP streaming	HTTP Dynamic Streaming for Adobe Flash (HDS)	HTTP Live Streaming for Apple iOS (HLS)	RTMFP
Mobile and devices	Not recommended because file sizes are large and hardware acceleration isn't available.	Flash Player 10.1 and later and AIR supported on a wide array of devices. Hardware acceleration available for optimal playback. H.264recommended.			MPEG-TS streaming format supported. H.264 required.	Flash Player 10.1 and later and AIR supported on a wide array of devices.
Adaptive bitrate	Not supported	Not supported	Enables bandwidth detection and bitrate switching over RTMP connections.	Enables bandwidth detection and bitrate switching over HTTP.	Enables bandwidth detection and bitrate switching over HTTP.	Enables bandwidth detection and bitrate switching over RTMFP connections.
Content protection	Not supported	Adobe Access support	Provides inherent protection because the video file is never cached. Additional options include: • Adobe Access encryption • Real-time protection with RTMPE • SWF verification	Protected HDS and Adobe Access support	Protected HLS	128-bit encryption
OSMF	Not supported	Use OSMF to build custom players or use prebuilt Flash Media Playback or Strobe Media Playback. Plug-in architecture enables easy extension of player features and integration with third-party APIs.	Use OSMF to build custom players or use prebuilt Flash Media Playback or Strobe Media Playback. Handles RTMP connection and supports adaptive bitrate delivery.	Recommended approach to implementing HTTP Dynamic Streaming. Use OSMF to build custom players or use prebuilt Flash Media Playback or Strobe Media Playback. Pass in manifest file URL. Supports adaptive bitrate delivery.	Not supported	Supports F4M multicast manifests

	Embedded Video	Progressive download	RTMP streaming	HTTP Dynamic Streaming for Adobe Flash (HDS)	HTTP Live Streaming for Apple iOS (HLS)	RTMFP
Encoding	Video and audio is encoded on import into Flash using a Sorenson Spark or VP6-E codec. Alternately, FLV files (encoded elsewhere) can be imported and placed on the Flash Timeline (re-encoding is not necessary).	Video files are encoded in either the built-in or standalone version of Adobe Media Encoder, through Adobe Media Encoder and a third-party nonlinear editing or encoding product, or using a standalone video encoding application such as Sorenson Squeeze or On2 Flix.	Same as progressive delivery. In addition, you can capture and record live video feeds from client-side webcams or DV cameras, or using Adobe Flash Media Live Encoder. Live encoding variables such as bitrate, frames per second, and video playback size, can be controlled program-matically.	File Packager prepares prerecorded media, and Live Packager prepares live RTMP streams. These utilities create MP4 fragment compliant files (F4F) and generate an XML-based manifest file (F4M).	iOS stream packager automatically creates media fragments (M2TS) and manifest file (M3U8) on demand when stream is requested by the client.	Same as progressive delivery. In addition, you can capture and record live video feeds from client-side webcams or DV cameras, or using Adobe Flash Media Live Encoder
SWF File Size	SWF files contain both video and audio data as well as the playback interface, resulting in a single, substantially larger file size.	SWF and video files are stored separately, resulting in a smaller SWF file size. Video delivered via progressive delivery is stored in memory and is not recommended for large video assets.	Same file size as progressive delivery.		N/A	Same SWF file size as progressive delivery.
Start Time	Large SWF files often require users to wait before the video starts playing, resulting in a negative user experience.	Starts relatively quickly after enough of the video has downloaded to begin playback.	Immediate. The fastest way to go from initial load to actually playing the video.	Quick start. Begins to play after the manifest file has been read and the first fragment data is received.		Quick start. Begins to play after the manifest file has been read, the peer connections have been made, and the first fragment data is received.

	Embedded Video	Progressive download	RTMP streaming	HTTP Dynamic Streaming for Adobe Flash (HDS)	HTTP Live Streaming for Apple iOS (HLS)	RTMFP
Timeline Access	When embedded in the Flash Timeline, video appears on individual frames and can be treated like any other object on the stage.	Video is played back only at runtime. Individual frames are not visible on the stage. Timeline events can be triggered at selected times during video playback using ActionScript.			N/A	Video is played back only at runtime. Individual frames are not visible on the stage.
Publishing	Each time the SWF is published or tested, the entire video file is republished. Changes to video files require manually reimporting the files into the timeline.	Video files are only referenced at runtime. Publishing SWF files is much faster than embedded video. Video files can be updated or modified without recompiling the SWF file.	Same as progressive delivery. You can dynamically pull video files from virtual locations, such as your storage area network (SAN), a FVSS, or other CDN.	Content must be packaged into F4F format. Manifest files can be updated with new F4F file information. Content is automatically packaged by Adobe Media Server. To update media, new files must be uploaded to Adobe Media Server and the servers' media cache must be cleared. Content can also be prepackaged using the file packaging utilities included with Adobe Media Server.	Content must be packaged into M3U8 format. Manifest files can be updated with new M2TS file information. Content is automatically packaged by Adobe Media Server. To update media, new files must be uploaded to Adobe Media Server and the servers' media cache must be cleared. Content can also be prepackaged using the file packaging utilities included with Adobe Media Server.	Same as RTMP streaming.
Frame Rate	Video frame rate and SWF movie frame rate must be the same.	The video file can have a different frame rate than the SWF file. Live video capture has programmable control over frame rate.			No restrictions on frame rate.	The video file can have a different frame rate than the SWF file.
Seek and navigation ability	The entire SWF file must be downloaded before user can seek or navigate the video.	User can only seek to portions of the video that have been downloaded.	User can seek anywhere at any time. New buffer controls enable smooth playback during reconnection if connection is lost. Instant replay and other advanced play functionality.		User can seek anywhere at any time.	User can seek anywhere at any time.

	Embedded Video	Progressive download	RTMP streaming	HTTP Dynamic Streaming for Adobe Flash (HDS)	HTTP Live Streaming for Apple iOS (HLS)	RTMFP
Content Delivery	The entire SWF file must be downloaded to the client via HTTP and loaded into memory to play back video.	Video files are progressively downloaded via HTTP, cached, and then played from the local disk. The entire video clip doesn't need to fit in memory.	Video files are streamed from Adobe Media Server via RTMP, displayed on the client's screen, and then discarded from memory in a play-as-you-go method.	Manifest and video fragment files are downloaded via HTTP, cached, and then played from the local disk. The entire video clip doesn't need to fit in memory.		Video files are streamed between clients via RTMFP, displayed on the client's screen, and then discarded from memory in a play-as-you-go method.
Playback Performance	Audio and video sync is limited. Sync between audio and video suffer after approximately 120 seconds of video. Total file duration is limited to available RAM on the playback system.	Improved performance over embedded SWF video with higher resolution and reliable audio synchroni-zation. Provides best image quality, which is limited only by the amount of available hard drive space on the playback system.	Improved efficiency from a network load perspective, with optimal bitrate delivery on an as-needed basis to as many customers as necessary.	Like RTMP streaming, optimal bitrate can be delivered. Network efficiencies of standard HTTP server and network hardware can potentially decrease overall cost of delivery.		Lightest load on the network, but can introduce some latency.
Compatibility	Flash Player 6 and later, including mobile devices	Flash Player 7 and later, including Flash-enabled mobile devices	Flash Player 6 and later, including Flash-enabled mobile devices	Flash Player 10.1 and later and AIR 2.0 and later, including mobile devices	HTML5, native iOS playback, or AIR	Flash Player 10.1 and later and AIR 2.0 and later, including mobile devices

Delivery comparison for live streaming

The following table compares the video delivery techniques available for live streaming with Adobe Media Server. Progressive download and embedded video do not support live streaming.

	Live RTMP streaming	Live HTTP Dynamic Streaming for Adobe Flash (HDS)	RTMFP IP multicast	RTMFP Application-level multicast	RTMFP Multicast fusion	HTTP Live Streaming for Apple iOS (HLS)
Video source	Adobe Media Live Encoder, local webcam or DV camera in Flash Player, or third-party encoder. Visit www.adobe.com/products/premiere/dvhdwrdb.html for compatible devices. Could also be a server-side VOD stream broadcast as live.					Adobe Media Live Encoder or third-party encoder.
Content protection	Provides inherent protection because the video file is never cached. Additional options include: oReal-time Adobe Access encryption oReal-time protection with RTMPE oSWF verification oRTMFP encrypted delivery	Media is cached; Protected HDS or Adobe Access 2 or later is required for protection.	RTMFP protocol is encrypted. Internal network is used. Adobe Access 2 or later supported.			Protected HTTP Live Streaming
Video player	Custom player applications, OSMF-based players (Flash Media Playback, Strobe Media Playback or custom) in Flash Player or AIR.					HTML5 or native iOS playback
Network hardware	Port 1935 and RTMP required. For caching, additional FMS servers are required.	Standard HTTP caching technology can be used. For media packaging, FMS is required at the ingest.	Multicast-enabled routers required. If WAN is not multicast-enabled, an additional FMS is required to replicate. UDP-enabled.	UDP-enabled with ports open. Network partitioning may be required to optimize data flow.	Both IP and application–level multicast requirements.	Standard HTTP caching technology can be used. For media packaging, FMS is required at the ingest.
Firewall Traversal	Good traversal. Port 80 tunneling available if needed.	Uses standard HTTP delivery protocol.	Internal network must be tuned to accept multicast traffic.	Might be restricted. RTMFP used to open P2P connection between clients.	Flexible firewall traversal. Uses P2P over RTMFP if network isn't configured for IP Multicast traffic	Uses standard HTTP delivery protocol.

	Live RTMP streaming	Live HTTP Dynamic Streaming for Adobe Flash (HDS)	RTMFP IP multicast	RTMFP Application-level multicast	RTMFP Multicast fusion	HTTP Live Streaming for Apple iOS (HLS)
Latency	Lowest latency	Higher latency due to real-time fragmenting process and inherent latency of HTTP delivery (vs. RTMP).	Latency of 5-8 seconds should be expected for multicast streams, based on network configuration and buffer settings.			Higher latency due to real-time fragmenting process (a minimum of 25 seconds should be expected).
Adaptive Bitrate	Dynamic Streaming enables bandwidth detection and bitrate switching over RTMP connections.	Dynamic Streaming enables bandwidth detection and bitrate switching over HTTP connections.	Not supported. Multicast supports delivery of a single stream only.			Adaptive bitrate streaming enables bandwidth detection and bitrate switching over HTTP connections.
DVR functionality	Supported. Pause and rewind live streams		Not supported.			Not supported.

Video Player Development

Unlike other video delivery technologies, which just present prebranded players to your viewers, Adobe Media Server 5 integrates with Flash Player, AIR, and even HTML5, allowing you to create completely customized playback interfaces.

Figure 5

The Open Source Media Framework simplifies video player development.

The Open Source Media Framework (OSMF) provides a standards-based structure for building custom video players, enabling developers to take advantage of the latest Flash Platform features and delivery methods without the heavy lifting of coding from scratch. If a simple branded player is all that is needed, Adobe Media Playback and Strobe Media Playback provide prebuilt solutions built on OSMF. Whether it's a totally custom player built on OSMF, or one of the prebuilt players, deploying full-featured playback applications is simpler than ever. For more information about OSMF, visit http://osmf.org.

Glossary

Adaptive bitrate—Using bandwidth detection and processor performance measurement to deliver the most appropriate bitrate stream to a client, switching between bitrates as needed during playback..

Adobe AIR—Cross-platformruntime that lets developers use their existing web development skills in HTML, Ajax, Flash technology, and Flex to build and deploy RIAs to the desktop.

Application-level multicast—Sometimes referred to as P2P multicast, this delivery method provides an optimized stream distribution among peers, which can result in a bandwidth cost-savings. Participating peers organize themselves into an overlay topology for data delivery. Each edge corresponds to a unicast path between two peers in the underlying Internet. All multicast-related functionality is implemented at the peers instead of at routers. The goal is to construct and maintain an efficient overlay for data transmission. The original stream can be distributed from a client or from Adobe Media Server. This is referred to as application-level because the multicast delivery is being enabled by Flash Player or AIR runtime, rather than hardware.

Bandwidth—Amount of throughput for a server or client computer. Usually measured in megabits per second (Mbps) or kilobits per second (kbps). A typical, wired Ethernet connection is 100Mbps, and Wi-Fi is 54Mbps. Server and client bandwidth limits determine how much video can be served or received.

Buffer—Amount of video stored in RAM on the client computer. The larger the buffer, the smoother the video plays back. The buffer is never written to disk.

Client—Consumer connecting to server via the Flash Player, AIR application, or iOS.

Codec—The compression algorithm used to encode a video or audio file. Flash uses the Sorenson Spark, On2 VP6-S, On2 VP6-E, or H.264 codec for video, and Nellymoser, MP3, AAC, or Speex for audio. Short for "code/decode," the decoding part must be present in the player to play back video using a specific codec.

Connection—When clients are streaming video, they consume one connection. Multiple clients streaming at the same time is referred to as simultaneous connections.

Content—Video, audio or data streamed from Adobe Media Server.

Content delivery network (CDN)—A company that offers streaming services and bandwidth so that customers do not need to set up and install their own servers.

Digital Rights Management (DRM)—Video encoded with DRM can be sold and protected against stealing and unauthorized sharing.

Encoder—Hardware or software that compresses or transcodes video from one format to another.

Enhanced RTMP (RTMPe)—Encrypted RTMP supported in Flash Player and AIR, that increases security and performance.

Flex—Cross-platform, open source framework for creating RIAs that run identically in all major browsers and operating systems via Flash Player/AIR.

Flash Media Live Encoder—Free desktop application for Windows and Mac OS that connects to Adobe Media Server and allows you to stream live video and audio to Flash Player, AIR, and iOS.

Flash Media Playback (FMP)—Based on Open Source Media Framework, FMP is a free, standard media player for the Adobe Flash Platform that is hosted by Adobe. It can be used by any website with only a few lines of HTML. Its extensible plug-in architecture enables easy integration with content delivery networks (CDNs) and advertising platforms, as well as support for analytics, additional third-party services, and the latest delivery methods. (For an open source, self-hosted version of Flash Media Playback, see Strobe Media Playback.) To get started go to: http://www.adobe.com/products/flashmediaplayback/

Adobe Video & Advertising Solution Partners—Partner program that helps promote a strong ecosystem around Flash technology and Adobe Media Server.

H.264—Industry-standard video codec. Currently one of the most commonly used formats for the recording, compression, and distribution of high definition video. Supported in Flash Player 9 and later. Usually combined with AAC for audio.

HTTP Dynamic Streaming—Delivery method that enables an adaptive-bitrate, protected streaming experience to Flash and AIR clients, with common HTTP servers, caching devices, and networks. Uses a standard MPEG-4 fragment container format.

HTTP Live Streaming— Delivery method that enables an adaptive-bitrate, protected streaming experience to iOS clients, with common HTTP servers, caching devices, and networks. Uses iOS-compatible MPEG-4 fragment container format.

IP multicast—Network-efficient delivery method that uses existing multicast-enabled network hardware to deliver large internal broadcasts without overwhelming the network. Multicast-enabled routers create optimal distribution paths for data sent to a multicast destination address. The most common use case is live video, but it can be used to deliver on-demand video.

Live—Real-time streaming of content, typically from a camera source, using Flash Media Live Encoder, Flash Player, or a third-party encoder.

Latency—How long it takes for a packet of data to get from one point to another.

Multicast address—IP address that identifies zero or more computers in a network simultaneously. An IP multicast address can be any IPv4 or IPv6 multicast address.

Multicast fusion—Adobe's innovative combination of application-level multicast and IP multicast. Used cooperatively for a single stream. Allows for distribution of video to internal clients via IP multicast, and uses those clients to help distribute to clients outside of the multicast-enabled internal network.

Open Source Media Framework (OSMF)—An ActionScript 3 framework that simplifies the development of media players by allowing developers to assemble components to create high-quality, full-featured video playback experiences. This open framework enables development focused on web-based video monetization, with lower costs and faster turnaround. To get started go to: http://osmf.org.

On2 VP6—Video codec available for playback since Flash Player 8, offering high-quality, lightweight, full-screen playback. VP6-S is a simplified version of the codec that is ideal for delivery of high-quality video to older computers (available in Flash Player 9 and later). VP6-E, the original codec that shipped with Flash Player 8, is slightly higher quality, thus requiring more processing power for playback.

Protected HTTP Dynamic Streaming— A scalable delivery method for encrypted content over HTTP to Flash Player and AIR clients, without a DRM License Server. Use with SWF Verification for further protection.

Protected HTTP Live Streaming—A scalable delivery method for encrypted content over HTTP to iOS devices such as iPad and iPhone, without a DRM License Server. Uses AES-128 wire encryption over SSL. FMS can bind playback only to Apple devices to add further protection.

Publishing point—Directory on Adobe Media Server where customers can place video and audio, or publish live video.

Real Time Media Flow Protocol (RTMFP)—Adobe's proprietary peer-assisted communication protocol supported in Flash Player 10 and later and AIR 1.5 and later.

Real Time Message Protocol (RTMP)—Adobe's proprietary method of communication between Flash Player and AIR clients and Adobe Media Server.

Quality of service (QoS)—Refers to the quality of the consumer's playback experience.

Solution provider—Consulting and enablement organizations that provide advanced knowledge of Adobe Media Server and Flash technology, and their integration over multiple devices.

Sorenson Spark—Original video codec in Flash Player 6 and 7. An encoder for this codec is built into Flash Player, allowing for webcam broadcast and archiving when used with Adobe Media Server.

Strobe Media Playback (SMP)—Based on Open Source Media Framework, this compiled SWF allows you to get up and running quickly vs. spending time on technical details. Full source code is available for download and customization. Allows designers, content owners, enterprises, and developers to get started easily with an out-of-the-box, feature-rich media player. To get started, go to: http://osmf.org/strobe_mediaplayback.html.

Transcoding—Conversion from one video format to another. Usually transcoding allows you to change the codec. Quality is lost each time a file is transcoded.

Video on demand (VOD)—Delivery of pre-recorded video streaming.

Online Resources

General Information	
AMS Product Page	http://www.adobe.com/go/ams
AMS Technical Guide	http://www.adobe.com/go/ams_techguide
AMS Developer Center	http://www.adobe.com/go/ams_devcenter
AMS User Group	http://www.adobe.com/go/ams_usergroup
AMS Forum	http://www.adobe.com/go/ams_forum
Adobe Media Cookbook	http://cookbooks.adobe.com/adobe_media
Deployment papers	
Hardening guide for Flash Media Server	http://www.adobe.com/devnet/flashmediaserver/articles/hardening_guide.html
Transitioning from Microsoft Windows Media to the Adobe Flash Platform	http://www.adobe.com/devnet/flashmediaserver/articles/wm_flash_transition_guide.html
Eliminating the single point of failure with origin redundancy in Flash Media Server	http://www.adobe.com/devnet/flashmediaserver/articles/origin_redundancy.html
Firewall deployment	http://www.adobe.com/devnet/flashcom/articles/firewall_streaming.html
Performance tuning FMS	http://www.adobe.com/devnet/flashmediaserver/articles/performance_tuning_webcasts.html
Video encoding and transcoding recommendations for HTTP Dynamic Streaming on the Flash Platform	http://www.adobe.com/devnet/flashmediaserver/articles/encoding_recommendations.html
Large-scale streaming deployments with FMS 3.5	http://www.adobe.com/devnet/flashmediaserver/articles/fmis_largescale_deploy.html
Understanding the MPEG-4 movie atom	http://www.adobe.com/devnet/video/articles/mp4_movie_atom.html
Content Protection	
Adobe Access 4	http://www.adobe.com/go/adobeaccess
DRM and digital media protection with Flash Media Server	http://www.adobe.com/devnet/flashmediaserver/articles/beginner_vod_fm3.html
Video content protection measures enabled by Flash Media Server	http://www.adobe.com/devnet/flashmediaserver/articles/protecting_video_fms.html
Media Player Development	
Beginner's guide to streaming video with Flash Media Server	http://www.adobe.com/devnet/flashmediaserver/articles/beginner_vod_fm3.html
Understanding the difference between progressive download and streaming video	http://www.adobe.com/devnet/flash/articles/flv_download.html http://www.adobe.com/products/hdvideo/supported_technologies/streaming.html
Live multicast streaming using OSMF	http://www.adobe.com/devnet/flashmediaserver/articles/multicast_streaming_osmf.html
Creating a simple multicast video player using OSMF	http://www.adobe.com/devnet/flashmediaserver/articles/multicast_player_osmf.html
Webcasting live video with Flash Media Live Encoder	http://www.adobe.com/devnet/flashmediaserver/articles/webcasting_fme.html

Exploring Flash Player support for high-definition H.264 video and AAC audio	http://www.adobe.com/devnet/flashplayer/articles/hd_video_flash_player.html
Beginner's guide to security features in FMS 3.5	http://www.adobe.com/devnet/flashmediaserver/articles/beginner_security_fms3.html
Live dynamic streaming and DVR for non-developers	http://www.adobe.com/devnet/flashmediaserver/articles/live_dynstream_dvr.html
Open Source Media Framework	http://www.osmf.org
Real Time Application Development	
Using peer-to-peer applications on the Adobe Flash Platform	http://www.adobe.com/devnet/flashmediaserver/articles/p2p_apps_cirrus_lccs.html
Flash 411: FMS	http://tv.adobe.com/watch/flash-411/hookin-up-with-fms
Technology Guides	
F4V/FLV Specification	http://www.adobe.com/devnet/f4v.html
Manifest (F4M) Specification	http://sourceforge.net/nf/redirect/?path=http%3A//osmf.org/dev/osmf/specpdfs/F4MElementSpecification.pdf
H.264	http://www.adobe.com/ap/products/hdvideo/supported_technologies/h264.html
AAC	http://www.adobe.com/ap/products/hdvideo/supported_technologies/heaacv2.html
HD Gallery	http://www.adobe.com/ap/products/hdvideo/hdgallery/
FMLE	http://www.adobe.com/go/fmle/
Flash Player	http://www.adobe.com/go/flashplayer
Service Providers	
Adobe Video & Ad Partners	http://www.adobe.com/go/ams_partners
Content Delivery Networks	http://www.adobe.com/products/adobemediaserver/partners/cdn
Hardware & Encoders	http://www.adobe.com/products/adobemediaserver/partners/encoders
Live Broadcast Services	http://www.adobe.com/products/adobemediaserver/partners/broadcast
Related Blogs	
Digital Media	https://blogs.adobe.com/digitalmedia
Kevin Towes	http://blogs.adobe.com/ktowes
Flash Player	http://blogs.adobe.com/flashplayer
Jens Loeffler	http://www.flashstreamworks.com
Lisa Larson-Kelley	http://www.learnfromlisa.com
Stefan Richter	http://www.flashcomguru.com
Fabio Sonnati	http://sonnati.wordpress.com

About the Author

Lisa Larson-Kelley is a developer, consultant, and teacher of subjects related to online media technologies. She coauthored the book Flash Video for Professionals (Wiley, 2007). Her blog is www.LearnFromLisa.com.

Adobe Systems Incorporated
345 Park Avenue
San Jose, CA 95110-2704
USA
www.adobe.com

91072895 8/12