Next Generation Video Processing

Video Entertainment Summit, Day 2
Monte Carlo

December 4th, 2012
So, Another Session Telling You That…

- Your original business model is broken?!?
Fortunately, No. Contents of This Session:

- **Content Origination, Acquisition and Distribution**
  - Video and audio contribution over IP networks
  - Enhancements to real-time encoding and processing
  - Transcoding as alternative to high end encoding – why and how
  - Combined approach for TV Everywhere incl. Management
  - New service offerings enabling new customer relationships

- **Securing your valuable content**
  - Secure distribution to affiliates and cable/IPTV headends
  - Security solutions for TV Everywhere

- **Video Headend or Media Data Center?**
  - Finding a place for all that new Software

- **Case Study: Level 3 VenueNet+**
  - Presented by Scott Anderson, Level 3 Communications
Ongoing Changes in the TV Landscape

**Explosion of possibilities**
- Broadband access becoming universal
- IP delivered video enables distribution of more specialized content: Time shifted channels, niche channels, user generated content...
- Number of networked devices also multiplies $\Rightarrow$ estimated 15 billion by 2015, doubling the earth’s population

**Changes in consumer behaviour – Just watch the kids**
- Increasing trend towards “Any content, on any device, at any time”
- Tablets and mobile becoming increasingly popular, becoming the “2nd TV”
- Will there be 1st/2nd/3rd screens in the future – or just “screens”? 

**Operator’s Top of Mind**
- Shift of business models requires **Flexibility** and **Scalability**
- Maintain brand value, high video quality, customer satisfaction
- Manage complexity of end-to-end ecosystem
- Content accessibility and **Security** across devices
- Increasing number of **Software** solutions
HTTP Adaptive Bit Rate Streaming

The universal cure for all the TV Everywhere headaches?

- Instead of being restricted to managed networks, let video playback dynamically adapt to momentary network conditions
- No protocol or firewall issues due to use of standard HTTP (port 80)
- Quick playback, no re-buffering, suitable for fixed & mobile, live & VoD

But not everything is easier with ABR

- Multiplication of content: Every stream has 6-10 representations with individual bit rates which need to be encoded and published
- Different encapsulation formats (HLS, Smooth, etc.) further multiply the number of filesSTREAMS – will DASH be able to consolidate?
- No common standards for encryption, subtitles, monitoring, etc.
Origination and Acquisition
What Cisco and NDS Can Do

20 years of Digital Video experience providing:

- Advanced technology in robust HW and SW design
- Validated end-to-end system architectures
- Rapid service roll-out

Modular and unified product design ensuring:

- Ease of education of employees
- Less spare parts
- Pay-as-you-grow models

Build Value in the Network  Reduce OpEx  Increase Service Velocity  Differentiate Services

Secure  Versatile  Manageable  Reliable  Scalable  Profitable
**Contribution: DCM IP Video Gateway**

DCM Gateway is a compact and versatile video and audio Contribution adapter

- Loss less transport through Hitless Merge supporting the Cisco Live-Live feature providing a very high total uptime
- Unique density
  - 12 HD-SDI uncompressed streams in 1RU
  - 6 HD-SDI JPEG2K streams in 1RU
- Simultaneous Uncompressed and JPEG2K transport
- Supports transport of 1080p50/60, 3D and AES/EBU signals
- Unique scalability through a flexible s/w licensing scheme. Software/License upgrades are used to add new functionality (eg. 10GbE, HD, 3G, FEC & Hitless)
- Very service friendly architecture supporting hot-swap of modules, PSUs, as well as fans
Linear Headend: Only Two Key Elements

**D9036 Multi Format Encoder**

- **Encoding**
  - Dense Multi-Format and Multi-Channel Encoder
  - Video MPEG-2, MPEG-4/AVC, SD & HD
  - Multiple audio channels, multiple formats, including Dolby Digital Plus encode, Dolby-E decode
  - Advanced StatMux and Premium Picture Quality

**D9902 Digital Content Manager “DCM”**

- **Acquisition**
  - IP: ASI, Satellite (DVB-S/S2 with DRD card)
- **Multiplexing & Processing**
  - Descrambling, Scrambling, FEC, PSI/SI, PID Sync
  - SFN Adaptation, Logo & Text Crawl insertion
  - Multiformat MPEG-2/AVC Transrating/Transcoding with Statmux, Audio Leveling, Downconversion
  - Ad insertion and Digital Program Insertion (DPI)
  - Advanced Redundancy Features
Benefits of Encoding with the D9036

Advanced HW/SW Architecture
- One single hardware for MPEG-2 and MPEG-4/AVC, SD and HD
- Unmatched encoding density – up to 8 channels in 1 RU
- Flexible HW configurations, options are license based
- Future proof

Feature set to reduce complexity
- Internal signal routing and multiplexing
- Flexible audio handling and transcoding, Dolby-E input
- Remote statistical multiplexing with DCM

Leading Video Quality
- Based on experience with earlier platforms, but on the latest silicon
- Advanced 3D-MCTF pre-filtering and de-blocking filters
- Unified Rate Control statistical multiplexing
  - Centralized Rate Control and VBV management
  - More aggressive rate control and overall Picture Quality balance
Market Leading Processing: D990x “DCM”

Advanced HW/SW Architecture
- Massive scalability and unmatched transcoding density
- Flexible HW configurations, features are license based
- Processing and scrambling of up to 2000 services per chassis

Dense Satellite acquisition
- Up to 12 DVB-S/S2 L-Band Inputs per chassis
- Multi-service descrambling with CAM slots

Leading Video Quality
- Hardware based video transcoding with statistical multiplexing
- Flexible audio transcoding options, audio leveling

Stream Processing
- Demodulation, Descrambling, Scrambling, Interface Conversion
- Video and audio Transcoding or Transrating
- Ad Insertion, Local Program Insertion, Logo or Text Crawl Insertion
- Built-in stand-alone redundancy features
High End Encoding

D9036 Encoding Platform
- Next Generation StatMux
- 3D-MCTF pre-filtering
- Service based redundancy

Chosen when:
- Base Band sources are available
- Special features are required
- Highest quality is a must

Transcoding

D9902 Digital Content Manager
- Re-Encoding of compressed content
- Advanced silicon, closed loop statmux
- 1:1 device redundancy with heartbeat

Chosen when:
- Sources are delivered in MPEG
- Encoding is not under control
- High channel density is required
- Most economic solution required
The Linear Headend – In Two Boxes

Origination Acquisition

- DVB-S2 Demod
- DCM Mux / Processor
  - DVB-S / S2, CCM&VCM
  - DVB-CI slots
  - Multiplexing & SI Processing
  - Redundancy Functions
- Video Audio Encoder
- D9036 Multichannel Encoder

- Source SDI
- Source HD-SDI

Processing

- DCM Mux / Processor
- ABR Transcoder
- DCM Mux / Processor
- Transcoder
- Multi-plexer
- Scrambler

- IPTV Server
- DTH/DTT Client
- CATV Client
- IPTV Client

Delivery

- CME
- OTT Client
- IPTV
- IPTV
- T2-GW DVB-S2
- DVB-S2 / T2
- QAM Gateway
- CATV

Remote Sources

- Origination Acquisition
- Processing
- Delivery

Origination Acquisition

- Source SDI
- Source HD-SDI

Processing

- DCM Mux / Processor
- ABR Transcoder
- DCM Mux / Processor
- Transcoder
- Multi-plexer
- Scrambler

- IPTV
- DTH/DTT
- CATV

Origination Acquisition

- Source SDI
- Source HD-SDI

Processing

- DCM Mux / Processor
- ABR Transcoder
- DCM Mux / Processor
- Transcoder
- Multi-plexer
- Scrambler

- IPTV
- DTH/DTT
- CATV
Building Blocks: Origination and Acquisition

D9036 Broadcast Quality Encoder
- Primary Distribution Encoder
- Dense multi-format (MPEG-2, AVC), multi-channel design
- Advanced 3D-MCTF pre-filtering, next generation statmux

DCM Digital Content Manager
- Processing of uncompressed, J2K and MPEG-compressed streams
- Secondary distribution content transcoding and preparation
- (+ DPI, encryption, logo insertion, ...): linear headend in a box
- ABR formats (roadmap)

Cisco Media Processor/Encapsulator
- Carrier grade Encoder and multi format Encapsulator for ABR
- Multiple video scaling and encoding, subtitle and audio processing
- Encapsulation offered internally or as standalone capability
- 1RU appliance or on multiple channels per blade on Cisco UCS blade server infrastructure

Cisco Transcode Manager
- File based transcoder with workflow automation
- Automated quality check, analysis and decision making
- Easily scalable on Cisco UCS infrastructure

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ABR Live SW Transcoding

- CMP platform with full feature set
- Cisco HW architecture on UCS blades
- Advanced density and picture quality with SW version 7.0 (x.264 codec) – Q1CY13
- N/M redundancy with LSM

Chosen when:
- Data center concept is an advantage
- Cutting edge features are required
- Internal encapsulation is required

ABR Live HW Transcoding

- DCM SW roadmap for MFP card
- Dedicated and versatile hardware transcoding platform
- Best picture quality and density with hardware transcoding
- 1:1 redundancy with heartbeat / ROSA

Chosen when:
- DCM is present for other functions
- Highest density and PQ is required
- Project timing is Q2CY13 or later
**ROSA Video Service Management**

- Video Flow Control and Verification over easy-to-use GUI, for both Contribution and Distribution (DVB/OTT/ABR)
  - Single Click service setup and tear-down
  - Manual and scheduled setup and tear-down of Sessions/Services
  - Easy Configuration of Devices via pre-defined configuration templates
  - Spreadsheet-like ABR TC templates
  - Video Equipment Redundancy Support
  - Video Resource Verification

- One central platform to configure the service lineup
- Reduced GUI interaction by 90%
- Monitor and Assure Services at System Level (Service Dashboard and Service Alarming).
- Assist in Service/Channel design and planning, including the dynamics / scheduling.
- Prepare off-line before apply.
Content Distribution
End Users expect:
- Multitude of content in high quality, on any device
- Live, VoD and everything in between (TSTV etc.)
- No buffering, disconnects, or playback stutter
- Consistent user experience across devices

Broadcasters and Service Providers need:
- Premium (PQ, features, availability) service offerings
- Better scalability and reach
- Efficiently leverage available bandwidth
- Expand monetization of content
- Prevent fraud and piracy
- Lower costs to deploy and operate
Multi-Screen Time Shifted TV

Making content available anywhere. At any time. On any device. At home and on the go.

- **Pause Live TV**: Pause, rewind live TV without a DVR
- **Restart TV**: Ability to watch shows that are already in progress from the beginning with a guide-based navigation
- **Reverse EPG**: Navigate the Linear EPG Back in Time
- **Trick Modes**: SP configurable, subscriber controlled
**VDS-OS: Virtual Origin Services**

- Virtual Origin Server is a Software Platform that enables Media Content Origination as a Service.
- Provides Unified Content Ingest, Preparation, Storage and Delivery Framework for all major Media Service use cases.
- Provides a flexible multi-tenant management and services framework for Rapid Service Creation and Deployment.

<table>
<thead>
<tr>
<th>Origin Server Consolidation</th>
<th>Media Storage Optimization</th>
<th>Time-Shifted Recording</th>
<th>CDN Distribution</th>
<th>Cloud Driven</th>
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<tbody>
<tr>
<td>Live &amp; VoD HTTP Adaptive Streaming and PDL</td>
<td>On-Demand Encapsulation</td>
<td>Any-Device Access</td>
<td>Origin content for VDS-IS or other CDNs</td>
<td>Optimizes multiple media formats at origination</td>
</tr>
<tr>
<td>Origin services from common infrastructure</td>
<td>Store in Common Format (H.264 ATS), encapsulate on demand to achieve significant storage savings.</td>
<td>Supports VDS-VR Cloud DVR, Live-to-VoD recording, common format file storage</td>
<td>Any HTTP CDN can be served content from optimal VDS-OS node.</td>
<td>Supports SP &amp; Data Center Ecosystems</td>
</tr>
</tbody>
</table>
Content Security
### PowerVu – An Ongoing Success Story

#### Application Domain
- Secure **Primary Distribution** to CATV/IPTV headends: Premium Content in high quality, most critical for the content rights owners.

#### Value Proposition
- **Highly secure**: Protects content much better than smart card based systems (DVB-CI). 25 years of uncompromised security.
- DVB-S/S2 and MPEG-4/AVC based, DVB Simulcrypt CA possible.
- **PNC** (PowerVu Network Center) enables in-band network management of downlink equipment:
  - Receiver remote control (e.g. virtual channels, transponder change)
  - Authorization / User Management (service enable/disable, ...)
  - Disaster Recovery
- **Range of professional IRDs and Business Receivers**
**Videoguard CA and VG Connect**

**Application Domain**
- Secure **Secondary Distribution** to end users: Videoguard CAS for Premium Services & Copyright Protection. Smart Card based as well as cardless solutions.
- VG Connect DRM securing content to unmanaged devices.

**Value Proposition**
- **End-to-End Security Suite for TV Everywhere**
  - Service, Device and Content Protection
  - User/device authentication and business rules across the TVE ecosystem
  - DRM policy as well as License and key management
  - DVB Simulcrypt as well as 3rd party DRM hosting for Multi-Platform solutions
  - Studio approved
- Open modular security architecture to achieve multi-screen strategy
- Cisco/NDS as a trusted partner to implement end-to-end solutions.
Media Data Center
Video Center or Data Center?
Two Service Architectures are Unifying

Internet Data Center

- protocols
- Built for scale with general purpose hardware
- Best effort delivery

Media Cloud

- Massive scale, guaranteed performance
- Efficient ingest, storage and management of media content, metadata and applications
- Built for performance with purpose-built hardware

MPEG TV Systems

- delivered over a closed and managed network, to limited devices
- Built for performance with purpose-built hardware
- Increasing importance of software solutions

Increasing importance of software solutions
The classic DVB or IPTV headend is rapidly evolving into a multiscreen Service Delivery Platform, enabling advanced User Experiences, using an increasing amount of software.

- Contribution, Signal Acquisition and Linear Video Headend Processing
  - Live video front ends (encoders, receivers, processors) remain in dedicated hardware

- Processing for TV Everywhere / OTT: The ever growing Video Plane
  - Strong product portfolio of Cisco Media Processor (live encoder/transcoder) and Cisco Transcode Manager (VoD transcoder), Media Encapsulator and VDS-QS (Virtual Origin Server) software solutions: Enable unlimited scale.

- Service Management, Content, Catalog & User Management, Security
  - Large suite of software solutions from the combined Cisco/NDS portfolio

- Cisco Unified Computing System (UCS) as universal hardware platform
  - Extreme scalability and significant savings in capital and operational expenses
Transcoding on Unified Computing System

Single unified design: Pre-integrated blade server and Data Center networking infrastructure, with self integrating components and policy-based automation

Integrated system wide UCS management from a single management IP address

All components hot-swap, redundant connections

Integrated connectivity and switching:
- Uplink Ethernet for inputs, outputs, management
- Fiber Channel for SAN (where necessary)
- “Wire once”: Only 24x 10GbE links using VNICs

CMP on 47x B200M3 blade servers, N:M redundancy
Up to 188 channels ABR transcoding & encapsulation

Same HW layout for Live & VoD transcoder, Origin Server, DRM, CMS, management servers, etc.

Ex: 32 HE for blade chassis & fabric interconnect
Media POD or Media Data Center on UCS

- Single Point of Management
- Support Many Customers on a common Infrastructure

Unified Fabric
- Data Center Management
- Service Mgmt, Analytics & Session Control
- Security Suite
- Unified Compute Stateless Servers...Service Profiles...Virtualized Apps

CTM VoD Adaptive Transcode rs Packagers
- Content Mgt & Entitlement
- Catalog Mgmt Publisher
- VDS-OS Origin Services

Storage Array

+ Add Linear Service, Grow VoD Service (PC / Tablet)
- Media Services 2
- Media Services 3
- Customer Support Many Customers on a common Infrastructure

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Key Takeaways
Key Takeaways

What you should remember from this session:

1. Quality: Makes engineers and customers happy
   - Picture Quality, Service Uptime, Innovative Service Offerings
   - Appreciate the latest innovations in Encoding and Transcoding
   - Take Premium Services to any screen

2. Profitability: Makes the CFO happy
   - Get the most of your investment, and operate smart
   - Limit the variety of equipment in the Headend and Data Center
   - Scale smart with Hardware, Software and Licenses

   - Protect your content well and get a good night’s sleep
Disclaimer

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