



The next 3 hours of your life

9:00 – 10:15	Anatomy of a Video player for Adobe Flash and Adobe AIR
10:30 – 10:35	Introduction to Live Video with Flash
10:35 – 11:00	SPECIAL GUEST
11:00 – 11:45	Live Video Broadcasting with Flash
11:45 – 12:00	Sneak Peaks from Adobe

Copyright 2008 Adobe Systems Incorporated. All rights reserved. Adobe confidential.

2



YouTube started in 2005

Revolutionized video on the web

User Generated Content

Video Sharing

2.5 Billion videos watched in June 2006

Google purchased for 1.6 Billion in Nov. 2006

79 million users have created a video as of January 2008

Why?

Copyright 2008 Adobe Systems Incorporated. All rights reserved. Adobe confidential.



2008

Between 2007-2008 Every major broadcaster (re) introduced new online video libraries

Customized players help monetize and track

As of May 2008:

- 12 billion video clips online
- 228 minutes per user/mo
- 85 clips watched per user/mo

Source: comScore Video Metrix – May 2008

Video playback in Flash

- Developers and designers changed the way the world looks at video
- Reach of the Flash platform was the launching pad
- High quality video in Flash player 8 (circa 2006)
- Above 80% penetration in less then 12 months

Media Consumption has changed

- | | |
|-----------------------|------|
| ▪ High Quality Video | 2006 |
| ▪ Lots of Content | 2007 |
| ▪ Great Experience | 2007 |
| ▪ Engaging and Social | 2008 |
| ▪ Accessible Anywhere | 2008 |

Copyright 2008 Adobe Systems Incorporated. All rights reserved. Adobe confidential.

5



Copyright 2008 Adobe Systems Incorporated. All rights reserved. Adobe confidential.

6





Media Players do a lot more then play video www.adobe.tv

- Basic playback controls
- Full Screen mode
- Automatic Bit rate shifting
- Rating system
- Video Sharing
Embed / Deep link/ Email
- Feed Subscription / Syndication
- Tracking and Logging
- Monetization
- Advertising
- Searching and Discovery

Copyright 2008 Adobe Systems Incorporated. All rights reserved. Adobe confidential.

Common tasks for the Media player

- Play the media
- Track the media
- Discover media
-
- Protect the media
- Watch multiple media
- Monetize the media
-
- Generate new content
- Share + Syndicate media
- Interact with the media
- Mash up the media



Copyright 2008 Adobe Systems Incorporated. All rights reserved. Adobe

Basic Media player flow

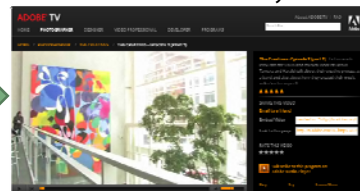
Video Asset



Streaming Server



Client Video Player

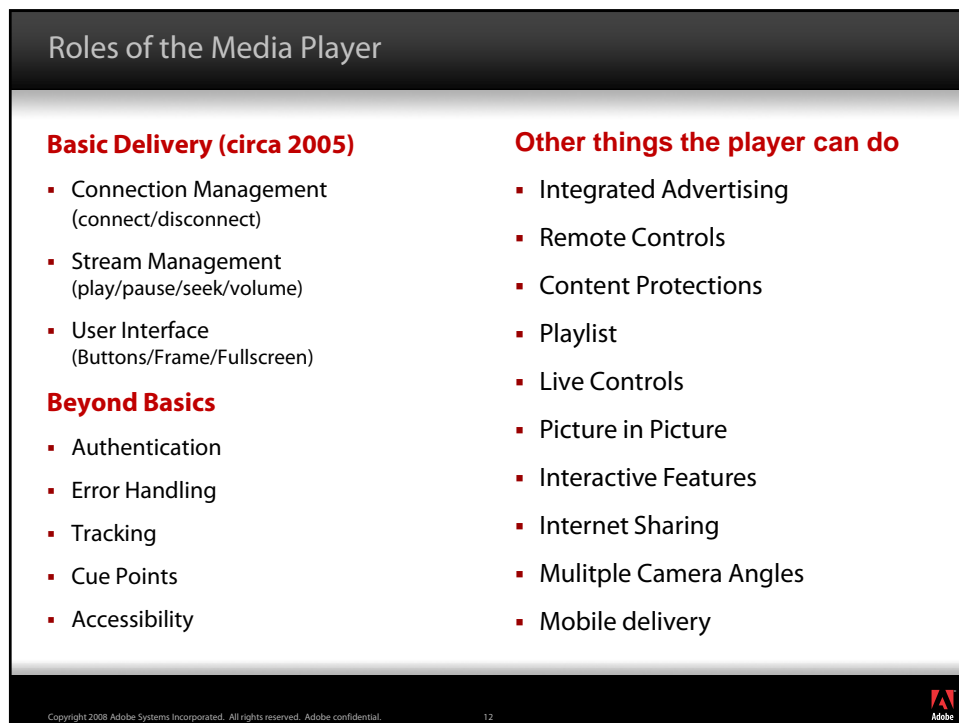
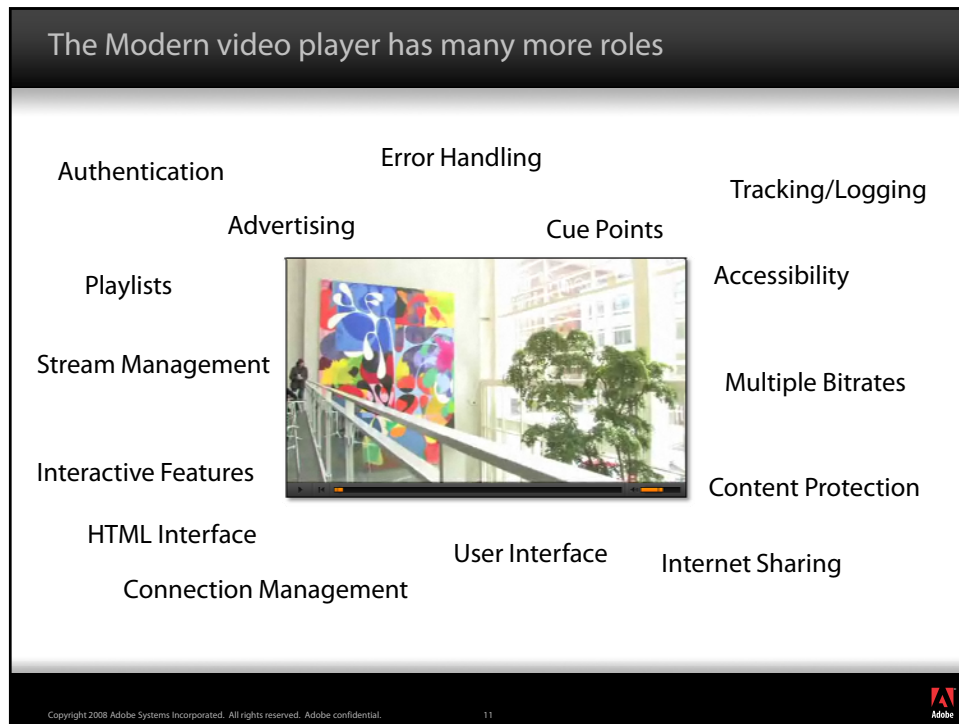


- The basic flow of video playback is
 - Video player requests media
 - Server Delivers media
 - Video player renders media

Copyright 2008 Adobe Systems Incorporated. All rights reserved. Adobe confidential.

10





Fundamentals of Video playback

The diagram consists of four colored boxes arranged horizontally: a brown box for 'Connection Management', a blue box for 'Stream Control', a yellow box for 'Extra Features', and a red box for 'User Interface'.

Connection Management

Stream Control

Extra Features

User Interface

*Adobe Flash platform
enabled companies to change the way we experience media today*

Complete control of video playback experience
ActionScript Programming API's let you innovate

Adobe Flash Professional lets you create
Adobe Flash Media Server helps protect
Adobe Flash player maximizes your reach

Copyright 2008 Adobe Systems Incorporated. All rights reserved. Adobe confidential.

13

Fundamentals of Video playback

The diagram shows the same four pillars as the previous slide, but with detailed sub-points listed below each one. Some sub-points are enclosed in red rounded rectangles.

Connection Management

- Server Relationship
- Protocol
- Encryption
- Error Handling
- Bandwidth Control
- Authentication

Stream Control

- Playback commands
- Buffer management
- QOS Monitoring

Extra Features

- Advertising
- Rights Mgmt
- Playlists
- Live Controls
- Picture in Picture
- Interactive
- Live Capture
- Internet Sharing

User Interface

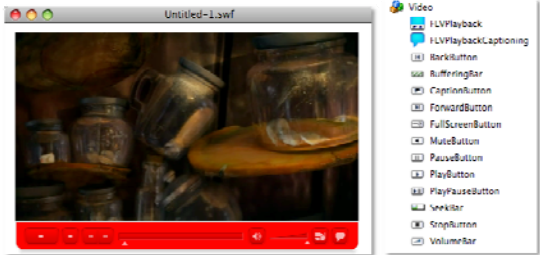
- Layout
- Playback controls
- Full Screen
- Video browsing

Copyright 2008 Adobe Systems Incorporated. All rights reserved. Adobe confidential.

14

Flash Professional CS3 + Video

- Encode video into FLV / F4V
- Drag and Drop Media player
 - Connection Management
 - Stream Control
 - User Interface
 - Stream from Flash Media Server
 - Play from a web server
- Embed into the Flash SWF
 - User Interface
 - ActionScript



The screenshot shows the Flash Professional CS3 interface. On the left, a video player skin is displayed with a video of jars. On the right, a list of video controls is shown, including FLVPlayback, FLVPlaybackCaptioning, BackButton, BufferingBar, CaptionButton, ForwardButton, FullScreenButton, MuteButton, PauseButton, PlayButton, PlayPauseButton, Seeker, StopButton, and VolumeBar.

Copyright 2008 Adobe Systems Incorporated. All rights reserved. Adobe confidential. 15

Basic Connection Management

Connection Management

Step 1: Connect to Flash Media Server


- ActionScript 3 class: **flash.net.NetConnection**
- URI: **rtmp://[server]/[application]**

Step 2: Wait for connection to be accepted + monitor connection

- ActionScript 3 event: **flash.events.NetStatusEvent**

Step 3: Setup the Stream controller

- ActionScript 3 class: **flash.net.NetStream**
- Stream Name: "video.flv"



The diagram shows a blue arrow pointing right with the text "Stream Control" inside.

Copyright 2008 Adobe Systems Incorporated. All rights reserved. Adobe confidential. 16


Flash Media URLs

Connection Management

- URL's are not the same as Web or Progressive Download URLs
- Many publishing systems / CDNs use single URL strings that include
 - Server
 - Stream Name
 - Authentication
 - Other parameters
- URL Parsing is done in ActionScript and broken into
 - Connection
 - Stream Name /Source
 - Authentication details

Copyright 2008 Adobe Systems Incorporated. All rights reserved. Adobe confidential.

17




URL Structures for Flash Streaming

Connection Management

- Basic URL
 - `rtmp://172.16.4.128/vod/mystreamname`
- H264-based or MP3-based URL
 - `rtmp:// 172.16.4.128/vod/mp4:mystreamname`
 - `rtmp:// 172.16.4.128/vod/mp3:mysound`
- FLVPlayback (Source)
 - `rtmp:// 172.16.4.128/vod/mp4:mystreamname.f4v`
 - `http://webserver.com/myPlaylist.smil`
- Application instances
 - `rtmp:// 172.16.4.128/vod/_definst_ /mp4:mystreamname`
- Stream folders
 - `rtmp:// 172.16.4.128/vod/_definst_/folder/mp4:mystreamname`
- Query-based Authentication
 - `rtmp:// 172.16.4.128/vod/mp4:mystreamname?token=234h234jkh&account=kt`

Copyright 2008 Adobe Systems Incorporated. All rights reserved. Adobe confidential.

18



Flash Media Connection Events


Connection
Management

ActionScript Events let you monitor connection status changes

- **flash.events.NetStatusEvent**
 - "NetConnection.Connect.Closed"
 - "NetConnection.Connect.Failed"
 - "NetConnection.Connect.Success"
 - "NetConnection.Connect.Rejected"
 - "NetConnection.Connect.AppShutdown"
 - "NetConnection.Connect.InvalidApp"

Copyright 2008 Adobe Systems Incorporated. All rights reserved. Adobe confidential.

19




Stream Control

Stream
Control

- Manage the stream playback
- Multiple streams can be delivered through a single connection
- Basic stream commands:
 - Play
 - Pause
 - Seek
- Manage the Buffer
- Monitor properties of the stream
 - Time
 - Current Frame per Second
- Manage a playlist
- Publish a live stream

Copyright 2008 Adobe Systems Incorporated. All rights reserved. Adobe confidential.

20



Controlling the Stream

Stream Control

Step 1: Connect the Stream to the Connection

- ActionScript 3 class: **flash.net.NetStream**

Step 2: Set the Buffer Size

- NetStream.bufferTime


Step 3: Use the NetStream.play() command

- NetStream.play([streamname], [start], [length],[reset playlist])
 - eg: NetStream.play("myVideo",0,-1,true);

Step 4: Attach commands to the User Interface

Copyright 2008 Adobe Systems Incorporated. All rights reserved. Adobe confidential.

21



Flash Media Stream Events


Stream Control

ActionScript Events let you monitor stream status

- flash.events.NetStatusEvent**
 - NetStream.Buffer.Empty; NetStream.Buffer.Full; NetStream.Buffer.Flush
 - NetStream.Play.Start NetStream.Play.Stop NetStream.Play.Failed
 - NetStream.Pause.Notify NetStream.Unpause.Notify
 - NetStream.Seek.Failed NetStream.Seek.InvalidTime NetStream.Seek.Notify
 - NetStream.Play.StreamNotFound
 - NetStream.Play.InsufficientBW
- New events for H.264 containers
 - NetStream.Play.FileStructureInvalid
 - NetStream.Play.NoSupportedTrackFound

Copyright 2008 Adobe Systems Incorporated. All rights reserved. Adobe confidential.

22



Media Player User Interfaces

User Interface

DESIGNER

DEVELOPER

Ps Ai Fw

Fl Dw Fx

The workflow between Design and Develop in Adobe Tools makes it easy to create new interactive experiences

Designers build experiences with Professional Tools

Developers program with a feature rich programming language

DEMO – Workflow between Products

Copyright 2008 Adobe Systems Incorporated. All rights reserved. Adobe confidential.

23

Advertising

Extra Features Advertising

- Many external servers/services are required
 - Content
 - Tracking
 - playlist
- Video player connects based on
 - Time code
 - Timer
 - Dynamic Cue Points (ad insertion points)
- User Interface reacts to data messages

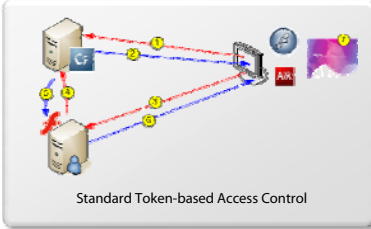
Copyright 2008 Adobe Systems Incorporated. All rights reserved. Adobe confidential.

24

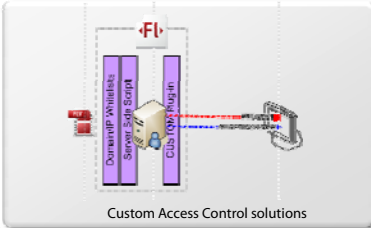
Access Control / Rights Management

Extra
Features
Rights Mgmt

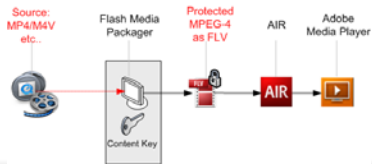
- Access control can occur
 - Before the streaming connection is requested
 - During streaming connection
- Real time Encryption
 - Unique feature of Flash Media Server (RTMPE)
 - Protects the content delivery
- SWF Verification
 - Protects the playlist and the media
- Rights Management (Adobe AIR only)



Standard Token-based Access Control

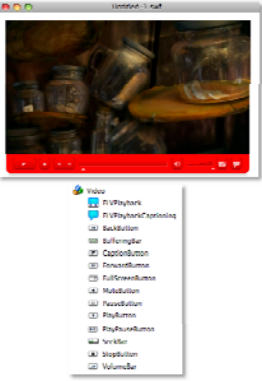




Custom Access Control solutions



Copyright 2008 Adobe Systems Incorporated. All rights reserved. Adobe confidential.

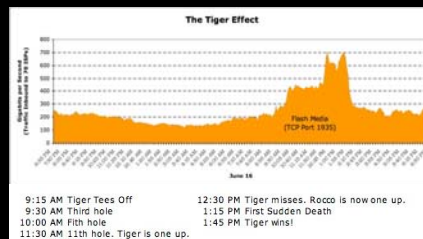
Pre-built Video players for Flash and AIR

FLVPlayback Component Adobe Flash Professional	OPEN VIDEO PLAYER INITIATIVE http://www.openvideoplayer.com	JW FLV MEDIA PLAYER 4.1 http://www.jeroenwijering.com
	 <p>OPEN VIDEO PLAYER INITIATIVE PARTNERS:</p> <div style="display: flex; justify-content: space-around; font-size: small;"> </div> <div style="display: flex; justify-content: space-around; font-size: small;"> </div> <div style="display: flex; justify-content: space-around; font-size: small;"> </div>	 <p>Below is the swfobject 1.5 code for this setup. For things like MySpace, use this example code</p> <pre> <script type="text/javascript" src="/shared/swfobject.js"></script> <div id="preview">This div will be replaced</div> <script type="text/javascript"> var si = new SWFObject("/shared/player.swf", "play", "470", "290", "b"); si.addParam("allowfullscreen", "true"); si.addParam("allowscriptaccess", "always"); si.addParam("wmode", "opaque"); si.addParam("flashvars", "file=buggy.flv&streamer=rtmp://edge01.d"); si.write("preview"); </script> </pre>

Copyright 2008 Adobe Systems Incorporated. All rights reserved. Adobe confidential.



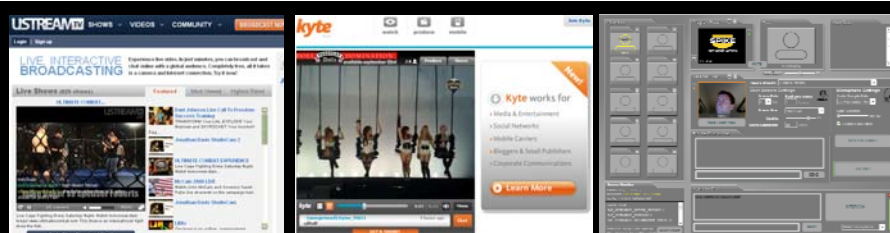
Media consumption has changed



- **Explosive growth in live video in 2008**
- **Big League Sports**
- **Broadcast Simulcast**
- **Online-only**
- **Conferences**
- **Concerts**
- **Examples include**
 - PGA Golf, NFL, MLB, Euro 2008, Olympics
 - Operation My Space
 - Oprah

Copyright 2008 Adobe Systems Incorporated. All rights reserved. Adobe confidential.

29



User Generated Live Content

- **Next generation of UGC**
- **Video captured with Flash player / Adobe Flash Media Live Encoder**
- **Rich publishing controls**
- **Massive reach**
- **Millions of dollars being invested**
- **Social Media driven**
- **Major Broadcast adoption**

Copyright 2008 Adobe Systems Incorporated. All rights reserved. Adobe confidential.

30




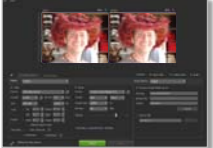



USTREAM.TV
using the Adobe Flash platform

John Ham
Co-Founder
uStream.tv

Copyright 2008 Adobe Systems Incorporated. All rights reserved. Adobe confidential.

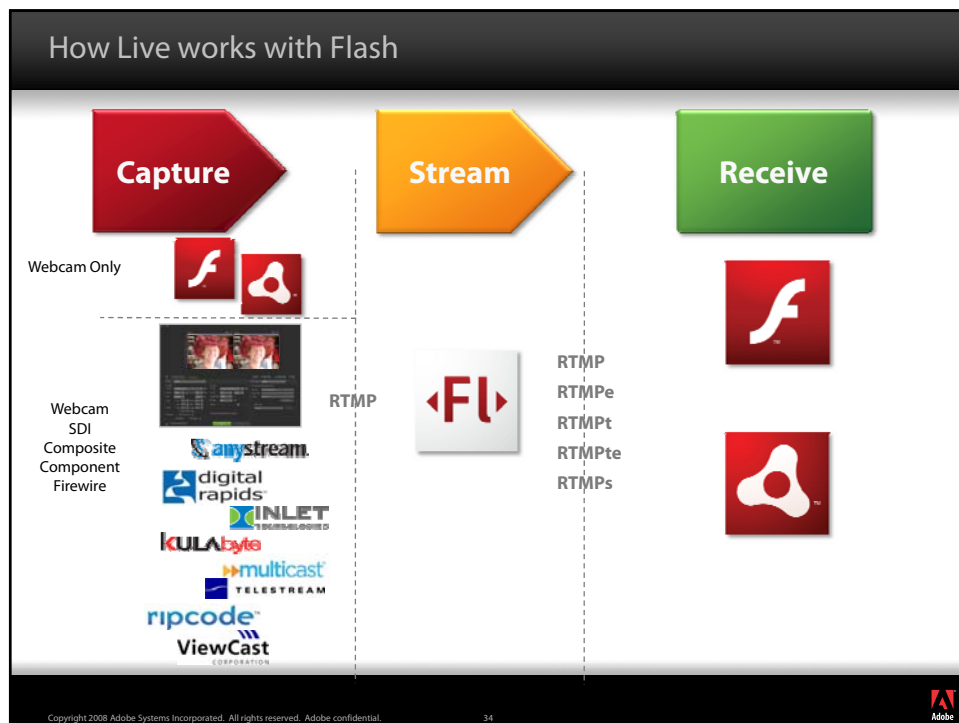
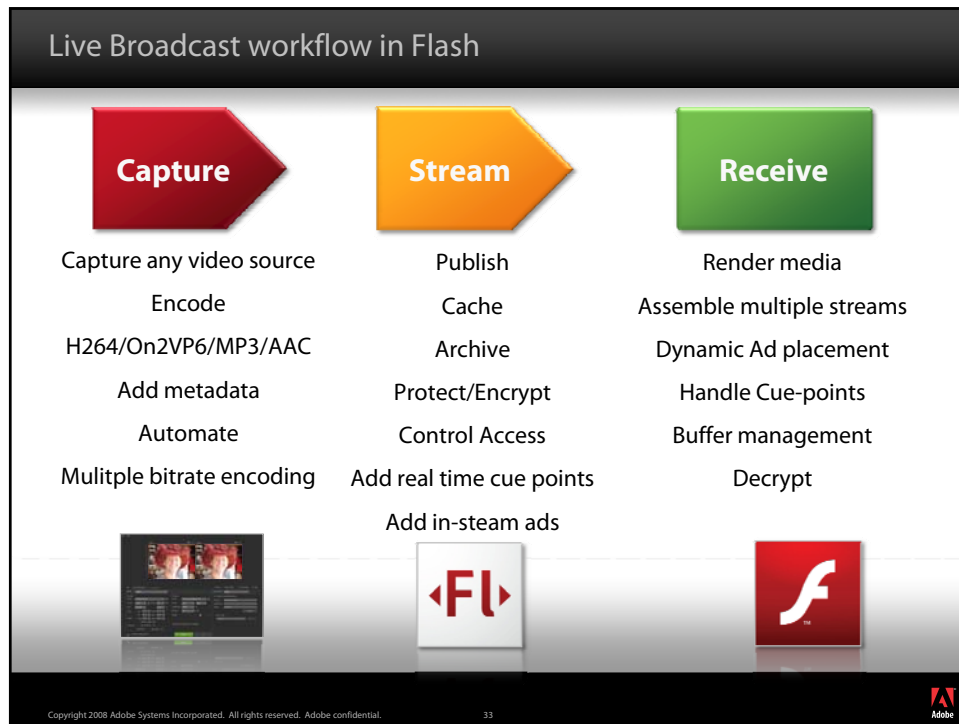
The image features a dark background with a grid of colorful Adobe software icons (AI, Br, FL, Fw, Di, Cp, AE, Dw, UI, Ps, OL, CF, etc.) arranged in a perspective view, creating a sense of depth. The USTREAM.TV logo is prominently displayed on the left, and the Adobe logo is visible in the center of the icon grid.

Adobe Flash player Adobe AIR	Adobe Flash Media Live Encoder Free Live Encoder	Adobe Partners Hardware Live Encoding
 <p>Live Capture (Available since 2001)</p> <p>Webcam Quality H263 Video</p> <p>Nellymoser Audio (Speex support in FP10)</p> <p>ActionScript Controlled User Generated Content</p>	 <p>High Quality Encode H264 / VP6 Video AAC / MP3 Audio</p> <p>Command-line Error Handling VITC Timecode Pre-processing Live Metadata</p>	

Copyright 2008 Adobe Systems Incorporated. All rights reserved. Adobe confidential.

32

Adobe



Live Publishing with Flash Player / AIR

Capture

The Connection Management Process is the exact same as playback

Step 1: Connect to Flash Media Server

- ActionScript 3 class: **flash.net.NetConnection**
- URI: **rtmp://[server]/[application]**

Step 2: Wait for connection to be accepted + monitor connection

- ActionScript 3 event: **flash.events.NetStatusEvent**

Step 3: Setup the Stream controller

- ActionScript 3 class: **flash.net.NetStream**

Copyright 2008 Adobe Systems Incorporated. All rights reserved. Adobe confidential.

35



Live Publishing with Flash Player / AIR

Capture

The Stream Control Process is the very similar to playback

Step 1: Connect the Stream to the Connection

- ActionScript 3 class: **flash.net.NetStream**

Step 2: Capture the Camera / Microphone

- ActionScript 3 class: **flash.media.Camera**; **flash.media.Microphone**
- Camera.get();**
- Microphone.get();**

Step 3: Attach the inputs to the NetStream


- NetStream.attachVideo(Camera)**
- NetStream.attachAudio(Microphone)**


Step 4: Use the **NetStream.publish()** command

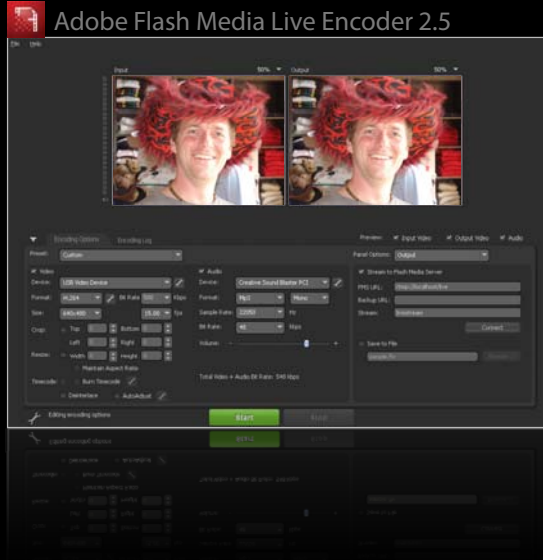
- NetStream.publish([streamname], "[live|record|append]")**
 - eg: **NetStream.publish("myVideo", "record");**

Copyright 2008 Adobe Systems Incorporated. All rights reserved. Adobe confidential.

36




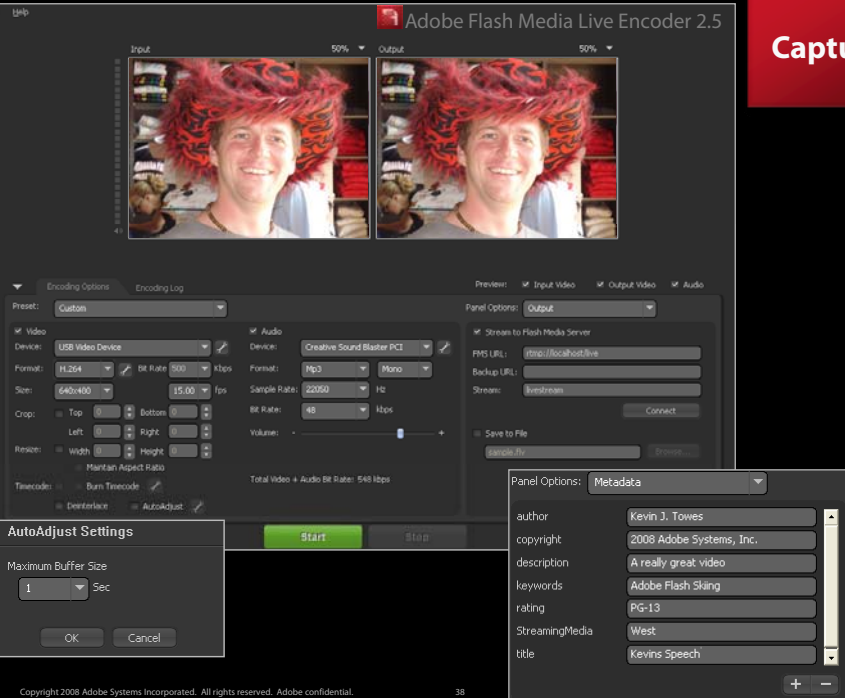




- Free from Adobe.com
www.adobe.com/go/fme
- Broadcast-level capture
- Any Input Source
- High Quality Encoding
Video: H264 | VP6 (up to HD)
Audio: AAC | MP3
- Command-line control
- Image pre-processing
- Multiple destinations
- Metadata
- Buffer Management
- Local Archive
- VTC Timecode support

Copyright 2008 Adobe Systems Incorporated. All rights reserved. Adobe confidential. 37





Copyright 2008 Adobe Systems Incorporated. All rights reserved. Adobe confidential. 38

Adobe Flash Media Encoder – *from the command line*

Commands

```

C:\Program Files\Adobe\Flash Media Encoder 2.5\FMEcmd /?
Adobe(R) Flash(R) Media Encoder Command Line Utility v 2.5.0.2086
Copyright(C) 2007-2008 Adobe Systems Incorporated. All rights reserved.

Encode from DirectX-recognized devices to Flash Video file or live streams.

JSAGE:
FMEcmd [/?]
FMEcmd [/p profile] [/l log_file]
FMEcmd [/ap auth_string] [/ab auth_string] [/t ddishmm] [/r]
FMEcmd /g /p profile [/ap auth_string] [/ab auth_string]
FMEcmd /s [fme_uid]
FMEcmd /u [fme_uid]

Notes:
/? Display this help message.
/p profile Specifies XML profile path. Default profile is taken
from the default path.
/l log_file Specifies log file path and filename. Default path is
the default path.
/ap auth_string Specifies authentication string for Primary Server.
/ab auth_string Specifies authentication string for Backup Server.
/t ddishmm Specifies time interval after which FME would be restarted.
/r Register FME to start automatically at OS launch.
/g Launches FME in GUI mode.
/s fme_uid Stops FME instance with given identifier.
/u fme_uid Prints all running FME instances if identifier is wrong or unspecified.
/u fme_uid Unregister FME with given identifier to not to start automatically at OS launch.
Prints all registered FME sessions if identifier is wrong or unspecified.

Where:
auth_string Authentication string.
Format depends on authentication module.
e.g. username:password.
ddishmm Must be max. two digits positive integer.
fme_uid FME Unique Identifier.
Output file path if only encoding to file.
        
```

Capture

Streaming

```

Video Settings:
Device: USB Video Device
Format: H.264
Size: 640x480 15.00 fps
Frame: Interlaced
Parity: Disabled
Intercode: Disabled
Bit rate: 200 Kbps
Deinterlace: Disabled

Audio Settings:
Device: Creative Sound Blaster PCI
Format: Mp3 Mono
Sample Rate: 22050 Hz
Bit rate: 48 Kbps
Volume: 75 %

Stream to Flash Media Server:
FMS URL: rtmpe://localhost/live
Backup URL:
Stream Name: TestStream

Sun Sep 21 2008 13:13:09 * Selected video input devices: USB Video Device
Sun Sep 21 2008 13:13:10 * Selected audio input devices: Creative Sound Blaster PCI
Sun Sep 21 2008 13:13:11 * Primary Stream Status: Success
Sun Sep 21 2008 13:13:12 * Primary - Network Connection: rtmp://localhost:1935
Sun Sep 21 2008 13:13:12 * Primary - Stream Status: NetStream.Publish.Start
Sun Sep 21 2008 13:13:12 * Session Started
Sun Sep 21 2008 13:13:13 * Audio Encoding Started
Sun Sep 21 2008 13:13:13 * Video Encoding Started

Encoding Statistics:
Current
Video: 0:00:11 475 Kbps Drops: 0 Frame Rate: 15.00
Audio: 0:00:11 48 Kbps Drops: 0
Total: 0:00:11 523 Kbps Drops: 0

Average
Video: 0:00:11 465 Kbps Drops: 0 Frame Rate: 15.47
Audio: 0:00:11 47 Kbps Drops: 0
Total: 0:00:11 512 Kbps Drops: 0

Server
Bandwidth: 203 Kbps Buffer: 0.00 sec Frame Drops: 0
Backup: 0 Kbps Buffer: 0.00 sec Frame Drops: 0

Streaming to Primary...
        
```

- Scriptable
- Easy to deploy presets
- Windows Server compliant
- Auto start with OS

Copyright 2008 Adobe Systems Incorporated. All rights reserved. Adobe confidential.

Live Broadcasting with Adobe Flash Media Server 3

- Live streaming is supported in all versions of FMS
- “Publishing points” are not required
- Simple stream provisioning
- Stream-level configuration
- Bandwidth management
- Real-time encryption with RTMPE or SSL
- High Capacity
- Live Cuepoint injection
- Multi-point publishing
- Server side archiving
- Server side playlists

Stream

Copyright 2008 Adobe Systems Incorporated. All rights reserved. Adobe confidential.

FMS as a live source

Flash Media Server can act as a live source

- **Server side playlist**
 - Allow you to use pre-recorded content and stream it live
 - Requires Server Side ActionScript and a playlist
- **Multipoint publish**
 - Republish an existing live stream
 - Insert real-time metadata into the stream
 - distribute to multiple servers / CDNs

DEMO (Time Permitting)

Copyright 2008 Adobe Systems Incorporated. All rights reserved. Adobe confidential.

Changes in the Media player

Receive

The Stream playback process is similar except the play command

Step 1: Connect the Stream to the Connection

- ActionScript 3 class: **flash.net.NetStream**

Step 2: Set the Buffer Size

- `NetStream.bufferTime`

Step 3: Use the **NetStream.play()** command

- `NetStream.play([streamname], [start], [length],[reset playlist])`
 - eg: `NetStream.play("myLiveVideo",-1,-1,true);`

Step 4: Attach commands to the User Interface

- "start" parameter can be a "-1" to play a pre-recorded if live is not available
- Default: "-2" will play a live stream and wait to become available

Copyright 2008 Adobe Systems Incorporated. All rights reserved. Adobe confidential.

Flash Professional CS3 + Live Broadcast

Receive

- FLVPlayback will work with Live Broadcasts
- Set the "isLive" property to "true" using ActionScript



- The AS2 Component is configured in the component inspector

Copyright 2008 Adobe Systems Incorporated. All rights reserved. Adobe confidential.

43



