

# Creating End-to-End Smooth Streaming Video Solutions with Silverlight and IIS Media Services

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# Objectives

- Understand end-to-end IIS Smooth Streaming
- Get started with IIS Smooth Streaming
- Use Expression Encoder to create, protect, and seamlessly publish content
- Target common scenarios, such as delivering training, a live webcast, and ad monetization
- Deliver to a wide range of end user conditions and clients, including Silverlight and Apple devices

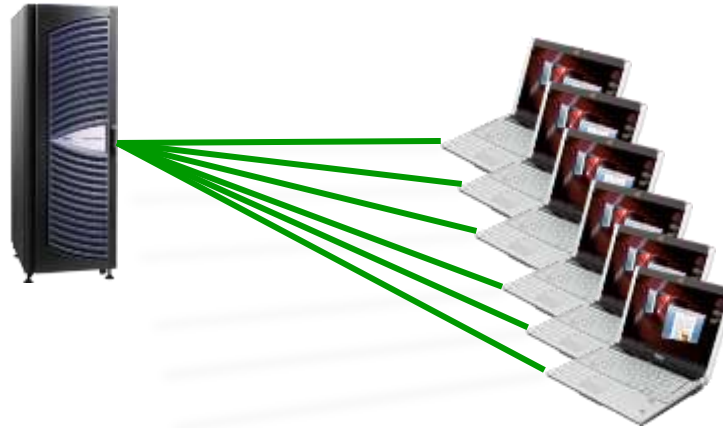
# Agenda

- Context for IIS Smooth Streaming
- Breaking Down the Workflow
- Next Steps

# Context

- Why not traditional delivery?

# Traditional Distribution Hurdles



## Streaming

(Windows Media Services, Flash Media Server, QuickTime Streaming Server, Windows Media MBR, Flash Dynamic Streaming)

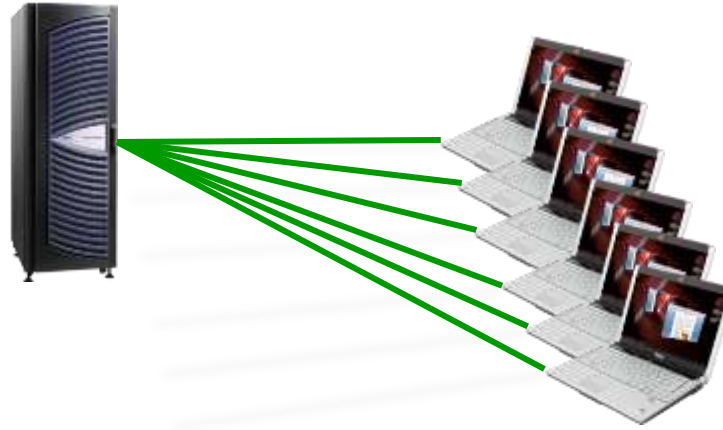
Many one-to-one persistent sessions

May require dedicated streaming servers

Scalability an issue when demand tops provisioning

May be disrupted by variable network conditions

# Traditional Distribution Hurdles



## Streaming

(Windows Media Services, Flash Media Server, QuickTime Streaming Server, Windows Media MBR, Flash Dynamic Streaming)

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May require dedicated streaming servers

Scalability an issue when demand tops provisioning

May be disrupted by variable network conditions

## Progressive Download

(Any standard Web or HTTP caching server)

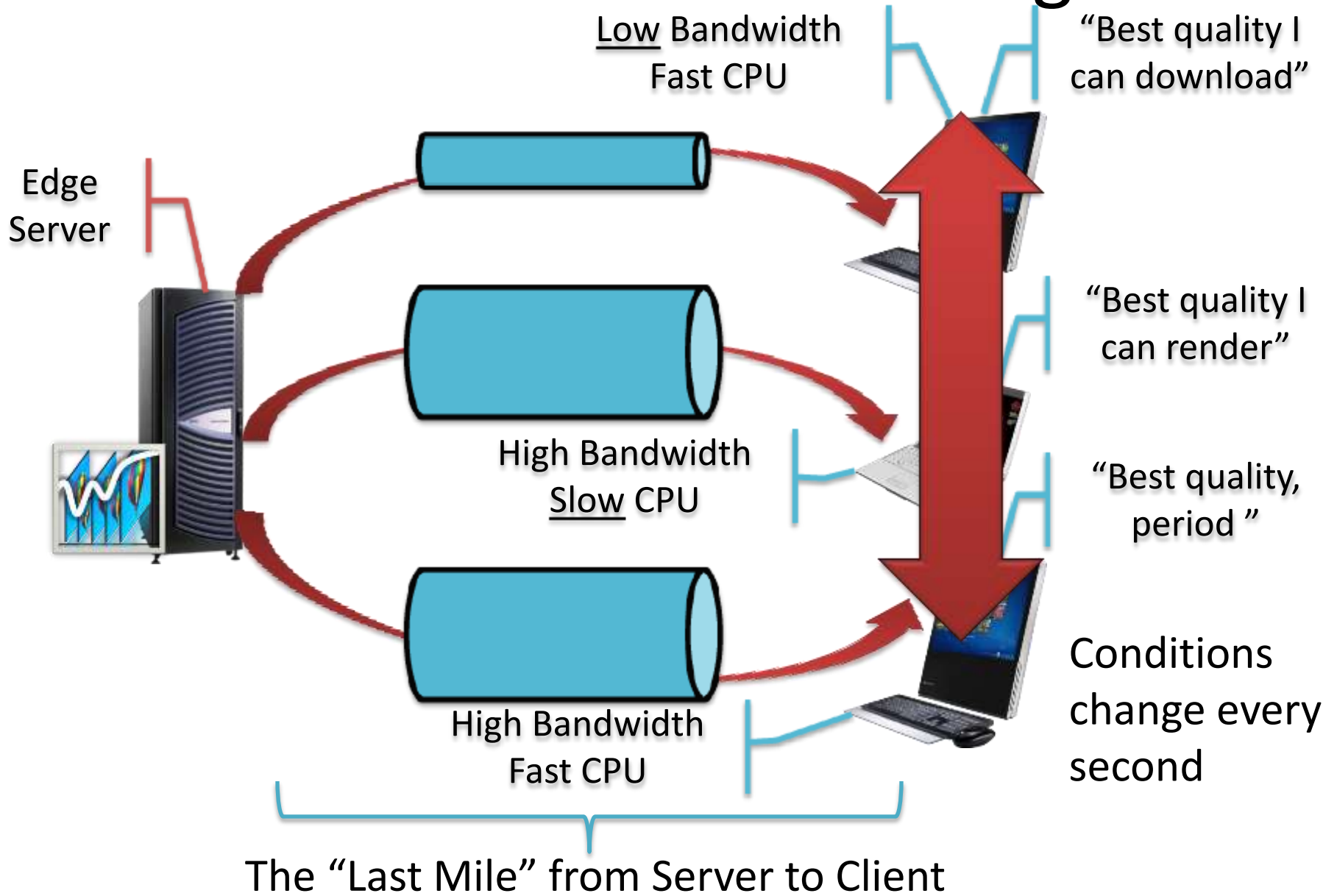
Hurdles similar to streaming, plus...

Limited user experience

Limited user tracking

Wasted bandwidth (20% watched)

# The "Last Mile" Challenge

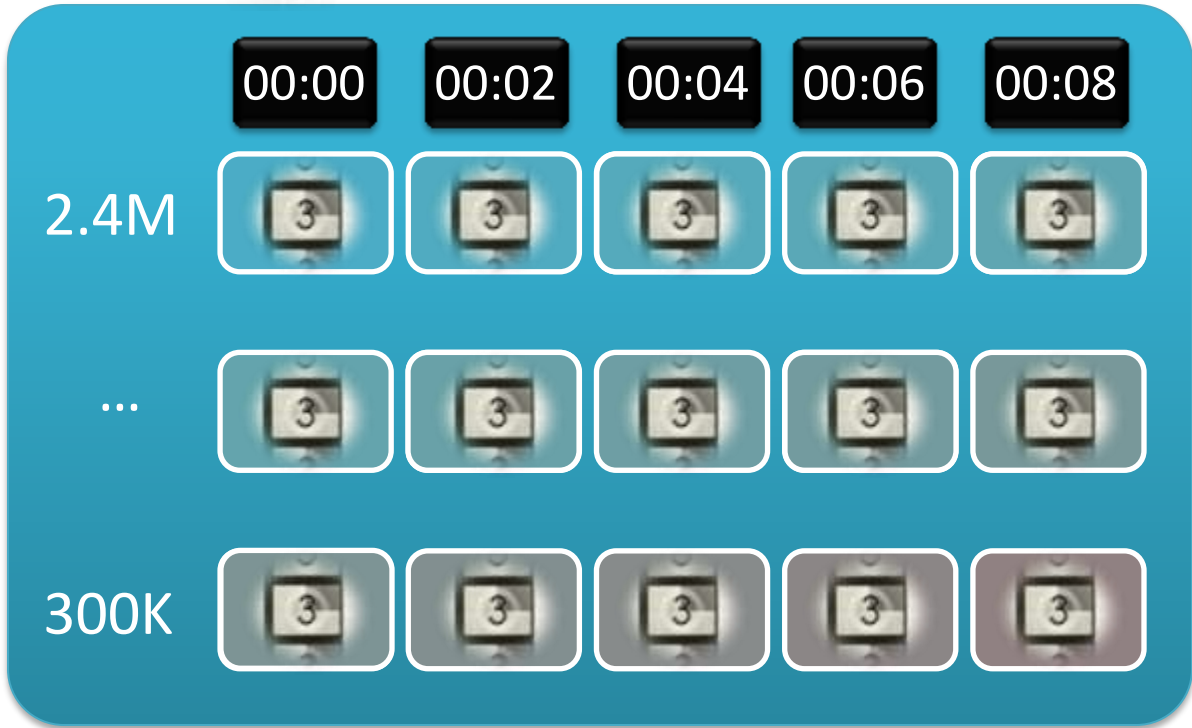
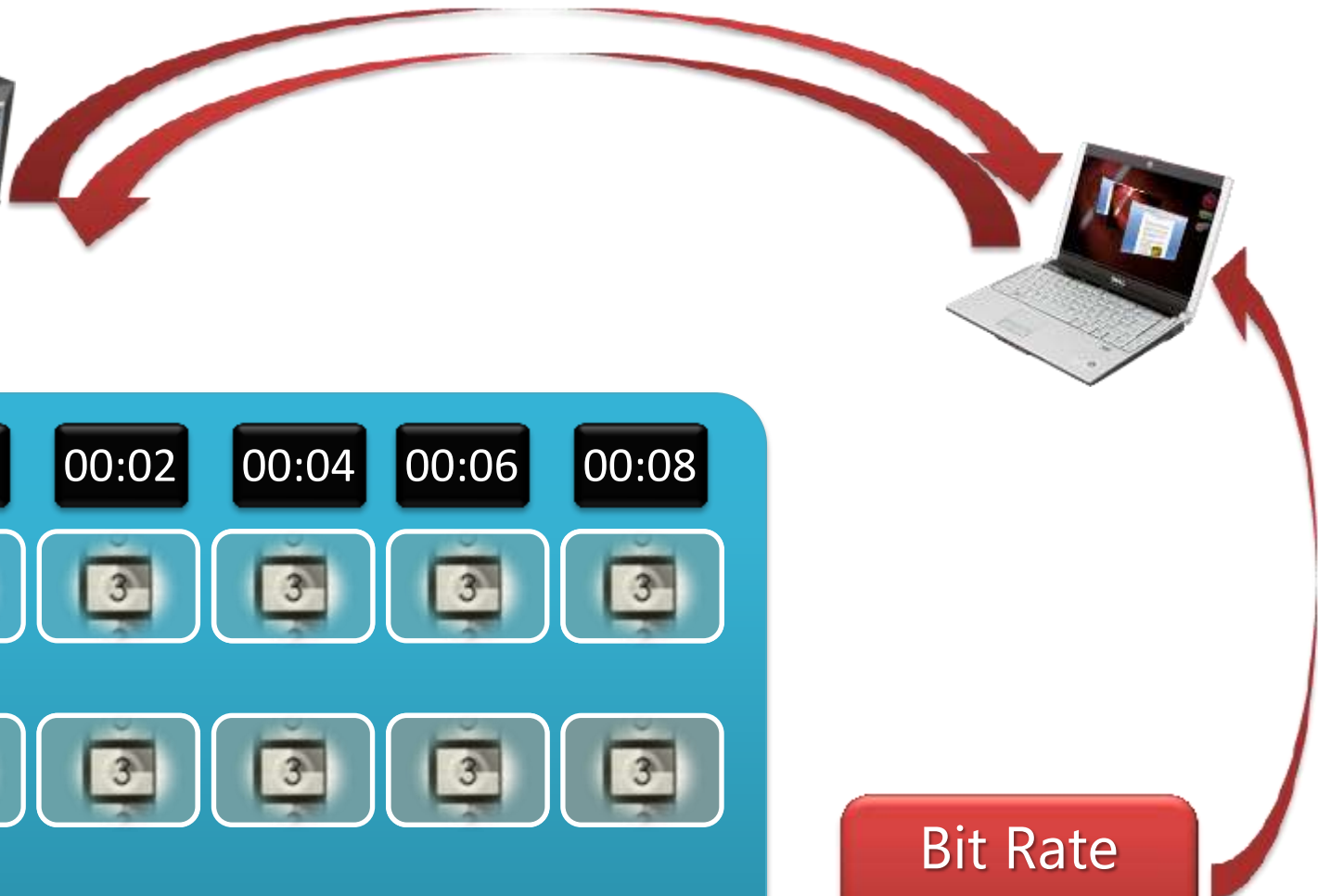


# Context

- Why not traditional delivery?
- What is IIS Smooth Streaming?



# Basic IIS Smooth Streaming



Bit Rate  
Heuristics

[IIS.net Graphing Player](#)

[NextSmooth.com Demo Site](#)

**DEMO**

# 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

# Live Smooth Streaming

- Builds on Smooth Streaming
  - Cacheable HTTP delivery for Live events
  - Network Digital Video Recorder (DVR)
    - 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)
- Trick Play: FF, Rewind, Slow Motion

# Context

- Why not traditional delivery?
- What is IIS Smooth Streaming?
- **Why IIS Smooth Streaming?**

# 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

IIS Smooth Streaming [Multi-Camera Player](#)

**DEMO**

# IIS Smooth Streaming Workflow

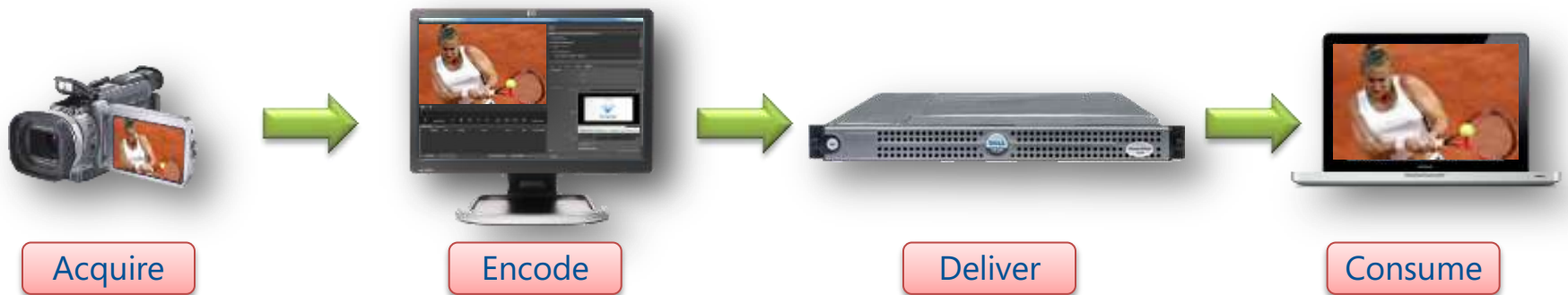
From simple on-demand training...





# IIS Smooth Streaming Workflow

...with straightforward workflows...



# IIS Smooth Streaming Workflow

...to highly enhanced experiences...

The image shows a screenshot of an NFL game stream interface. The main video area displays a football game in progress, with a scoreboard at the bottom showing CHI 2, GB 10, 1ST & 10, 3RD 14:55. The interface includes a navigation menu on the right with options like Game, Videos, and Stats. A sidebar on the right shows alternate camera angles: Cable Cam, End Zone, Sideline, and Star Cam. A control bar at the bottom features a play/pause button, a progress bar, and a quality meter. The interface is branded with 'SUNDAY NIGHT FOOTBALL [EXTRA]' and 'NFL.COM'.

HD quality Video

Instant Replay  
Slow Motion  
FFWD / REW

Complete Control

Key Play Markers

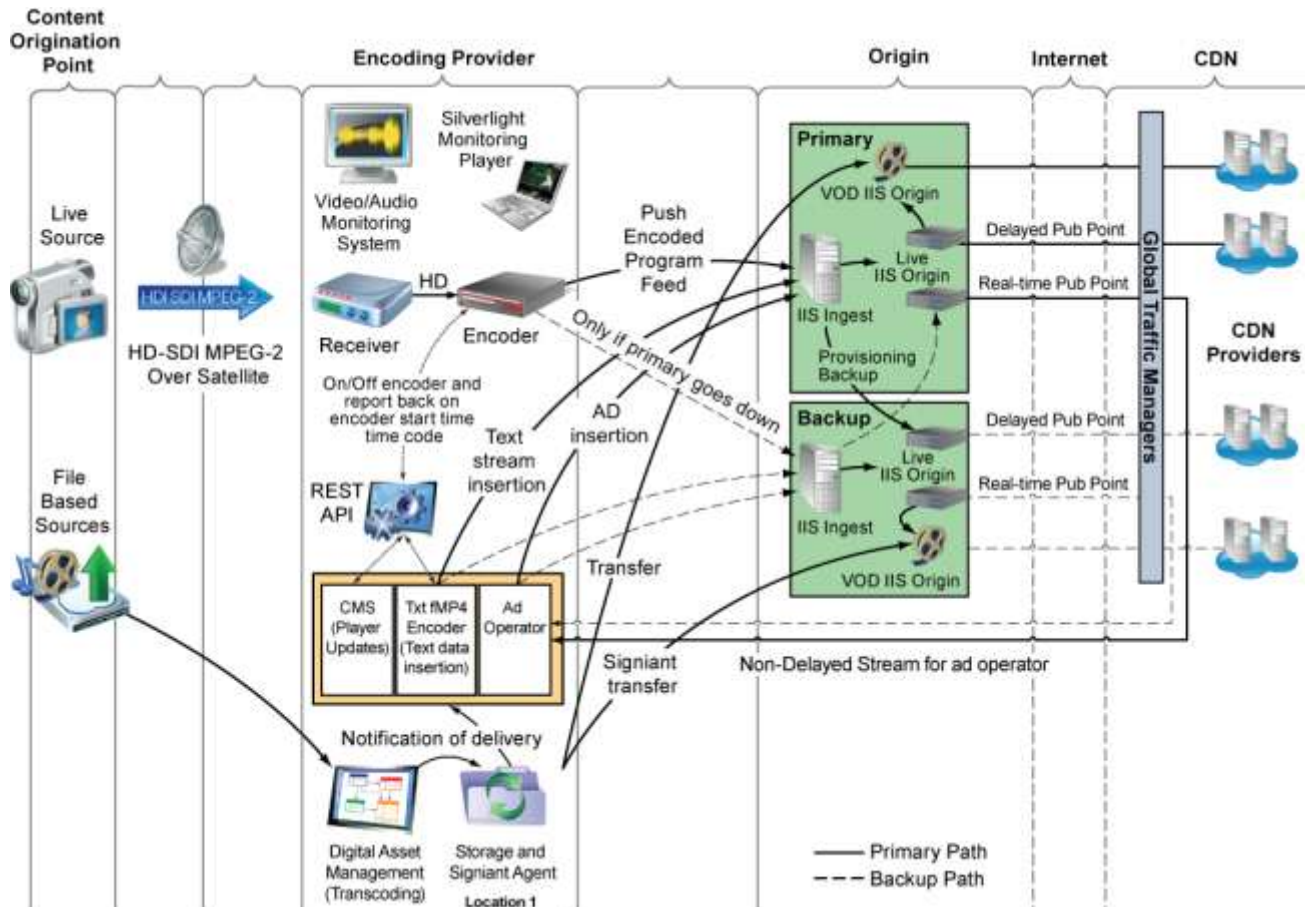
Quality Meter

Live Ad Insertions

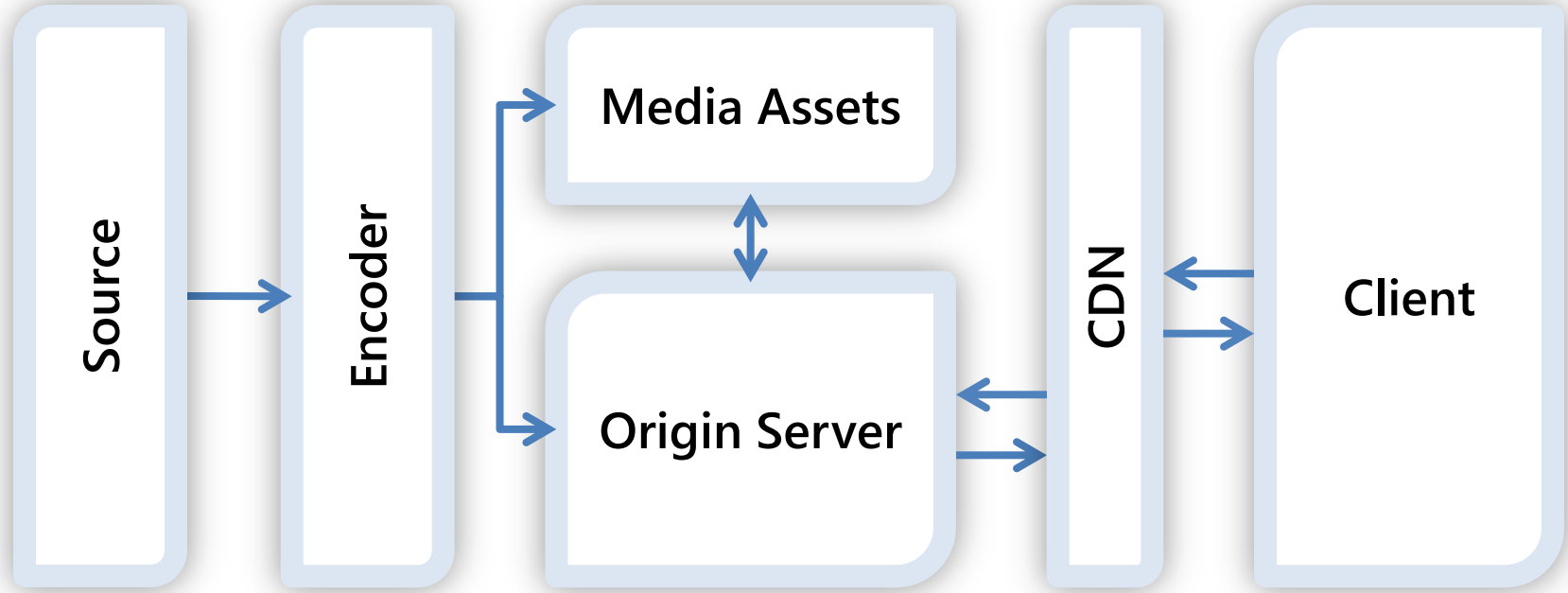
Alternate Cam Angles

# IIS Smooth Streaming Workflow

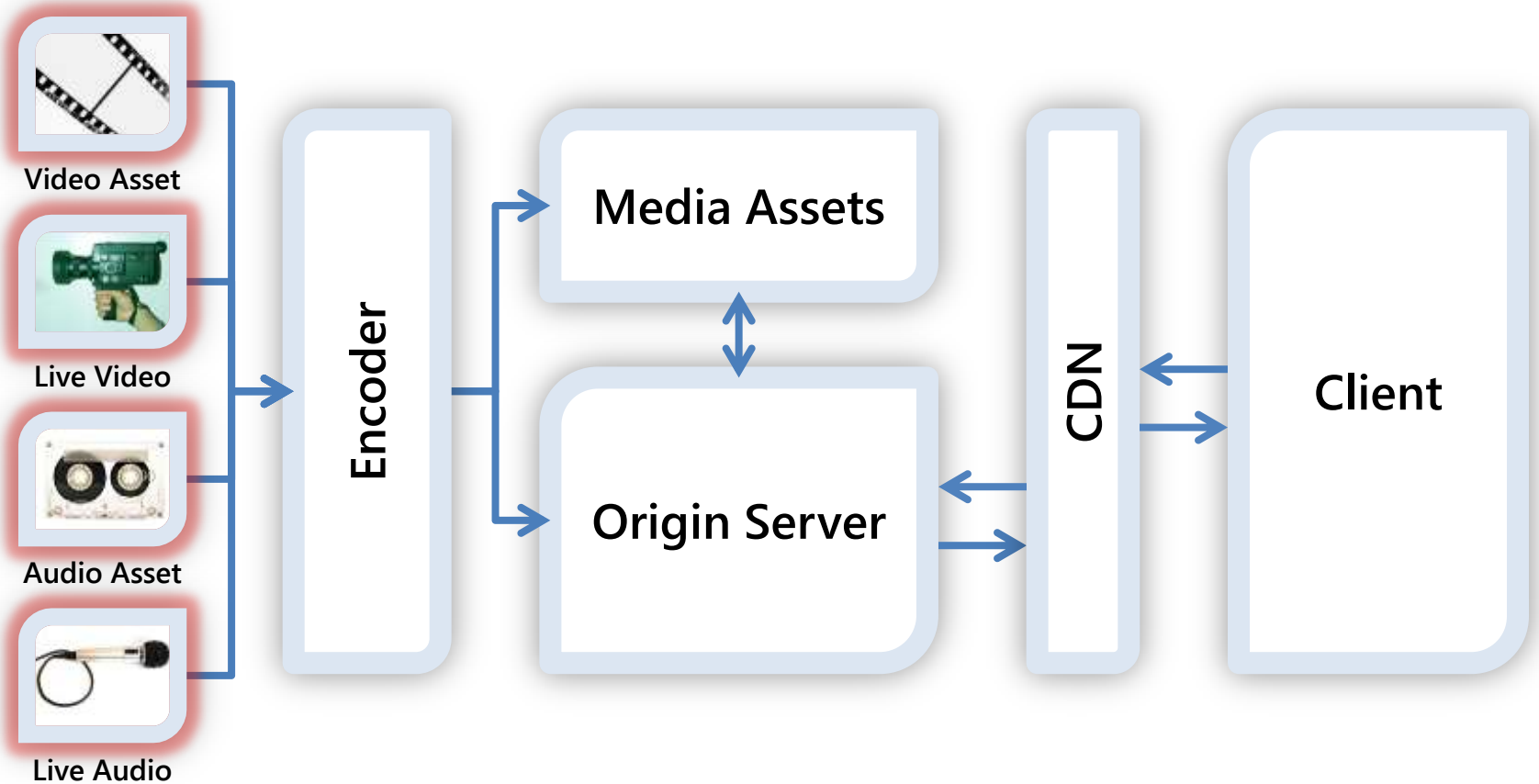
...that are a bit more complex.



# IIS Smooth Streaming Workflow



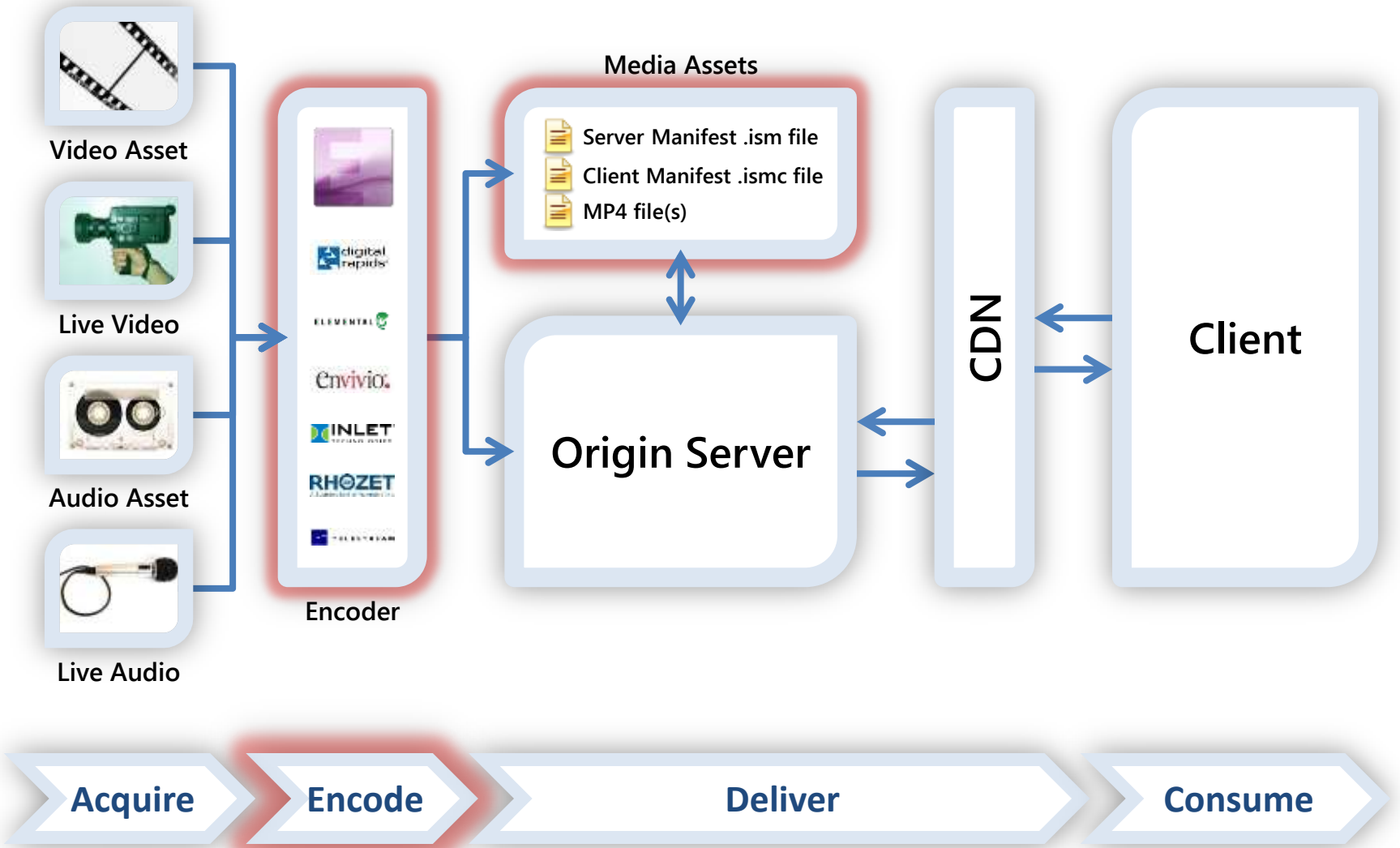
# IIS Smooth Streaming Workflow



# Acquire – Getting Content

- The higher the quality, the better
- Include your advertising – make it HD & interactive
- Not just video: IIS Smooth Streaming can also deliver...
  - Synchronized in-stream text & metadata
    - Captioning and subtitling
    - Sparse data (e.g., chapter markers)
    - Control events (e.g., ad insertion points)
  - Audio tracks
    - Additional languages
    - Commentary
    - Audio-only broadcasts (coming soon!)

# IIS Smooth Streaming Workflow



# Encode

- 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



# 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 <http://www.iis.net/media/showcase> for a longer list of partners, with more on the way

# Microsoft Expression Encoder 4

- Upcoming video encoder, editor, and SDK
- Replaces Windows Media Encoder
- New and improved features – coming soon!
  - Live Smooth Streaming support
  - OD, Live Smooth Streaming Presets (VC-1, H.264)
  - Publish directly to IIS & WMS origin servers
  - PlayReady DRM encryption for Smooth Streaming
  - High quality screen capture encoding
  - Greatly increased performance...

# Expression Encoder 4 Performance

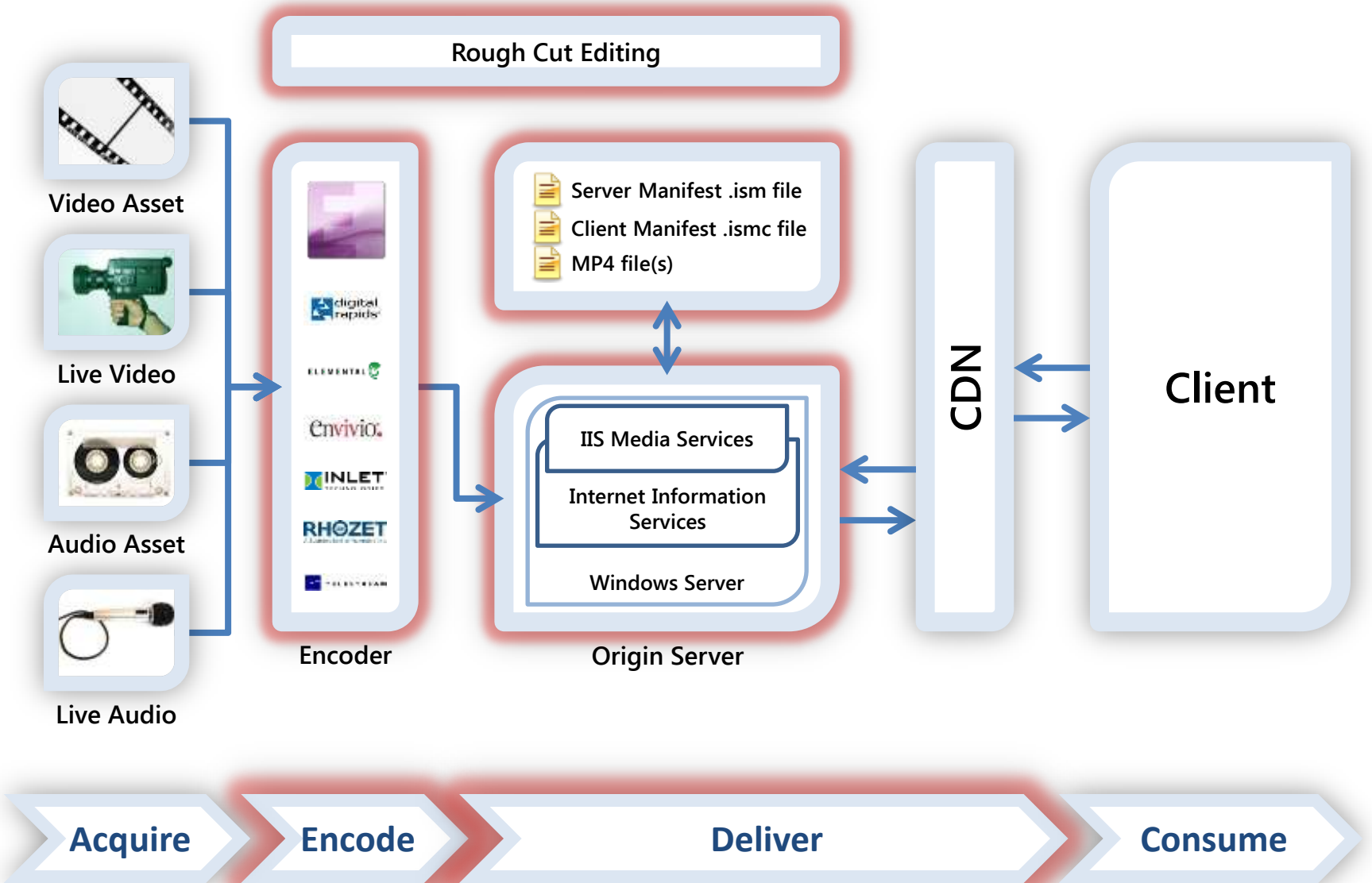
- Recent test results
  - H.264 Live Smooth Streaming
  - Outputting 10 streams up to 1080p
  - Combines encoder and IIS media server in one box
- Hardware
  - Intel Xeon 5600 Series (Westmere-EP)
  - 3.3 GHz CPU, 24 cores, 91% CPU usage
  - Retail pricing from OEMs under \$5,000



# IIS Encoding Options

- Smooth Streaming Format SDK
  - Enables encoder and workflow products
- IIS Transform Manager
  - On-Demand transcoding, transmuxing, encryption
  - User-specified hot 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
  - Partner SDK for ISV-supplied tasks and jobs

# IIS Smooth Streaming Workflow

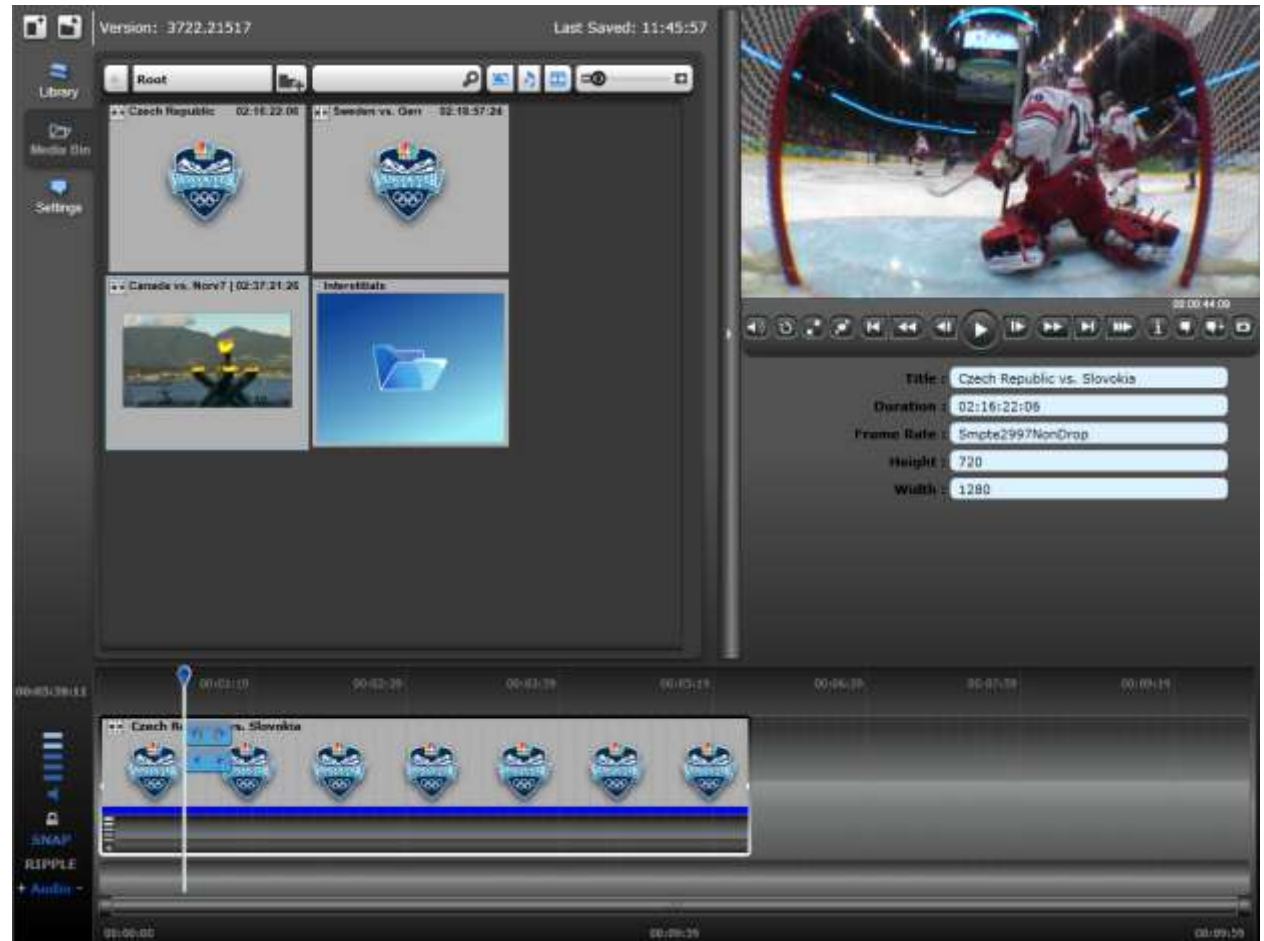


# Rough Cut Editing

- 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

# Silverlight Rough Cut Editor

- Free tool
- Used for Olympics
- Built in Silverlight
- Source code is provided
- Download from



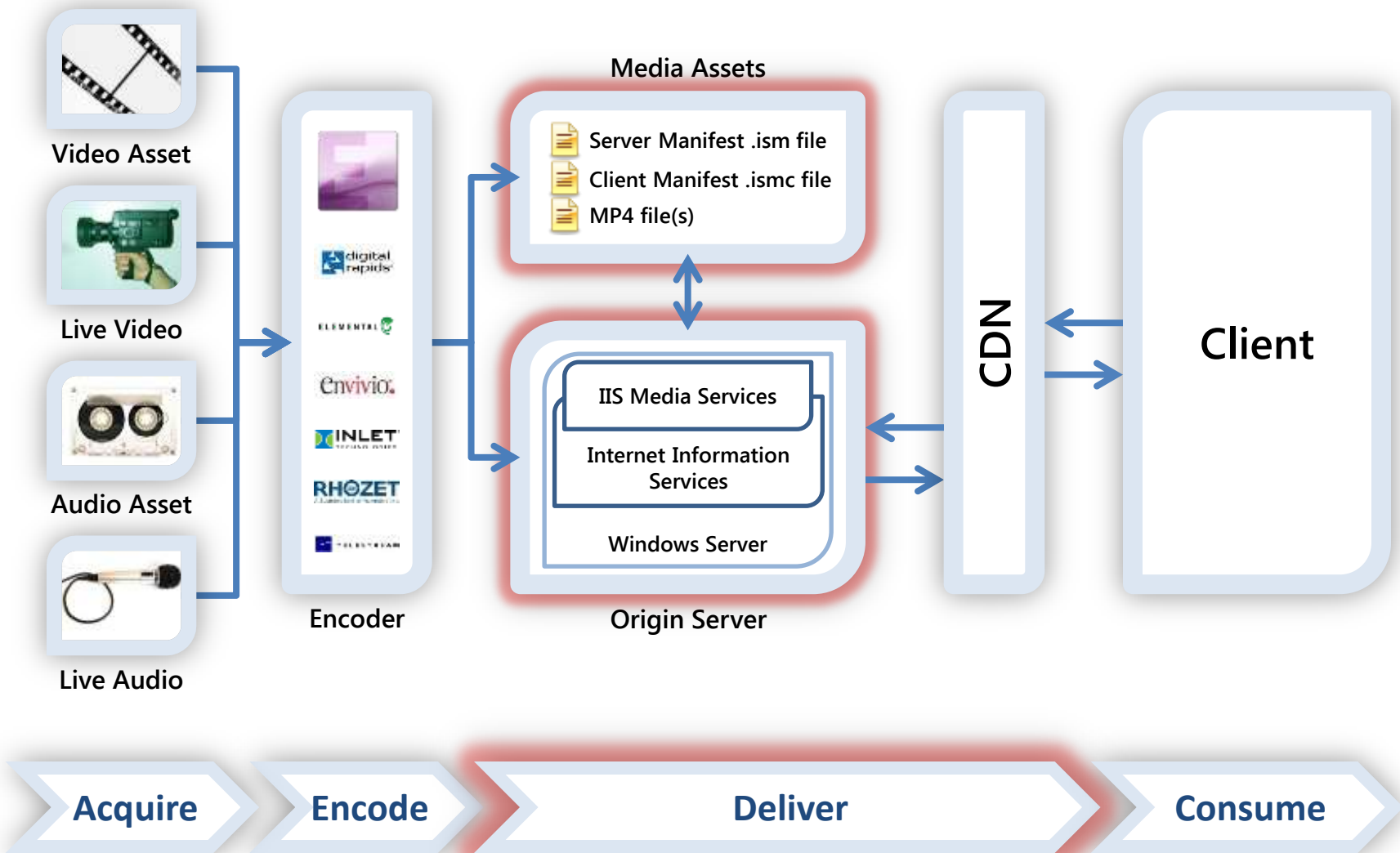
<http://code.msdn.microsoft.com/RCE>

Time to stretch!

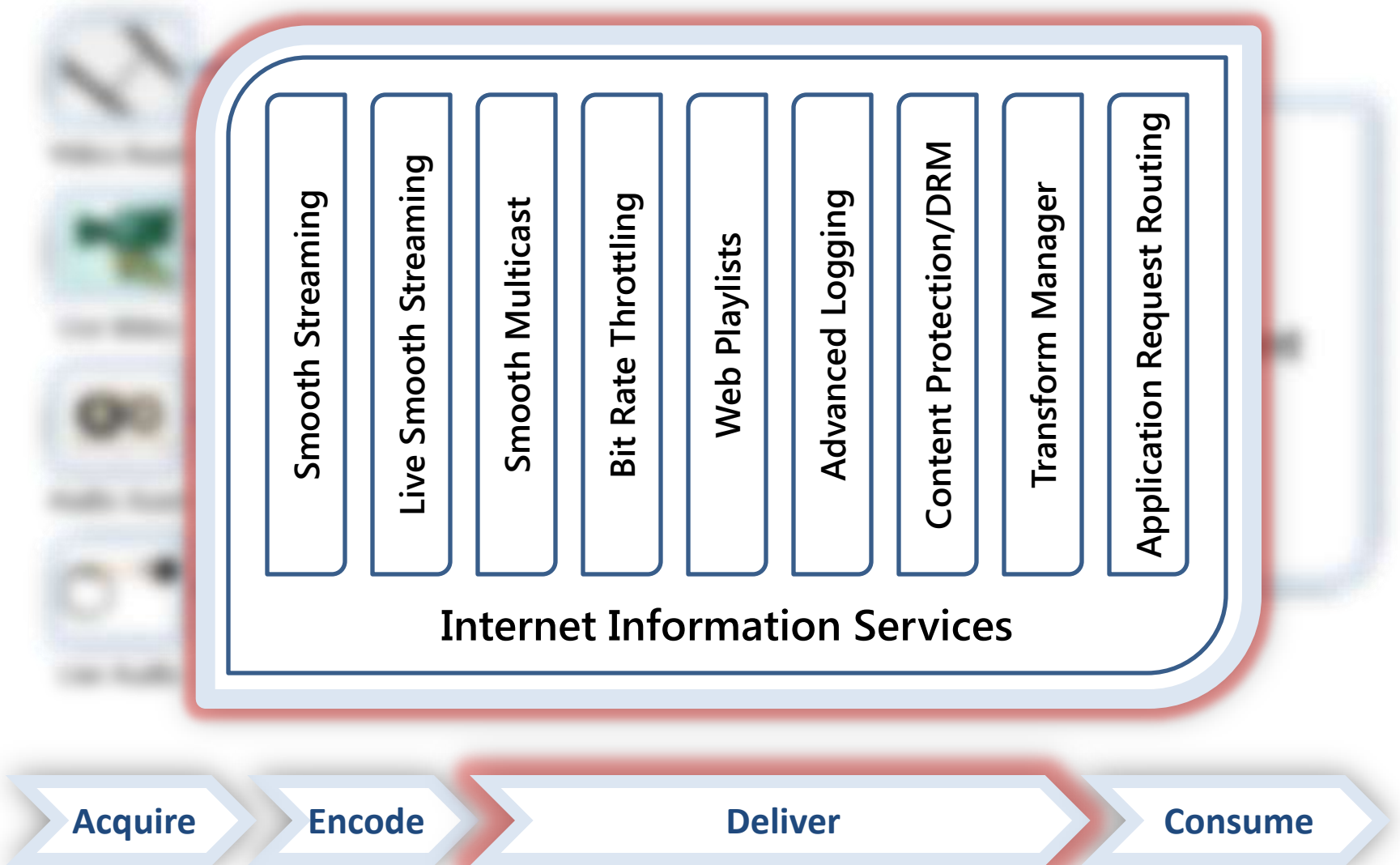
**10-MINUTE BREAK**



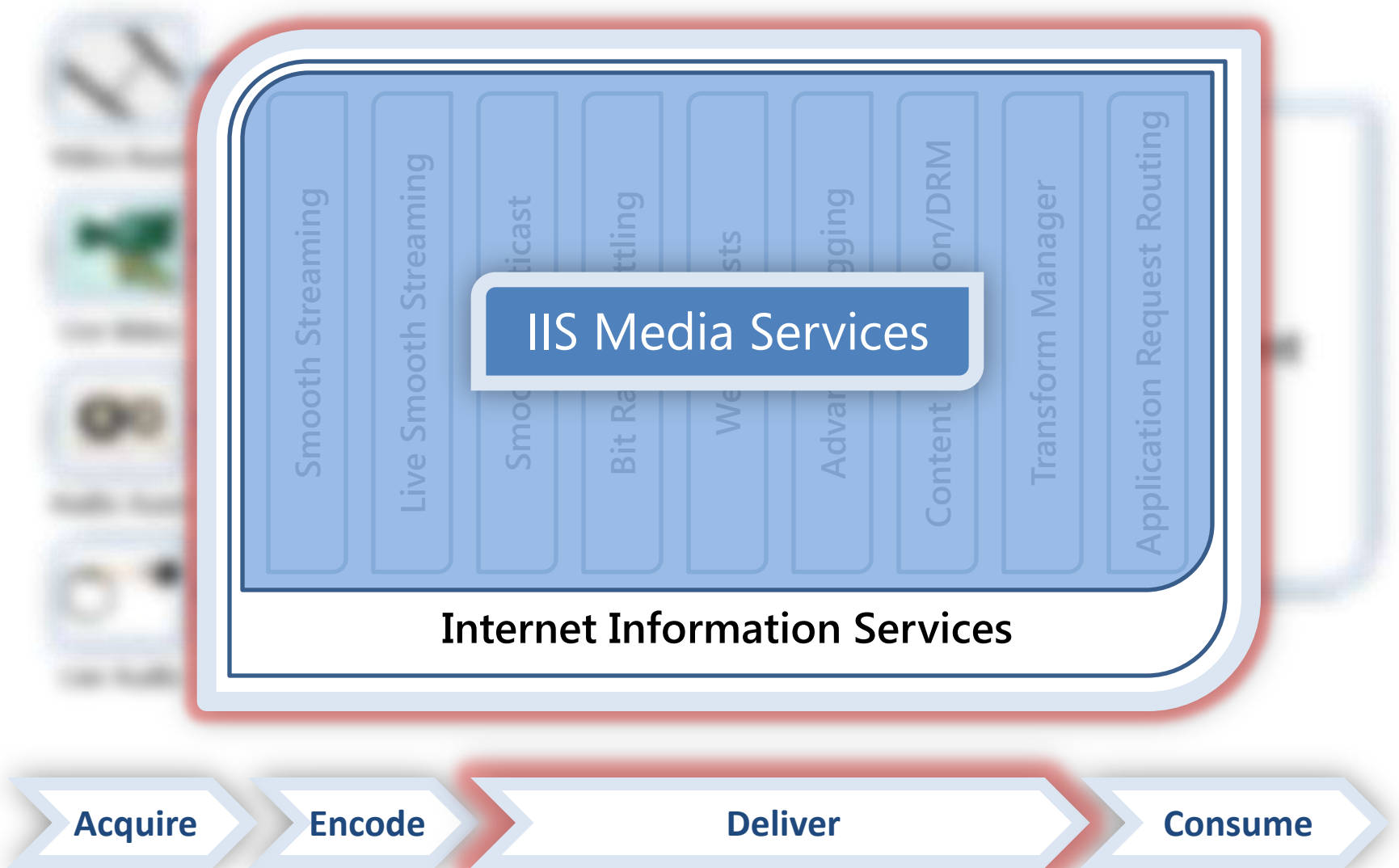
# IIS Smooth Streaming Workflow



# IIS Smooth Streaming Workflow



# IIS Smooth Streaming Workflow



# IIS Media Services Platform Goals

- Extend Media Engagement
  - Scale using Web servers and HTTP caching
  - Deliver True HD (720p+) live & OD video
- Measure and Monetize Media
  - Real-time server- and client-side logging
  - Reduce Web server bandwidth usage
- Create One Web Platform
  - Consolidate multiple media formats
  - Manage Web and media content together

# IIS Smooth Streaming

- Smooth Streaming (on-demand)
- Live Smooth Streaming
- Low-Latency Live Smooth Streaming
  - Less than 2 seconds from source to client screen
  - HTTP cacheable media delivery
  - Enables financial, gam(bl)ing, and surveillance verticals

# IIS Smooth Streaming

- Smooth Multicast (coming soon!)
  - Combines best of multicast and Smooth Streaming
  - Reliable, scalable delivery on multicast networks
- iPhone, iPod, and iPad support
  - Server delivers in devices' native formats
  - Single content set – easy to manage

IIS Smooth Streaming &  
Output to Apple Devices

**DEMO**

# Intelligent Progressive Download

- Bit Rate Throttling
  - Automatic format and encoding buffer detection
  - 11 pre-defined A/V formats (FLV, MP4, MOV, etc.)
  - Can be extended to almost any format
  - Also works with data files
- Web Playlists
  - Hybrid of client- and server-side playlists
  - Tokenizes URLs and prevents third-party playback
  - ASX by default; easily adapted to other formats



# 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

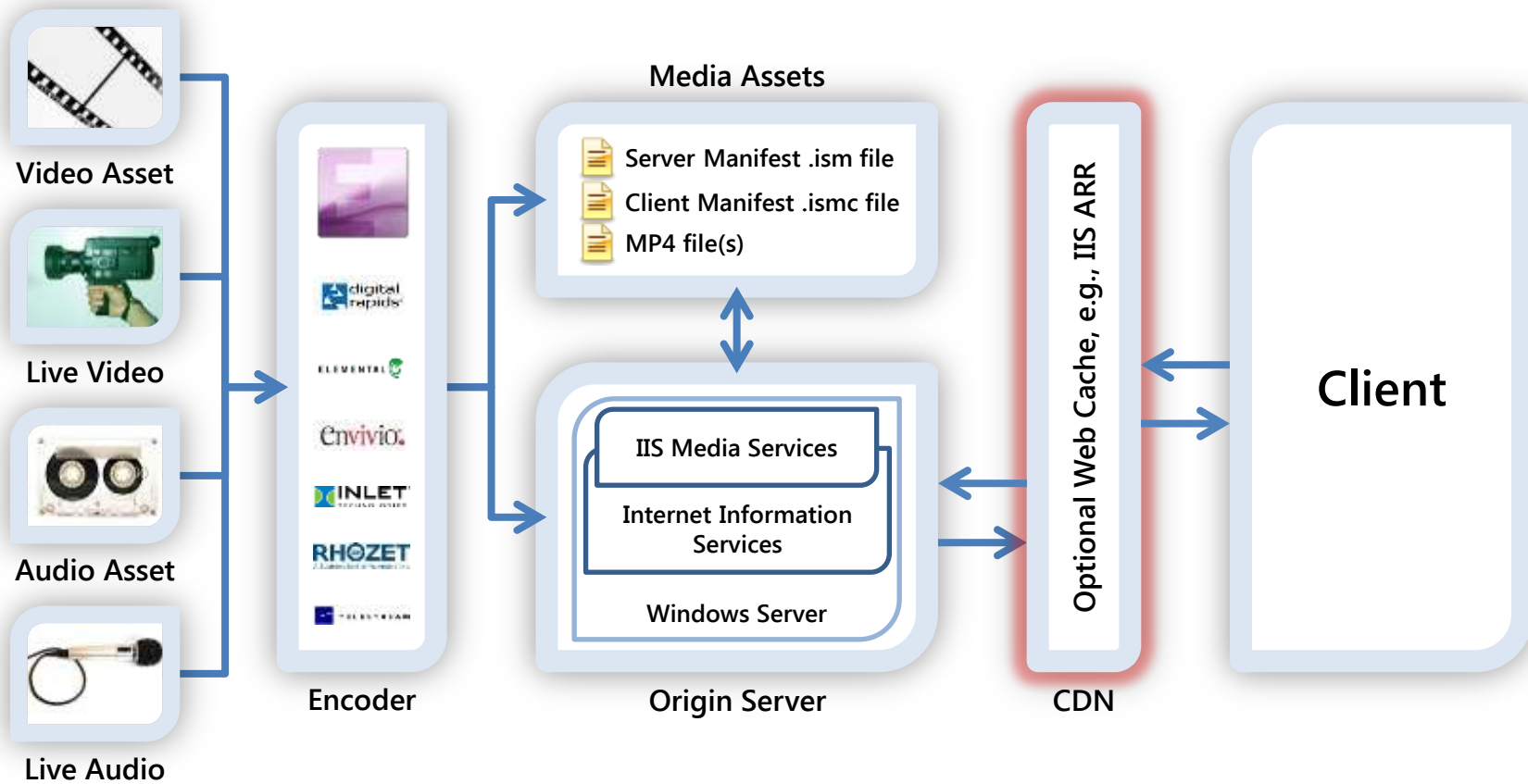
# Content Protection/DRM

- Supported in Smooth Streaming via...
  - Smooth Streaming Format SDK
  - PIFF (Protected Interoperable File Format)
  - Smooth Streaming Player SDK
- The Digital Entertainment Content Ecosystem (DECE) is using a subset of PIFF for their prescribed 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

# IIS Smooth Streaming Workflow



Acquire

Encode

Deliver

Consume

# 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

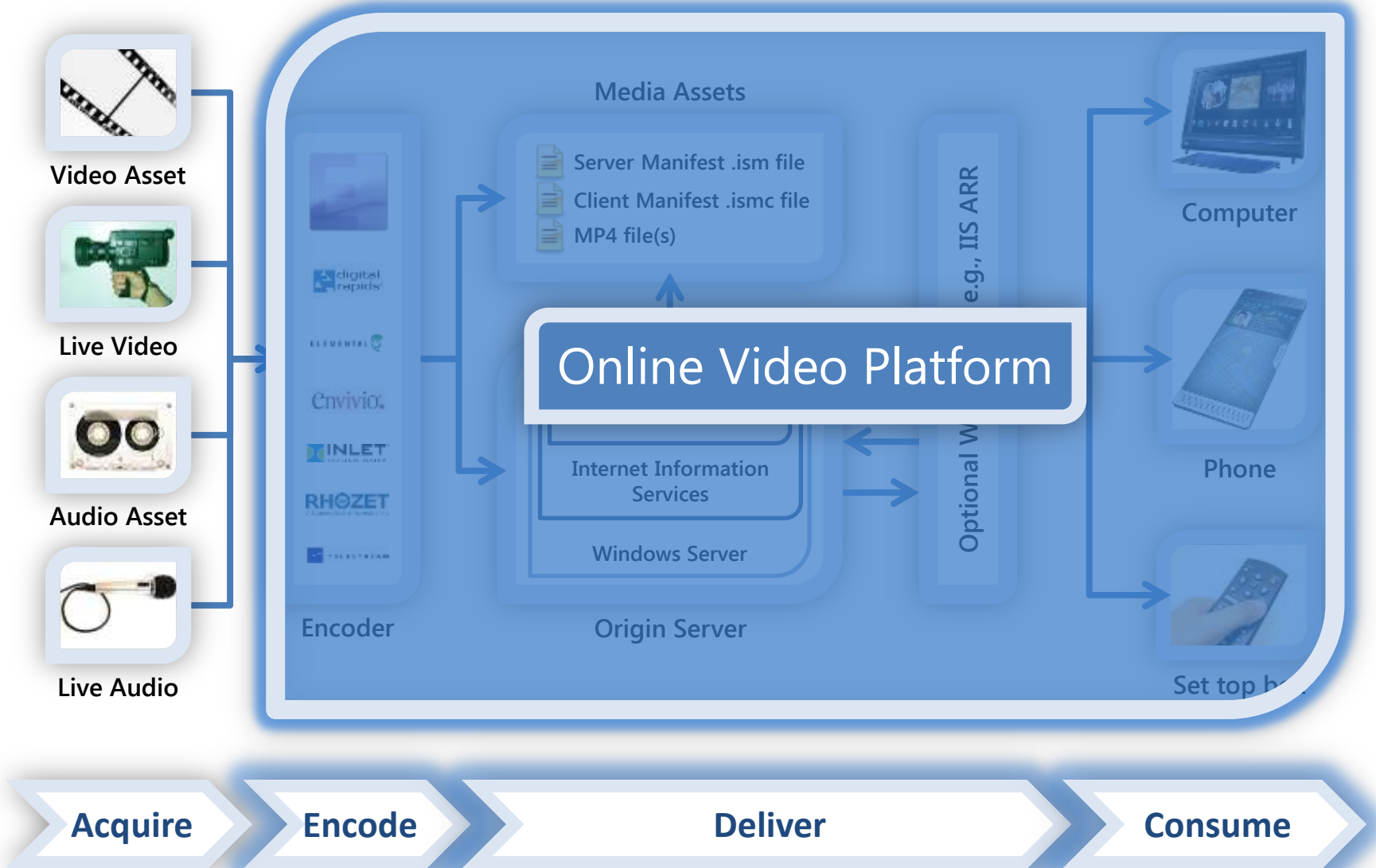
# Using a CDN

- Content Delivery Networks (CDNs):
  - Have 1000s of geographically dispersed servers
  - Most provide value-added media delivery services
  - Provide fast scalability to reach a global audience
- Many CDNs support IIS Smooth Streaming, including Limelight Networks, Level 3, Internap, CDNetworks, and Akamai
- More CDNs are beginning to offer media player templates and transcoding services

# Using an Online Video Platform

- An Online Video Platform (OVP) typically provides:
  - Transcoding
  - Global delivery
  - Media player design
  - Monitoring and analytics
  - Monetization through targeted advertising
- Ooyala and Kaltura are two OVPs that have announced support for IIS Smooth Streaming

# IIS Smooth Streaming Workflow





# Purchase Caching Appliances

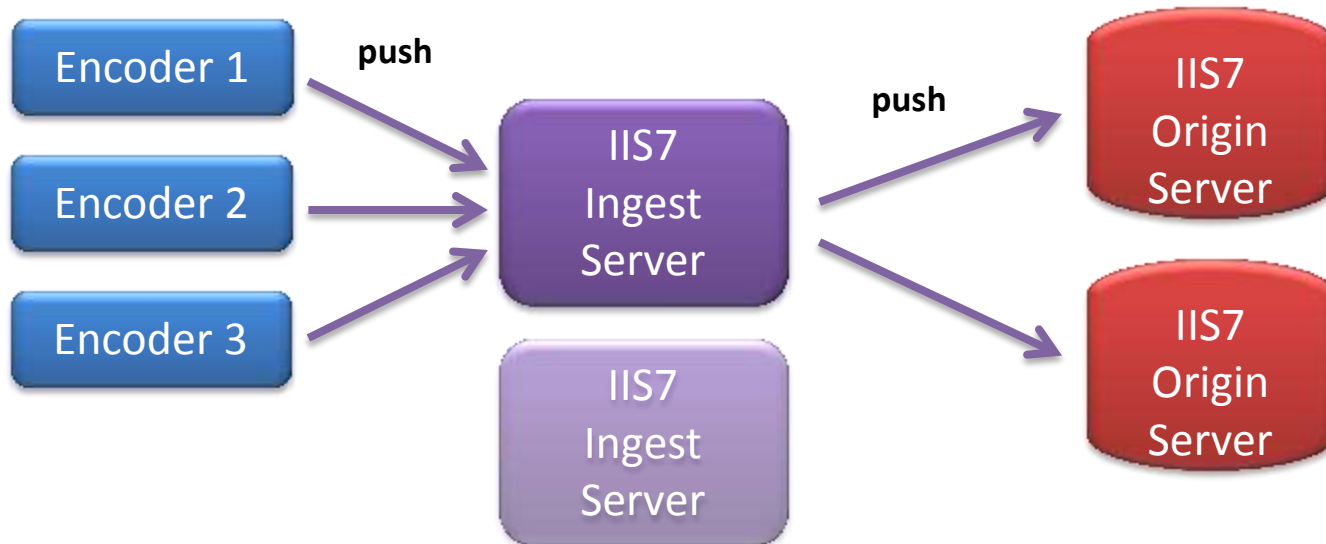
- Caching appliances are often:
  - Priced based on features and capacity
  - Designed to provide high reliability and up-time
  - Running a custom OS or management platform
- May be very useful:
  - For mission-critical private or managed networks
  - Where high volumes of redundant network traffic would result in congestion or high bandwidth bills
- Examples: Cisco, Bluecoat, Riverbed

# Scaling Out Your Deployment on IIS

- ARR and Smooth Streaming can use new or existing servers to scale out your delivery and get content closer to end users
- Build out in tiers; each adds unique value
  - Ingest – acquire, aggregate, manage sources
  - Origin – maintain authoritative archives
  - Distribution – control load on the Origin
  - Edge Servers – cache data close to viewers

# High Availability Architecture

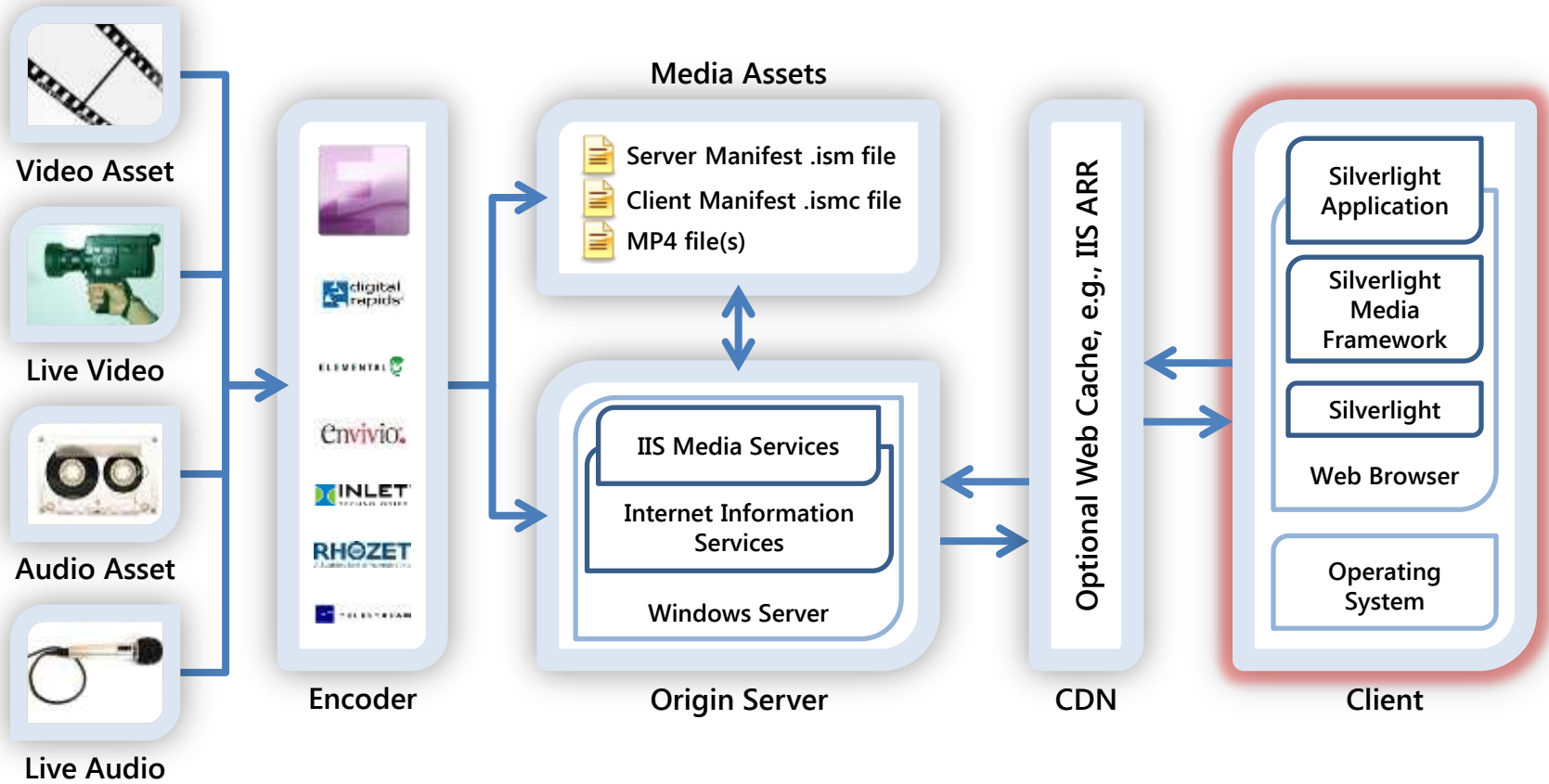
- Failover at each point in the critical path
  - Encoder – redundant or hot-spare model
  - Ingest – active/passive recommended
  - Origin – active/active recommended



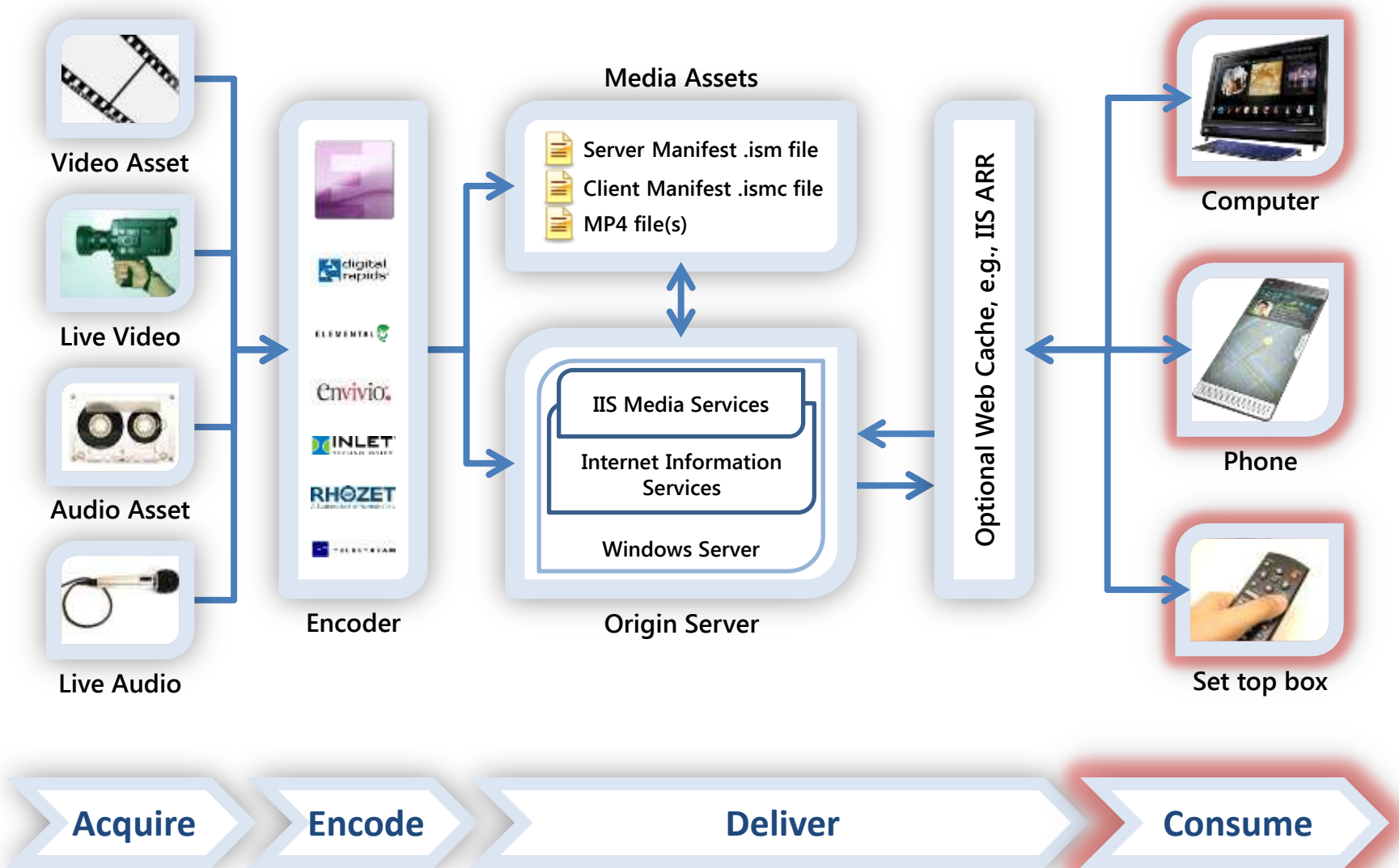
# Live DVR and Archive Settings

- For Live 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

# IIS Smooth Streaming Workflow



# IIS Smooth Streaming Workflow



# One Silverlight, Multiple Screens

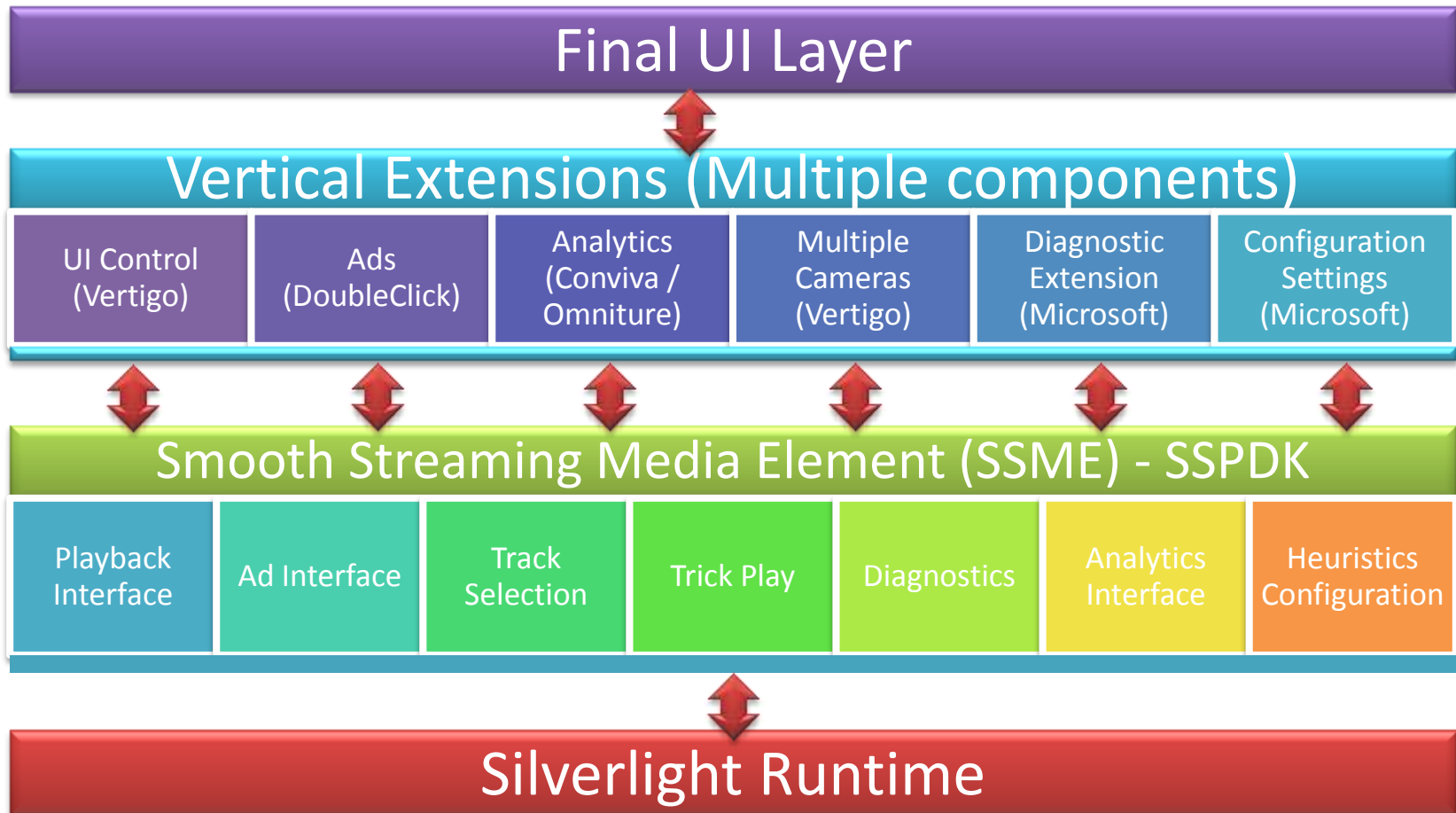
- Cross-platform computer support (now approaching 60% of desktops worldwide)
- Coming to Nokia & Windows phones in 2010
- Coming to set-top boxes, connected TVs, Blu-ray players, etc. via Intel & Broadcom SOC
- Consistent quality and experience across all endpoints

# IIS Smooth Streaming Player

- IIS Smooth Streaming Player Dev. Kit (PDK)
  - IIS Smooth Streaming Client SDK
    - Smooth Streaming Media Element
    - Enables third-party extensions
  - Encoder Simulator (“Push Encoder”) used to:
    - Simulate Live streams
    - Simulate Ad insertions
  - Sample Smooth Streaming Player (built on SDK)
    - Includes Bit Rate and Frame Rate visualizations
    - Ability to control perceived bandwidth



# IIS Smooth Streaming Player Architecture



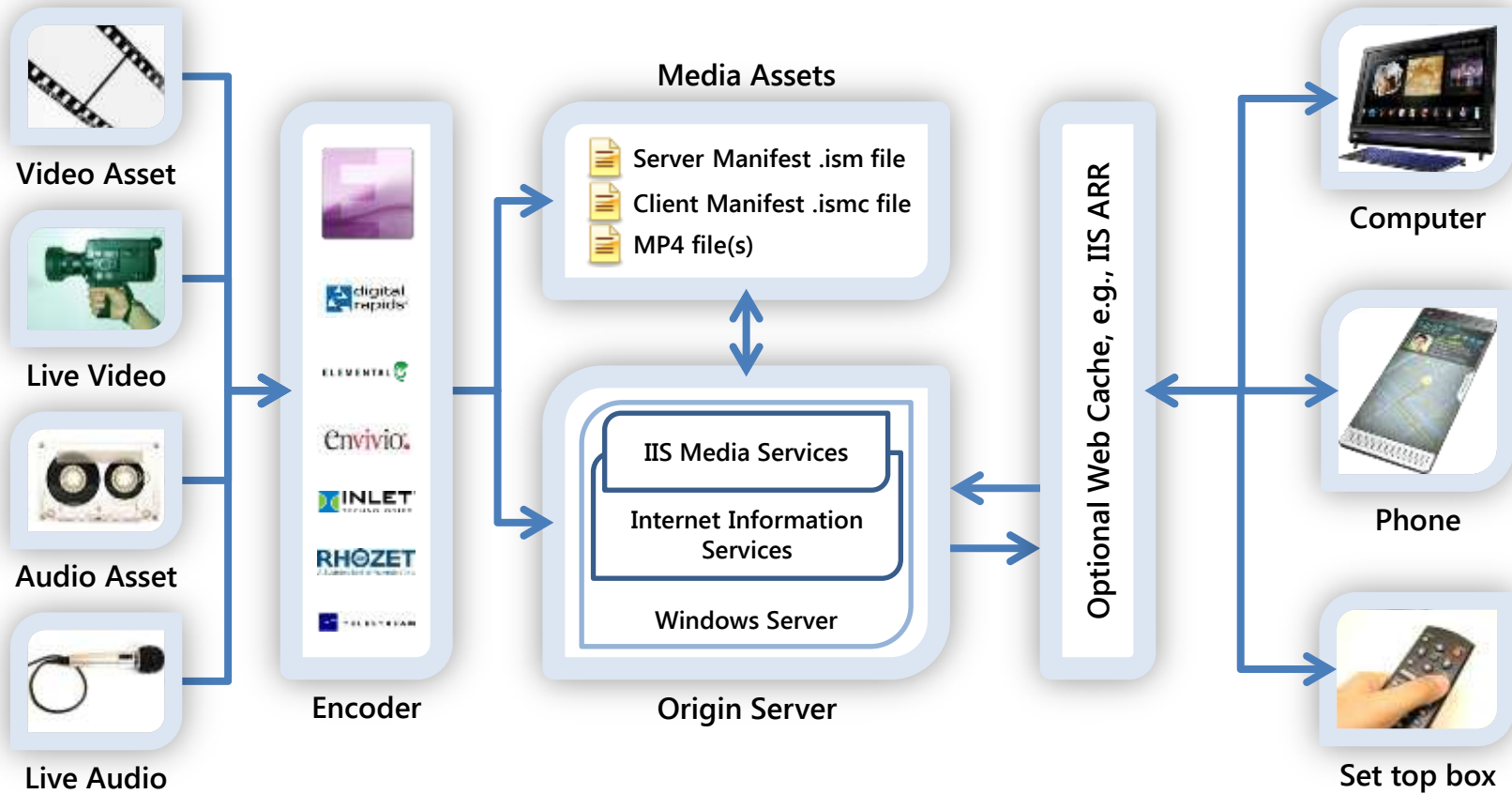
# Silverlight Media Framework

- Open source media player framework
- Builds on the core functionality of the PDK
- Enables developers to quickly deploy a robust, scalable, customizable media player for IIS Smooth Streaming delivery
- Built on the player code base used to deliver many Smooth Streaming deployments, such as Sunday Night Football, the Olympics, etc.

# Reporting, Analytics, Monitoring

- IIS Advanced Logging
- Third-party integration
  - Conviva (real-time content delivery analytics)
  - Omniture (Web analytics)
  - DoubleClick (advertising)
- Silverlight Analytics Framework integration
  - Logs video experiences built on the Silverlight Media Framework

# IIS Smooth Streaming Workflow



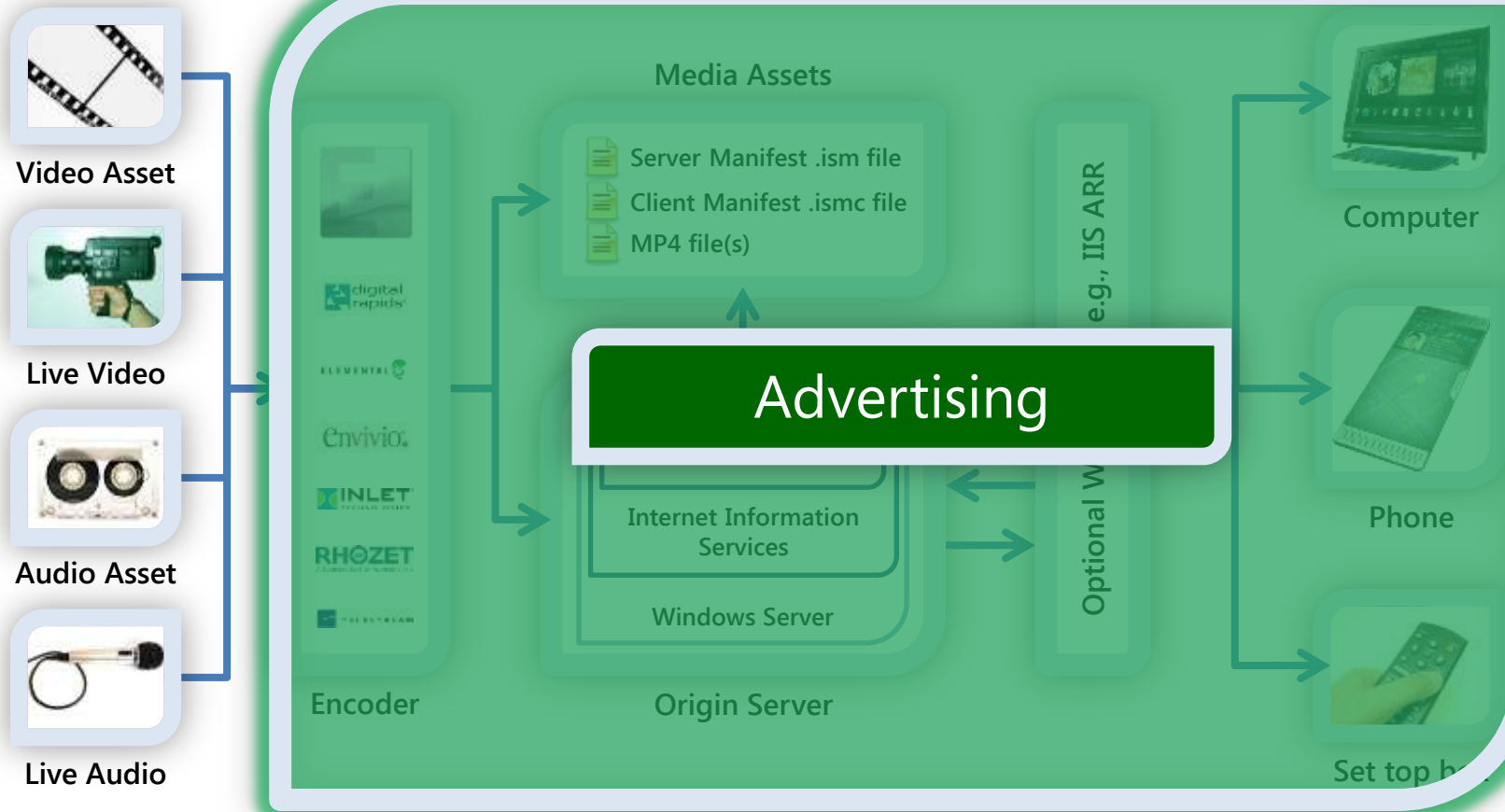
Acquire

Encode

Deliver

Consume

# IIS Smooth Streaming Workflow



Acquire

Encode

Deliver

Consume

# Advertising with Smooth Streaming

- Pre-roll or pre-timed interstitial videos
- Live stream ad insertion
- Synchronized banner ads
- Interactive overlay advertising
- HD advertising using bit rate history
- Targeted advertising based on analytics
  - Via third-party PDK extensions
  - Via IIS Advanced Logging

# Next Steps – Acquire & Encode

- Acquisition – switch to HD source if possible
- Encoding
  - Expression Encoder
    - Download the free trial of EE3 (soon to be EE4) from [http://www.microsoft.com/expression/products/Encoder\\_Overview.aspx](http://www.microsoft.com/expression/products/Encoder_Overview.aspx)
    - Upgrade the free trial version on-line for just \$49
  - Third-party encoders
    - See the list at <http://www.iis.net/media/showcase>
    - Visit encoder companies here on the show floor

# Next Steps - Deliver

- Server
  - Visit <http://ww.iis.net/media> to learn more IIS Media Services and edge caching with ARR
  - See the list of CDN partners at either:
    - <http://www.microsoft.com/silverlight/partners/>
    - <http://www.iis.net/media/showcase>
  - Follow up with [Kaltura](#) and [Ooyala](#)



# Next Steps – Consume

- Client technologies
  - Learn about the broader Silverlight Media Framework at <http://smf.codeplex.com>
  - Learn more about the IIS Smooth Streaming PDK, see <http://www.iis.net/smoothplayer>
  - Get the details on the Microsoft Silverlight Analytics Framework at <http://msaf.codeplex.com>.

Please...

**FILL OUT YOUR EVALUATION FORM**

**Q & A**

Chris.Knowlton@microsoft.com

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

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