

Choosing an Enterprise Encoder

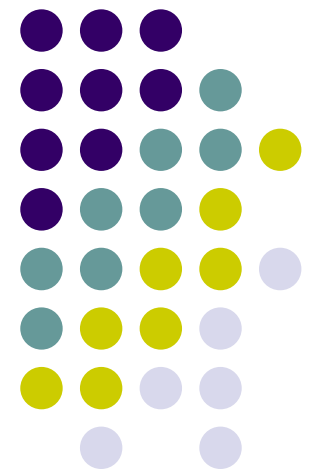
Jan Ozer

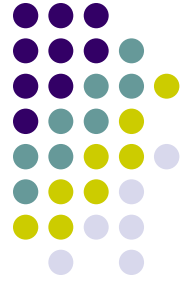
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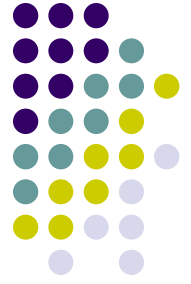
Agenda

- What's covered (and what's not)
- What is an enterprise encoder
- Classes of enterprise encoders
- Points of differentiation (factors to consider when choosing an enterprise encoder)



What's covered (and what's not)

- On-demand encoding only
 - Not live (though many of the lessons and buying considerations are similar)
 - Not video conferencing or conferencing
- For desktop/mobile and compatible markets
 - Not broadcast or cable
 - Not IPTV (though some overlap with OTT)
- Local installation (not cloud)



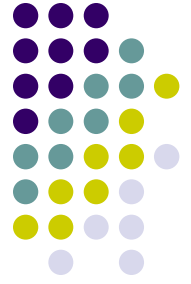
What is an Enterprise Encoder?

- How is Squeeze Server different than Squeeze, or Episode Engine different than Episode Pro?
- Varies by product, but here are some concepts



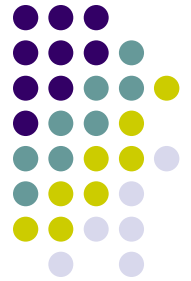
What is an Enterprise Encoder?

- Shared use
 - Watch folders, UI, API
- Highest performance
 - Full parallel encoding/split and stitch
 - How Episode Engine differs from Episode Pro
- Scalable
 - Single point of control
 - Multiple encoders with failover



What is an Enterprise Encoder?

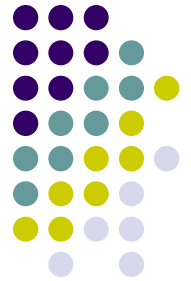
- All relevant outputs (video and manifest files)
 - Single file H.264
 - HTTP Live Streaming
 - HTTP Dynamic Streaming
 - Smooth Streaming
 - DASH
- Enterprise features unavailable on desktop products
 - Closed captioning (not universally supported in enterprise products, though should and will be)
 - DRM support for major output formats



What is an Enterprise Encoder?

- Programmable via API/plugin
 - How Squeeze Server differs from Squeeze Desktop
- Can be hardware
 - Thomson ViBE EM4000, Envivio 4Caster, Telestream Lightspeed Server
- Can be software
 - Harmonic Carbon Coder, Telestream Vantage, Ateme TITAN KFE
- Can be command line
 - YouTube uses FFMPEG to perform their encoding

Classes of Enterprise Encoder



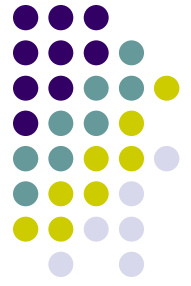
- Fall into three classes:
 - Important to identify class you're looking for before getting started
- Class 1: Swiss Army Knife Transcoders
 - All formats in, all formats out
 - Can input and output most camera and intermediate formats
 - Output most codecs, including legacy formats and playout servers

Classes of Enterprise Encoder

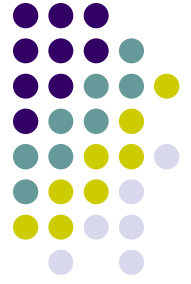


- Class 2: High-volume encoders
 - Often limited I/O format support
 - Input
 - Output
 - Fastest possible H.264 encoding

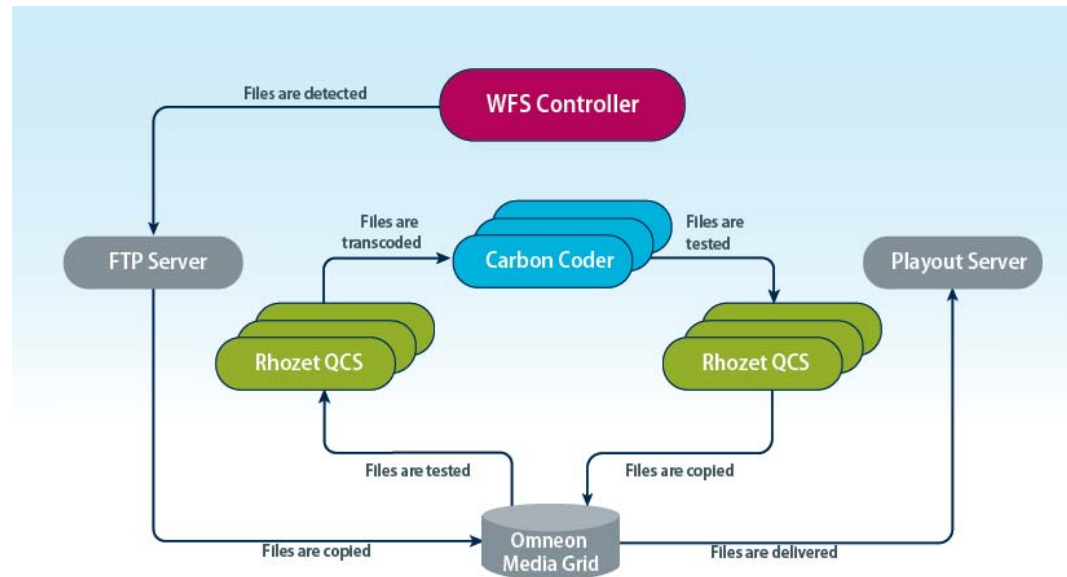
Classes of Enterprise Encoder



- Class 3: Workflow systems
 - Integrate encoding with quality control and other functions
 - Make encoding decisions based upon metadata
 - Interrogate file and place in encoding buckets
 - HD vs. SD, or 16:9 vs. 4:3
 - Perform incoming QC checks
 - Perform post-encoding QC checks
 - Self-healing workflows (encode at higher data rate if quality metrics too low)



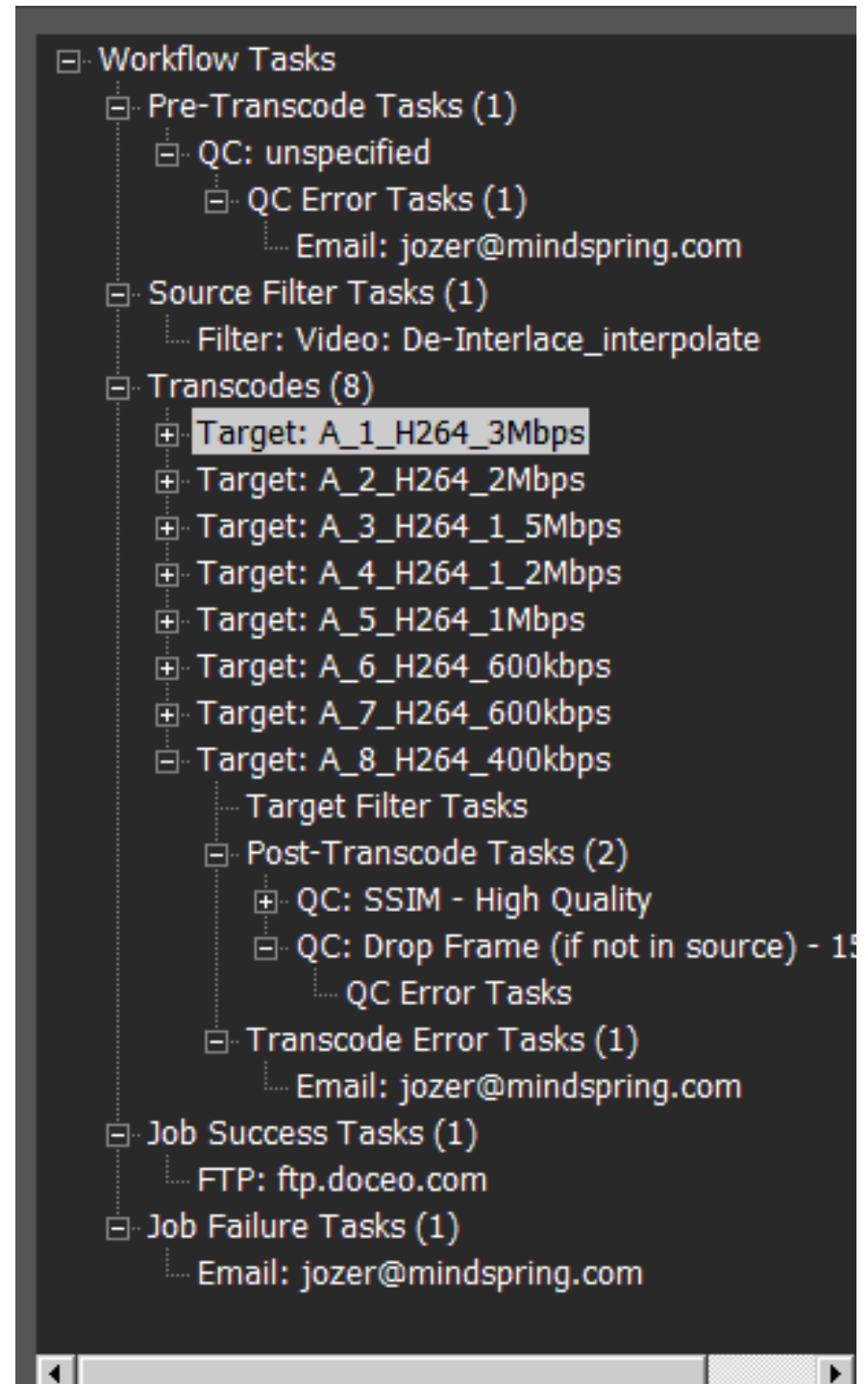
Harmonic ProMedia

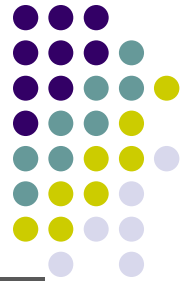


- Workflow is uber-program that sits above encoding/QC and other programs

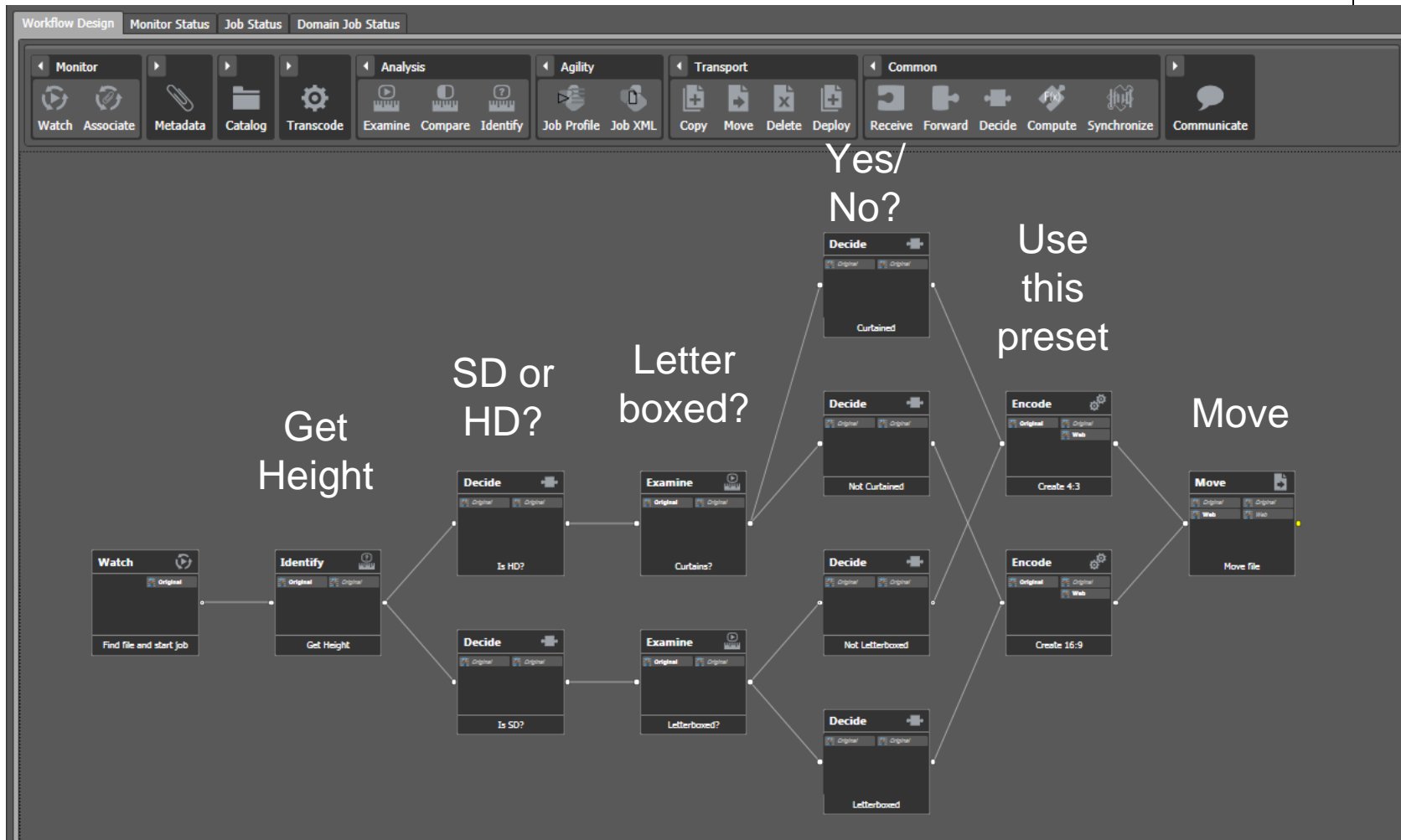
Harmonic WFS

- Pre-transcode
 - Find error – email
- De-interlace once
- Encode to 8 targets
- Test each for SSIM/drop frame
 - Success – FTP
 - Failure - email





Telestream Vantage





Digital Rapids Kayak

The screenshot displays the Kayak Workflow Designer interface. The main workspace shows a video processing pipeline with the following components:

- Media File Input**: Provides filename, UncompressedVideo, Timecode, CompressedVideo, UncompressedAudio, CompressedAudio, UncompressedAudio 2, CompressedAudio 2, Subtitle, and Subtitle 2.
- Remove Borders**: Takes video input and outputs processed video.
- 3:2 Pulldown?**: Takes video input and outputs processed video.
- Inverse Telecine**: Takes video input and outputs processed video.
- Loudness Correction**: Takes audio input and outputs processed audio.
- H.264 Encoder**: Takes video and audio inputs and outputs encoded video.
- MPEG DASH**: Takes video, audio, and subtitle inputs and outputs DASH segments.
- QC (Quality Check)**: Takes DASH segments and outputs Pass/Fail status.
- Deliver**: Takes QC input and outputs final DASH segments.
- Notify!**: Receives QC output for notification.

An **Audio Video Preview** window shows a kayaker in white water. A **Workspace** window shows the H.264 Encoder configuration.

Key	Value
color_space	yuv
sample_layout_strategy	planar
constant_frame_rate	true
constant_bit_rate	true
image_height	1080
decoding_buffer_size	
color_space_standard	
bytes_per_plane.0	2073600
bytes_per_plane.1	518400
bytes_per_plane.2	518400
media_duration	00:06:56.949 Local: 00:06:5...
language_code	
time	
field_topness	1
storage_bits_per_sample	8
segmented_frame	
field_dominance	top_field
image_width	1920
sample_signed	
maximum_bit_rate	745750249
sample_layout_details	yuv
pixel_sampling	420
frame_rate	30000/1001
average_bit_rate	745750249
lengthOfStream	
video_sample_type	frame
endOfStream	true
frame_layout	interlaced

Additional data shown in the workspace:

- Data Rate : 3:1 Gbits/s
- Packets/sec: 126.0
- Timestamp : null



Workflow Pro's and Cons

Pros

- More sophisticated workflows
 - Branching
 - QC
 - Self-healing
- Integrated reporting for encoding/QC
 - You can add QC to any system, but reporting is separate and operation not as well integrated

Cons

- Cost – WF software is extra
 - Harmonic - \$20K
 - Vantage - \$8,500
- Complexity



What's the Point?

- Three types are very distinct, with meaningful pros and cons
- Know which you're trying to buy on the way in
- Choosing a workflow system can dictate encoder selection:
 - Vantage – Vantage/Vantage Lightspeed
 - Carbon WFS – Carbon Coder or ProMedia Xpress



Who's Who?

Swiss Army Knife

- Amberfin iCR 1101
- Ateme TITAN KFE
- Thomson ViBE
Convergent Video System
- Harmonic Carbon Coder
- Telestream Episode
Engine
- Sorenson Squeeze
Server
- Digital Rapids Transcode
Manager
- Rovi TotalCode

High Volume Encoders

- Thomson ViBE
EM4000
- Envivio 4Caster
- VBrick 9000 Series
- Digital Rapids StreamZ
- Viewcast Niagara 9100
- VBrick 9000 Series
- Haivision Makito

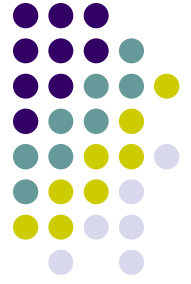
Workflow Systems

- Telestream
Vantage
- Harmonic WFS
- Digital Rapids
Kayak Workflow
Platform

When to Consider Workflow (or at least QC?)



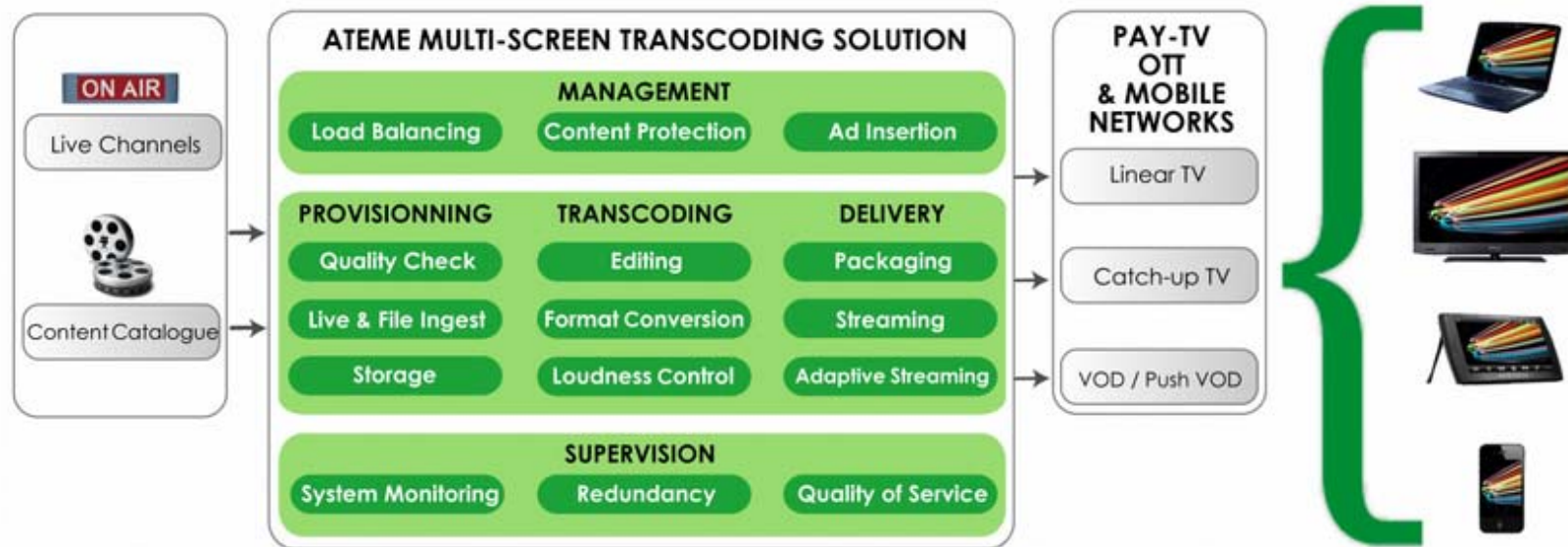
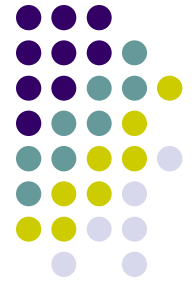
- Inputs from multiple sources
 - UGC/disparate input points
 - Multiple input formats
- Mixed 16:9/4:3 inputs
 - Different output buckets
- Deliver to customers (service bureau)
 - As opposed to internal or website



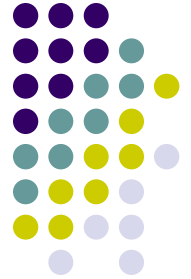
High Level Buying Process

- Identify required features
- Identify all candidates that meet those requirements
- Assume quality is equivalent
- Choose candidate who delivers best price for throughput

Identify your Required Features



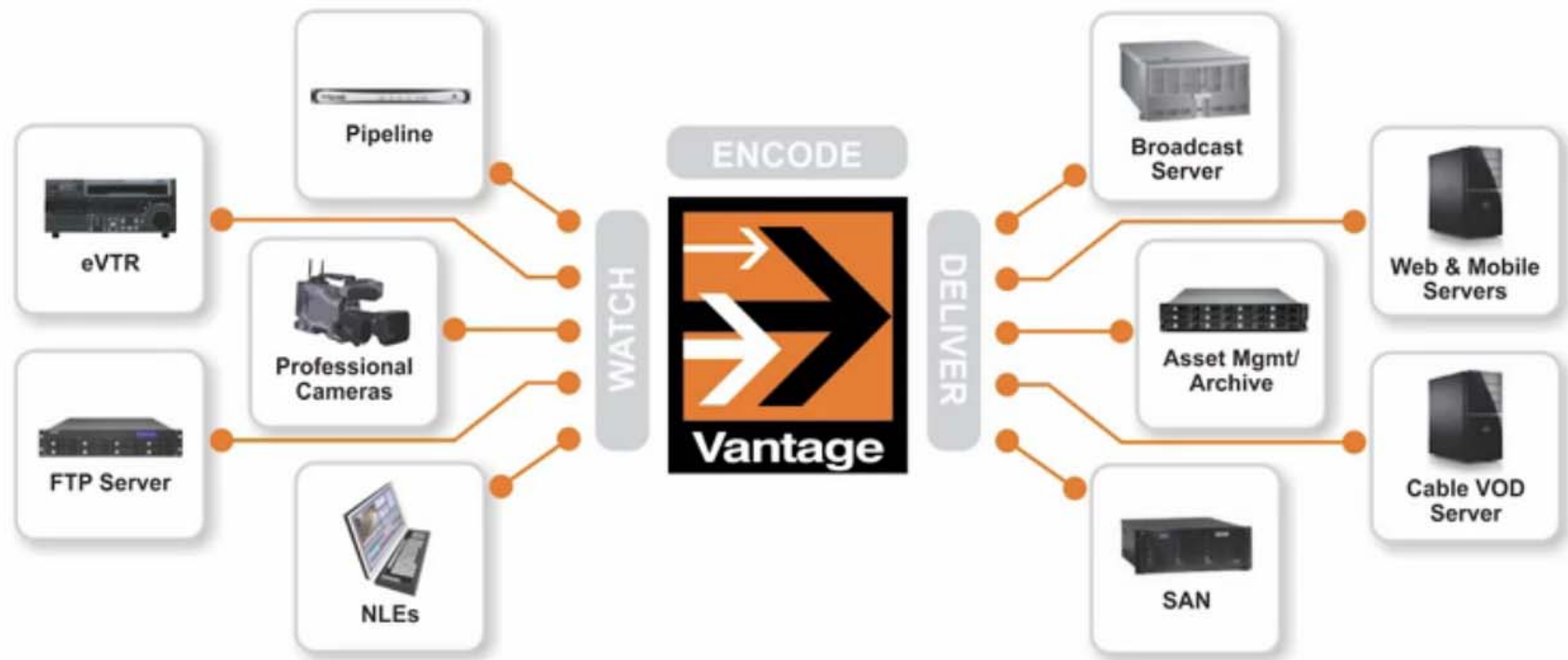
The Buying Process – Identify Requirements



- Identify encoder class
- Checklist features
 - Inputs
 - Outputs
 - Metadata support
 - Captioning/Advertising insertion
 - Digital Rights Management
 - Loudness control
 - Quality control
- API requirements
 - Connectivity to MAM/DAM
 - Connectivity to CMS
- Hooks to delivery infrastructure
 - Rovi/DivX template support



Inputs and Outputs





Inputs

- Vary by product
- Harmonic ProMedia Xpress
 - Targets cable markets starting with MPEG-2 transport streams
 - No MOV/XMF/DNxHD
 - Carbon Coder is the Swiss Army knife alternative
- Don't assume:
 - List required input formats – A/V/Metadata
 - Verify

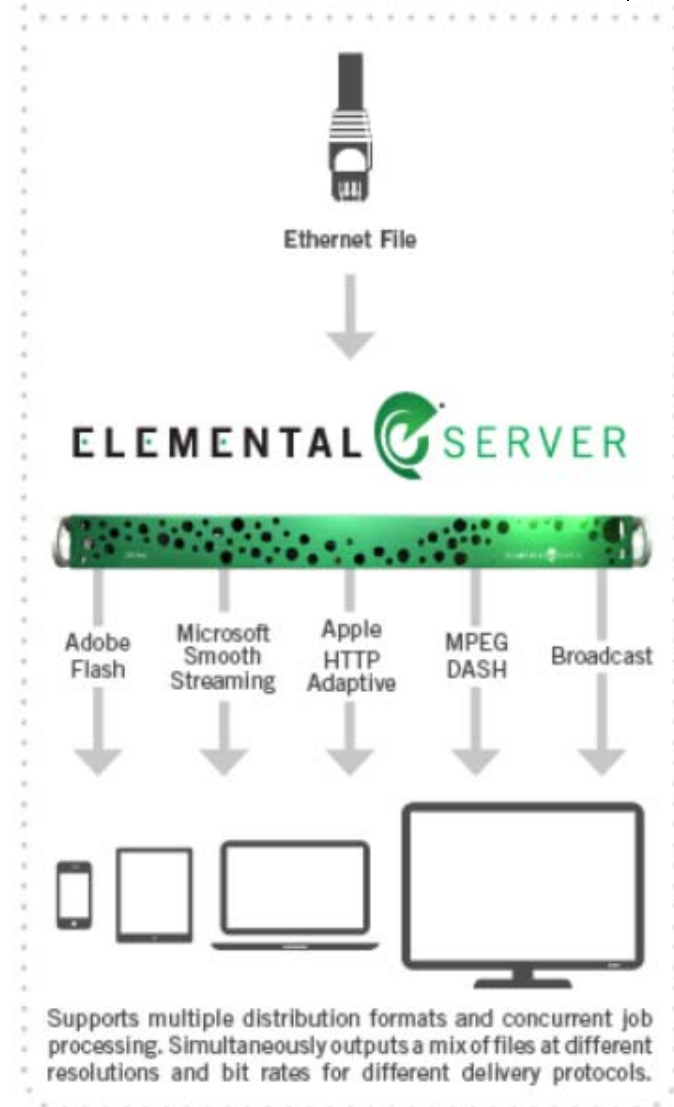
TRANSPORT STREAM INPUTS

Container	MPEG-2 Transport Stream
Video	MPEG-2 H.264, Including CableLabs & AVC1
Audio	Dolby® Digital (AC-3) Dolby Digital Plus (E-AC-3) MPEG-1 Layer II AAC-LC HE-AAC v1 & v2 SMPTE 302M
Metadata	Closed Captions: A/53 Teletext PID DVB Subtitling PID Splicing signaling: SCTE-35



Outputs

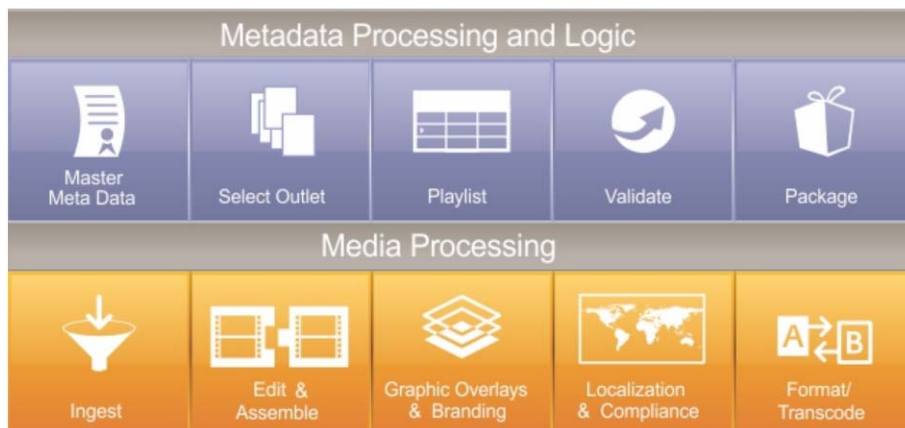
- ID all required single file and ABR formats
 - Very significant differentiation here
- ID plans for:
 - DASH
 - H.264/HEVC
 - WebM/VP9
 - Some will be field upgradeable/silicon based systems won't be





Metadata Support

- If delivering to multiple distribution/syndication outlets, automated metadata support is key
- Telestream Agility/
Avalon
 - “Distribute simultaneously to YouTube, iTunes, and cable operators. Avalon transcodes multiple media and metadata formats from a single source file and automates delivery to multiple outlets in each target output format.

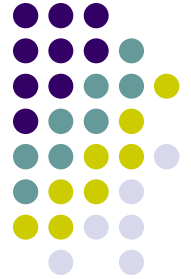


Closed Captions/Advertising Insertion

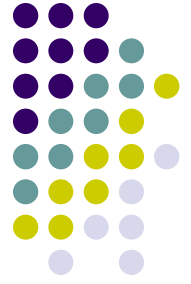


- Broadcast standards
 - EIA 608/708
 - SCTE-20
 - SCTE-27
 - DVB Teletext
 - DVB Subtitles
 - Captions/Teletext/subtitle burn in
- Streaming Standards
 - WebVTT
 - SAMI
 - SRT
 - TTML
 - DVXP
 - SCC
- Advertising Insertion
 - SCTE 35 passthrough

Closed Captions/Advertising Insertion



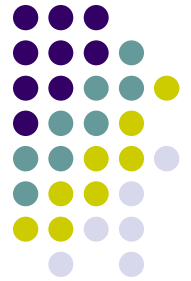
- Huge differentiator here
 - Companies traditionally serving the broadcast industry have a big head start
 - If you need closed captioning, check these capabilities early
 - Fortunately, most companies with have them make it clear on their brochures



Digital Rights Management

- Streaming
 - AES Encryption – HLS
 - Flash Access – Flash RTMP/HDS
 - Playready – HLS/Smooth
- Device
 - DivX
 - Widevine

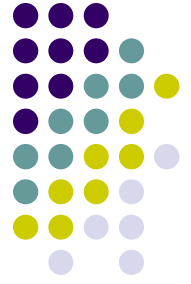
Calm Act (or Euro Alternative)



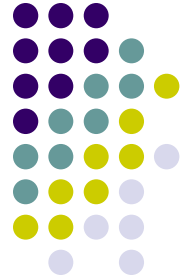
What the New FCC Rules Do

The FCC's new rules require TV stations, cable operators, satellite TV operators and other pay TV providers to limit a commercial's average volume to that of the programming that it accompanies. A commercial may have louder and quieter moments, but, overall, it should be no louder than the surrounding programming. This may mean, however, that some commercials will comply with the new rules, but still sound "too loud" to some viewers.

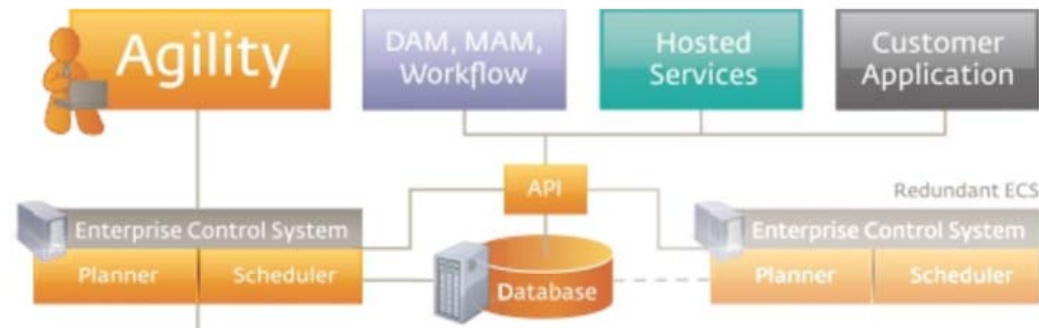
Quality Control – Where Applied and Functions Performed



- Pre-encode
 - Media compliance check (is it in the expected format?)
 - Media quality check (black frames/no audio)
- Post encode
 - Error checking (dropped frames, no audio)
 - Quality checking (quantization/SSIM/PSNR)
- Error handling
 - Kick out with notification
 - Self-healing – reencode at higher data rate

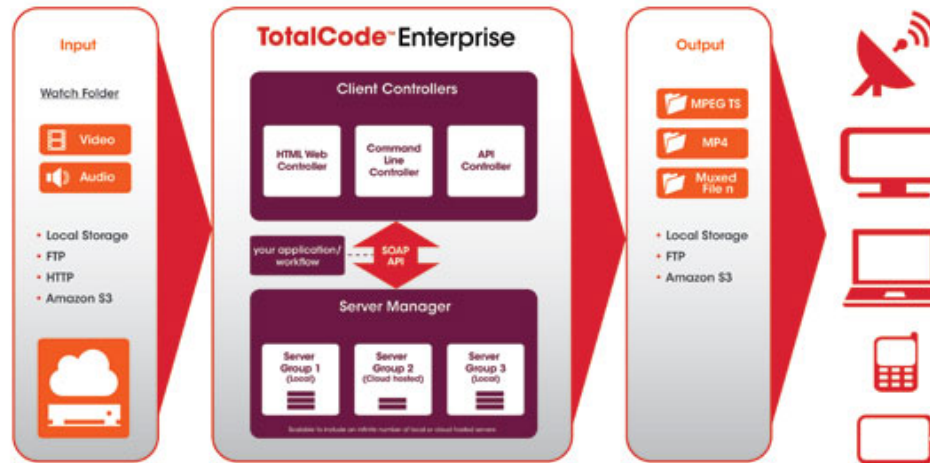
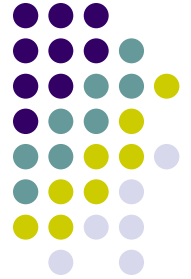


API Requirements



- Identify connectivity requirements
 - Digital/Media Asset Management
 - Content Management System (web publishing)
 - Enterprise control system
- Make sure API is sufficiently robust to support all required connections

Hooks to Delivery Infrastructure



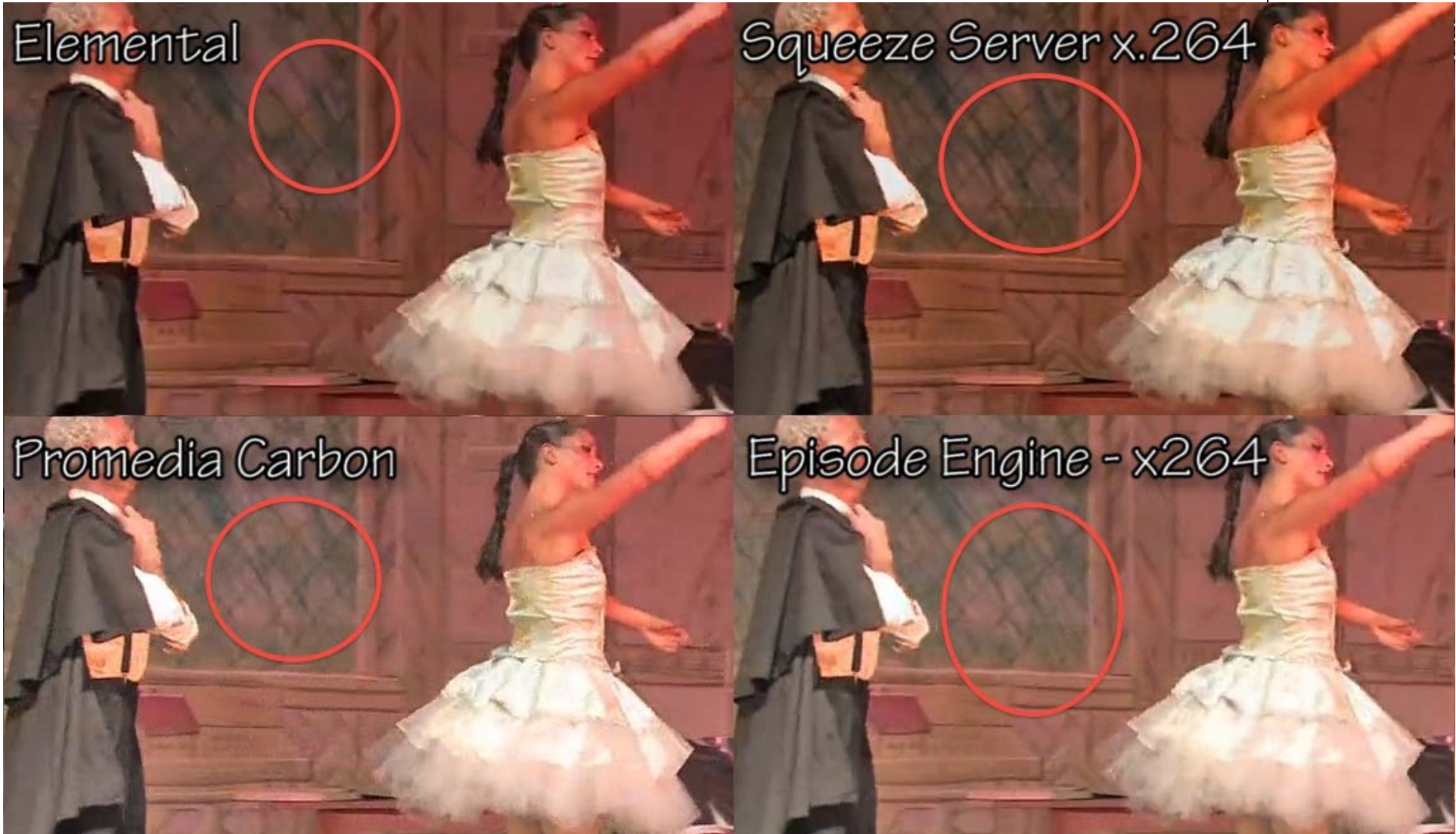
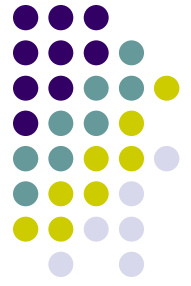
- If working in defined distribution infrastructure like DivX, encoding tool must support
 - Encoding presets for various certification levels
 - DRM injection
- May be similar requirements for Widevine

Differentiating Between Contenders



- Quality
- Performance
- Operational Issues/Cost
 - How many units do you need?
 - What about failover redundancy?

Analyzing H.264 Quality



Elemental



Squeeze Server x.264



Promedia Carbon



Episode Engine - x264





Vantage vs Elemental Server



- Very minor differences in quality
 - Could be attributed to data rate consistency



Analyzing Performance

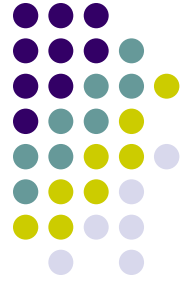
Test	Presets	Codec	Software Only			GPU Accelerated	
			Episode Engine	ProMedia Carbon	ProMedia Xpress	Elemental Server	Vantage Lightspeed
52 minute 1080p	11	H.264	1:03:21	2:35:16	35:41	25:45	1:09:25
24 1-minute DV files	11	H.264	29:41	37:46	15:10	12:27	15:00

- Episode Engine/ProMedia Carbon on HP Z800 workstation
- All other times on dedicated encoders sold by vendor

Very Significant Performance Difference



- Must be built into pricing models
 - Identify required throughput
 - Compute how many encoders are necessary to meet this requirement
- Software encoders
 - Must build in cost of computers to run the encoder



So:

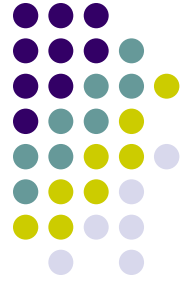
- ProMedia Xpress - \$26,000 (ProMedia 5200 Application Server)
- ProMedia Carbon - \$4,995



So:

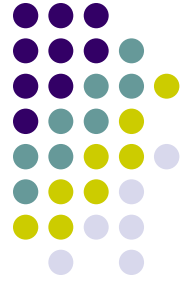
- ProMedia Xpress - \$26,000 (ProMedia 5200 Application Server)
- ProMedia Carbon - \$4,995

	ProMedia 5200 Application Server with Xpress	ProMedia Carbon
Cost	\$26,000	\$4,995
Encoding time-11 file transcode	35 minutes	155 minutes
Equivalent		4.43
Licenses required		\$24,975
Computers at \$6K each		\$30,000
Total cost	\$26,000	\$54,975
Annual additional power cost	?	?



Operating Models

- Cluster encoders
 - Can add additional encoders by buying new encoders
 - Squeeze Server, Elemental Server, Episode Engine
 - No single point of failure



Operating Models

- Controller/Encoding node – Digital Rapids, Vantage, Carbon
 - Server component adds to price
 - Can be single point of failure



When Comparing Pricing

- Remember to:
 - Add costs of computer when comparing software vs. hardware
 - Understand whether system requires a separate controller or is more of a clustering of encoders
 - Understand the redundancy that you're looking for and make sure that's priced in
 - No single point of failure can cost a lot