Wowza Media Server and End-to-End Workflows

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VP, Product Management
Wowza Media Systems
Agenda

• Survey
• Laying the Groundwork
• Basic Workflows
• Scaling Out
• Securing Your Content
• Administration
• Cloud-Based Scaling & Delivery
• Players and Newer Technologies
• Q&A and wrap-up
Quick Survey

- Streaming background
  - Experienced?
  - New?
- Type of network
  - Public
  - Private
- Targeted devices
  - Desktop
  - iPhone, iPad
  - Android
  - Blackberry
  - Windows (Phone) 8
  - Game console
  - Set-top box
    - Traditional
    - Hybrid
    - Internet
- Second Screen app
- Administrative preference
  - Command Line or XML
  - Graphical User Interface
- # of media servers in use
- Media servers
  - Adobe / Flash Media
  - Windows Media
  - IIS Media Services
  - QuickTime / Darwin
  - RealNetworks Helix
  - Wowza Media Server
  - Other
  - New to Wowza
LAYING THE GROUNDWORK
Prerequisites

- **OS**
  - Windows, Linux, Unix, Solaris, Mac OS X
  - 64-bit is best
- **Java (SE) - JDK (preferred) or Server JRE**
- **Five Editions**
  - Developer – limited connections, 180 days
  - Trial – full functionality, 30 days
  - Daily Subscription
  - Monthly Subscription
  - Perpetual
Launching Wowza

• Hardware – on-premises or in the cloud

• Server Run modes
  – Standalone – best for testing & development
  – System service – best for 24/7 & auto-restarts

• Control methods
  – Command line
  – Scripts and batch files
  – API
  – User interface
Wowza Configuration Levels

- Server
- Virtual Host (vhost) – default instance
- Applications & application instances

vhost1 (e.g., Marketing)
- App vod
- App vod_mobile
- App live
- App live2
- App live3

vhost2 (e.g., Support)
- App vod1
- App vod2
- App vod3
- App live
- App chat1
- App chat2
- App chat3
To create an application, you need matching named folders in both the “applications” and “conf” directories. Within the named sub-directory under “conf” there should always be at least an Application.xml file.
Newer Multi-Format Workflow
Wowza Multi-Format Workflow

Many sources in...  ...one media server infrastructure...  ...many formats out

Content management, billing, log analysis, DRM services, etc.

Origin Server(s)

Wowza Media Server

Caching / Edge Servers (optional)

Wowza Media Server

Content management, billing, log analysis, DRM services, etc.

RTSP/RTP  MPEG-TS  RTMP

ICY

HTTP  NFS/AFS

ARCHIVES & VOD ASSETS

MSS

RTMP/HDS

HLS

RTSP/RTP

MPEG-TS

MPEG DASH

RTMP

RTSP/RTP

ICY

Many sources in...  ...one media server infrastructure...  ...many formats out

Content management, billing, log analysis, DRM services, etc.
Adaptive Bitrate Formats in Wowza

<table>
<thead>
<tr>
<th>Genesis</th>
<th>Name</th>
<th>Also Known As...</th>
<th>Players Include...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microsoft</td>
<td>Smooth Streaming</td>
<td>smoothstreaming</td>
<td>Microsoft Silverlight, other Smooth Streaming SDK or Porting Kit clients</td>
</tr>
<tr>
<td>Adobe</td>
<td>(RTMP) Dynamic Streaming</td>
<td>RDS</td>
<td>OSMF, Flash Player, JW Player</td>
</tr>
<tr>
<td>Adobe</td>
<td>HTTP Dynamic Streaming</td>
<td>HDS, sanjosestreaming</td>
<td>OSMF, Flash Player, FlowPlayer</td>
</tr>
<tr>
<td>Apple</td>
<td>HTTP Live Streaming</td>
<td>HLS, cupertinoiostreaming</td>
<td>Apple iOS devices, other HLS players</td>
</tr>
<tr>
<td>MPEG</td>
<td>Dynamic Adaptive Streaming over HTTP</td>
<td>DASH, mpegdashstreaming</td>
<td>See <a href="http://dashif.org/clients/">http://dashif.org/clients/</a></td>
</tr>
</tbody>
</table>

...plus RTSP/RTP, RTMPx, MPEG-TS (unicast & multicast)
BASIC WORKFLOWS
Basic Streaming Workflows

Live Streaming

Source → Encoder → Origin → Media Server → Client

On-Demand Streaming

Source → Encoder → Origin → Media Server → Client

DISK
DEMO

GETTING STARTED WITH
WOWZA MEDIA SERVER
Basic Live Workflow

Webcam

Source → Encoder (Wirecast) → Origin → Client

IP Camera

Source → Encoder → Origin → Client

GoCoder

Source → Encoder → Origin → Client
## Compatible Live Stream Inputs

<table>
<thead>
<tr>
<th></th>
<th>RTP</th>
<th>RTSP/RTP</th>
<th>RTMP</th>
<th>MPEG-TS</th>
<th>ICY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Video</td>
<td>H.264, H.263</td>
<td>H.264, H.263</td>
<td>H.264, VP6, Sorenson Spark, Screen Video v1 &amp; v2</td>
<td>H.264</td>
<td>n/a</td>
</tr>
<tr>
<td>Audio</td>
<td>AAC, AAC-LC, HE-AAC, MP3, Speex</td>
<td>AAC, AAC-LC, HE-AAC, MP3, Speex</td>
<td>AAC, AAC-LC, HE-AAC, MP3, Speex</td>
<td>AAC, AAC-LC, HE-AAC, MP3</td>
<td>AAC, AAC-LC, HE-AAC v1 &amp; v2, MP3</td>
</tr>
<tr>
<td>Push</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Pull</td>
<td>X</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Transmuxing

- Rewrapping compressed audio and video (a.k.a. (re)packaging or packetizing)
- Requires minimal hardware resources

Incoming Stream (e.g., RTSP)

H.264 Video & AAC Audio In

Outgoing manifest (e.g., F4M) & MP4 fragment files (for HTTP)

H.264 Video & AAC Audio Out
Repackaging in Wowza

Repackaging is built into the core of Wowza Media Server…

<table>
<thead>
<tr>
<th>Input Files / Streams</th>
<th>Output Streaming Formats</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>On-Demand</strong></td>
<td><strong>MP4(^1) (H.264 video, AAC or MP3 audio(^2))</strong></td>
</tr>
<tr>
<td><strong>Live</strong></td>
<td><strong>RTSP, RTMP, MPEG-TS</strong></td>
</tr>
</tbody>
</table>

**Notes**
1. MP4 files include, but are not limited to, the following variants: .mp4, .f4v, .mov, .m4v, .mp4a, .3gp, .3g2, .isma, .ismv
2. Smooth Streaming does not support MP3 audio
Transcoding

- Converting from one or more codecs, bitrates, or resolutions to others
- Typically requires significant resources
- Can be combined with packetization

Incoming Stream (e.g., MPEG-TS)
- e.g., H.264 Video & Speex Audio In*

Media Server

Outgoing manifest (e.g., F4M) & MP4 fragment files
- MBR H.264 Video & AAC Audio Out

Live Transcoding & Transrating

Live Transcoding

Source → Encoder → Media Server → Client
- Source
- Encoder (MPEG-2)
- Media Server (720p H.264/AAC)
- Client

Live Transrating

Source → Encoder → Media Server → Client
- Source
- Encoder (H.264/AAC)
- Media Server (720p H.264/AAC)
- Client

Options:
- 1080p H.264/AAC
- 480p H.264/AAC
- 360p H.264/AAC
Wowza Transcoder AddOn

- Live transcoding for single and adaptive bitrate
- Ingest from live encoders, IP cameras, TV headends
- Leverages commodity GPU acceleration

Wowza Transcoder AddOn converts these formats...

<table>
<thead>
<tr>
<th>Input (Decoding)</th>
<th>Output (Encoding)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audio: MP3, AAC (LC &amp; HE), MPEG-1 Part 1/2, Speex, G.711</td>
<td>AAC (LC &amp; HE)</td>
</tr>
<tr>
<td>Video: MPEG-2, MPEG-4 Part 2, H.264/AVC</td>
<td>H.264/AVC, H.263</td>
</tr>
</tbody>
</table>

...and supports these types of GPU Acceleration

<table>
<thead>
<tr>
<th></th>
<th>NVIDIA CUDA</th>
<th>NVIDIA NVENC</th>
<th>Intel Quick Sync</th>
</tr>
</thead>
<tbody>
<tr>
<td>Windows 64-bit*</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Linux 64-bit</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

*On Windows Server 2008 and 2012, also requires installing .NET Framework 3.5.1+ and Desktop Experience
SCALING OUT
Use a MediaCache Edge Server configuration from Corporate HQ to Remote Company Sites.
On-Demand EC2 Streaming Scale

Use a MediaCache Edge Server configuration from Amazon S3 to Amazon EC2 Edge Servers

Streaming from Amazon S3 to Amazon EC2

Streaming to End Users

Single Copy of OD Content

Amazon Edge Server on Amazon EC2

Adaptive Streaming

Wowza Media Server

Remote Region B

Wowza Edge Server on Amazon EC2

Adaptive Streaming

Amazon Region A

Wowza Edge Server on Amazon EC2

Adaptive Streaming

Amazon S3 Storage
Use Web Servers to add Load Balancing and Redundancy in front of storage.
MediaCache Notes

• MediaCache pulls content from:
  – Any OS-recognized storage on the network
  – Web servers (using HTTP byte ranges)
  – Amazon S3 (persistent) storage

• Use Wowza MediaCache AddOn to pull on-demand content to Edge servers

• Ensure disk storage is sized correctly to take into account asset sizes, asset churn, and how often assets will be accessed
MediaCache Notes

• Tune Wowza Media Server to reduce impact on storage source (e.g., increase request sizes to reduce # of requests)
• Have high I/O speed at WMS cache drive
• Add redundancy by scaling out and load balancing
• Read more: http://info.wowza.com/mediacache-white-paper
Enterprise Live Streaming

Use a Live Stream Repeater Origin-Edge configuration plus Multicast

Streaming on HQ Network

Streaming to Remote Users

1 Mbps Multicast

2 Mbps Unicast

3 Mbps Unicast

Remote Network A

Remote Network B

Wowza Edge Server

Wowza Edge Server

Wowza Edge Server

Encoder

Origin Server

Backup Origin

Media Server

Media Server

Media Server

Media Server
Silverlight® Multicast Player allows users to stream MPEG-TS multicasts from Wowza Media Server to any Silverlight-enabled desktop.
Enterprise Live Streaming Notes

• Use multicast to reduce load on LAN
  – Only works on multicast-enabled LANs
  – Silverlight multicast security and VLANs

• Use Live Stream Repeater for Origin-Edge configuration to send unicast to edges and reduce load on WAN links

• For high availability:
  – Set up an identically-configured Origin Backup
  – Configure Live Stream Repeater Edges to failover to the Origin Backup
Resources

• Push Publishing AddOn
  – Multicast networks
  – Deliver to CDNs – Akamai, Mirror Image, etc.
  – YouTube, Justin.TV, Livestream, Ustream
  – Downstream Wowza and Adobe servers

• Live Stream Repeater:
  www.wowza.com/forums/content.php?227
Similar, but different: NGRP & SMIL

Named Groups (NGRP)

- Stream Name Groups
- Group together key-frame-aligned output streams
- Used to describe sets of Wowza Transcoder AddOn live streams
- Used at the server where the transcoding is occurring (typically the origin), and can be used by players pulling from the origin
- *Cannot* be used at edge servers

SMIL (“smile”) files

- Synchronized Media Integration Language files
- Group together key-frame-aligned output streams – both live and on-demand
- Used by Live Repeater (“edge”) servers and players
HTTP Origin Mode

Use both HTTP Cache Origin Server and Wowza Origin-Edge configurations for Live & On-Demand Streaming directly to users.

→ www.wowza.com/forums/content.php?457
Cons
• HTTP edge caches pull data from the Wowza HTTP origin; all clients receive the same cached data
• HTTP Origin mode is session-less
  – URL query parameters aren't supported, such as play start and duration
  – Session-specific information (for example, connection counts) isn't available
• Reliant on caching network to provide full edge control & security

Pros
• Allows massive scaling over existing caching networks (e.g., CDNs)
• Offloads (or at least changes) edge network infrastructure and management
• Can co-exist with a Live Stream Repeater Origin-Edge configuration
• Live Event Workflow Examples
  – Akamai pulls streams from venue
  – Mirror Image ingests, then transcodes
  – Camfoo pulls from a CDN ingest, transcodes, acts as origin, and pushes back out to a CDN or live streaming providers (who use CDNs)
High-Scalability Live Streaming
High-Reliability Live Streaming

Wowza nDVR AddOn

- Single nDVR cache – any screen TV-like playback
- Live stream trick play - pause, rewind, resume
- Single and adaptive bitrate support
SECURING YOUR CONTENT
Securing Content with Wowza

- SecureToken for RTMP
- Hotlink Denial Module
- SWF Verification
- Network: Secure Socket Layer (SSL)
  - HTTPS
  - RTMPE
  - RTMPS
  - Wowza StreamLock™
- AES 128 content encryption
- DRM…
Wowza DRM AddOn Workflow

DRM Service Providers
- BUYDRM
- EZDRM
- verimatrix

DRM Technologies
- Microsoft PlayReady
- VCAS

Wowza Media Server
- on-the-fly encryption

Live
- (RTMP, RTSP/RTP, MPEG-TS)

Unencrypted

Unencrypted

Unencrypted

VOD
- (.f4v, .ismv, .mp4, .mp4a, .mov, .mp4v, .3gp, .3g2)

Unencrypted

Encrypted

Encrypted

Encrypted

Encrypted

Apple HLS

mpeg-DASH

Microsoft Smooth Streaming

Sample Clients
- Desktop Players
- iOS
- Android
- Windows

Streamling media west
## Wowza DRM AddOn

<table>
<thead>
<tr>
<th></th>
<th>BuyDRM</th>
<th>EZDRM</th>
<th>Verimatrix</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DRM Service Providers</strong></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>DRM Platforms</strong></td>
<td>Microsoft® PlayReady®</td>
<td>Microsoft PlayReady</td>
<td>Verimatrix® VCAS™ Microsoft PlayReady</td>
</tr>
<tr>
<td><strong>Live Clients</strong></td>
<td>BuyDRM™ Players and Smooth Streaming clients on PCs, Macs, iOS devices, Android devices, Windows phones, game consoles, set-top boxes, and smart TVs</td>
<td>Smooth Streaming clients on PCs, Macs, Windows phones, game consoles, set-top boxes, and smart TVs</td>
<td>ViewRight Web for HLS clients and Smooth Streaming clients on PCs, Macs, iOS devices, Android devices, Windows phones, game consoles, set-top boxes, and smart TVs</td>
</tr>
<tr>
<td><strong>On-Demand Clients</strong></td>
<td>Same as Live Clients</td>
<td>Discretix SecurePlayer™ and Smooth Streaming clients on PCs, Macs, iOS devices, Android devices, Windows phones, game consoles, set-top boxes, and smart TVs</td>
<td>Same as Live Clients</td>
</tr>
</tbody>
</table>
More DRM Options

• Support for DRM encryption for INSIDE Secure customers

• Decryption API for PlayReady, enabling:
  – On-the-fly decryption of assets
  – “Any Screen” transcoding and repackaging
  – On-the-fly re-encryption
  – Great for planes, trains, cruise ships, etc.
ADMINISTRATION
Logging

• Detail level
  – Minimal (INFO) logging enabled by default
  – DEBUG setting provides verbose logs

• Viewing and analyzing
  – Access logs directly
  – Use a W3C log analysis tool or product, e.g.:
    • Sawmill
    • CasterStats
    • Skytide
Management and Monitoring

• Native support for JMX+JConsole
• Third-party tools
  – Admin Consoles
    • WMSPanel
    • Cast Control
    • Willow
    • Synapse Media Admin Console
  – Enterprise Media Asset Management
    • Dalet
    • Ensemble Video

→ See www.wowza.com/partners for more
DEMO

NATIVE WOWZA ADMIN CONSOLE (COMING SOON)
CLOUD-BASED SCALING & DELIVERY
Cloud-based Streaming Motivation

• Content requirements have evolved
• Infrastructure requirements growing exponentially
• Trend toward increasing individualization of content
• Economics drive media processing towards the edge
• Efficiencies through use of a common infrastructure
Cloud-based Streaming Benefits

• The Cloud can save you money
• Especially well suited for…
  – Trying new concepts without upfront expenses
  – Getting to market faster
  – Scaling out rapidly
  – Fluctuating workloads
  – Reducing hardware maintenance costs
• Allows you to focus on what matters to customers
Cloud Services continuum

On Premises
- Applications
- Data
- Runtime
- Middleware
- O/S
- Virtualization
- Servers
- Storage
- Networking

Infrastructure (as a Service)
- Applications
- Data
- Runtime
- Middleware
- O/S
- Virtualization
- Servers
- Storage
- Networking

Platform (as a Service)
- Applications
- Data
- Runtime
- Middleware
- O/S
- Virtualization
- Servers
- Storage
- Networking

Software (as a Service)
- Applications
- Data
- Runtime
- Middleware
- O/S
- Virtualization
- Servers
- Storage
- Networking

You Manage
- Vendor Manages
Wowza in the Cloud

• Amazon Web Services
  – DevPay
  – BYOL [where “L” = License Key], a.k.a. LicKey

• Other clouds where Wowza is used:
  – RackSpace
  – CloudSigma
  – Windows Azure
## Amazon Options

<table>
<thead>
<tr>
<th>Feature</th>
<th>DevPay</th>
<th>EC2 “LicKey”</th>
<th>Marketplace</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preconfigured AMIs</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>One-Stop Shopping</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Bring Your Own Wowza License</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Run Premium AddOns</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Built-in CloudFront Configuration</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

PLAYERS AND
NEWER TECHNOLOGIES
Player - The End of the Workflow?

• Players can be challenging
• Flash – plays on most desktops
• RTSP – plays on most mobile phones
• MSS – Xbox, Windows, enterprise (SL)
• HLS – plays most everywhere else
• JW Player – great HTML5 + Flash option
• Flowplayer – great HTML5 + Flash option
• HTML5…
HTML 5 Playback

• In theory, has great promise
• In reality, is very problematic for video:
  – No common implementation across browsers
  – No live or standard adaptive streaming
  – No DRM
  – No closed captioning
• HTML 5.1 should address these issues with
  – Media Source Extensions (MSE)
  – Encrypted Media Extensions (EME)
  – Incorporation of DASH built on MSE and EME
Player Resources

• Media Players and Devices Articles: http://www.wowza.com/forums/content.php?6


• The State of HTML5: www.jwplayer.com/html5/
MPEG-DASH

• Dynamic Adaptive Streaming over HTTP
• Already ratified by MPEG and being studied or deployed by 12 standards development organizations
• 40+ ecosystem partners releasing products
• Wowza Media Server
  – Used by VRT for the 2012 Summer Olympics
  – Released DASH in preview mode last May
  – Full DASH support coming very soon
HEVC (H.265)

• Planned replacement for H.264
• Ratified in April as a standard
• In testing, currently offers ~35% reduction in bitrate as compared to H.264
• Likely has 12+ months before it is broadly supported for streaming
• On Wowza’s roadmap, with release date TBD based on market velocity
Closed Captions

Many formats in, many formats out

Wowza Media Server

Streaming and Caption Formats *
- Apple HLS
- CEA-608
- Adobe HDS onTextData
- RTMP onTextData
- Native Caption File

* see table for actual streaming / caption format compatibility

Captions on Any Screen!

Hello, Mr. Butterfly!
# Closed Captions

<table>
<thead>
<tr>
<th></th>
<th>Caption input format</th>
<th>Streaming output formats</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Live</strong></td>
<td>CEA-608</td>
<td>CEA-608</td>
</tr>
<tr>
<td></td>
<td>onTextData events (either already in stream or injected via Wowza API)</td>
<td>onTextData</td>
</tr>
<tr>
<td><strong>VOD</strong></td>
<td>CEA-608</td>
<td>CEA-608</td>
</tr>
<tr>
<td></td>
<td>3GPP data tracks from VOD asset (MP4)</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>TTML files</td>
<td>onTextData</td>
</tr>
<tr>
<td></td>
<td>SRT files</td>
<td>onTextData</td>
</tr>
<tr>
<td></td>
<td>SCC files</td>
<td>onTextData</td>
</tr>
<tr>
<td></td>
<td>Also supported: side-car caption files delivered alongside the stream</td>
<td>onTextData</td>
</tr>
</tbody>
</table>

- **Apple HLS**: CEA-608, onTextData, onTextData
- **RTMP**: CEA-608, onTextData, onTextData
- **Adobe HDS**: CEA-608, onTextData, onTextData
Graphic Overlays

- Static or dynamic
- Great for branding, titling, advertising, tickers, logos, watermarks, etc.
- Full control over motion & transparency
- Can be configured and injected using XML configuration, watch folders, and via API with custom modules
WRAPPING UP

- Ask Questions
- Next Steps
- Turn in the Survey
THANK YOU FOR ATTENDING!

QUESTIONS? PLEASE WRITE TO CHRIS@WOWZA.COM...