Cisco Expo
2012

Cisco Videoscape

SP3/L2

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Program

- SP Video Trends
- Videoscape Experience
- Videoscape Architecture
  1. Acquisition Suite
  2. Distribution Suite
  3. Media Suite
  4. Videoscape Clients
  5. Conductor

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SP Video Trends

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Experiences Consumers Want Now

But SP's Struggle to Deliver

Online Content on TV /STB

Intuitive Unified Navigation for All Content

Multiscreen TV Experience

Web 2.0 Experiences on TV/STB

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Experiences Consumers Want Now

But SP's Struggle to Deliver

Online Content on TV /STB

Intuitive Unified Navigation for All Content

Multiscreen TV Experience

Web 2.0 Experiences on TV/STB

Without Forklift Upgrade of Existing Infrastructure

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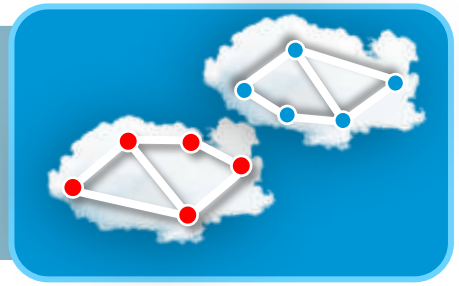
Three Dimensions of the Problem: Content, Transport and Devices

Managed & Unmanaged Content

Managed & Unmanaged Networks



Managed & Unmanaged Devices

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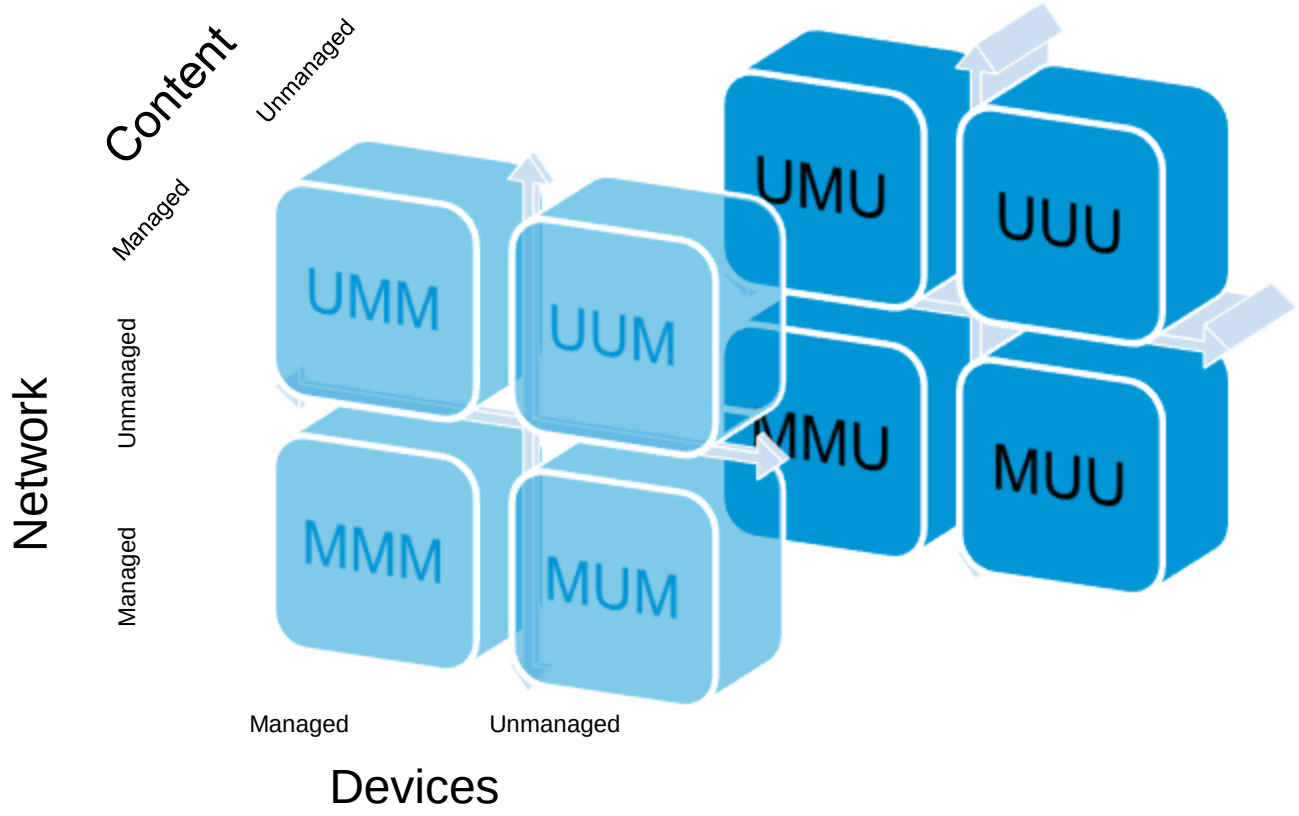

Network	Devices	Content	Examples
Managed	Managed	Managed	Existing Linear, VOD
Managed	Managed	Unmanaged	YouTube-to-TV
Managed	Unmanaged	Managed	Linear, VOD to the PC, Game Console
Managed	Unmanaged	Unmanaged	Existing HSD Service w/ optional QoS
Unmanaged	Managed	Managed	Netflix/Roku, Amazon Unbox/2Wire, AppleTV
Unmanaged	Managed	Unmanaged	Google Android
Unmanaged	Unmanaged	Managed	Sling, Linear, VOD to the PC while traveling, Comcast The Fan
Unmanaged	Unmanaged	Unmanaged	Yahoo/Google

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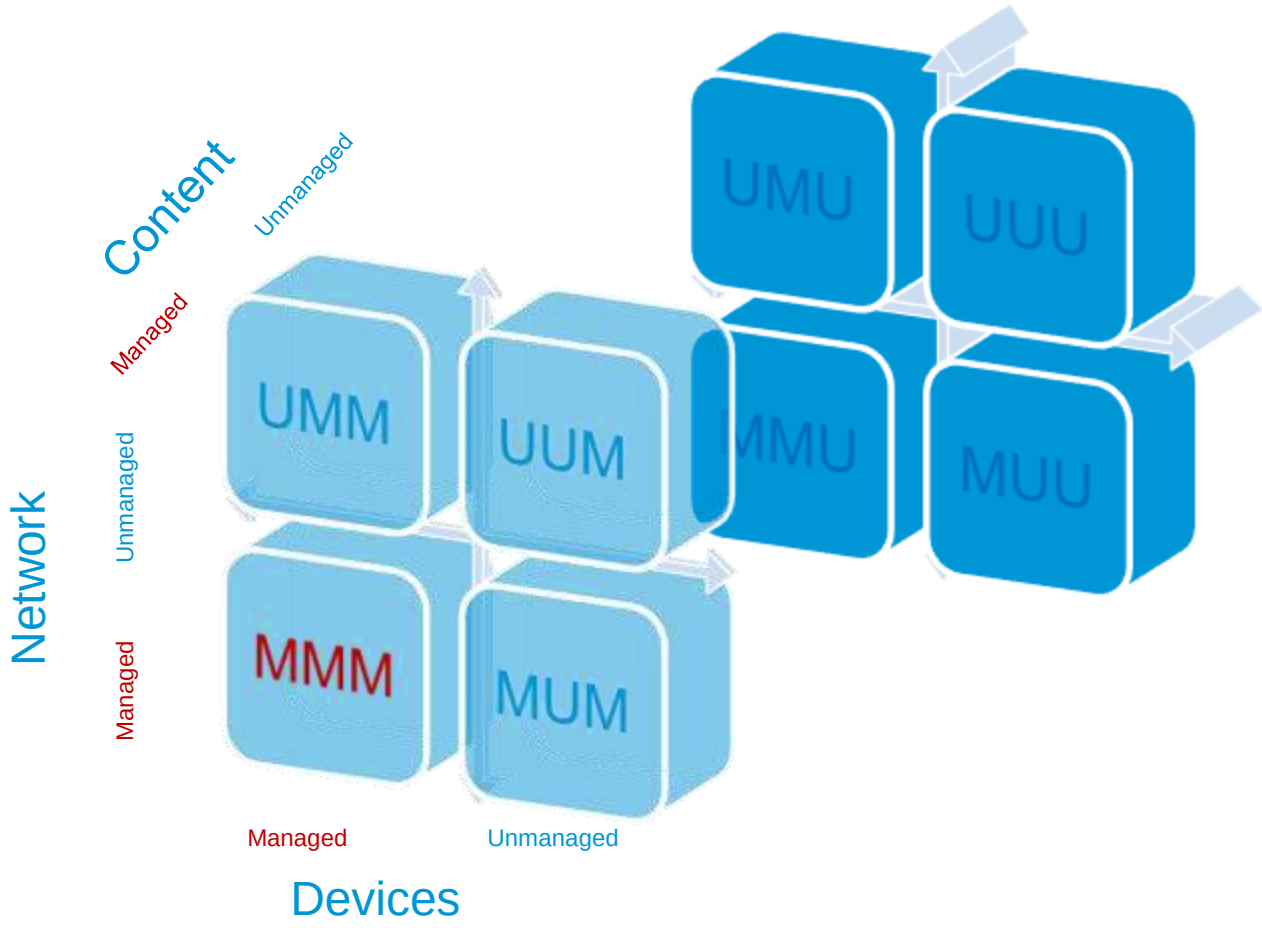

Traditional Service Provider video is in the bottom left front quadrant. Using a Managed Network (HFC, DSL, FTTH) and Managed Devices (Set Top Boxes) to provide Managed Content (HBO, ABC, ESPN, grid guide, VOD, Etc)

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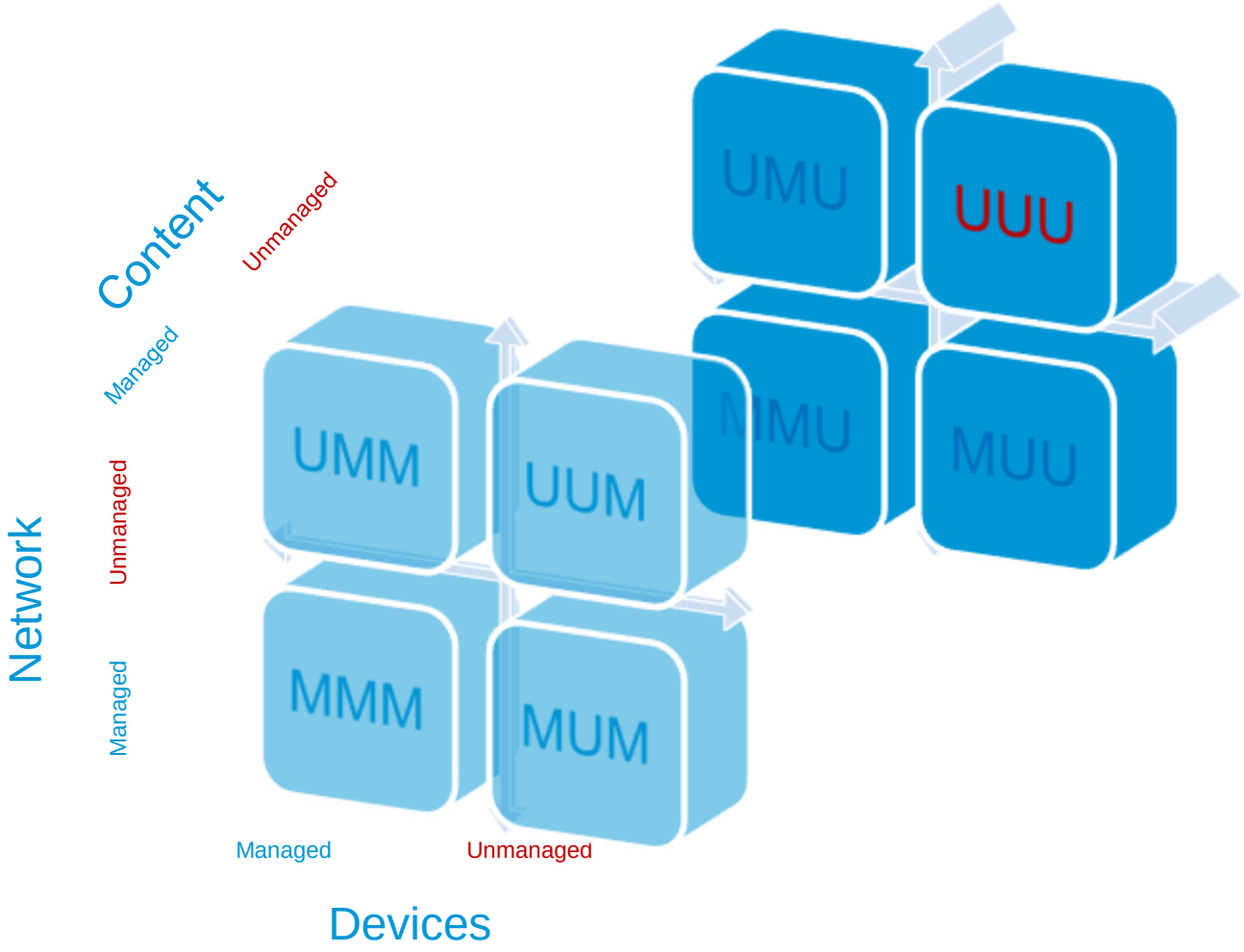

As seen by the SP, established Over The Top content occupies the rear upper right quadrant. Consumers using an unmanaged network with the subscribers devices (PC, Mac, cell phone, game adapter) to receive Content from a variety of sources

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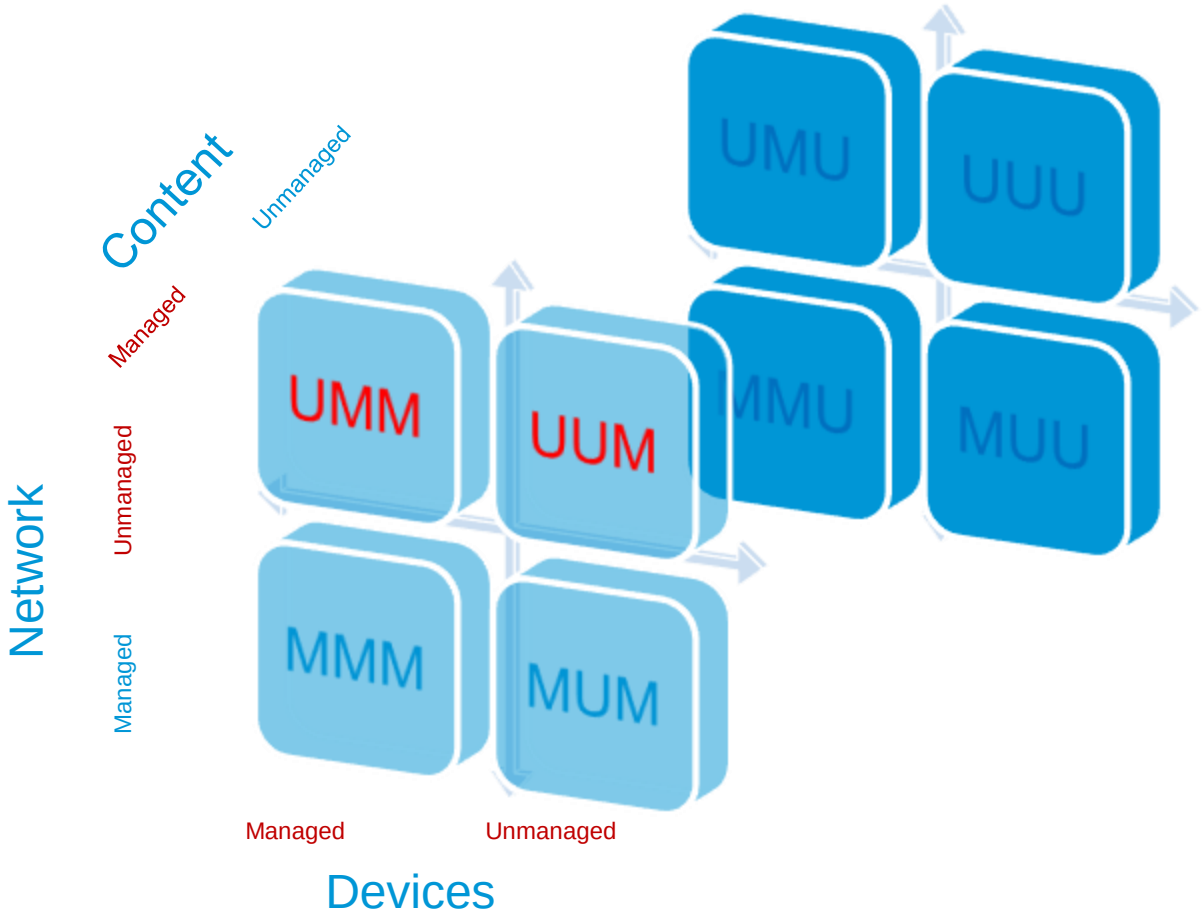

Netflix etc can be characterized as using unmanaged networks and Managed/Unmanaged devices to deliver managed content.

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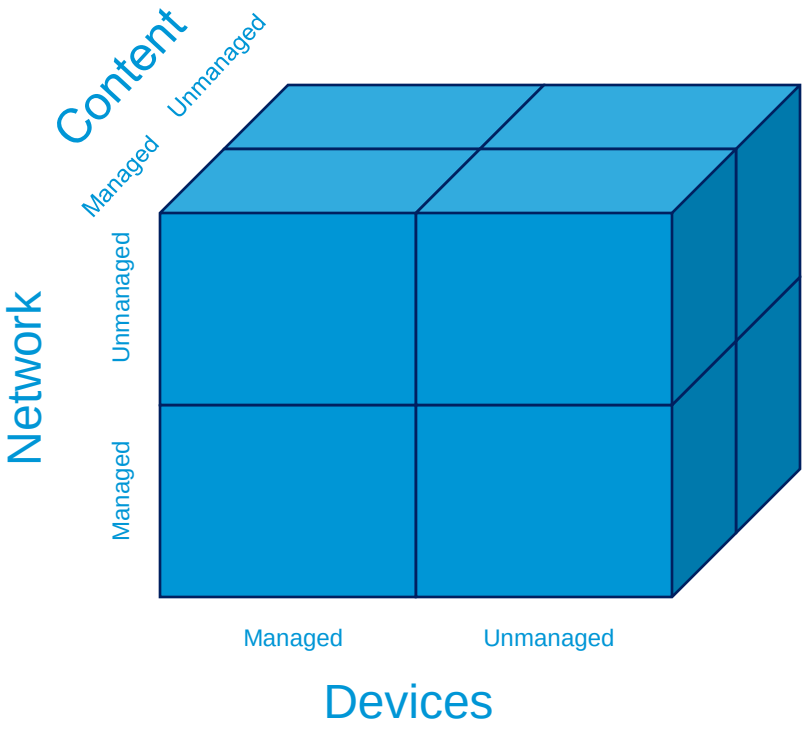
The Problem Space



The challenge is to provide a solution that covers each of these quadrants, without introducing complexity and cost.
Design to the most general case, optimize where appropriate

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From Best-Effort to Fully-Managed Offerings
Challenge is to Provide a Solution that Covers All

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From Best-Effort to Fully-Managed Offerings
Challenge is to Provide a Solution that Covers All

Design to the most general case
Optimise where appropriate

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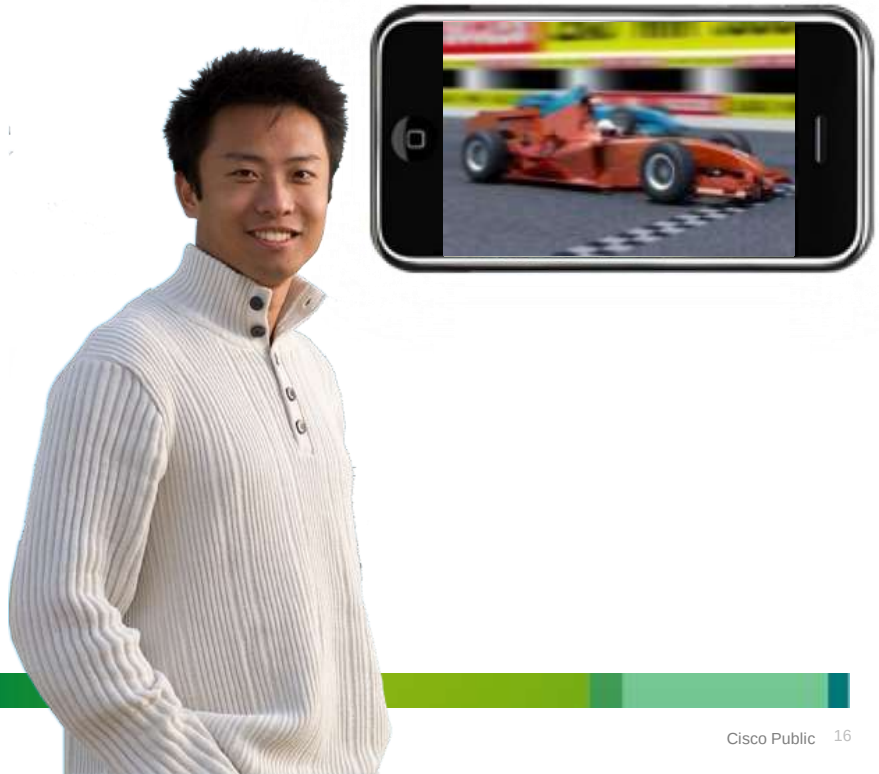
Session Shifting between Different Services
Pause and Resume across Devices



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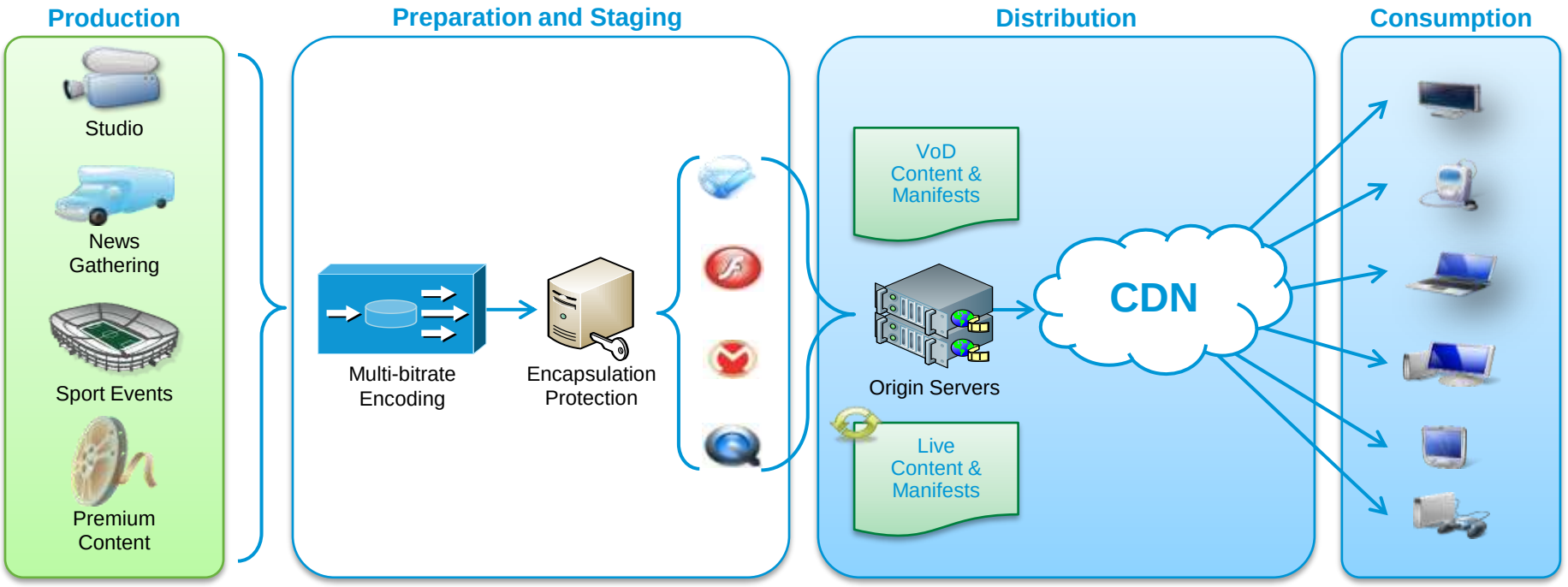
Today's Over-the-Top (OTT)
Adaptive Streaming Delivery



- Service Providers have little control and visibility into OTT services
- Content Providers have little control of the delivery of their content

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Two Worlds are Coming Together

- Simple access business model
- Built for scale
- Limited security/privacy
- No SLAs

- Multiple business models
- Focused on services
- Built for performance
- Security, privacy, SLA guarantees

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Two Worlds are Coming Together

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Videoscape Experience

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Introduction: Fragmentation

- Fragmented Consumer Experience
  - Linear programming confined to TV
  - OTT content confined to separate devices and platforms
  - Separate navigation and UI for each content source
- Fragmented Business Models
  - Hard for SP to differentiate and demonstrate value
  - Content value diminishing

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Solution: Videoscape

- Infinite content choices
- Managed and unmanaged networks
- Managed and unmanaged devices
- Demo today will show STB, iPad, Android, and PC/Mac
- Reinvent the TV experience
- Let’s see how your SP uses Videoscape across all your devices

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Videoscape Strategy

Integrated & Consistent Experience

Unified experience beyond TV

Unified experience beyond Android & Apple devices

SP Customized UI and UX

Universal Guide

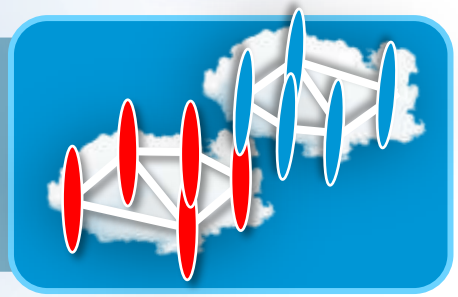
Multi-screen, cloud services

QoE

Quality of Experience

Infinite Content Sources

Managed & Unmanaged Networks



Managed & Unmanaged Devices

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Videoscape TV UI
Introduce Home Screen

- “10-foot” experience
- Purpose-built for big-screen TVs
- Navigation with one thumb and a remote control

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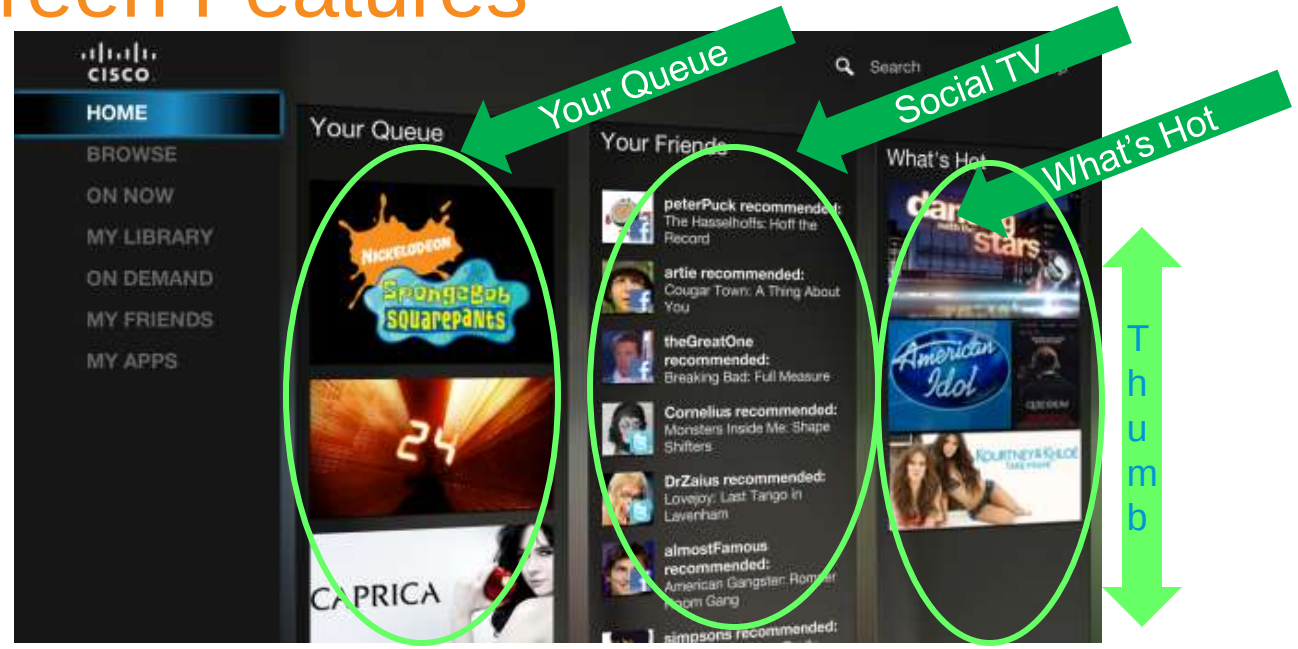
Videoscape TV UI
Home Screen Features



- Your Queue: Content you've bookmarked, purchased, or recorded. New episodes of your favorite shows.
- Friends Feed
  - Recommendations; what's trending now
  - Share and comment on content
  - Start a text or video chat
  - SP-managed social networking plus OTT services (Facebook, Twitter, etc.)
- What's Hot: Promote and monetize content
- Rich navigation
- Full integration
  - Aggregated metadata across all content sources
  - Content cached at STB or gateway for higher-quality experience
  - Content can be downloaded for targeted experience

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Videoscape TV UI
Recommendations / Unified Theme

- Share Favorites
  - Recommend content to your friends
- Show “Recommendation wheel” on iPad, PC
- Unified Theme
  - Same UI “theme” across different devices
  - Each device UI tailored for specific form factor and capabilities
  - All recognizable as being part of the same Videoscape “experience”

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Videoscape TV UI
On Now

- Rich, dynamic Video Wall
  - Browse linear programs more visually
  - Watch, record, share with friends
- Monetization
  - Related Content available for purchase
  - Browse and purchase while viewing
- Personalization
  - Toggle Favorites menu
  - See what's "Trending" among friends

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Videoscape iPad UI
On Now

- "On Now" EPG also available on iPad and other devices
  - Browse linear programs on iPad, Android or other device without interrupting big screen experience

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Videoscape TV UI
On Demand

- Rich content choices
  - Movies, TV, music, games, eBooks, etc.
  - Purchase on TV, view on any other device
  - Browse hottest content based on popularity among SP customers
- Multiservice integration
  - Browse SP VOD library plus OTT: Amazon, Netflix, etc.
  - One-stop shop for all video services
- Share content with friends

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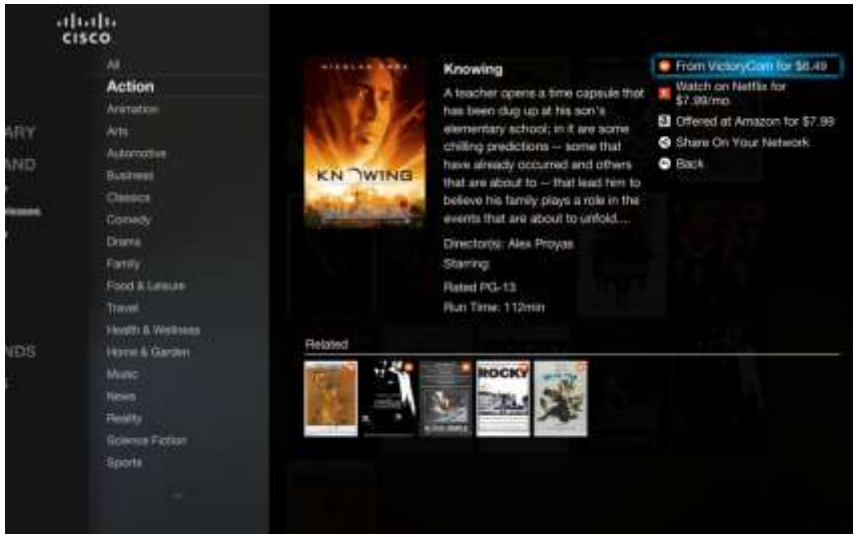
Videoscape TV UI
On Demand - Detail



- Multiservice integration
  - Videoscape can aggregate offers from multiple content providers
  - Offer consumers a broader choice of content sources and catalogs
- Related Content
  - Service Provider can suggest related content from their catalog

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Videoscape TV UI
My Library

- Personalized content
  - Recorded, purchased, or downloaded content in one place
  - Consume all content (video, music, etc.) on your TV
- Monetization
  - Browse and purchase related and popular content
  - Recommendations based on what other SP customers are watching
- Recommendations
  - Open architecture integrates recommendations from multiple sources
  - Workflow, content management, all integrated in the cloud by VMS

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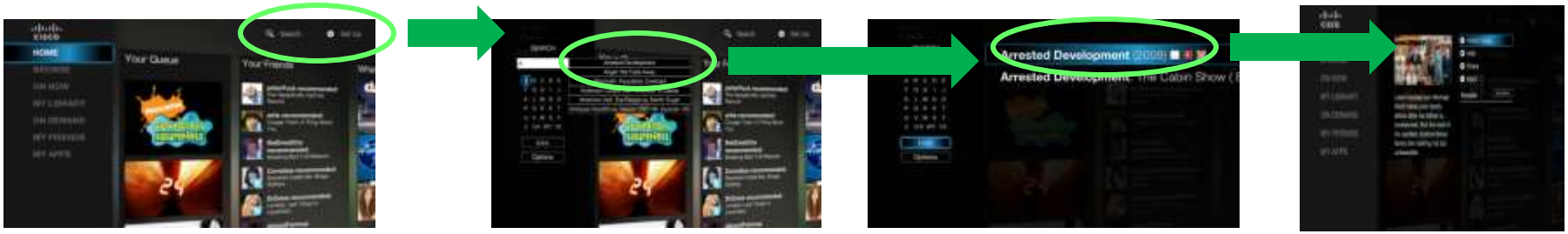
Videoscape TV UI
Universal Search



- Search across all content sources, both on SP network and off
- Discover results from linear TV, SP VOD library, OTT sources, etc.
- Delineate content already in your library from new content
- Key differentiator versus OTT platforms:
  - Integrates SP VOD library
  - Universal rights locker across multiple screens
  - Easy, powerful customer experience

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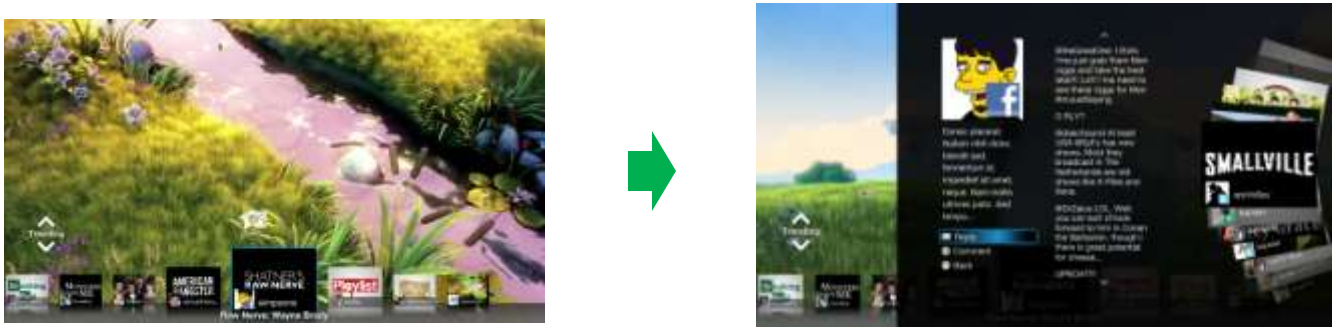
Videoscape TV UI
My Friends



- Rich social networking
  - SP social networking tool
  - OTT services (Facebook, Twitter)
- Trending and recommendations
- Comment
- Launch text or video chat

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Videoscape TV UI
Apps

- Access SP and third-party apps for your TV
  - Social networks (Facebook, Twitter)
  - Local news, weather, etc.
  - Personalized stock ticker
  - Games

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Videoscape TV UI
TV Experience Conclusion

- Amazing experience in its own right
- Now, let's look at how your SP extends it to all your other devices

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Videoscape iPad UI
General iPad UI Controls

Back button
(works within app)

Universal Search

Switch View
(Tiled or List)

Main Navigation
My Library, On Now and OnDemand

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Videoscape iPad UI
1 - Launching app to Home Screen

Do

Launch app

- Consistent experience
  - Same metadata and content across screens
  - Content cached locally for better experience
  - Downloadable content for anytime/anywhere consumption
- Platform-agnostic
  - Differentiator over Google or Microsoft
  - Customers can use any device they choose
  - SP can shift some capex costs to consumer
- Universal rights locker
  - Purchase content on one screen, consume on any other

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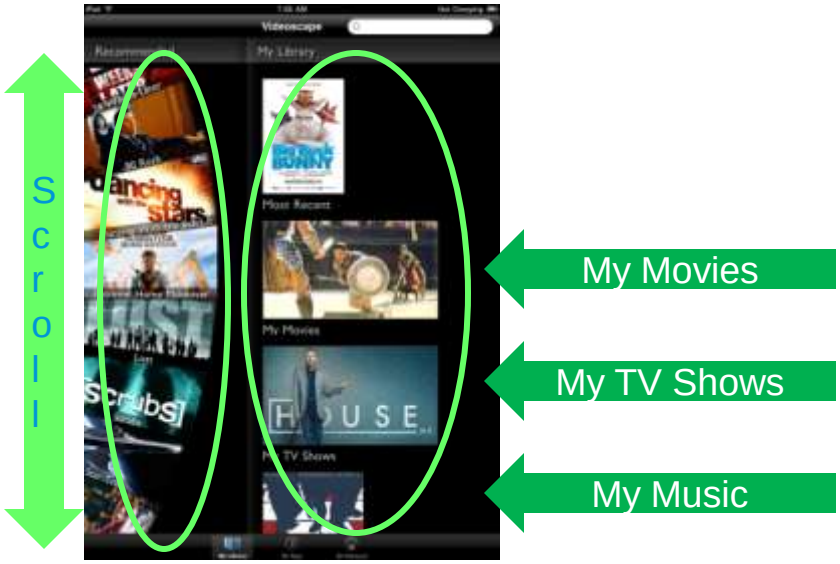
Videoscape iPad UI
Introduce Home Screen



- Consistent experience and interface with TV
- Access to My Library, On-Demand and linear programming
- No need to learn new UI for new device

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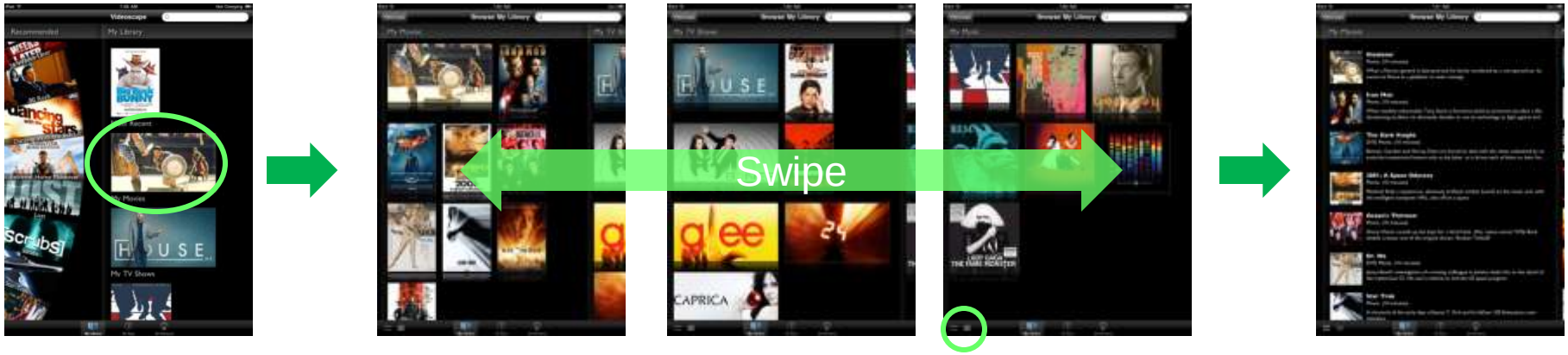
Videoscape iPad UI
Demonstrate iPad Search and Navigation



- Faster, easier navigation and search
- Full integration with iPad
- Rich, visual browsing
- Multitouch experience (gestures, swipe) enhance navigation

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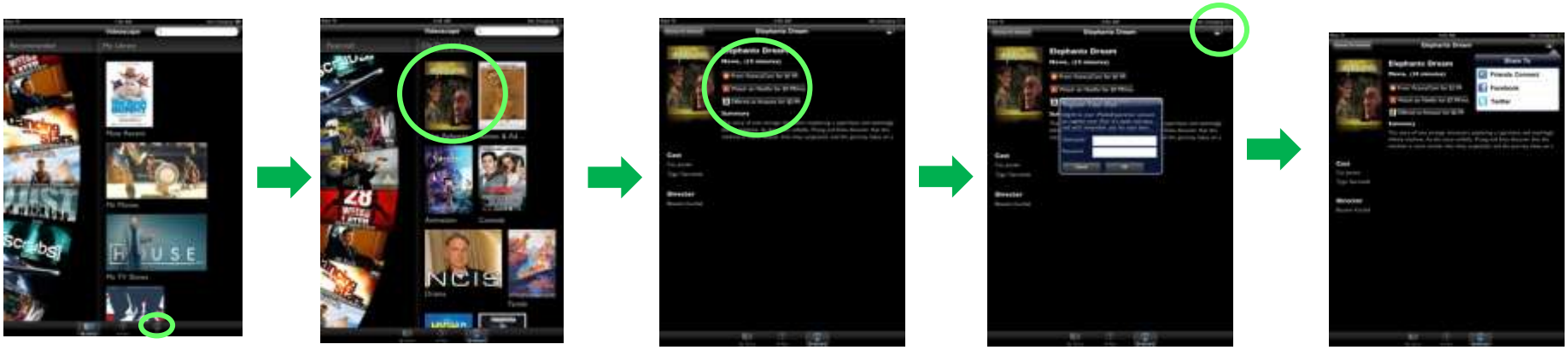
Videoscape iPad UI

Managed and OTT Integration with Social Media Links



- Painless device registration
- Multiple touchpoints for social media

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Videoscape iPad UI
Introduce Advanced Playback

- Bookmarks
  - Bookmark favorite scene or place for later viewing
  - Bookmarks stored in cloud, not device, extend to all screens
- Program chapters
- Browse special features and content associated with title

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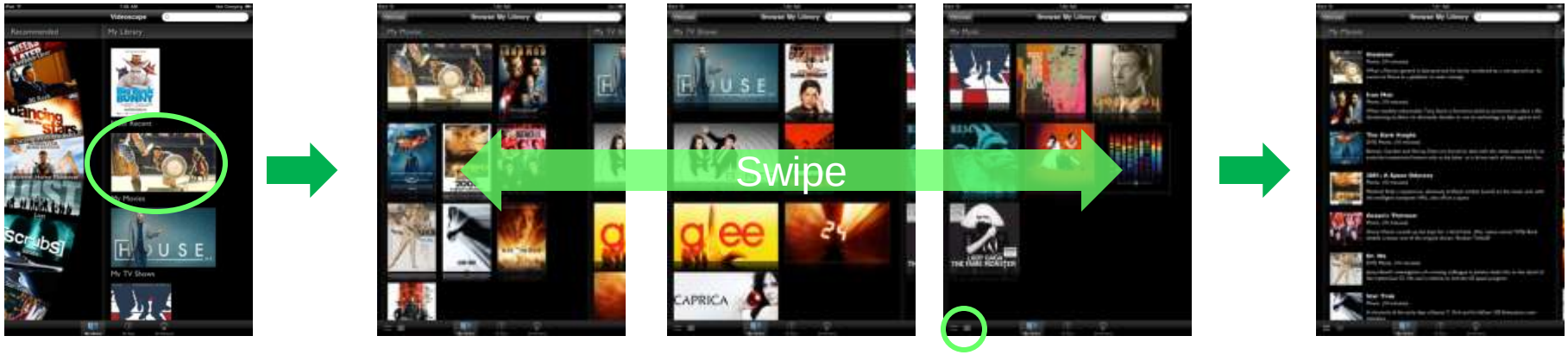
Videoscape iPad UI
Demonstrate My Library



- All of your personal media content: movies, TV, music, apps
- Content cached for easy consumption, can be streamed through SP portal
- Integrates content from multiple sources: managed service provider sources and OTT
- Rich experience with multiple views

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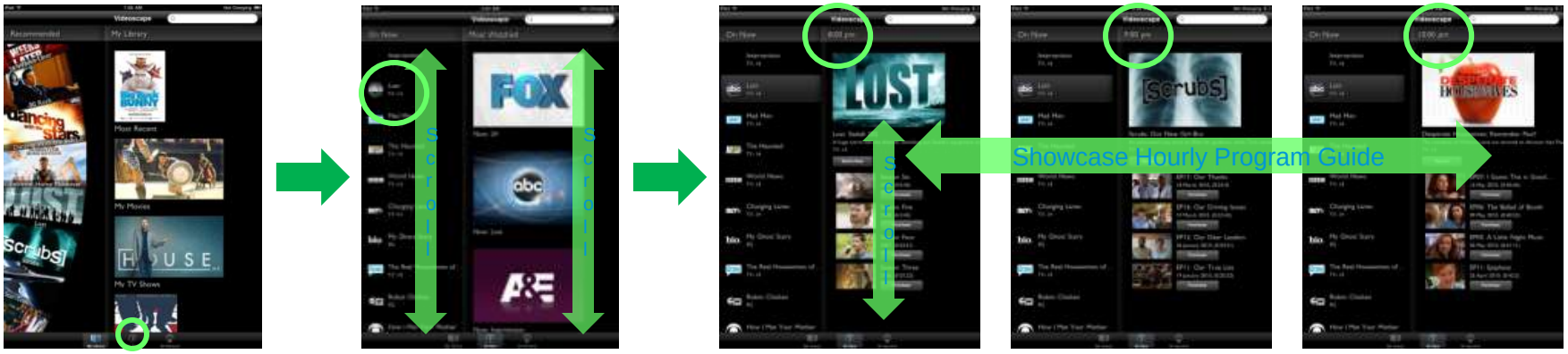
Videoscape iPad UI
Introduce On Now (Linear TV)



- Access linear programming across multiple screens
- Rich navigation
  - Scroll wheel showing most watched programs
  - Browse channels with iPad gestures
  - Full time-shifting capabilities

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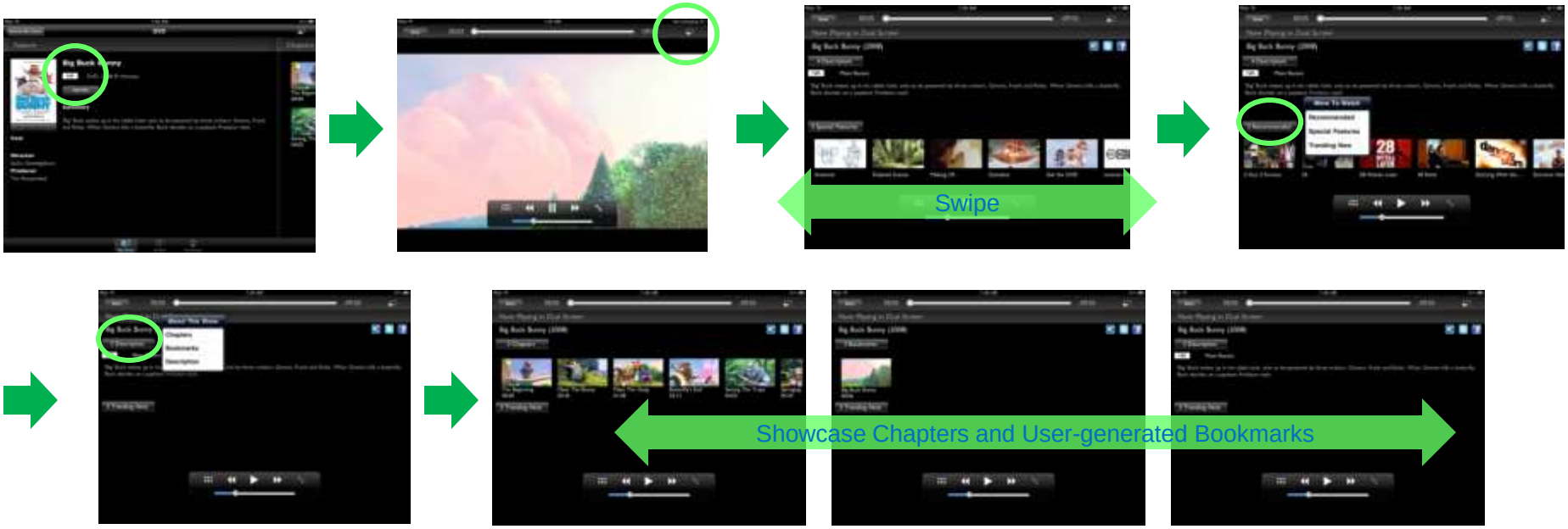
Videoscape iPad UI
Introduce Video On Demand Features



- Rich two-screen experience
- Discover on iPad, play on TV
- Navigate secondary content during playback
  - Browse chapters, bookmarks, special features
  - Social networking, recommendations, monetization

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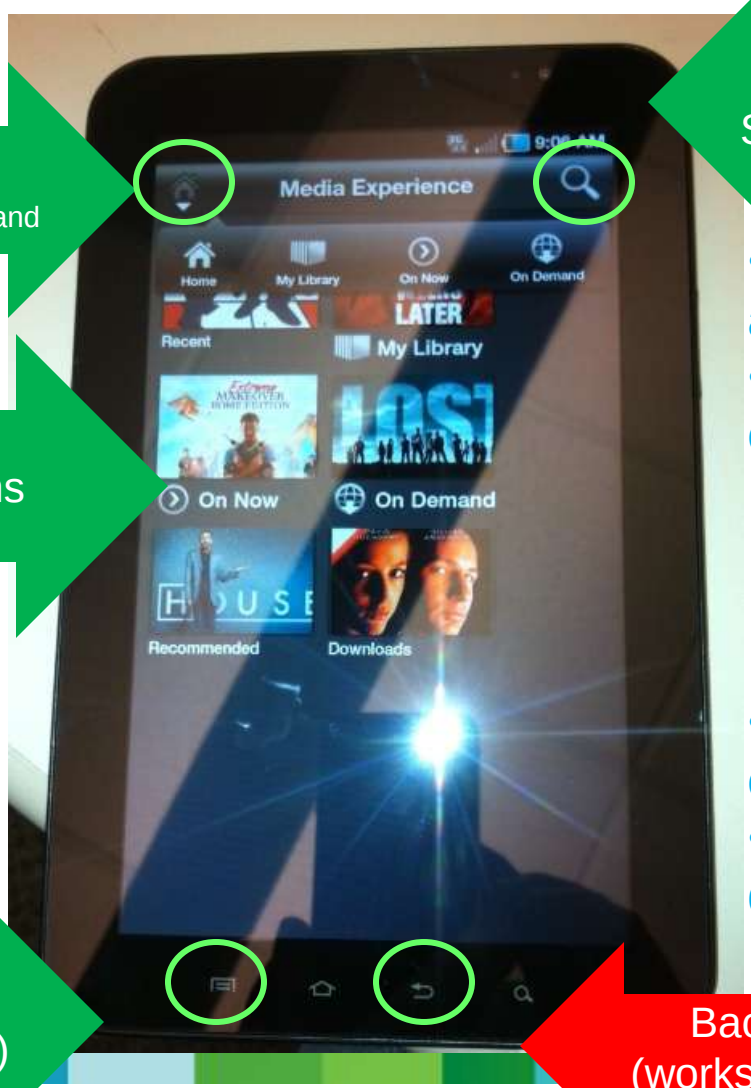
Videoscape Android UI
General Android UI Controls

Main Navigation
My Library, On Now and On Demand

Home Screen
Navigate Main Options
by pressing icons

App Menu Options
(not always actionable)



Universal
Search for content

- Native Android app takes full advantage of UI
- Consistent Videoscape experience
  - Same metadata and content provided by VMS
  - Same universal rights locker
- Single Android client runs on phone and tablet
- Experience tailored for different form factors

Back button
(works within app)

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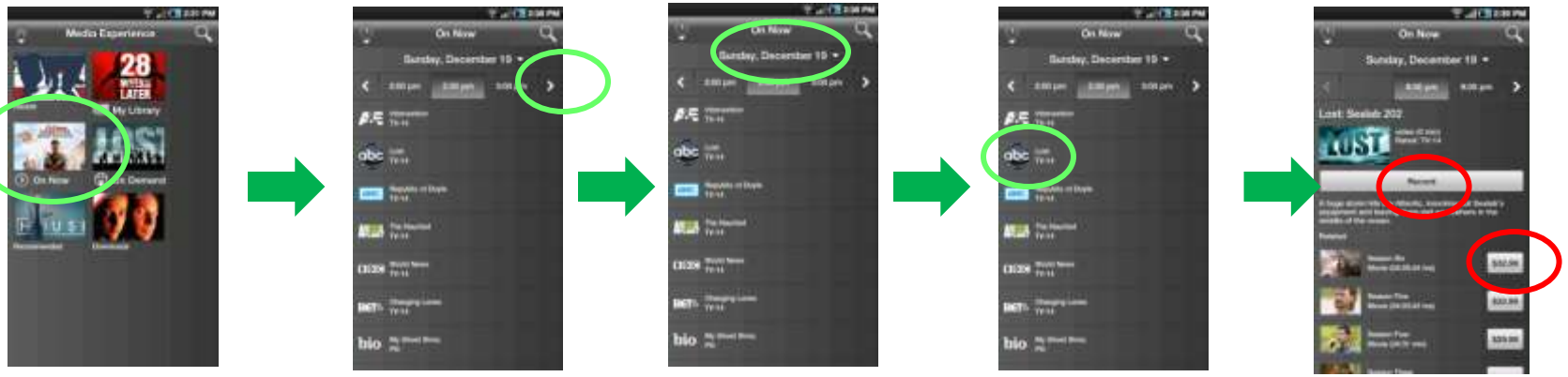
Videoscape Android UI
Introduce On Now (Linear)



- Linear programming on the go
- Remote recording of live content
- Additional monetization options
- Content downloaded and cached on mobile device with same integrated rights locker
- Content added to library, now available on other screens

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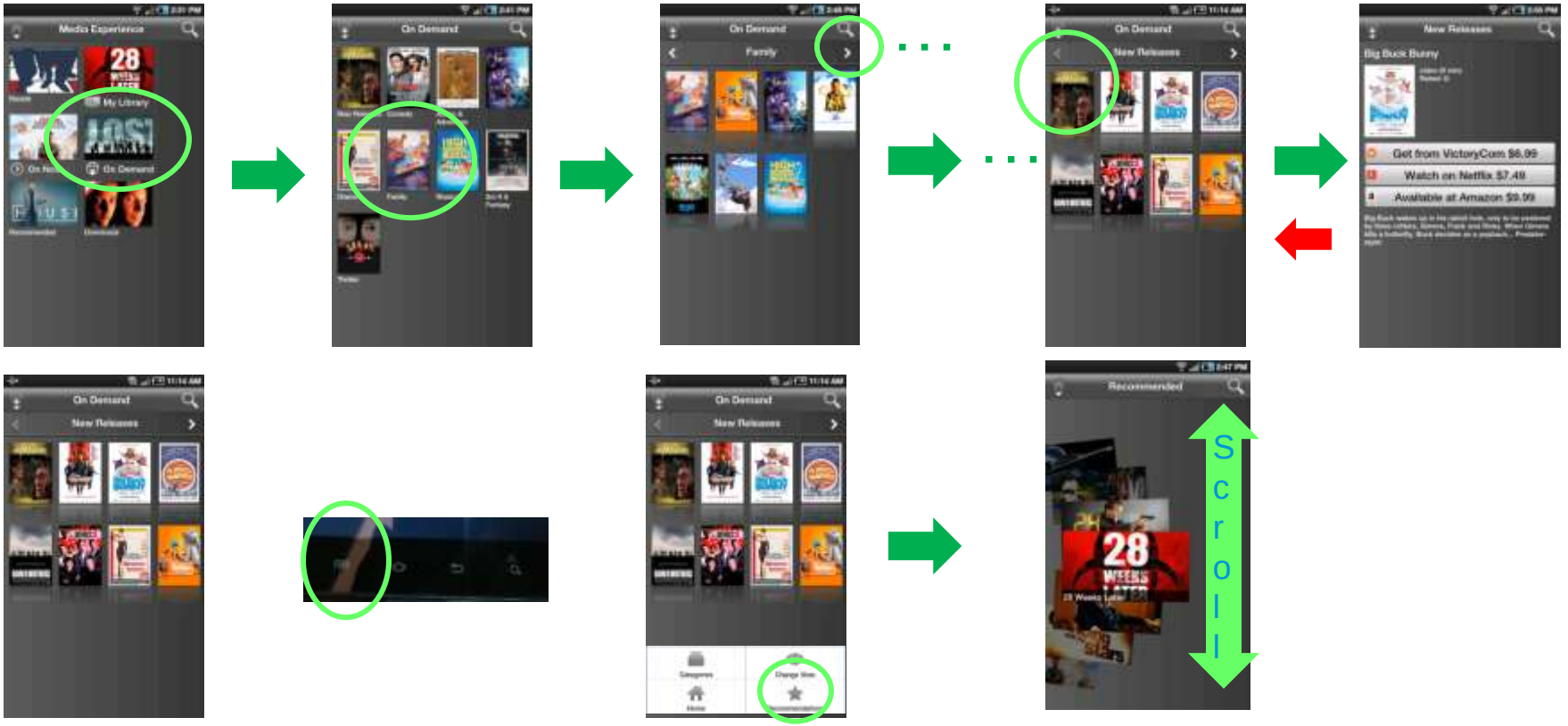
Videoscape Android UI
Introduce On Demand



- On Demand content from SP and OTT is equally accessible on the go
- Access bookmarks to resume watching from where you left off
- Content protected by DRM and authenticated with universal rights locker
- Tightly integrated options to bookmark, share, send to second screen

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Videoscape on PC Experience

- Extend personalized Videoscape experience to PC or Mac
- Consistent experience, now designed for keyboard and mouse
- All content, metadata, friends, bookmarks, etc. persist
- Access content through SP portal or download Silverlight player

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Videoscape Architecture

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Next-Gen Video Infrastructure
Key Tenets of IP Video Driving the Architecture

Built on Web Services Protocols
Cloud Service APIs - Accelerates universal reach and 3rd party innovation;
Designed for virtualisation

Exponential scale for large-scale unicast services
Leveraging caching technologies for efficient distribution
Whilst addressing the challenges of large scale concurrency (i.e. Linear)

Video intelligence propagates deep into the network edge
Providing media, device, and network awareness

Open Client Architecture
Multi-device support – for PCs, gaming consoles, tablets, mobile devices, set-tops, etc. Leveraging the cloud to provide adaptation in concert with network intelligence

Services Across Managed and Unmanaged Networks
Common experience no matter where the user connects
Design for unmanaged, optimised for managed

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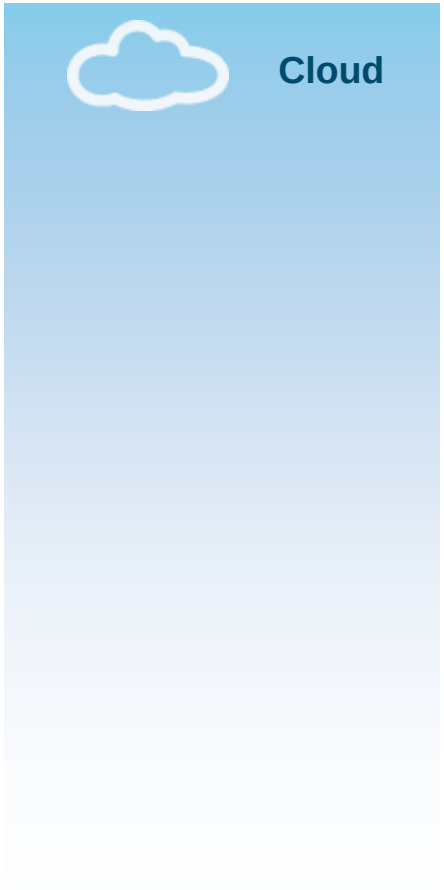
Videoscape Architecture



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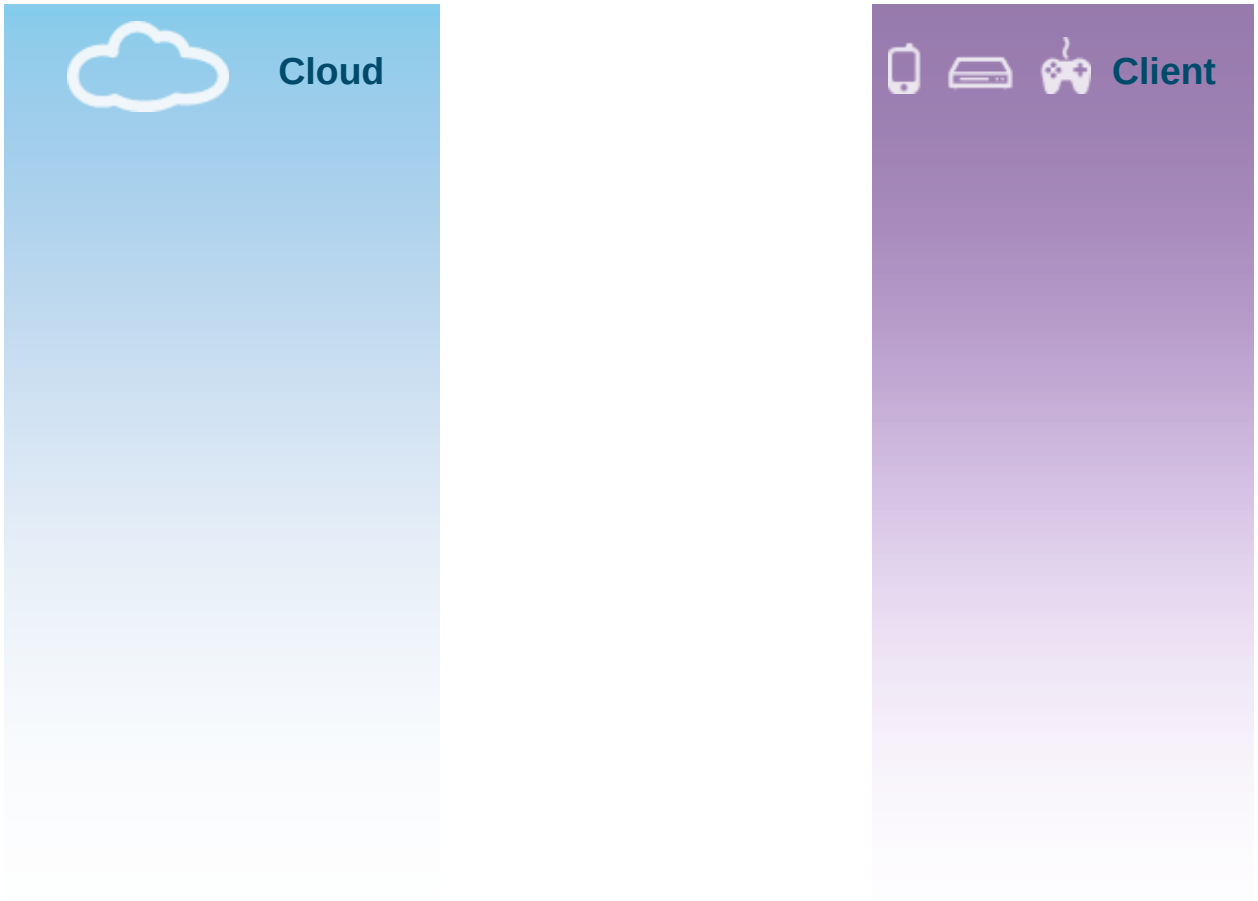
Videoscape Architecture



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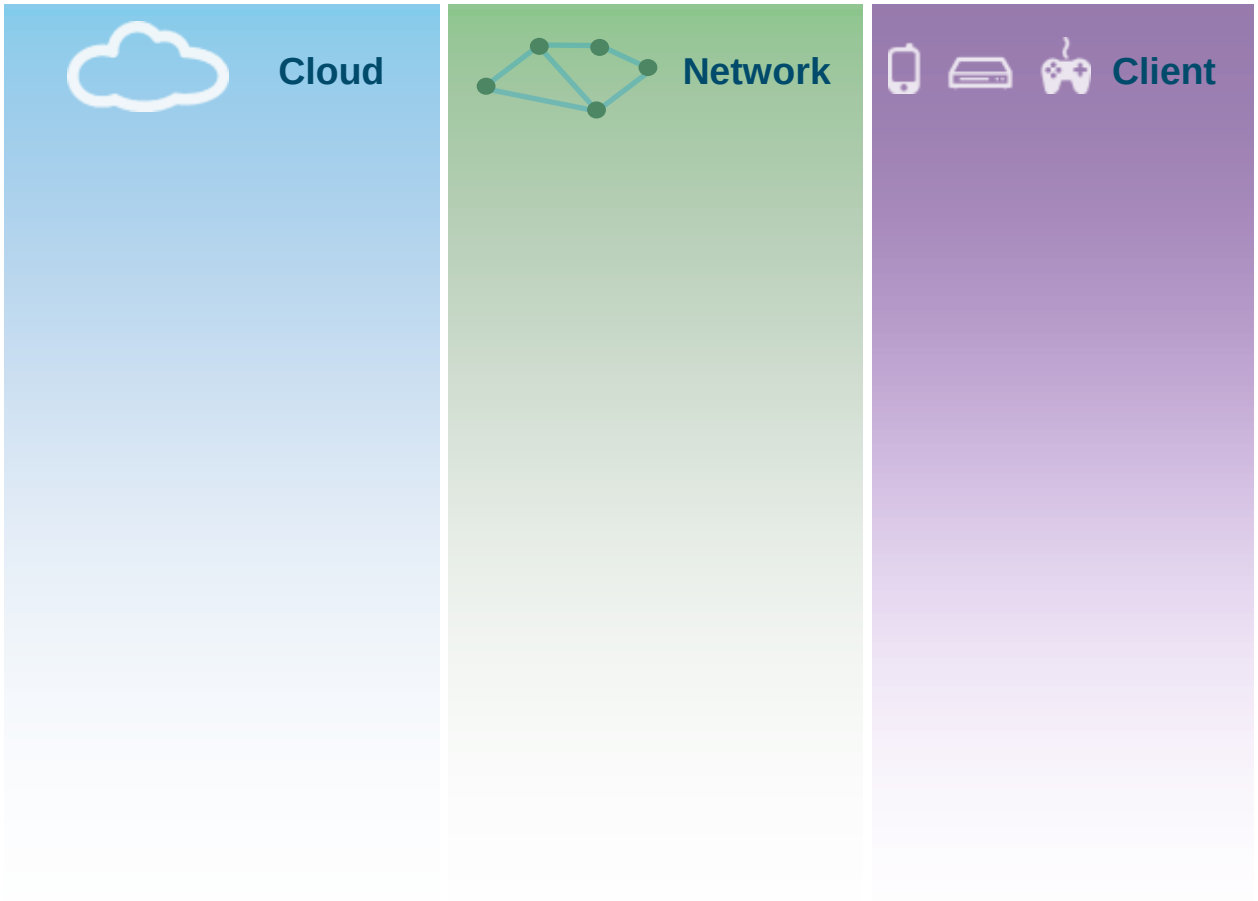
Videoscape Architecture



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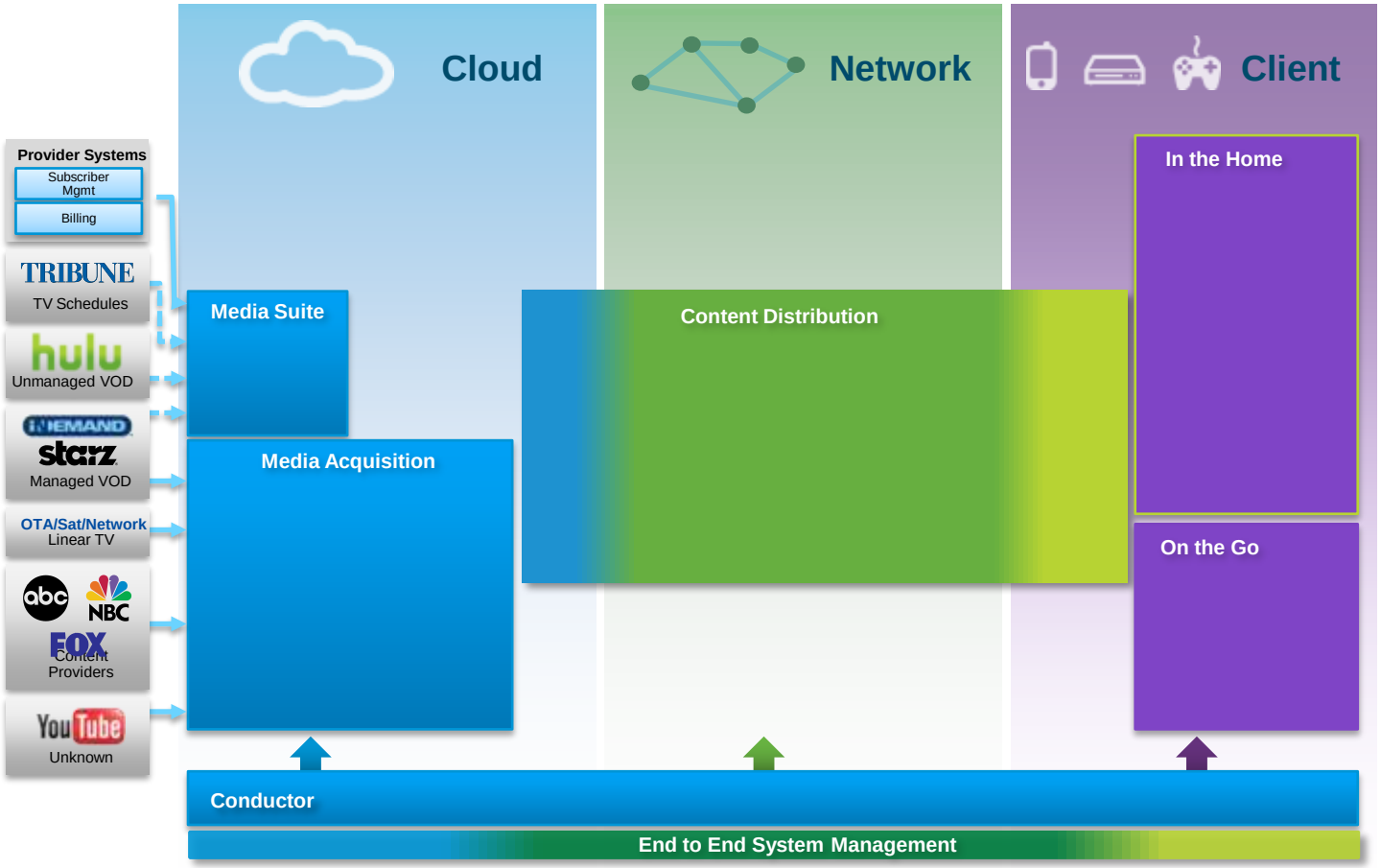
Videoscape Architecture



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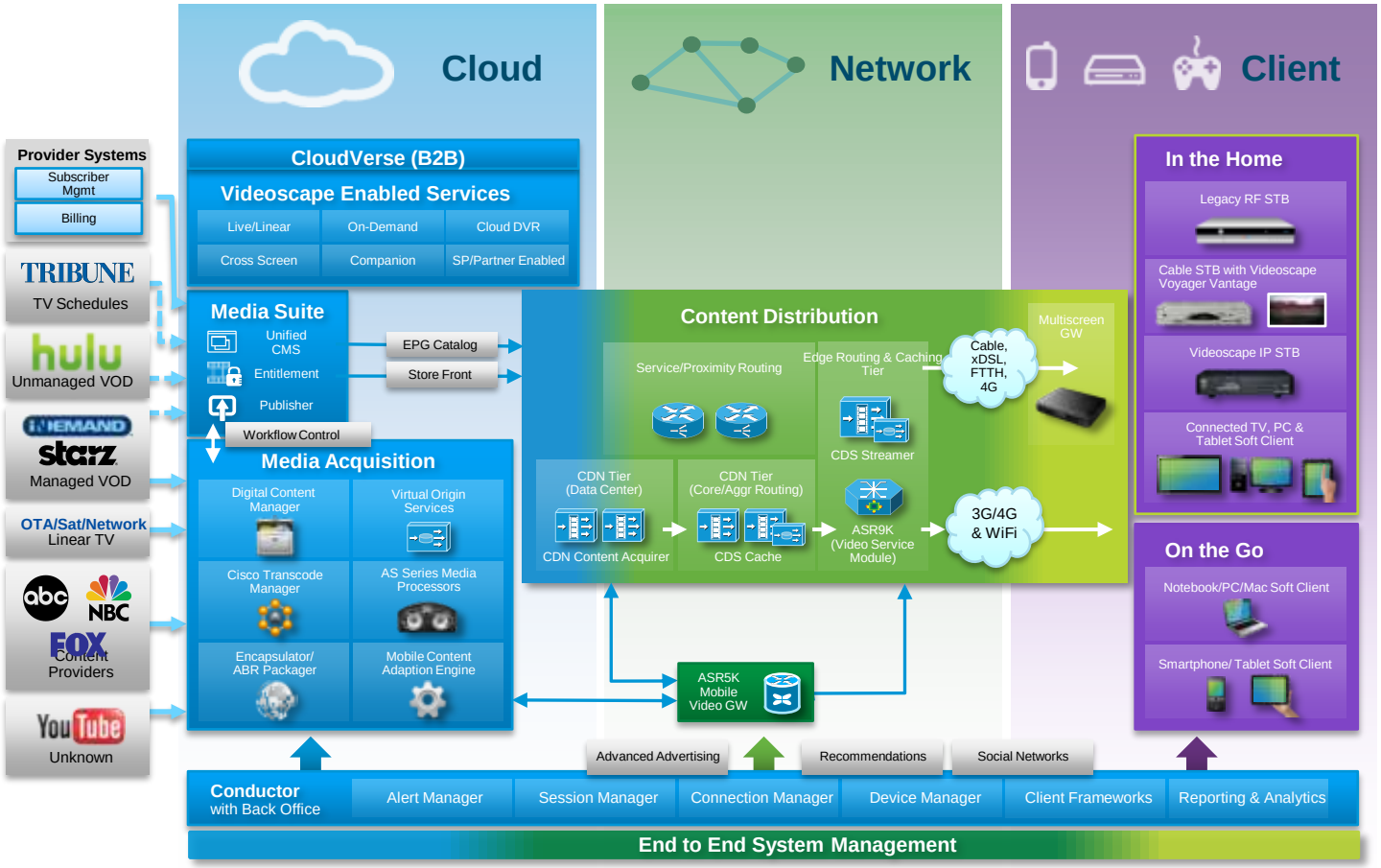
Videoscape Architecture



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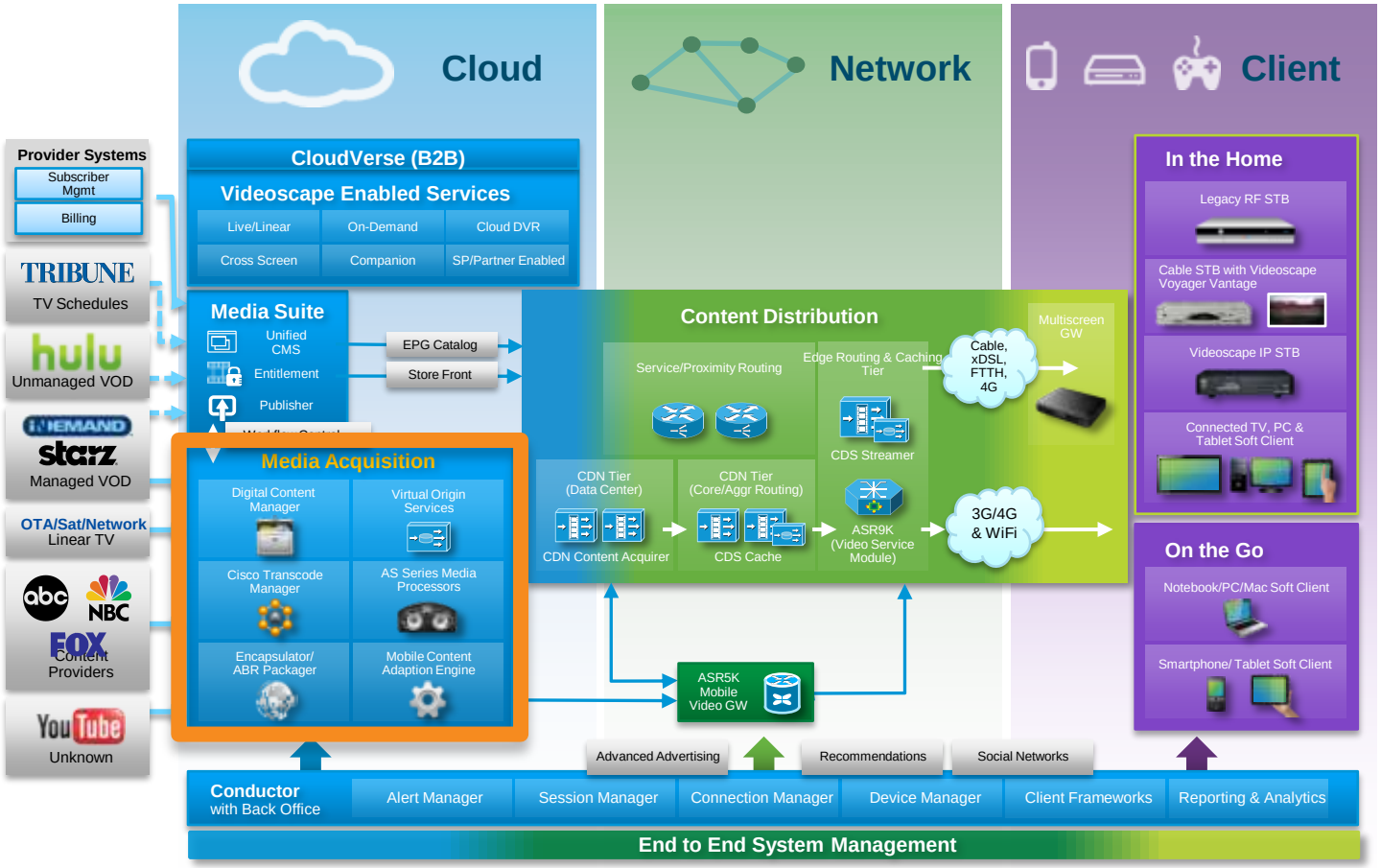
1) Videoscape Acquisition Suite
Flexible Media Processing



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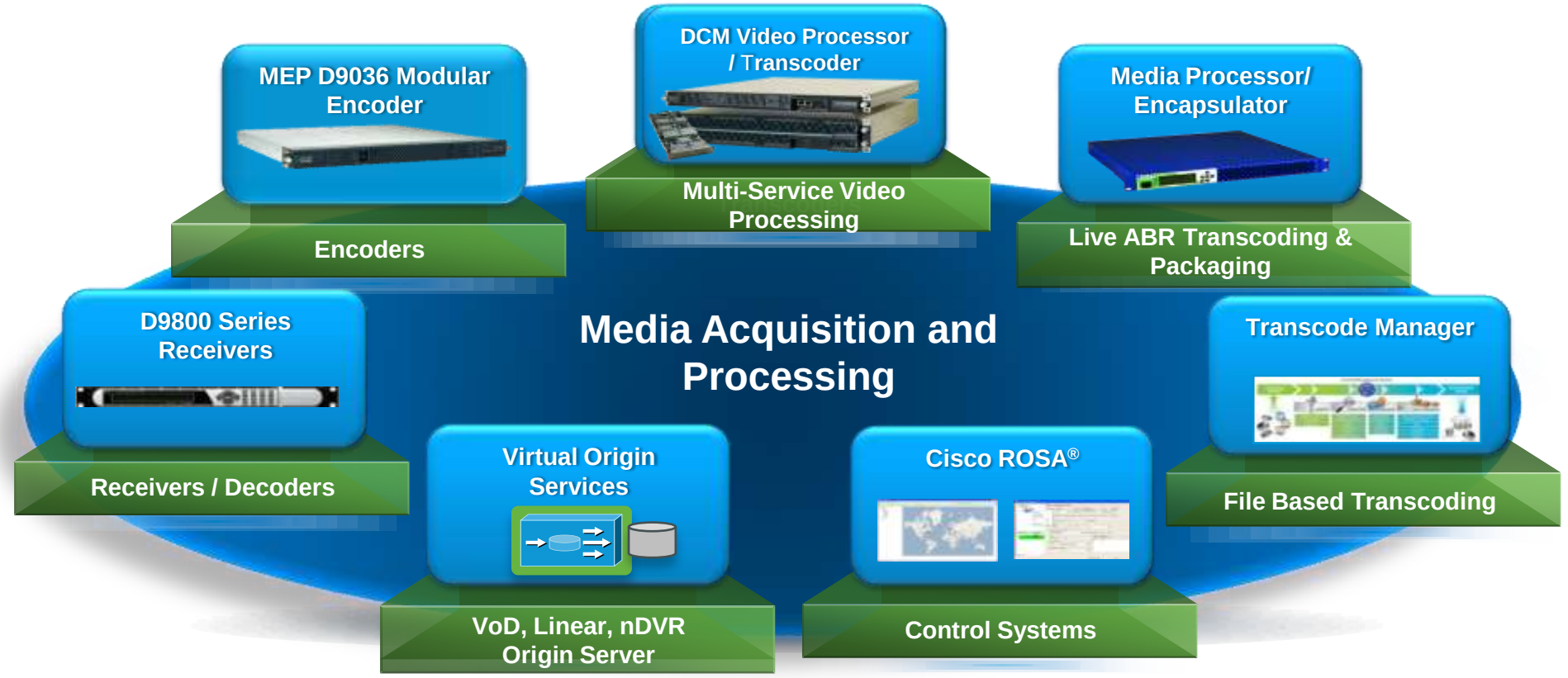
Media Acquisition and Processing Portfolio



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HTTP ABR – Format Comparison

No clear common ground apart from H.264/AAC

	HSS (Microsoft)	HLS (Apple)	HDS (Adobe)
Transport Protocol	HTTP	HTTP	HTTP
Fragment Size (typical)	2 seconds	10 seconds	Variable
#TCP connections	1 or 2	1	Variable
# Content Files on Origin Server	#profiles	#profiles x 720/Hr	#profiles (VOD) #profiles x frag duration/Hr (Live)
Codec Support	VC-1, **H.264**,WMA	**H.264**	**H.264**
Wire/Xport Format	MP4 fragments	MP2TS fragments	MP4 fragments
Content File Format on Origin Server	.ismv Fragmented mp4	.ts Segmented TS	.f4f, .fmf Fragmented mp4
Byte Range Mechanism	No	No	Yes
Std HTTP Origin Server	No	Yes	No
Encryption/DRM	Windows DRM PlayReady	AES-128	Adobe Access
Client	Silveright 2+ OSMF (OpenSource)	iPhone OS 3.0+ Quicktime X	Flash Player 10.1 with ZERI extensions
Manifest file	.ismc (.ism/Mfest or .isml/Mfest)	.m3u8	.fmf
Origin server	Helper integrated with IIS server	HTTP server	HTTP server with Helper module

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Multi-Language Audio, Metadata Processing
Still no convergence (actually worse)

	HSS	HLS	HDS
Multi-Language Audio	• Single audio track per language • Track has language descriptor • URL fragment request contains descriptor	• HLS supports multiple audio tracks, but each segment contains all audio tracks (pre-iOS5) • iOS5 now allows for separable audio streams, TBD when non iOS devices will support (Roku, etc.) • Change result of Cisco working with Apple on requirements – Apple has tended to be very NA focused	• RTMP has no support for multiple audio tracks/IDs • HDS supports multiple audio tracks, but each segment contains video and all audio tracks • Cisco applying pressure on Adobe on both of these issues
Metadata Processing	• Data Tracks (Name, Language, Sub-type) • Sparse (has Parent Track) • Non-Sparse (always present)	• Timed metadata introduced earlier this year • Private TS stream • ES=ID3 tag payload	• Cue points • (Name, Multiple Parameters) • Each parameter is (tag,value) pair
Captions/Subtitles	• Source converted to TTML – natively supported by client • Different approach highly desired to support bitmap-based subtitles (DVB)	• 608 user data on AVC ES for Closed Captioning • No subtitle support • Apple unlikely to add support soon	• No formal support • Client specific customer implementations (BBC)
Ad Splicing**	• SCTE-35 like metadata in sparse track • Client based reaction to metadata • Dual timelines to track parent and child (ad) streams	• Cloud based manifest manipulation • Client unaware of ad splice, additional metadata can be used to control trickmodes, etc. • Scale, cacheability implications of supporting highly targeted – manifest file management	• Client based reaction to some form of metadata • Little effort to standardise this data

** Divergent views across providers on cloud-based only vs client-based only –based splicing, as well as combination of the two – implications on different ecosystems

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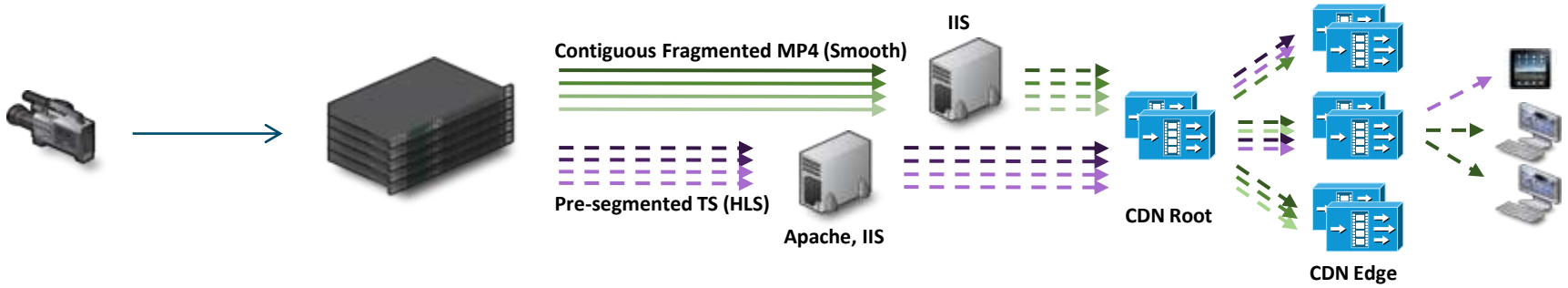
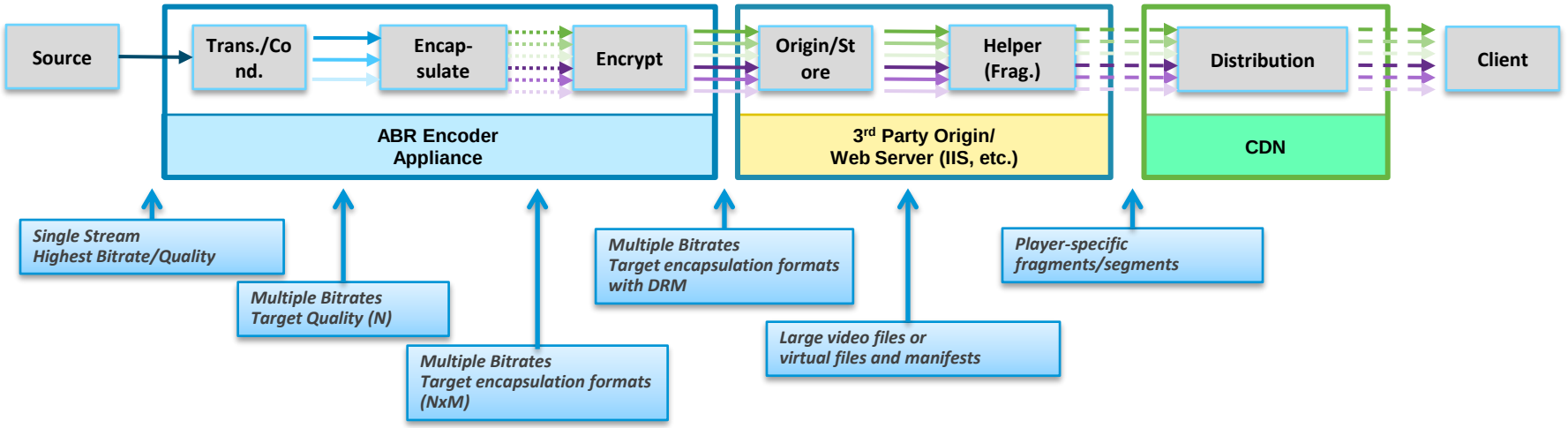
So how do we address the divergence? Look at a generic ABR Content Flow





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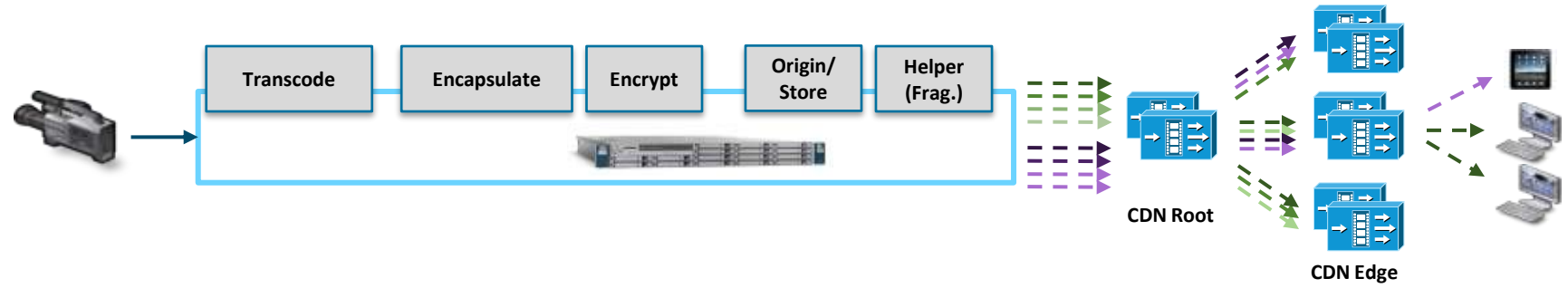
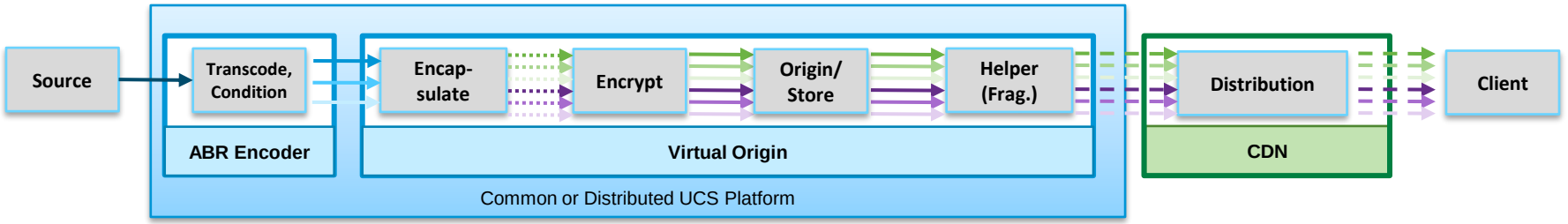
Encoding, Encapsulation, & Origin on a single UCS platform (multiple VMs)





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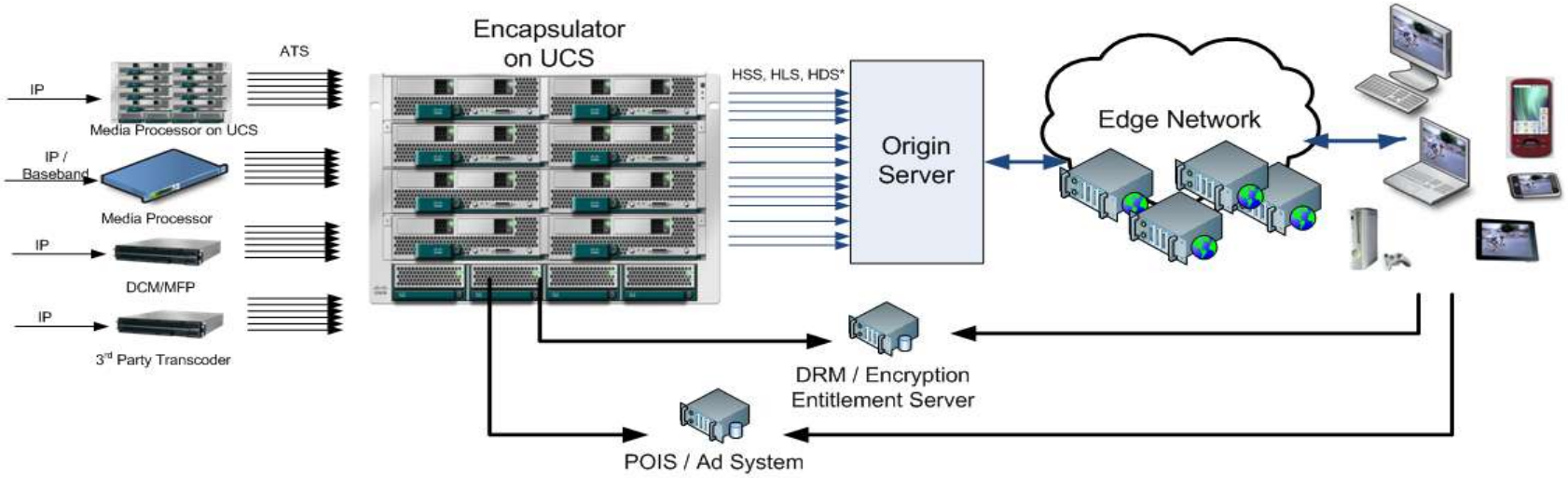
Media Encapsulator

- External ABR Fragmenter/Encapsulation from Adaptive Transcoding Systems
  - X86 Linux-based Software
  - Extensible to new formats, manifest forms (DASH)
- Based on ATS (Adaptive Transport Stream)
- Linear (today) and soon VOD and JIT (Cloud DVR) Workflows
- Integration with DRM/Encryption and Advertising Subsystems



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What is Just-in-Time Processing (JITP)?

- Single flavor in storage (Intermediary ABR-conditioned Format)
  - Result of VoD Transcode or Linear Recording
  - Assets Indexed to assist JIT
- On-demand, JITP produces Target-specific Manifest (HLS, Smooth)
  - Complete VoD Manifest if source asset is complete
  - Linear Manifest starting at beginning of assert if still recording
- Client makes requests against provided manifest
  - Fragments: Random seeks against known fragments
  - Updated Manifest in case of manifest updates (HLS)
- JITP continues to update Manifest if required
- JITP only produces fragments on-demand that are requested

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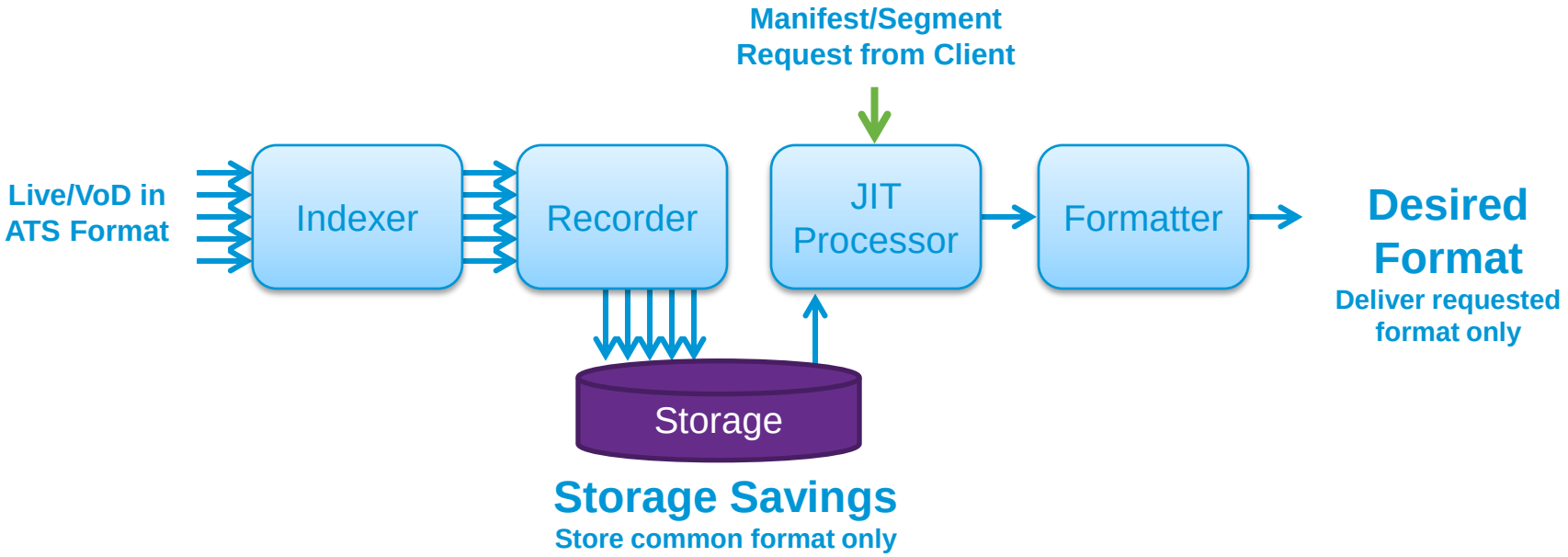
JIT Processing Flow



- Stored and Indexed Intermediary Format
- Dynamic Manifest, Encapsulation and DRM based on requests
- Provides significant Storage savings (only store common, ABR-independent format) and Network savings (only deliver requested fragments, not full ABR set)

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Virtual Origin Server

- Separates the Encapsulation, Encryption, Storage, and Helper functions into flexible processes that can be instantiated in different locations of the architecture
- Provides a unified architecture for VOD, Linear, and Timeshifting (CloudDVR). Supports multiscreen deployments (Legacy STB & ABR clients)
- Proximity Routing, Load Balancing and Resiliency
- Supports External Origins as well as direct ingest from Transcoders
- Multi-vendor solution (Microsoft, Apple, Adobe).
  - For protocols with Helper functions (IIS & FMS), implements Helper functionality directly in VOS, eliminating the need for a layer of servers in the Data Center.
  - Removes a point of failure, increases ability to scale, deployment approaching the edge of the network
- Adapts to evolving standards like DECE UV and DASH

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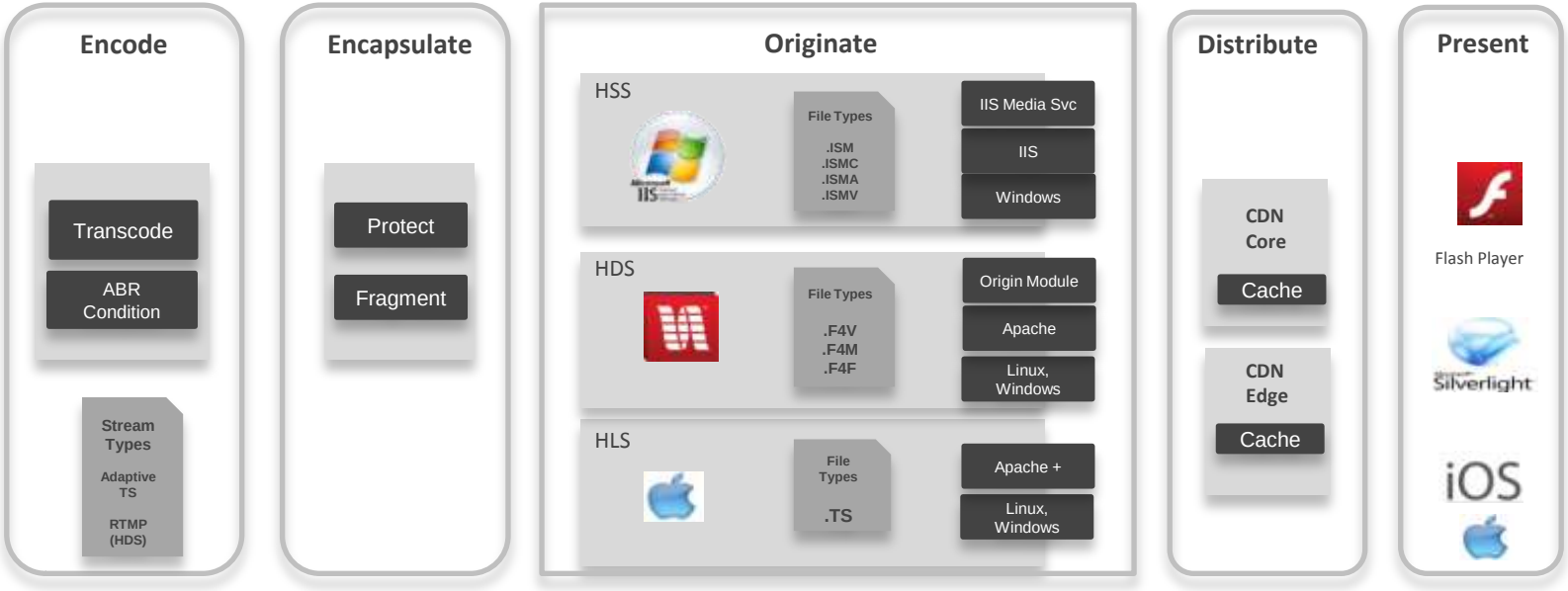
Virtual Origin Server (VOS)
Optimising H.264 ABR and Introducing Time-Shift TV

Traditional ABR Infrastructure
Origin Server Complexity and Redundant Storage
Inefficient CDN Distribution and Edge Cache Efficiency



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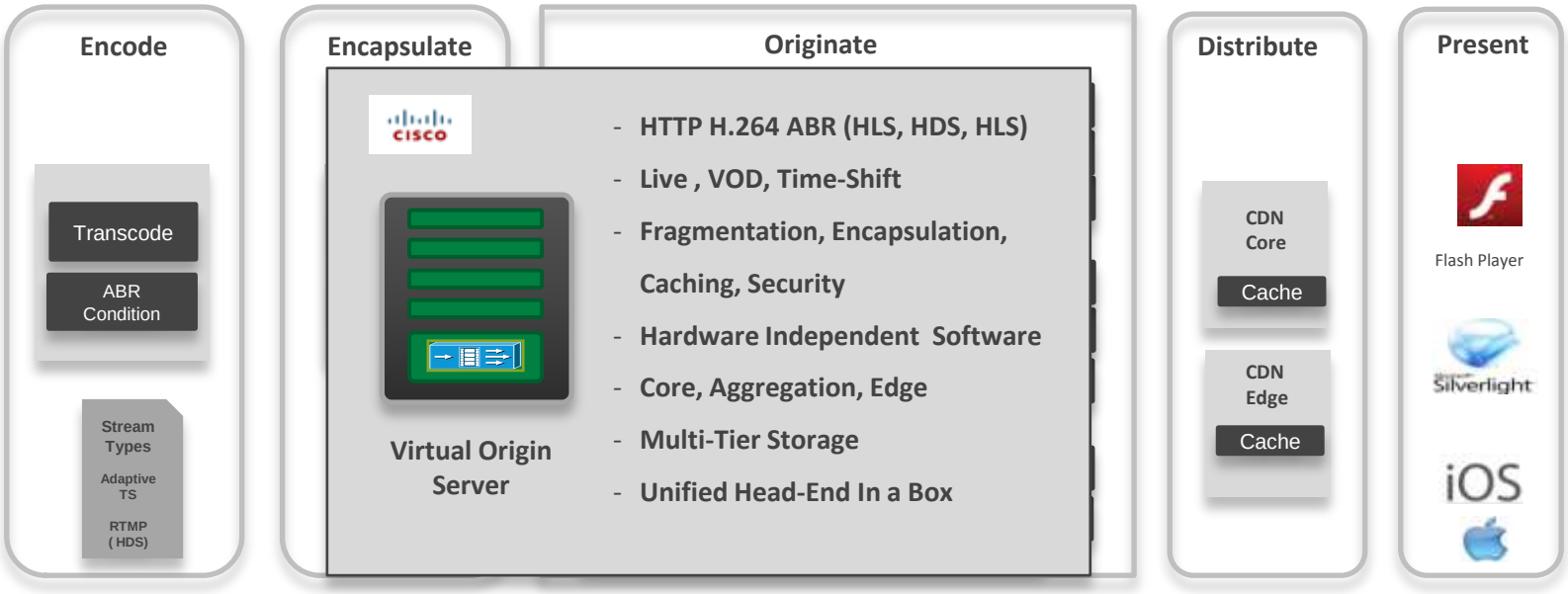
Virtual Origin Server (VOS)
Optimising H.264 ABR and Introducing Time-Shift TV

Virtual Origin Server optimises the H.264 Origin and CDN Infrastructure
Introduces new CloudDVR Revenue-generating Service



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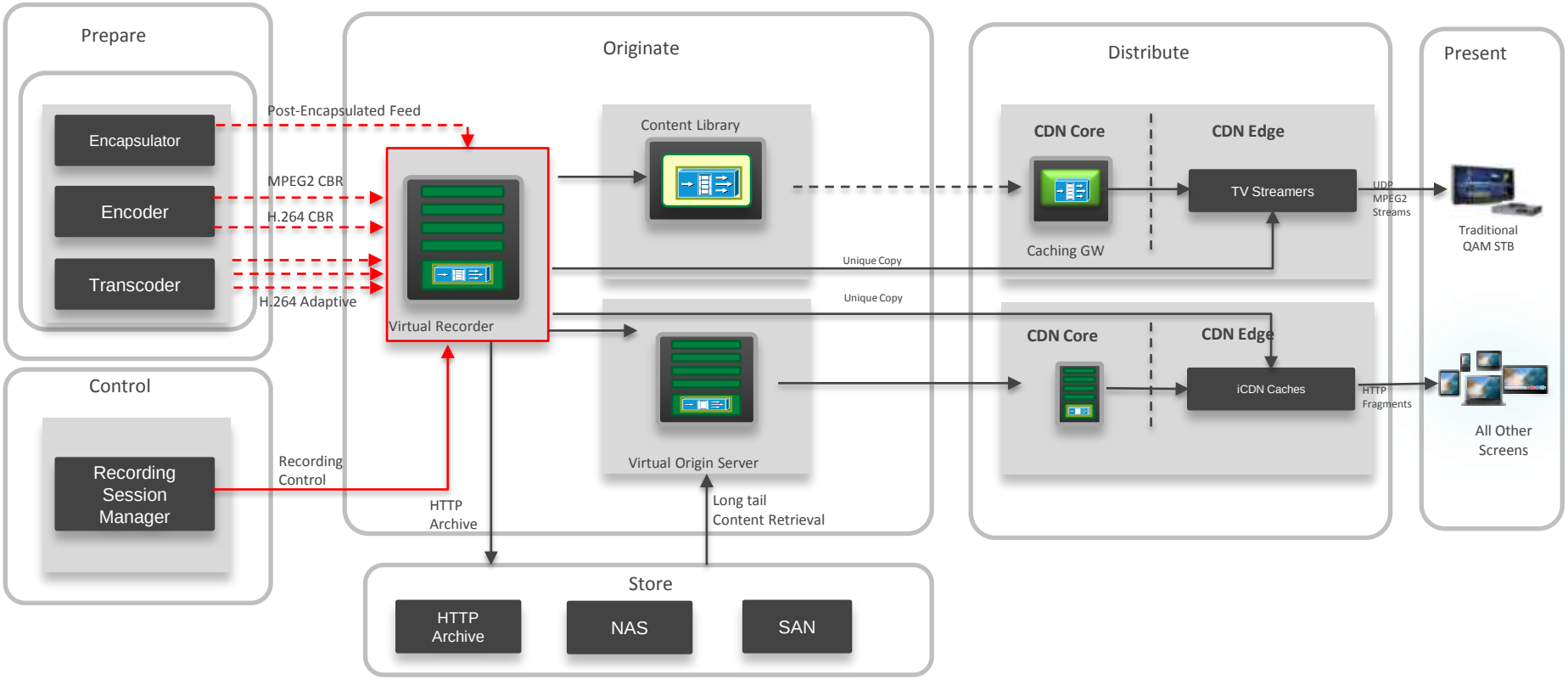
VOS Example:
Multi-Screen Cloud DVR



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Cloud DVR - Architecture Principles

- Record Once – Play-out in multiple screens
- Unified Control Plane for TV & Internet Screens
- Virtual Origin based Dynamic packaging and Play-out – expands to multiple Use case (Linear, VOD)
- Support Integrated and Distributed JIT Packaging – Computing scales independent of Capture resources
- Support 3rd Party Storage

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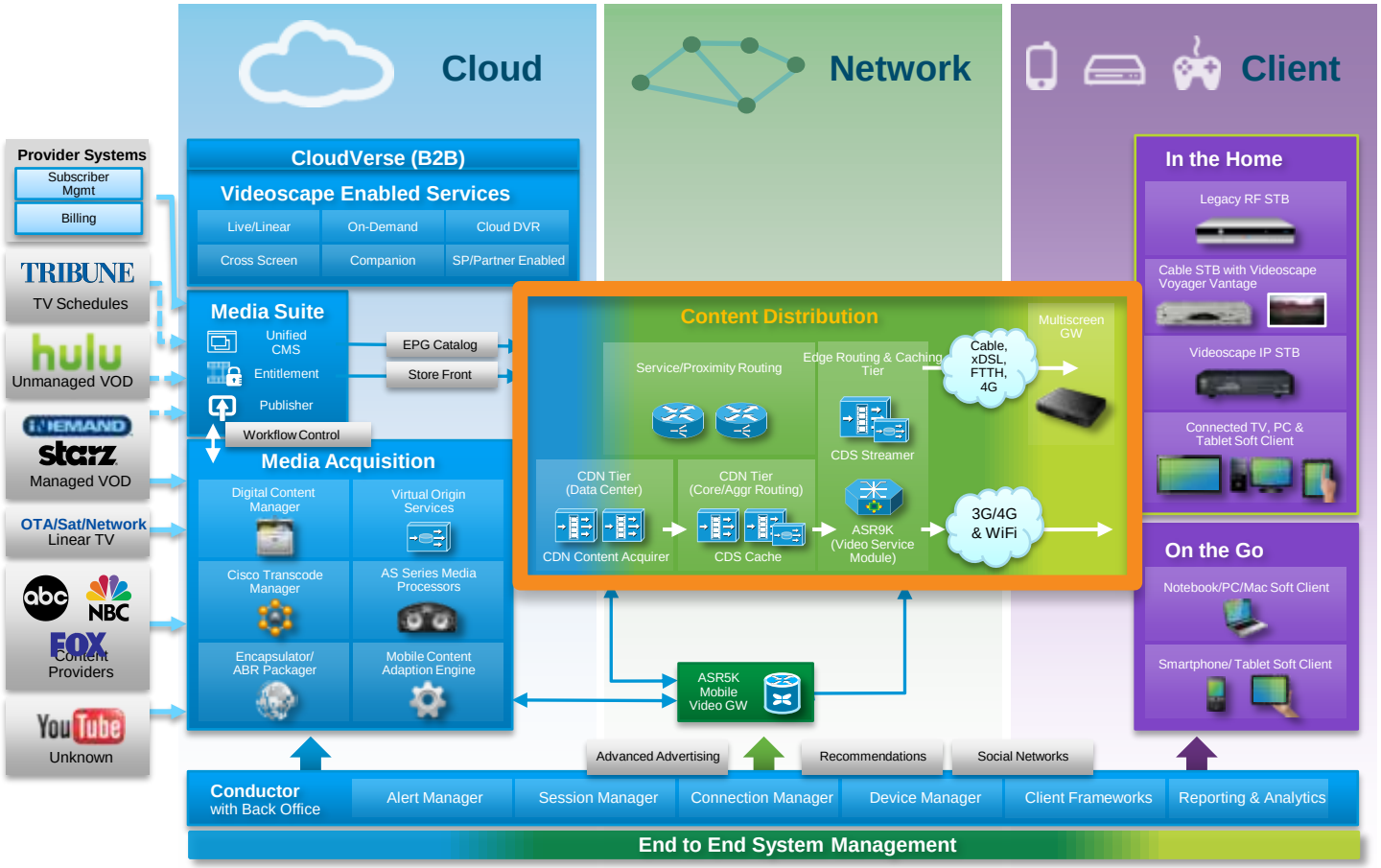
2) Videoscape Distribution Suite



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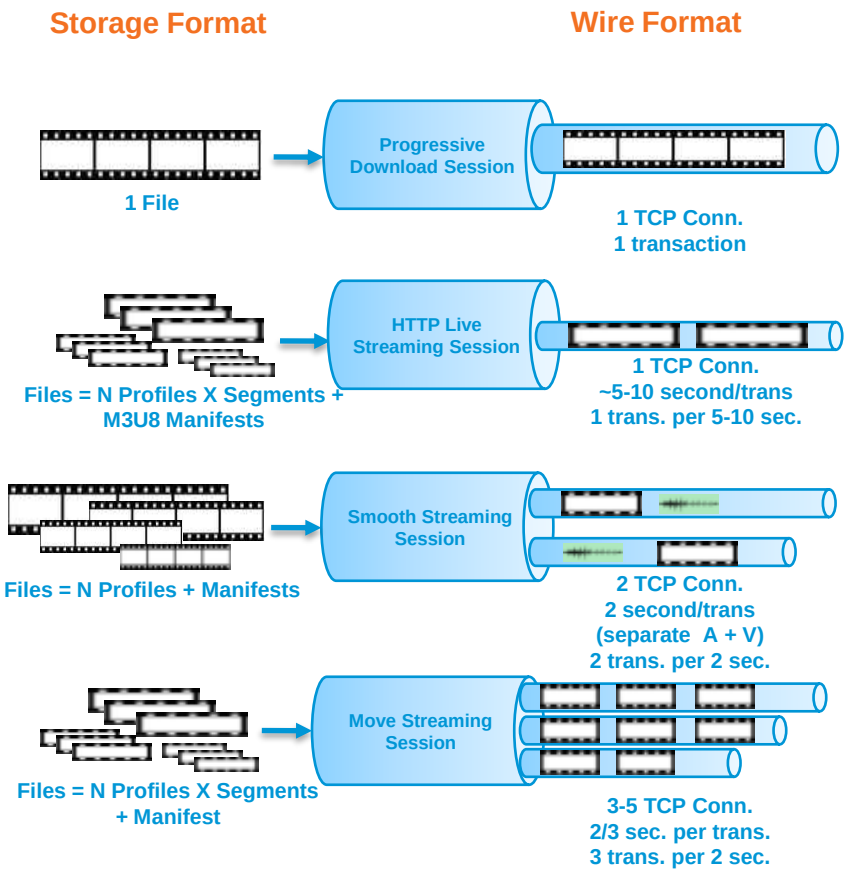
HTTP ABR – CDN Challenges

- ABR = Adaptive Bit Rate
  - Unicast HTTP-based delivery
    (and hence TCP congestion control)
  - Client-driven adaptation to available BW and CPU
- Large number of (relatively) small objects
  - File Storage vs. Wire Formats
- Transaction Load, File System Load
- Challenges to Reporting and Analytics
- No Inherent Server Side Session State
- Variability in client delivery implementations
- Lack of standard Content Access Protection methods
  - Prevent deep URL linking (including ABR fragments)
  - Prevent certain types of DoS attacks (e.g. Origin Server overload, cache poisoning")



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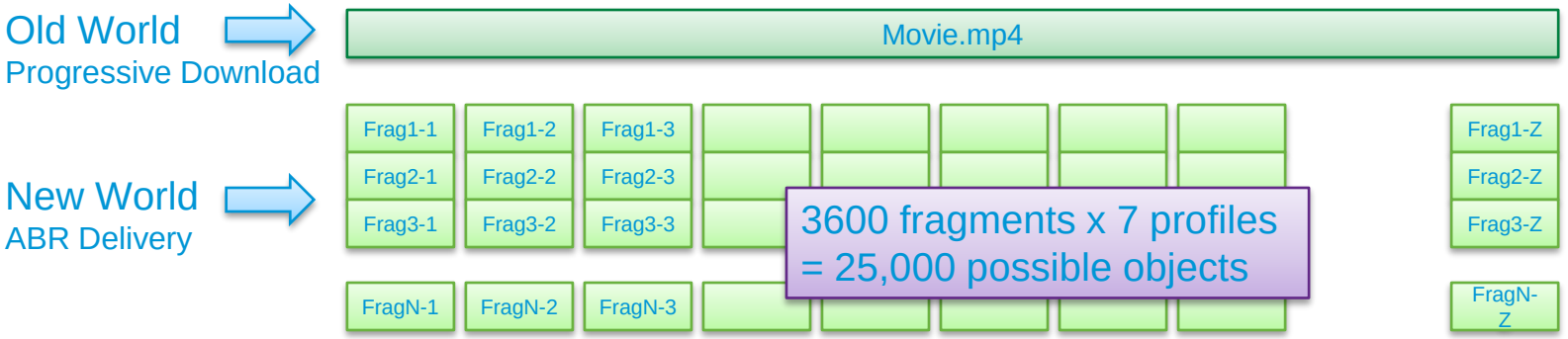
Challenges with Distributing ABR Objects



- Short fragment sizes translate to very high request TPS
- TCP connections can be short-lived (client and network conditions)
- Different standard fragment sizes (HLS v. Smooth) mean object sizes are different for each Delivery Service. CDS object handling can be configured on a per-DS basis

Transaction Rates

	Obj Length(sec)	Client Request TPS	TPS for 2000 clients	Objects/Hour/Asset	Obj/Hr 200 channels
Smooth	2	0.500	1,000	1800	360,000
HLS	10	0.100	200	360	72,000
PDL	3600	0.000	0.56	1	200

Object Size (MB)

	3000 kbps	1500 kbps	500 kbps
Smooth	0.75	0.38	0.13
HLS	3.8	1.9	0.6
PDL	1,350	675	225

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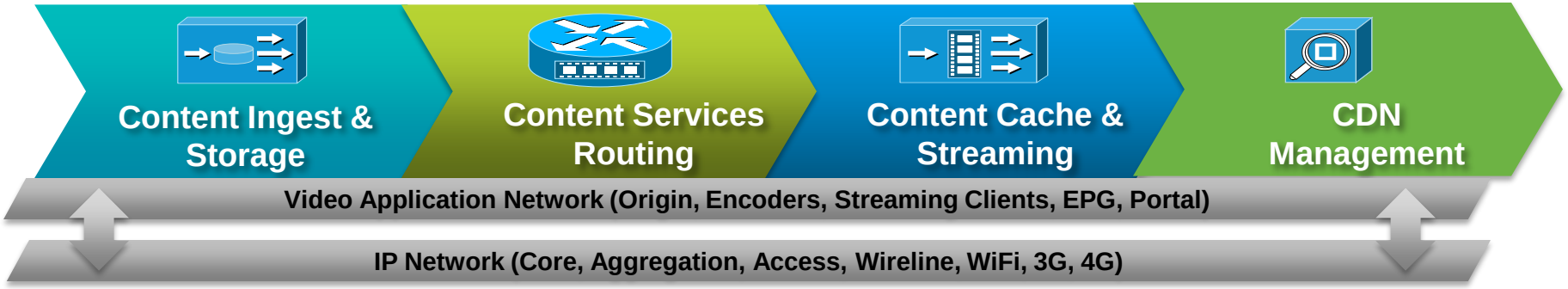
Videoscape Distribution Suite
Content Distribution System (CDS)



Content Acquirer

- Managed VoD Library Origin Server
- Scheduled & Dynamic Ingest to CDN
- Live Streams Ingest / Timeshifting
- VoD Prepositioning or Dynamic Cache-Fill
- Live Stream Splitting
- HTTP, FTP, CIFS, RTSP

Service Router

- Content Request Routing
- Global Load Balancing
- HTTP, RTMP, RTSP, DNS
- Content & Load Aware
- Subscriber & Network Aware
- BGP, OSPF Proximity

Content Cache & Content Streamers

- Low latency, caching (hierarchical & location based)
- Concurrent multi-protocol delivery
- VoD & Live streaming & download
- Stream Control HTTP, RTSP, RTMP
- High performance
- Detailed Reporting

VDS Manager

- Centralised EM
- WebGUI and HTTP API's
- VoD & Live Delivery Service Mgt
- System Monitoring
- Capacity Monitoring
- AAA Server Integration

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Cisco CDS Optimisations for ABR

- Optimised TCP connection handling
  - Scaling to support the large # of connections for ABR
- Optimised HTTP transaction handling
  - Scaling to support the high transaction rate of ABR. CDNs designed for ordinary HTTP transaction loads will not meet the high transactional demands of ABR
- Request Bundling
  - For live streaming, aggregates multiple cache-fill requests for same content into a single request from next cache-tier or Origin Server
- Small Object Cache Throughput Optimisations
  - Small objects written to memory, delayed write to disk
  - Large objects continue to be cached on disk
  - SSD support and optimisations
  - Customised object size caching behavior per Delivery Service
- Content Access Protection
  - URL signing
  - Access authentication through Conductor XMPP session persistence
- Live ABR and Client Request Optimisations
  - Request Bundling – Multiple near-time requests result in single requests upstream
  - Range Request Caching (HLS clients, Progressive DL clients)
  - Client/Streamer Stickiness (Content Affinity)
- Service Visibility
  - Reporting and Analytics optimisations for ABR
    - Asset-level treatment of fragments, Session association across ABR profile shifts
  - Streamer performance metrics associated with delivery transactions for overall system behavior views
  - Exposure of service metrics and transaction logs for 3rd party monitoring/reporting systems.

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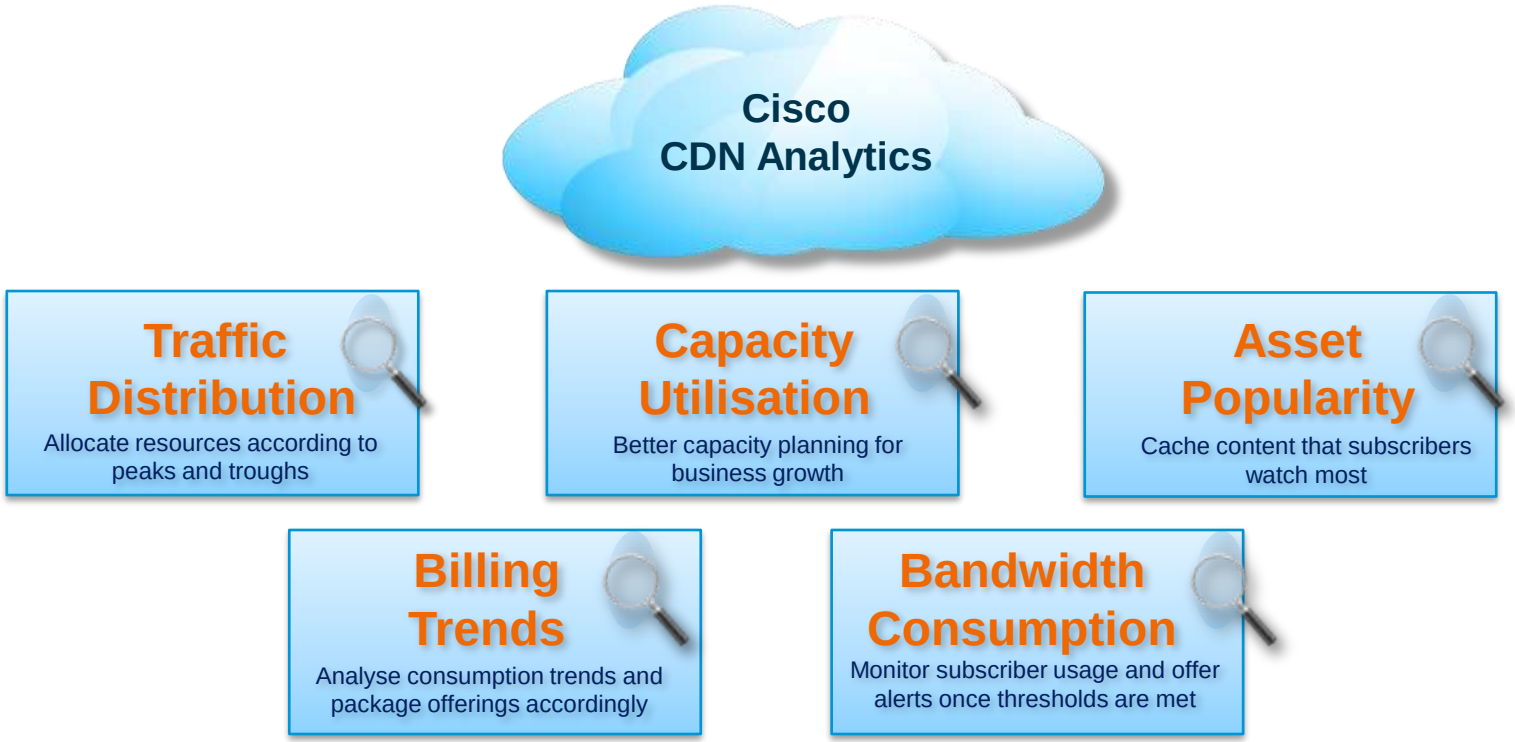
Videoscape CDN Analytics
Real Time, Deep and Broad Analysis



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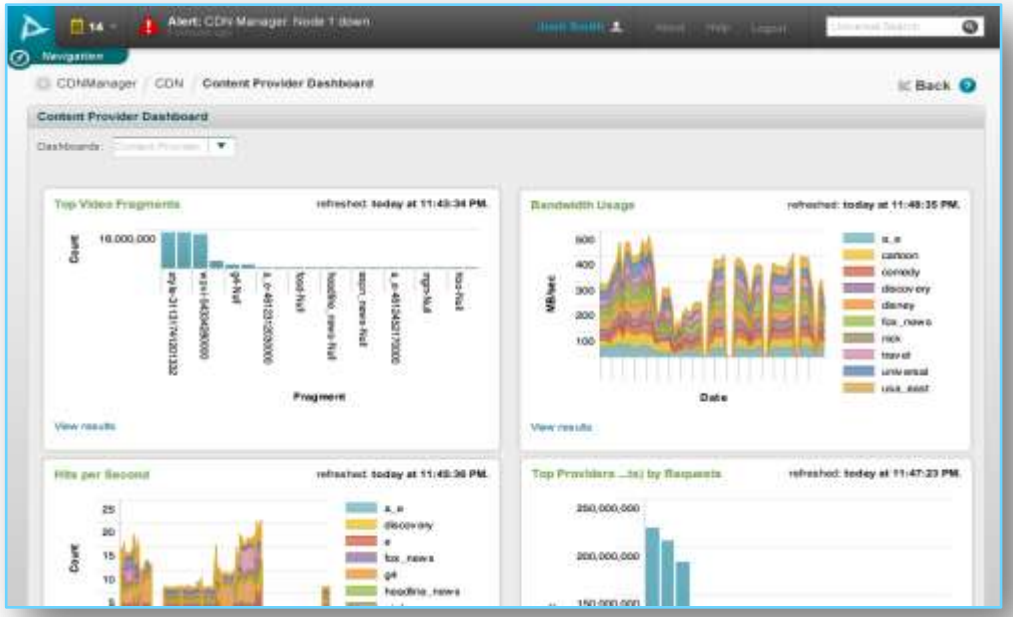
Videoscape CDN Analytics
Dashboards

- Dashboards link real-time data that has a common theme
  - Network Utilisation
  - QoS
  - Client Access
  - Geo-location
  - Content Usage



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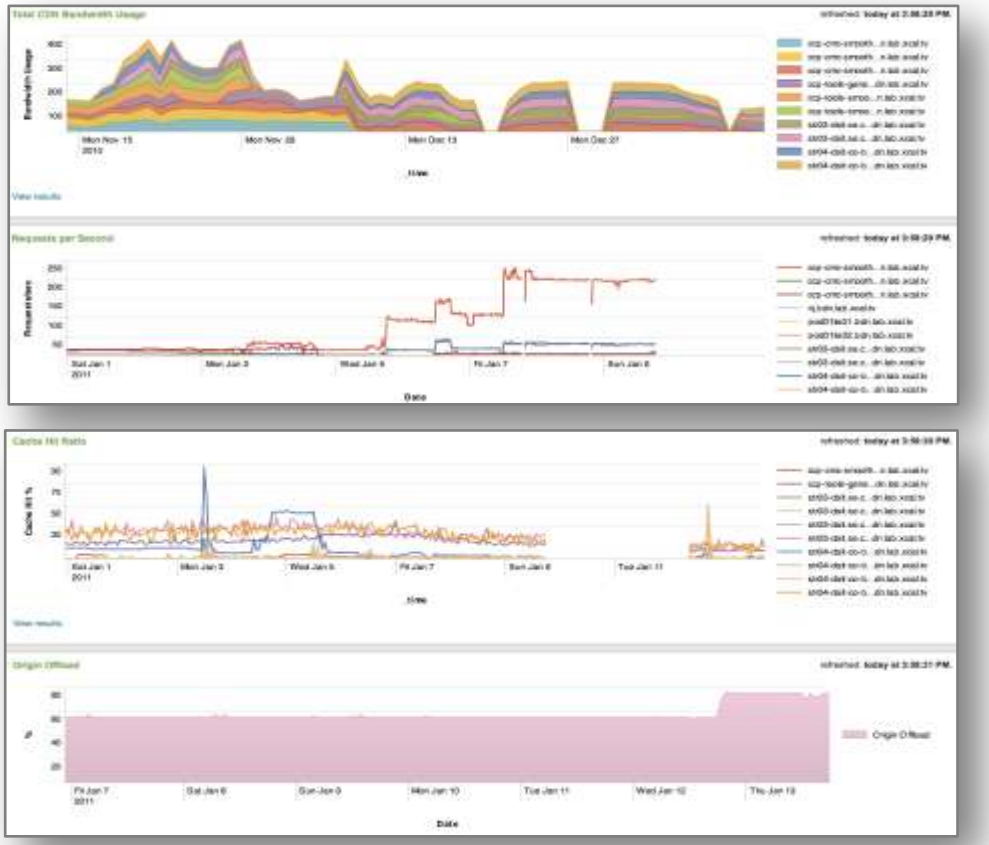
Videoscape CDN Analytics
Network Dashboard

- CDN Bandwidth Usage
- Requests Per Second
- Cache Hit Ratio
- Origin Offload
- Server Location



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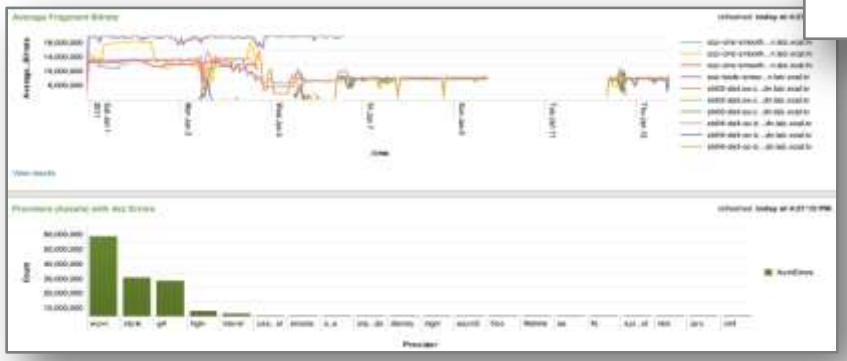
Videoscape CDN Analytics
QoS Dashboard

- Average Fragment Bitrate
- Assets with 4xx Errors
- Response Codes
- 4xx Error Code Rates
- Average Time to Serve



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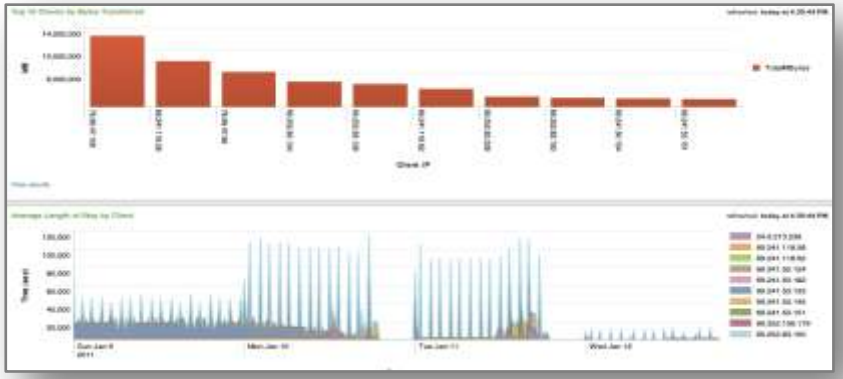
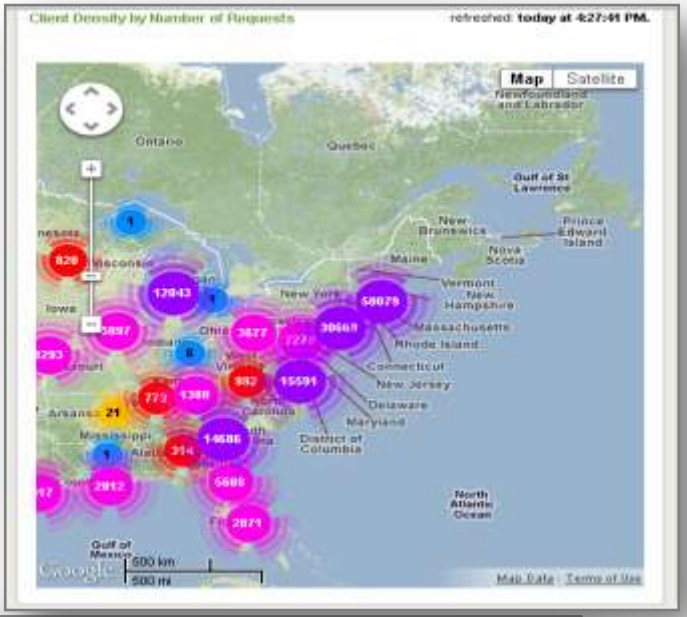
Videoscape CDN Analytics
Client Dashboard





- Client Density Map
- Number of Unique Clients
- Top 10 Clients by Request
- Top 10 Clients by Bytes Transferred
- Average Length of Stay

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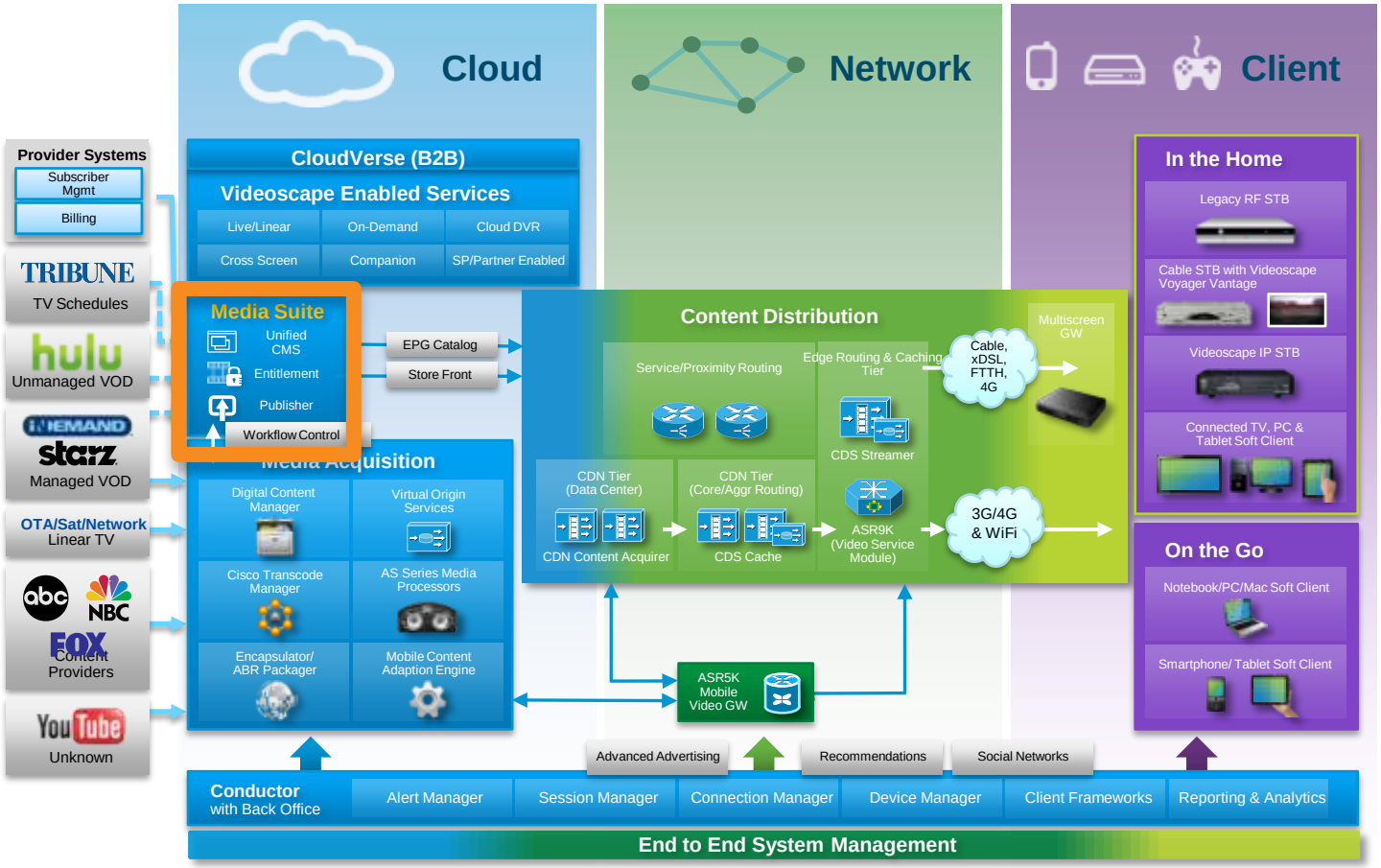
3) Videoscape Media Suite



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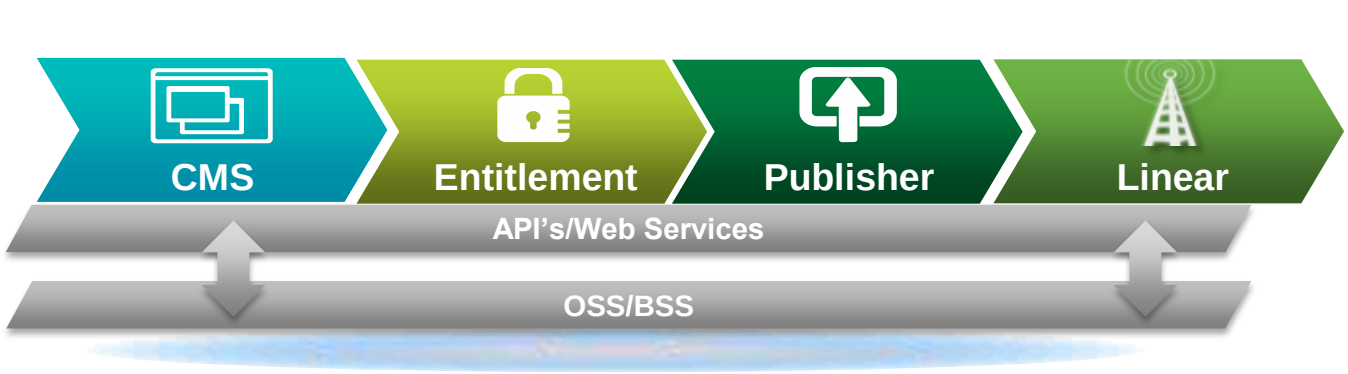
Media Suite: Components



Content Management

- Multiple content formats
- Sophisticated content bundling
- Customisable metadata model
- Metadata normalisation
- Extensible workflow
- Transcoding and encryption
- Distribution to delivery network

Entitlement

- Product/Offer rules creation
- Subscription, rental, EST, ad-supported models supported
- Custom entitlement checks prior to authorisation
- Accounts, devices, domains
- Multi-DRM framework
- Customer Care functionality

Publishing

- Feed aggregation & harmonisation
- Multipoint catalog publishing
- Category management
- Playlist publishing
- Search and Rating
- Metering & reporting

Linear

- EPG ingest & normalisation
- Channel maps/regionalisation
- Uses VMS workflow, bundling & entitlement
- Unified search - linear & VOD
- Event framework for record controls
- XML-based output formatting

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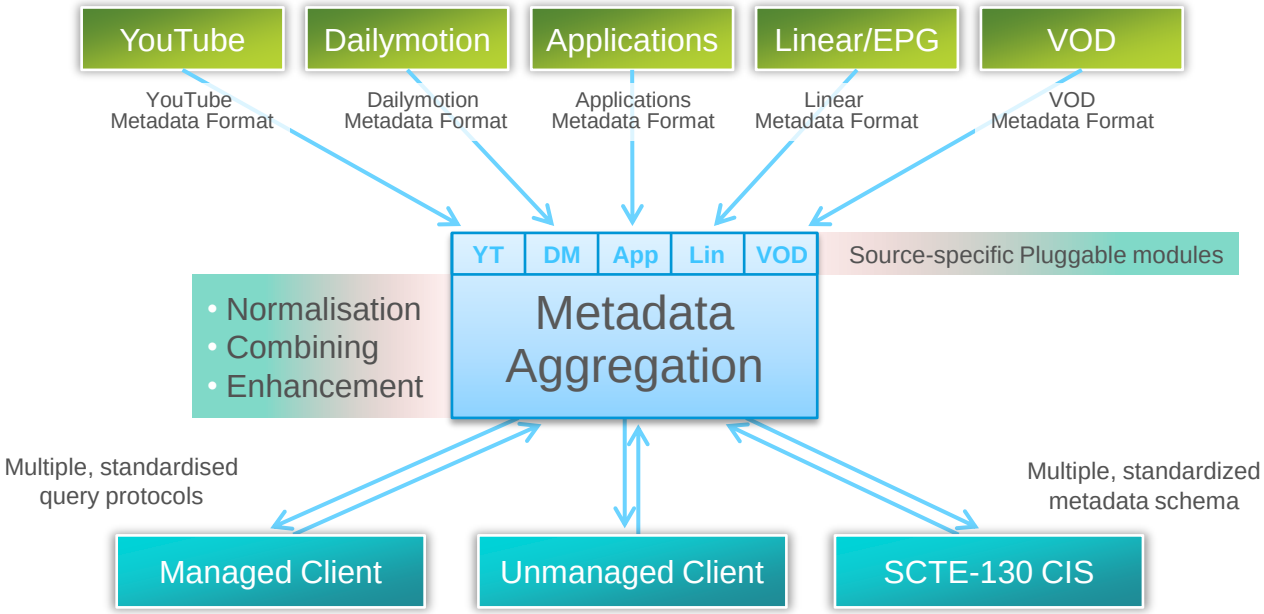
Unified Metadata Representation
Traditional and non-traditional content sources



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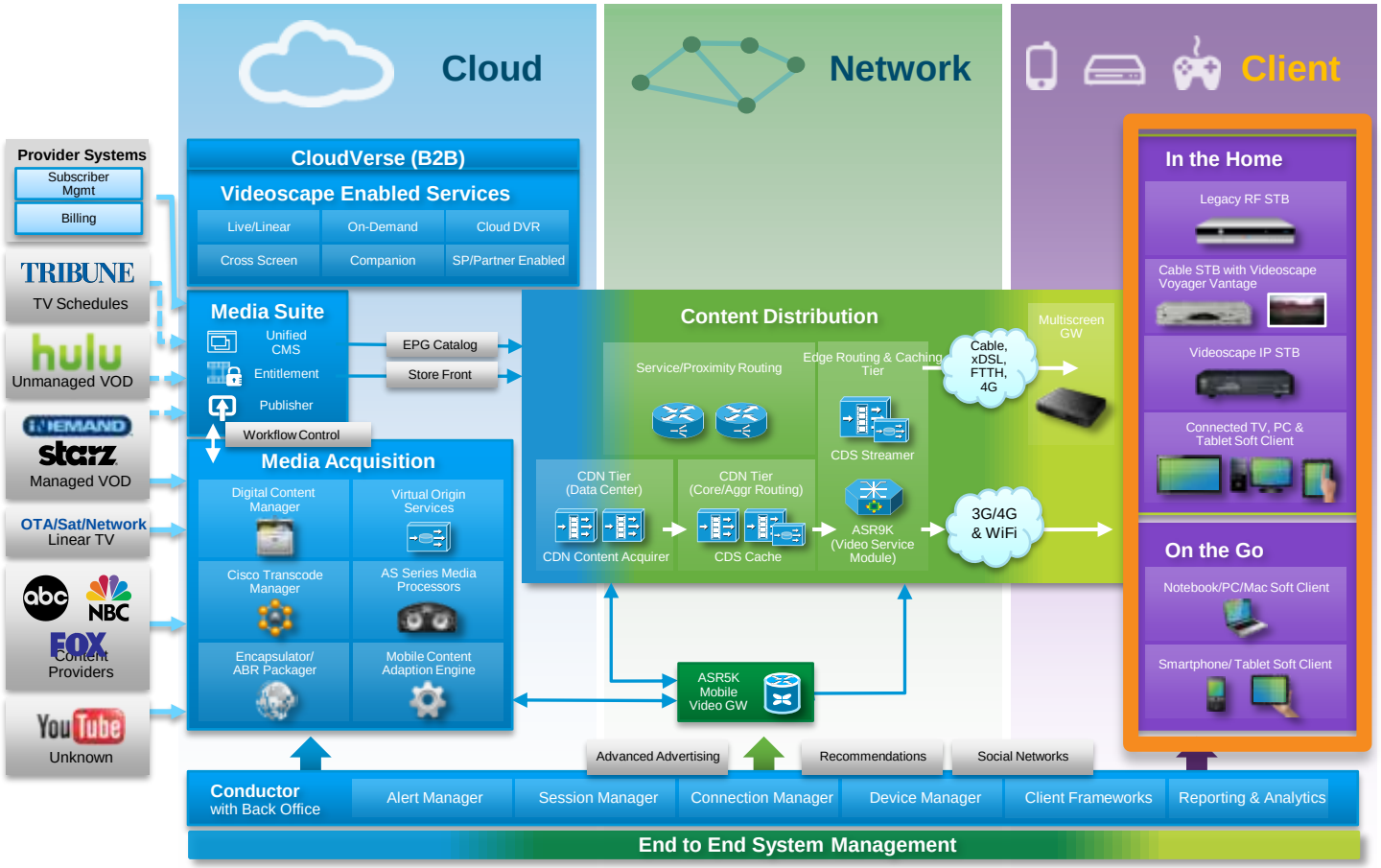
4) Videoscape Clients



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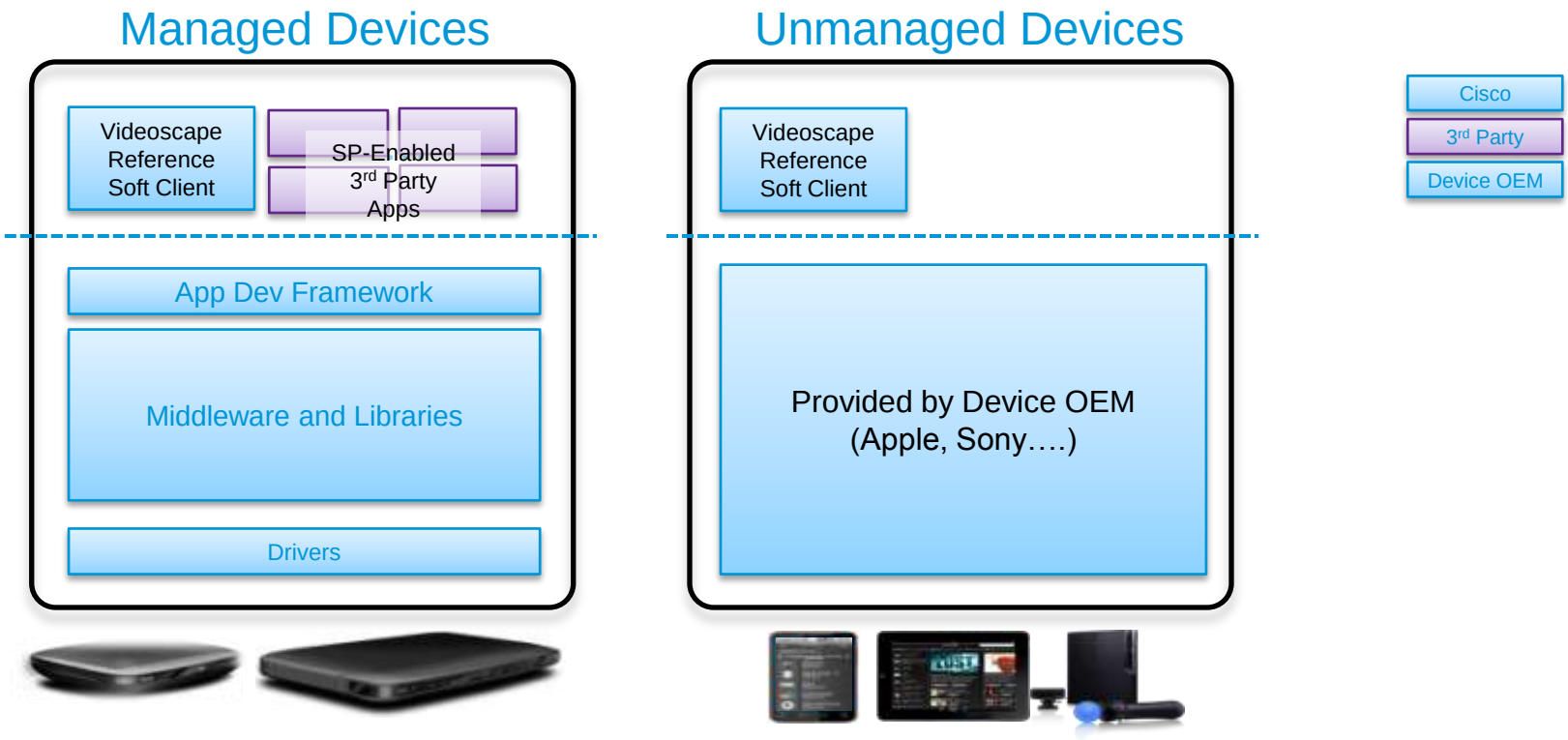
Videoscape Client Software



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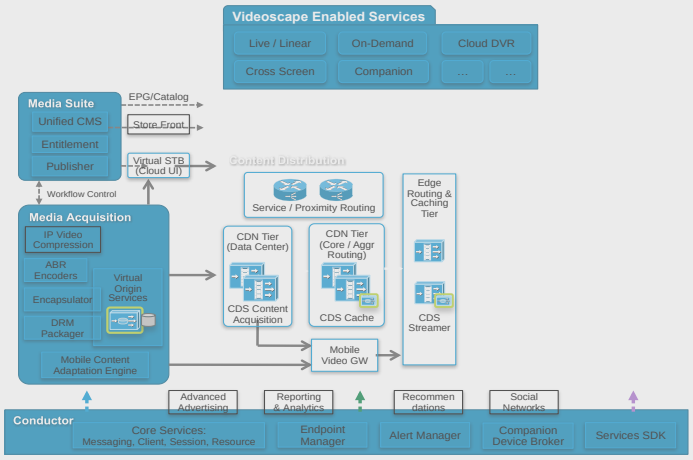
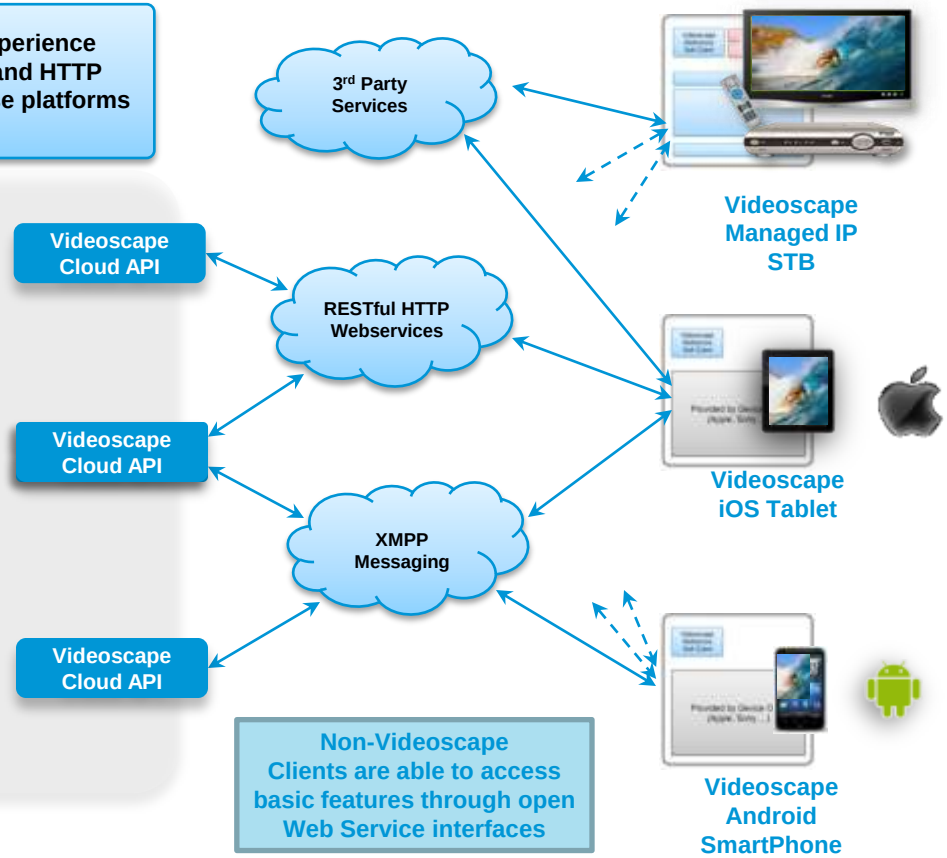
Videoscape Cloud APIs and Clients

- ✓ Videoscape Cloud APIs enable consistent user experience
- ✓ Videoscape Cloud APIs leveraging best of XMPP and HTTP
- ✓ Client SDKs facilitate Cloud API use across diverse platforms
- ✓ Open access to 3rd Party Services





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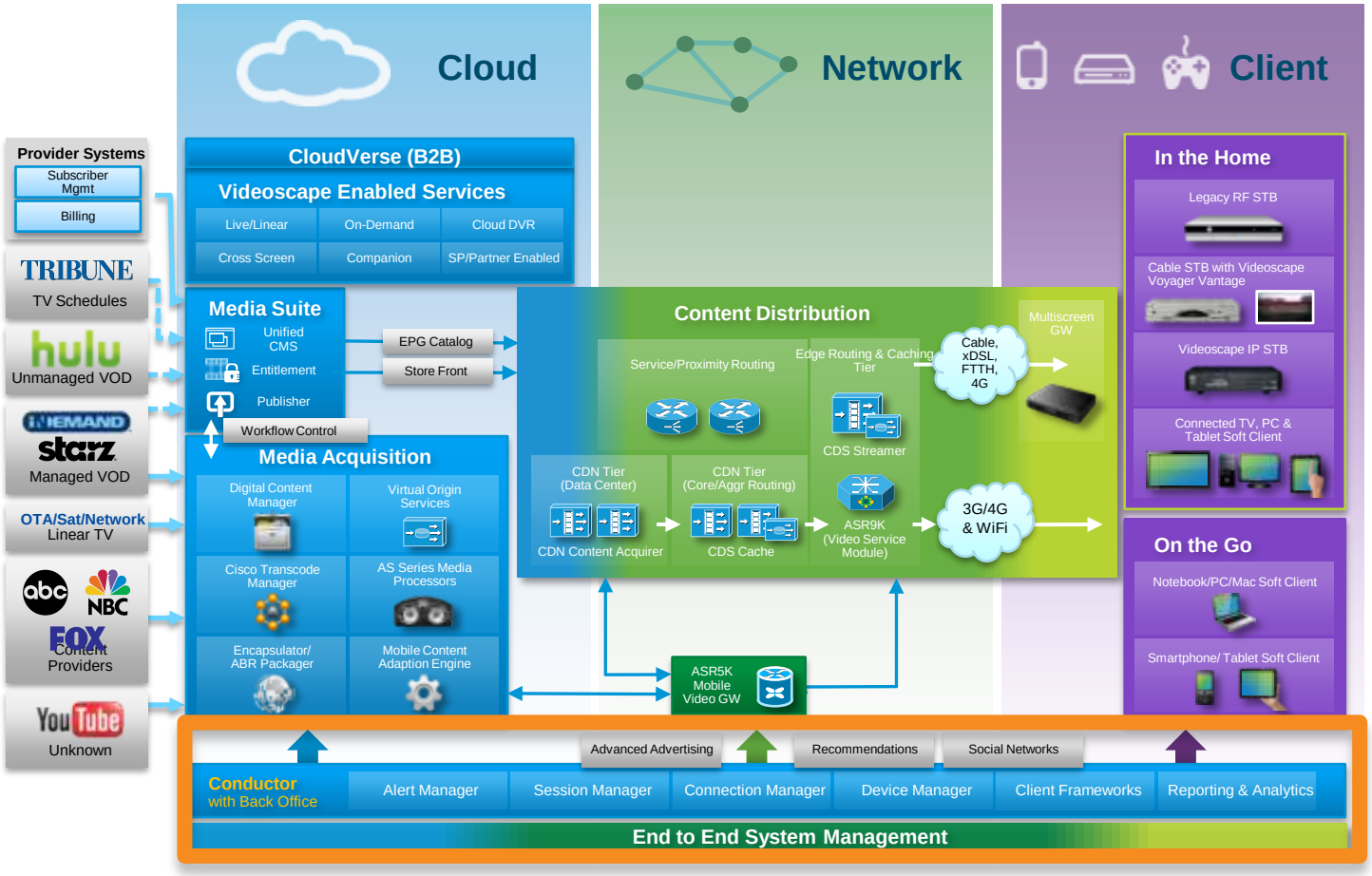
5) Videoscape Conductor



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Service Issues to Solve

- Multi-device and multi-user support on multiple access networks
  - Resource management and session policies, e.g. max active users or devices in an account
  - Multiple playback format(s) for nDVR recordings
  - Companion Devices interaction
- Decoupling customers from hardware devices
  - Accounts, users, devices, personalized services, and parental control
  - Content Access Protection and Digital Rights Management (DRM)
- Service Visibility
  - Statistics, audience measurements, and troubleshooting in an ABR environment
- Asynchronous messaging
  - Program Guides, SW updates, Emergency Alerts, etc.
- Service Acceleration
  - Introduction of new services, rapid modification of existing services, and linking to external services (e.g. social networks)

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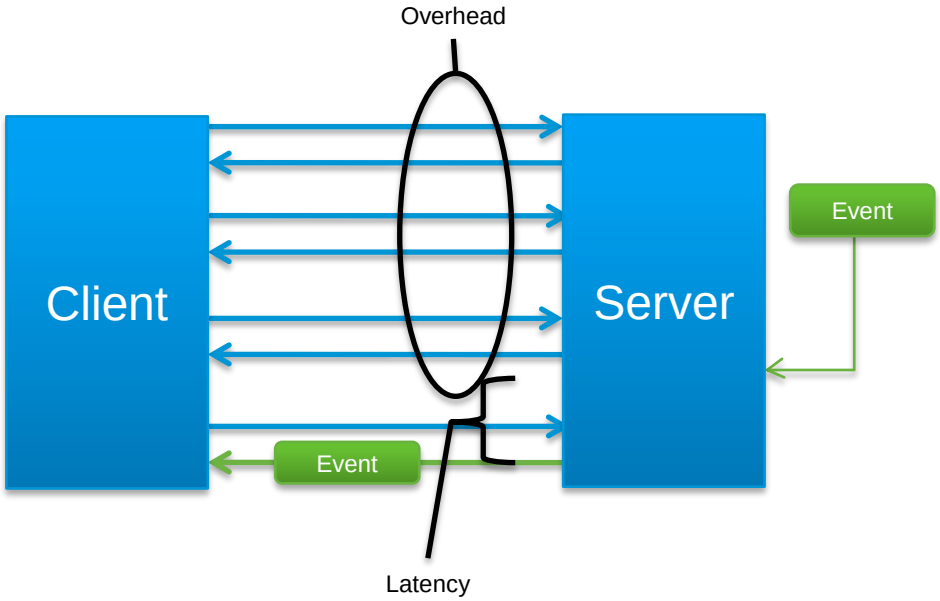
Augmenting Web Services – Persistent Connections

- Provide tools for 2-way asynchronous communications to clients over persistent connections
- Allow services to use a combination of HTTP and XMPP/WebSockets-style communications
- HTTP = short-lived, cacheable, client-initiated transactions
- XMPP/WebSockets = 2-way, long-lived, asynchronous



Asynchronous messaging via polling = tradeoff between overhead and latency

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Built to Scale for millions of Devices

Adoption

3.6B Mobile devices*

300,000 Daily Android Activations

1.8B Mobile web access devices*

- XMPP currently being used in millions of devices for IM applications today.
- Open standards Approach allows for Extensibility to a number of Device types including STB's
- Videoscape Conductor incorporates Jabber Technology and will address STB's and soft clients running on Smartphones, PCs, and Tablets
- XMPP framework provides asynchronous real-time messaging and presence awareness to 'Cloud'

**Gartner research prediction; Gartner Forecast: Tablet PCs, Worldwide, November, 2010

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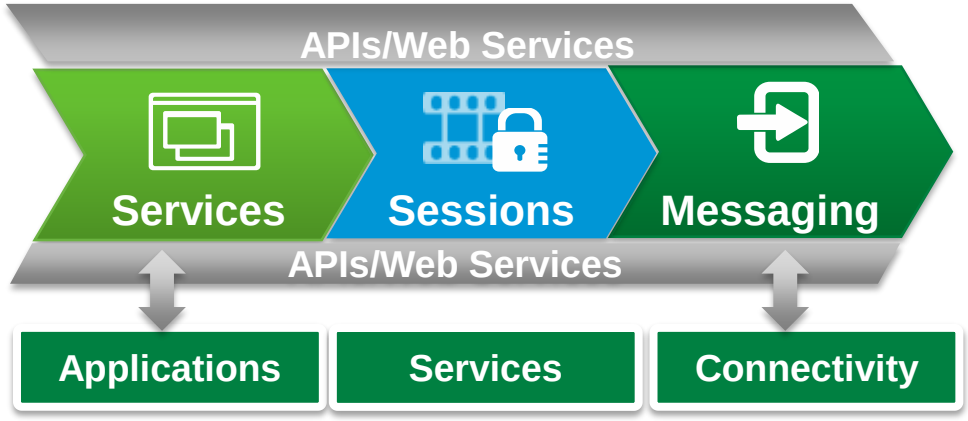
Conductor Services and Technology Toolkit



Applications

- Videoscape Applications deliver targeted functionality for managing devices, end-points
- Extensible through workflow, Simple (XML) data models

Services

- Session/service rules creation
- Service, Device, User, Context, Location based control
- Custom entitlement checks prior to authorization

Connectivity

- Standards-based with pluggable southbound interfaces for Service, BoSH, and WebSockets
- Widely proven real-time messaging plane scales to millions of concurrent sessions

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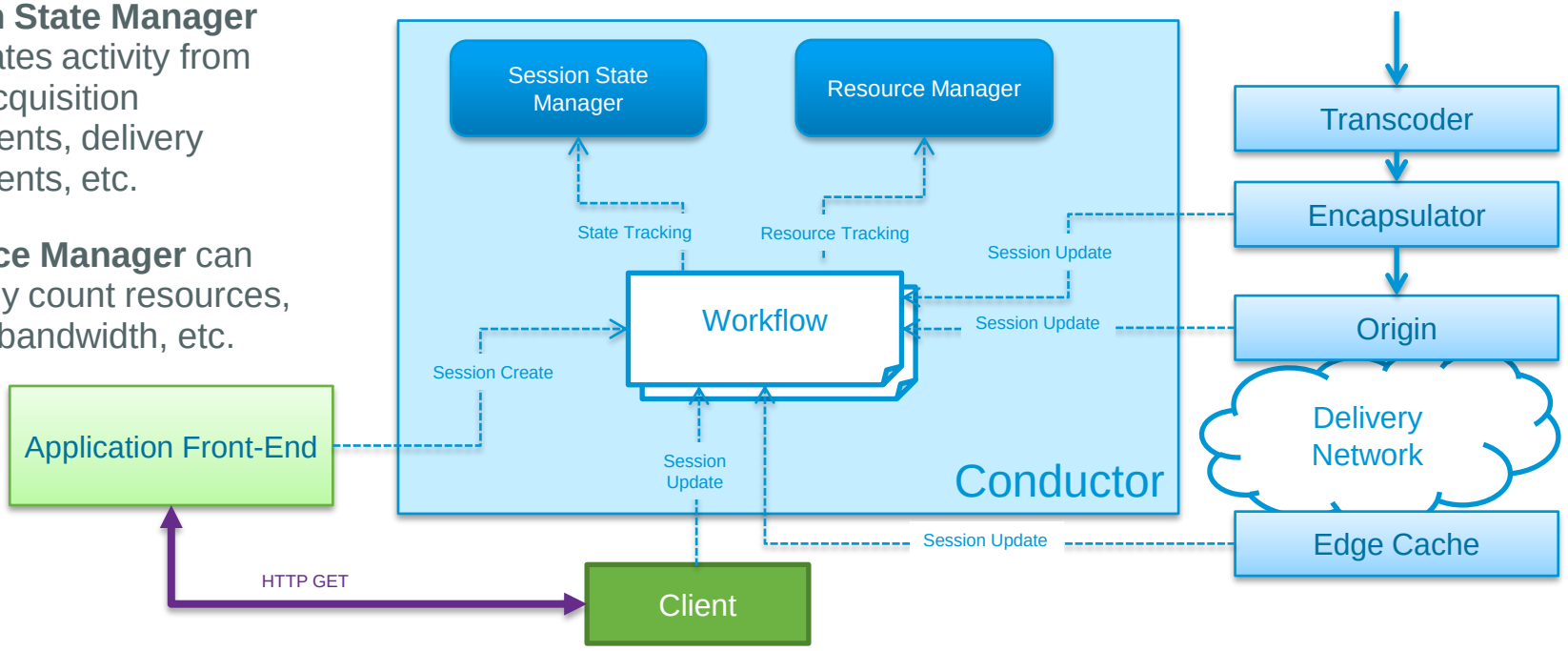
Example Cloud Service
ABR Session Management

- **Session State Manager** coordinates activity from client, acquisition components, delivery components, etc.
- **Resource Manager** can optionally count resources, reserve bandwidth, etc.



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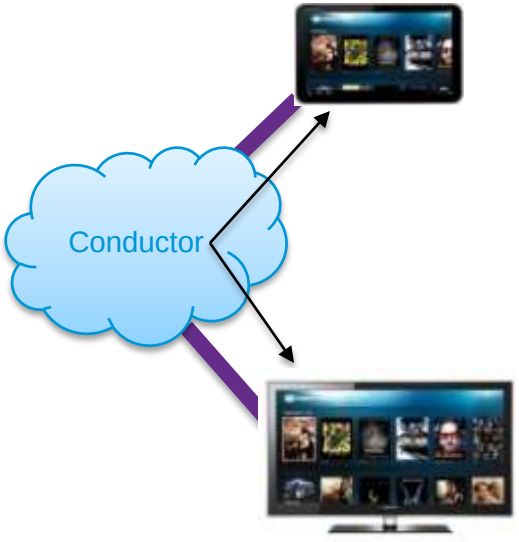
Example Client Service
Companion Device Browsing

- Search and Discover on Companion Devices
- Remote recording
- Shared viewing
- Share content

- Conductor facilitates discovery, capabilities exchange and communications
- Works whether devices are on same LAN/subnet or not (e.g., Tablet on 3G)



1. Tablet & TV sign on to Conductor. Authenticated, encrypted, persistent socket to TV and Tablet.
2. Tablet & TV receive presence messages showing current state of any household devices signed into Conductor
3. Tablet and TV advertise capabilities in presence messages. Each device can discover that the other is “companion” capable (among other things)
4. Tablet initiates browsing session with TV. Browsing packets can be sent via Conductor (small XML packets) between TV and Tablet.

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Závěr

- Cisco with service providers and media companies are reinventing the television experience
- Entertainment, social media, communications and mobility come together through IP technologies transforming how consumers engage with video, and how providers prosper
- Cisco's value proposition rests on the interworking between **cloud + network + client** architectures that result in compelling end user experiences while transforming the cost structure of network operations
- Cisco is uniquely positioned to bridge the existing Service Providers' infrastructure and the new IP video platform to seamlessly deliver new rich media Videoscape experiences

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Videoscape vs. legacy IPTV

	Videoscape	IPTV
platform	Open , modular, and non-proprietary platform which gives customer more flexibility and pick and chose building blocks	Proprietary & Vertically integrated platform
end2end	capable	limited
endpoints	Allows SP to provide services to multiple endpoints and app eco systems, not just proprietary	limited to proprietary endpoints
DRM	Multiple	Limited or proprietary
UI	Highly customizable UI based on SP requirements	Very little room for customization
OTT QoE	Videoscape is the SPs friend..☺	??

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Odkazy

- Articles

  “Not all packets are equal, part I: streaming video coding and SLA requirements,” IEEE Internet Computing, Jan./Feb. 2009

  “Not all packets are equal, part II: the impact of network packet loss on video quality,” IEEE Internet Computing, Mar./Apr. 2009

  “Deploying diffserv in backbone networks for tight SLA control,” IEEE Internet Computing, Jan./Feb., 2005

- Industry Tests

  Light Reading: Cisco Put to the Video Test

  http://www.lightreading.com/document.asp?doc_id=177692&site=cdn

  EANTC Experience Provider Mega Test

  http://www.cisco.com/en/US/solutions/ns341/eantc_megatest_results.html

  IPTV & Digital Video QoE: Test & Measurement Update

  http://www.heavyreading.com/insider/details.asp?sku_id=2382&skuitem_itemid=1181

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Seznam použitých zkratek

- ATS: Adaptive transport stream
- BMFF: Base media file format
- CATV: Cable TV
- CDN: Content delivery network
- CFF: Common file format
- CIF: Common intermediate format
- CMS: Content management system
- CPE: Customer premises equipment
- DASH: Dynamic Adaptive Streaming over HTTP
- DECE: Digital Entertainment Content Ecosystem
- DRM: Digital rights management
- DVR: Digital video recorder
- EPG: Electronic program guide
- QoE: Quality of experience
- GoP: Group of pictures
- QoS: Quality of service
- HLS: HTTP Live Streaming
- JIT: Just in time
- MPD: Media presentation description
- OS: Origin server
- OTT: Over-the-top
- PVR: Personal video recorder
- RTCP: RTP Control Protocol
- RTP: Real-time Transport Protocol
- SLA: Service-level agreement
- SSM: Source-specific multicast
- STB: Set-top box
- TS: Transport stream
- TVE: TV everywhere
- UV: UltraViolet
- VBO: Video back office
- VoD: Video on demand
- VoIP: Voice over IP
- VOS: Virtual origin server

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Zážitek Videoscape na stánku Cisco Expo

na PC, či Set-Top-Boxu:

na tabletech:

Videoscape = **Cloud** **Network** **Client**

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Otázky a odpovědi

- Twitter www.twitter.com/CiscoCZ
- Talk2Cisco www.talk2cisco.cz/dotazy
- SMS 721 994 600

- Zveme Vás na **Ptali jste se…** v sále **LEO**
  1.den 17:45 – 18:30
  2.den 16:30 – 17:00

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