# Live Broadcasting: How-To Examples Using the Microsoft Media Platform

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### Objectives

- Understand common scenarios for live broadcasting with the Microsoft Media Platform
- Learn how-to steps for some common live broadcast scenarios
- Deliver to a wide range of end user conditions and clients

### **CONTEXT SETTING**

# 2010 Vancouver Olympics



### Live Broadcast Workflow

#### Content Protection - Microsoft PlayReady









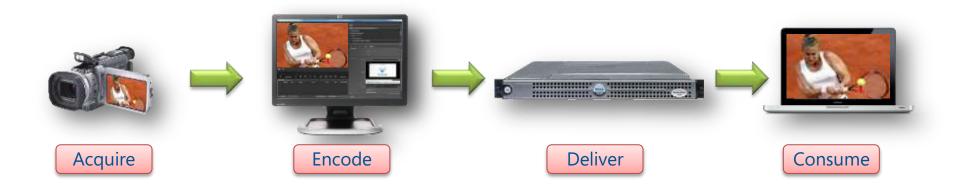
Media<sup>\*</sup>Player

Receive

From basic live streaming...

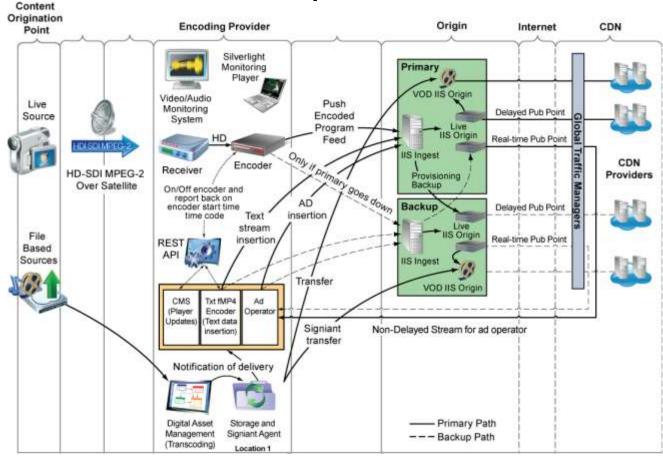


...with straightforward workflows...





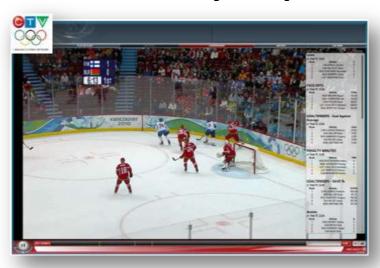
...that are a bit more complex.



### Vancouver 2010 Winter Olympics









# Other Major Sporting Events









# **Corporate Events**









### **TECHNOLOGIES**

## Microsoft Expression Encoder 4 SP2

- Video encoder, editor, and SDK
- Replaces Windows Media Encoder
- Features in version 4 with Service Pack 2
  - OD, Live Smooth Streaming Presets (VC-1, H.264)
  - Publish directly to IIS & WMS origin servers
  - PlayReady DRM encryption for Smooth Streaming
  - High quality, unlimited screen capture encoding
  - High perf: NVIDIA / Intel GPU accel, multiple CPUs
  - SRS 5.1 audio encoding built in



# Expression Encoder 4 SP2 **DEMO**

### **Encoding Partners**

- Professional Encoder Partner Ecosystem
  - Live Inlet, Envivio, Digital Rapids
  - VOD Live partners, plus Elemental, Grab Networks, Rhozet, Telestream, TwoFour Digital, Viewcast
- Each is finding ways to add value, e.g....
  - Carrier-class reliability
  - Enterprise-class pricing
  - Education-class ease of use
- See <a href="http://www.iis.net/media/partners">http://www.iis.net/media/partners</a> for a longer list of partners

### Windows Server

- Complete server operating system
- Available at different price points, starting at Free with Microsoft WebsiteSpark, BizSpark, DreamSpark
- Includes media server capabilities via Free downloads from Microsoft.com:
  - Windows Media Services
  - Internet Information Services (IIS) Media Services

### Core Media Server Scenarios

### Enterprise

- On-demand training
- Live executive broadcast

#### Internet

- News & entertainment
- Music & movie services
- Internet-based Radio/TV stations
- Radio & television rebroadcasts
- Live event broadcasts

### Delivering Media with Windows Server





- Unicast Streaming
  - WMS RTSP
  - WMS HTTP
- MBR Streaming
  - Intelligent Streaming
- Multicast Streaming
  - WMS Multicast

- Progressive Download
  - Bit Rate Throttling
  - Web Playlists
- Adaptive Streaming
  - Smooth Streaming
  - Apple HLS
- Multicast Streaming
  - Smooth Multicast

### Key Media Server Features

- Live & on-demand streaming
- Access control via authentication / authorization
- Rich logging & advertising support
- Multiple-bit-rate streaming
- Fast Streaming & Advanced FF/RW
- Archiving & Play While Archiving
- Extensible platform
- Server Core installation...
- Caching & Proxying...
- Scalability...

### Server Core Option

#### Design

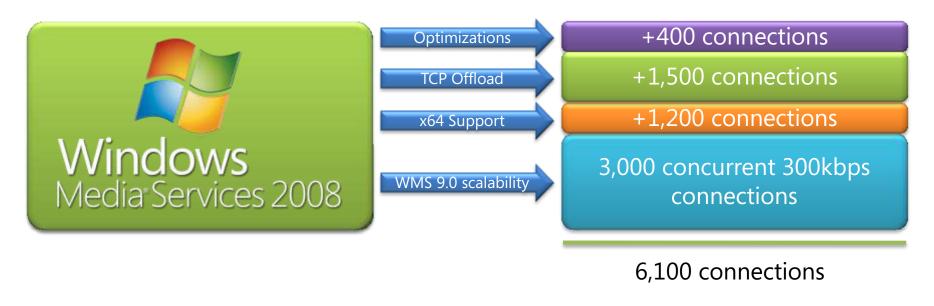
- Minimal-footprint headless installation option
- For running fixed-function server roles
- Good option for <u>Windows Embedded</u> appliances
- Supports all WMS plug-ins

#### Benefits

- Eliminates GUI and client features
- Reduces hardware requirements
- Reduces overall attack surface
- Reduces servicing costs

### Scalability

WMS example on standard rack-mount server



+ 10-25% more on Server Core

IIS is typically much more scalable than WMS

### Caching & Proxying

- WMS and IIS provide caching & proxying
  - WMS Cache/Proxy plug-in part of WMS
  - IIS Application Request Routing (ARR) download
- Benefits
  - Improved end user experience
  - Reduced load on the origin server
  - Reduced load on the network

## Caching & Proxying

- Usage Options
  - Proxy allows broadcast stream splitting
  - Caching
    - Opportunistic caching
    - Pre-caching (e.g., using DFSR)
    - Adheres to Expiry Date on content
  - Reverse Proxy
    - Provides a gateway server to users
    - Redirects content requests to a specified origin server

### Affordable Media Delivery Options

#### Costs for Windows Server 2008 R2:

Edition	Cost	Features	Notes
Web Server	\$ 0 / server	99%, Web-facing	1
Web Server	\$ 469 / server	99%, Web-facing	2
Standard	\$ 999 / server	99% of features	2, 3
Enterprise	\$3,999 / server	All features	3
Datacenter	\$2,999 / proc.	All features	3

#### ➤ Notes:

- 1. \_\_\_\_Spark programs provide free Web Server licenses for up to 3 years
- 2. WMS Multicast requires Enterprise or Datacenter edition
- 3. Standard, Datacenter, and Enterprise are available via Service Provider Licensing Agreement (SPLA), which charges for actual monthly usage

# Live Streaming – WMS vs. IIS

Live Streaming Features	WMS 2008	IISMS 4.x
Unicast HTTP streaming from live encoders	✓	✓
Broadcast streaming from files	✓	✓
Server- and client-side logging	✓	✓
High Availability content sourcing (encoder failover)	✓	✓
Archiving of live streams	✓	✓
Multiple-bit-rate streaming (Intelligent vs. Smooth)	✓	✓
HTTP Streaming	✓	✓
RTSP/TCP & RTSP/UDP Streaming	✓	
Multicast streaming	✓	<b>√</b> *
Play While Archiving (late joiner feature)	✓	✓
Windows Media Services proxying and caching	✓	
Advanced Server-Side Playlists	✓	
Standard HTTP proxying and caching		✓
Full Network DVR		✓
Low-Latency Streaming		✓

<sup>\*</sup> Targeting availability in IIS Media Services 4.5



# Web Platform Installer **DEMO**



Live Traditional Streaming with Expression Encoder and Windows Media Services

### **DEMO**

#### Time to stretch!

### **10-MINUTE BREAK**

### **IIS SMOOTH STREAMING**

### **Traditional Streaming Pros & Cons**

- Benefits of Traditional Streaming
  - Responsive User Experience
    - Users can pause, seek, fast-forward, rewind with ease
  - Effective use of bandwidth
    - Send only the content your users watch
  - Rich Logging and Monitoring
    - Know what your users are watching at all times
- Challenge of Traditional Streaming: Higher TCO
  - Packets do not make use of HTTP caching networks
  - Must deploy streaming edge servers to scale out

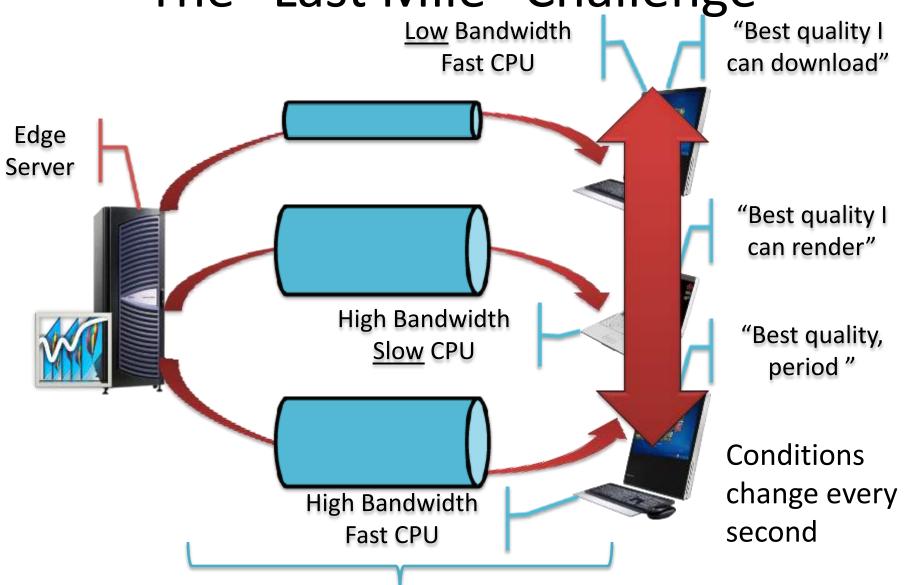
### Progressive Download Pros & Cons

- Benefits of traditional progressive download
  - Broad reach
    - No need for streaming code in the player
    - Gets through all firewalls
  - Optimized, cost-effective global delivery
    - Cacheable by existing HTTP caches
    - Distributed worldwide by CDN HTTP infrastructures

#### Challenges

- Limited user experience no... live streaming, instant start, instant seeking, or interactivity
- Wasted bandwidth (user downloads 100%, watches 20%)
- No visibility into viewer behavior & experience

The "Last Mile" Challenge

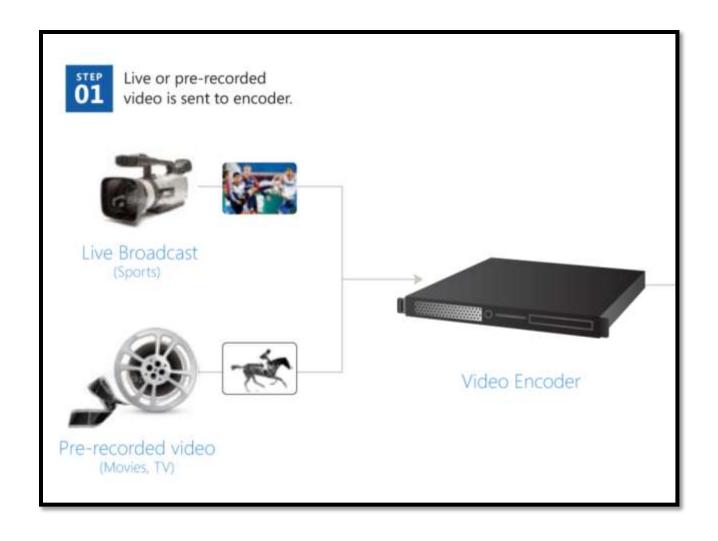


The "Last Mile" from Server to Client

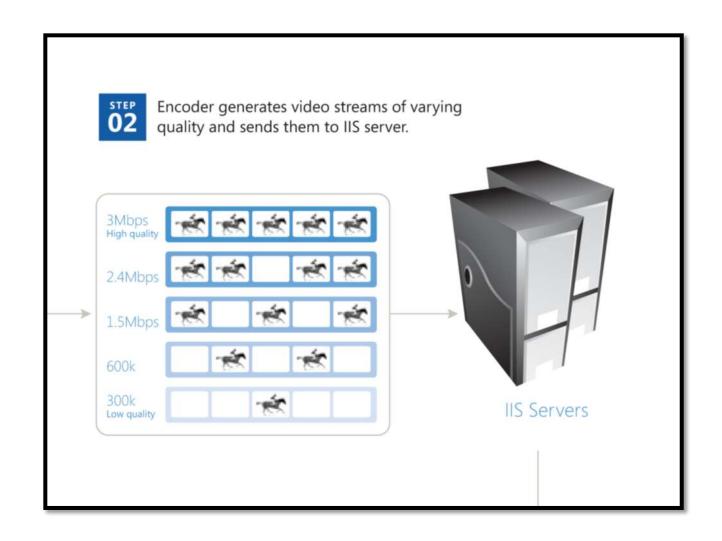
### Smooth Streaming - A New Approach

- Makes use of globally available HTTP caches:
  - Stateless no persistent connections required
  - No dedicated servers or overlay networks required
  - No provisioning required
- Adapts to constantly changing conditions
- Rich, interactive user experience
- Customizable, real-time client reporting
- Delivers only the bits needed for that moment

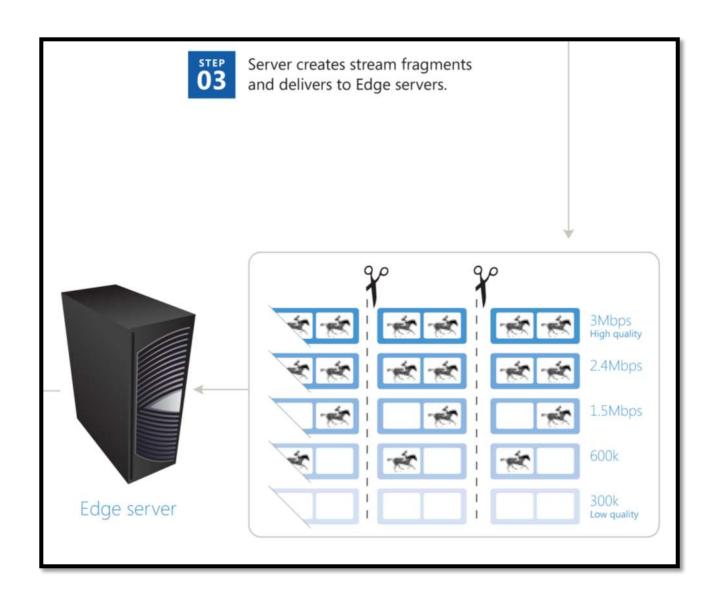
# **IIS Smooth Streaming**



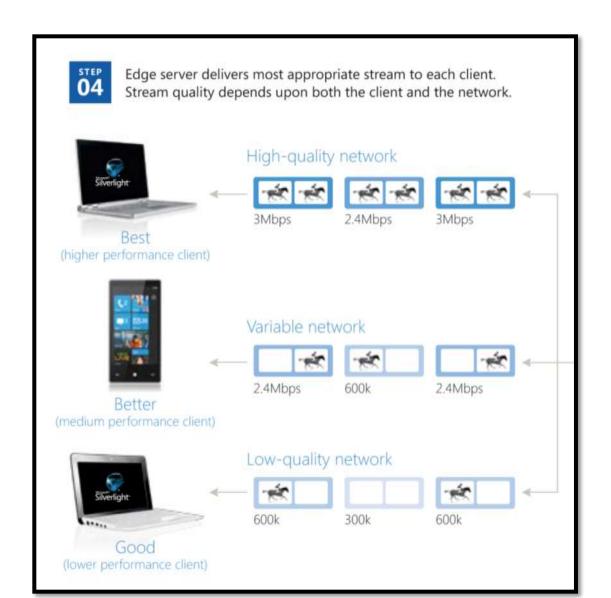
## **IIS Smooth Streaming**



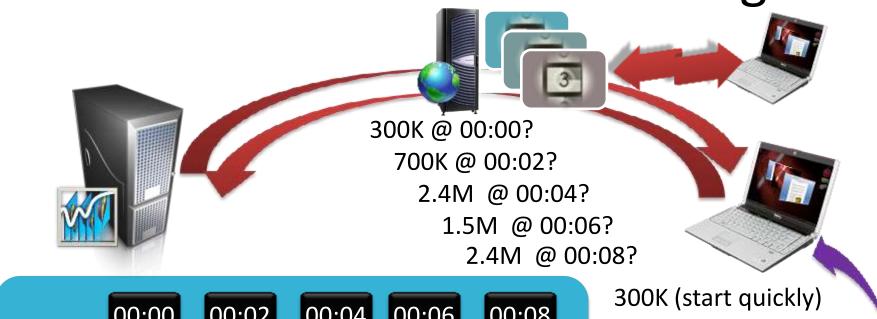
# **IIS Smooth Streaming**

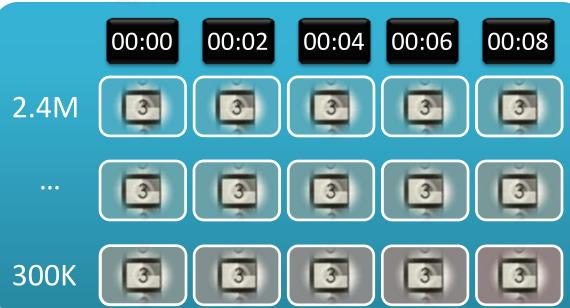


# **IIS Smooth Streaming**



# **Basic IIS Smooth Streaming**



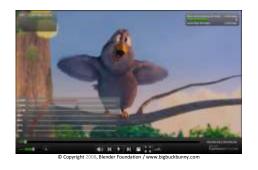


300K (start quickly)
700K (good network)
2.4M (great network)
1.5M (glitch)
2.4M (play on...)

Bit Rate Heuristics

#### **Smooth Streaming Results**

- Internet video is as good or better than TV
  - Users with only SD TVs can see Internet HD on their computers
- Users experience content in new ways
  - Contextual linking, Live DVR, multiple camera angles...
- Advertising can be very targeted
  - Ads that interest you, in HD
  - Could be embedded, interactive ads
- Longer engagement times
  - Users who watch HD content via the Internet stay engaged longer



# www.IIS.net Graphing Player **DEMO**

# Live Smooth Streaming

- Builds on Smooth Streaming
  - Cacheable HTTP delivery for Live events
  - Trick Play: FF, Rewind, Slow Motion
  - Network Digital Video Recorder (DVR) functionality
    - Pause, Instant Replay, Go to Start, Go to Live...
- Synchronized in-stream text & metadata
  - Captioning and subtitling
  - Sparse data (e.g., chapter markers)
  - Control events (e.g., ad insertion points)

### Live Smooth Streaming

- Multiple audio tracks (e.g., languages)
- Low-Latency Live Smooth Streaming
  - Less that 2 seconds from source to client screen
  - HTTP cacheable media delivery
  - Enables financial, gam(bl)ing, and surveillance verticals



Live Smooth Streaming with Expression Encoder and IIS Media Services to PC and iPad

#### **DEMO**

# **Encoding for Live Smooth Streaming**

- IIS Smooth Streaming encoders create:
  - Fragmented MP4 files
    - Contiguous MP4 files on disk
      - Easier file management
      - Can have separate files per bit rate, or one large MBR file
    - IIS fragments MP4 files into smaller cacheable objects
      - Highly scalable stateless delivery via HTTP caching
      - Users only receive the fragments they need, saving bandwidth
  - Two manifests
    - Server (.ism) lists available tracks and bit rates
    - Client (.ismc) lists codecs, resolutions, fragment index

### Other Smooth Encoding Options

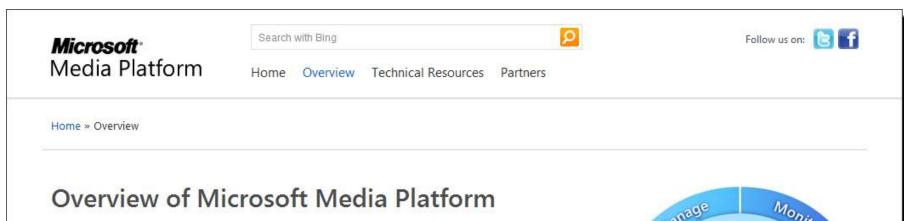
- Smooth Streaming Format SDK
  - Enables encoder and workflow products
- IIS Transform Manager
  - On-Demand transcoding, transmuxing, encryption
  - User-specified Watch Folders for content ingest
    - Expression Encoder integration for transcoding
  - Work queue and job management framework
    - Local scheduler for simple scenarios
    - HPC integration for scale-out
  - Task API on MSDN for ISV-supplied tasks and jobs

#### **Smooth Multicast**

- Smooth Multicast (coming soon)
  - Combines best of multicast and Smooth Streaming
  - Reliable, scalable delivery on multicast networks
  - Rollover to standard Smooth Streaming
  - Full DVR support

# MICROSOFT MEDIA PLATFORM (MMP)

#### www.microsoft.com/mediaplatform



The Microsoft Media Platform provides a comprehensive set of functions to support encoding, delivering and playing rich media to virtually any type of network connected device.

At the highest level, the Media Platform provides out of the box capabilities for each step of a video workflow:

#### Encode

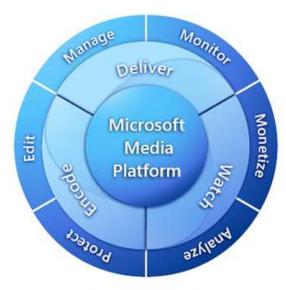
Encode and transcode live and archived media assets using industry standard H.264 and VC-1 codecs.

#### Deliver

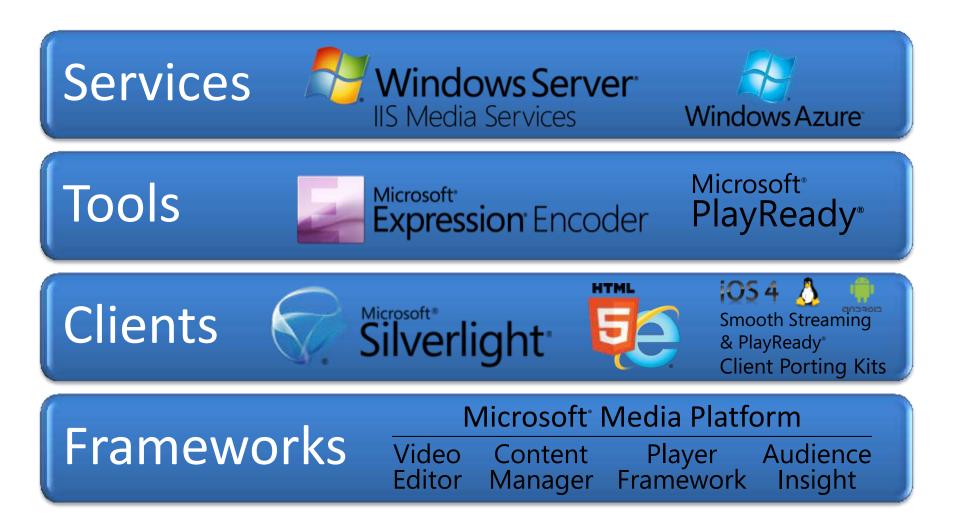
Deliver media via traditional streaming, dynamic adaptive streaming over HTTP, and intelligent progressive download.

#### Watch

Create immersive end-user media experiences on PC and Mac using Silverlight, HTML 5 or native client technologies with advanced playback functions and support for closed captions.



# **MMP** Components



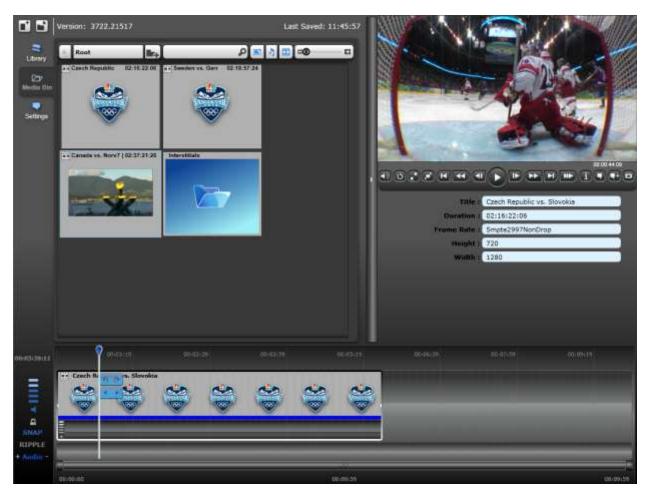
#### MMP Video Editor

- Provides instant highlights during live events
- Faster time to market with highlights
  - Repurpose existing assets
  - No transcoding, so publish in seconds
- Reduction in costs
  - Free tool no expensive video workstations
  - No additional storage costs
- Web based video editing
  - Location independent
  - Platform independent
- Fits in with encoders and other workflow tools

#### MMP Video Editor

- Used for Olympics
- Built on Silverlight
- Source code is provided
- Learn

more at http://videoeditor.codeplex.com





# MMP Video Editor **DEMO**

### **Smooth Streaming Clients**

- iPhone, iPod, and iPad support
  - Server delivers in devices' native formats or in Smooth Streaming format
  - Single set of Smooth files easy to manage
- Running on Linux STBs today
- Coming to Android soon

# **IIS Advanced Logging**

- Rich user engagement data
  - Perform deep analysis
  - Improve ROI
- Real-time integration for near-live monitoring
- Real-time filtering keeps client data separated
- Compatible with WMS and other W3C logging
- Centralized client logging for large networks

### Content Protection/DRM

- Supported in Smooth Streaming via...
  - PIFF (Protected Interoperable File Format)
  - Smooth Streaming Format SDK
  - Smooth Streaming Player SDK
  - One-click PlayReady in IIS (coming soon!)
- Netflix and the Digital Entertainment Content Ecosystem (DECE – now branded as Ultraviolet) are using PIFF as the basis of their file format

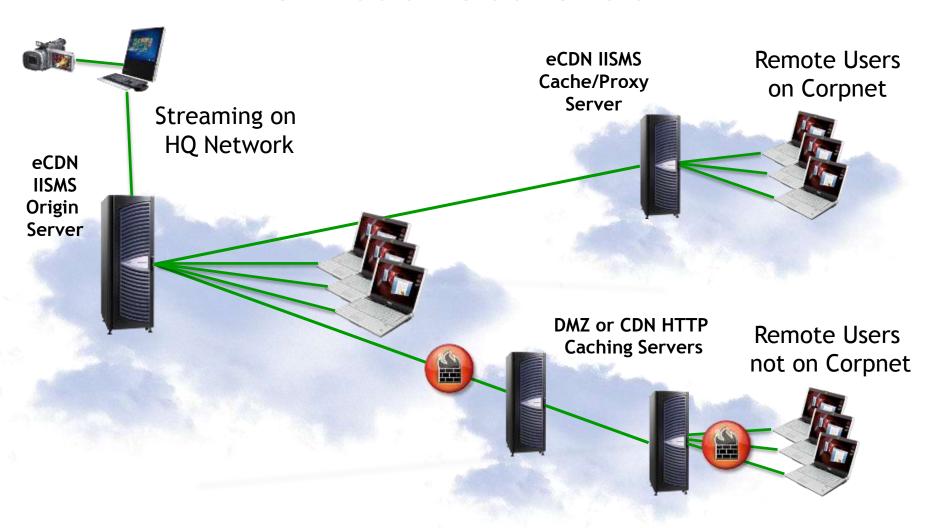
# Application Request Routing (ARR)

- Makes IIS a full-featured HTTP cache proxy
- Works better together with Smooth Streaming
- Provides control and extensibility for scaling

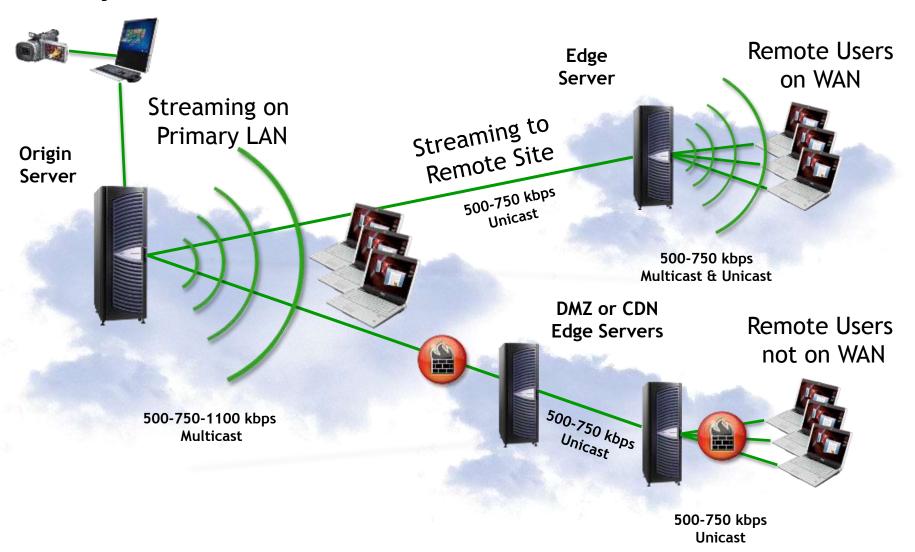
# Scaling Out IIS Smooth Streaming

- Use a Content Delivery Network (CDN)
- Use an Online Video Platform (OVP)
- Purchase caching appliances
- Build out a set of IIS caching servers
- Ensure a high-availability architecture

#### **Unicast Scale-out**

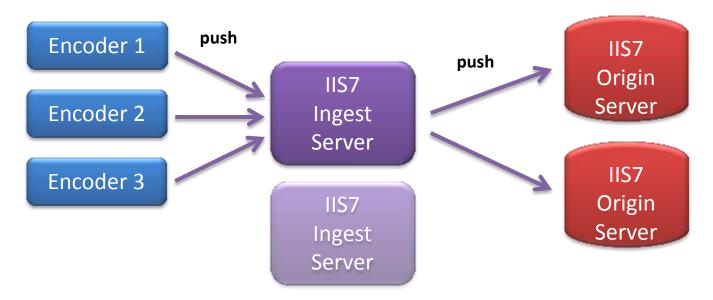


# Hybrid Unicast/Multicast Scaleout



# High Availability Architecture

- Failover at each point in the critical path
  - Encoder redundant or hot-spare model
  - Ingest active/passive recommended
  - Origin active/active recommended



### Live DVR and Archive Settings

- For Live Smooth Streaming broadcasts, use these features:
  - Temporary DVR archive
    - Delete DVR archive after live broadcast is done
  - Sliding window DVR archive
    - Only archive the most recent NN minutes
    - Ideal for 24/7 live broadcasts
  - Archive segmentation
    - Create a new archive file for every NN minutes

### Next Steps – Encoding

- Expression Encoder
  - Download the free trial of EE4 from <a href="http://www.microsoft.com/expression/products/E">http://www.microsoft.com/expression/products/E</a>
     <a href="http://www.microsoft.com/expression/products/E">ncoder Overview.aspx</a>
  - Upgrade the free trial version on-line for just \$199
- Third-party encoders
  - See the list at <a href="http://www.iis.net/media/partners">http://www.iis.net/media/partners</a>
  - Visit encoder companies here on the show floor

# Next Steps – Serving & Scaling

- Visit <a href="http://www.iis.net/media">http://www.iis.net/media</a> to learn more about Windows Media Services, IIS Media Services, and edge caching
- See the list of CDN partners at <u>http://www.iis.net/media/partners</u>
- Follow up with OVPs and EVM ISVs

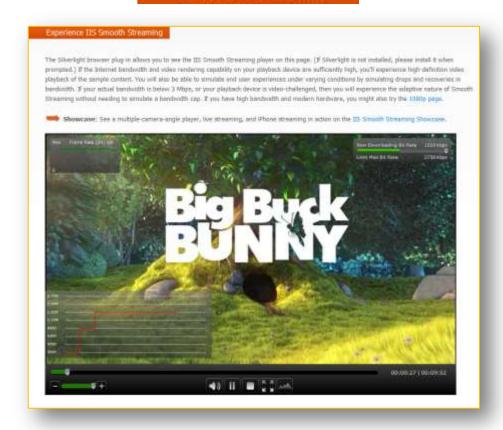
#### Next Steps – Consume

- Learn about the broader MMP Player
   Framework at <a href="http://smf.codeplex.com">http://smf.codeplex.com</a>
- Learn more about the IIS Smooth Streaming Client, see <a href="http://www.iis.net/smoothplayer">http://www.iis.net/smoothplayer</a>
- Get the details on the Microsoft Silverlight Analytics Framework at <a href="http://msaf.codeplex.com">http://msaf.codeplex.com</a>

#### Resources - Demos

#### www.IIS.net/media/demo

#### Watch It Now





#### Resources – Partners

#### www.IIS.net/media/partners

Overview Showcase Partners

#### **Partners**

While you can use Microsoft technologies to build a complete end-to-end solution on your own, sometimes working with one or more partners can help you achieve your goals more easily and quickly. Below, you will find a set of partners that have announced products or services that support IIS Media Services, including IIS Smooth Streaming. Click on a partner name to learn more. If you know of additional companies that should be on this list, please contact us.

Advertising & Analytics	Client Development	<b>Content Distribution</b>	<b>Content Protection</b>	Encoding
Conviva	iStreamPlanet	Akamai Technologies	BuyDRM	Anystream
DoubleClick	Stimulant	CDNetworks	CDNetworks	Digital Rapids
Omniture	Ucaya	Internap Network Services	CSG Systems	Envivio
	Vertigo	Internet Initiative Japan	Ipercast	Inlet Technologies
	Yacast Media	Level 3	Irdeto	Microsoft
		Limelight Networks	iStreamPlanet	Harmonic / Rhozet
		Yacast Media	Yacast Media	Twofour Digital
				VBrick
				Viewcast
				Winnov

#### Please...

#### FILL OUT YOUR EVALUATION FORM

# **Q & A**

#### smooth@microsoft.com

# SEND E-MAIL WITH ANY FOLLOW-UP QUESTIONS...

