Cisco Video 2.0 Solutions

March , 2008

Jean-Christophe Dessange

IPTV Bus Dev Manager

Cisco Europe

Agenda

- Introduction
- Market Dynamics
- Enabling Video 2.0
- Summary / Conclusion

Building on Unmatched Experience
Cisco IPTV Product & Solutions

- 6 Of Top 10 IPTV European Telco Use Cisco IP Network Solutions
  - IP Core & Carrier Ethernet (sources: Cisco)
- Of the 5 Microsoft TV Commercial deployments in Europe, Cisco Provides End to End IP Network Solutions & STBs To 4 Of them
  - Includes DT/ToLine Germany
- Implementing one of largest IPTV projects
  - Engineer-furnish-install (EF&I)
  - 2 SHEs and 40+ VHOs
  - Video Operations Centers and operations outsourcing
- Over 30 million Explorer Digital STBs
  - Over 9 Million DVR units shipped
  - Over 8 Million HD STBs shipped
- Over 260 video head-ends deployed globally

Video 2.0 Market Paradigm Shift

Video 1.0

- Broadcast
- Limited content
- Few streams
- Single device
- One size fits all content
- Scheduled viewing

Video 2.0

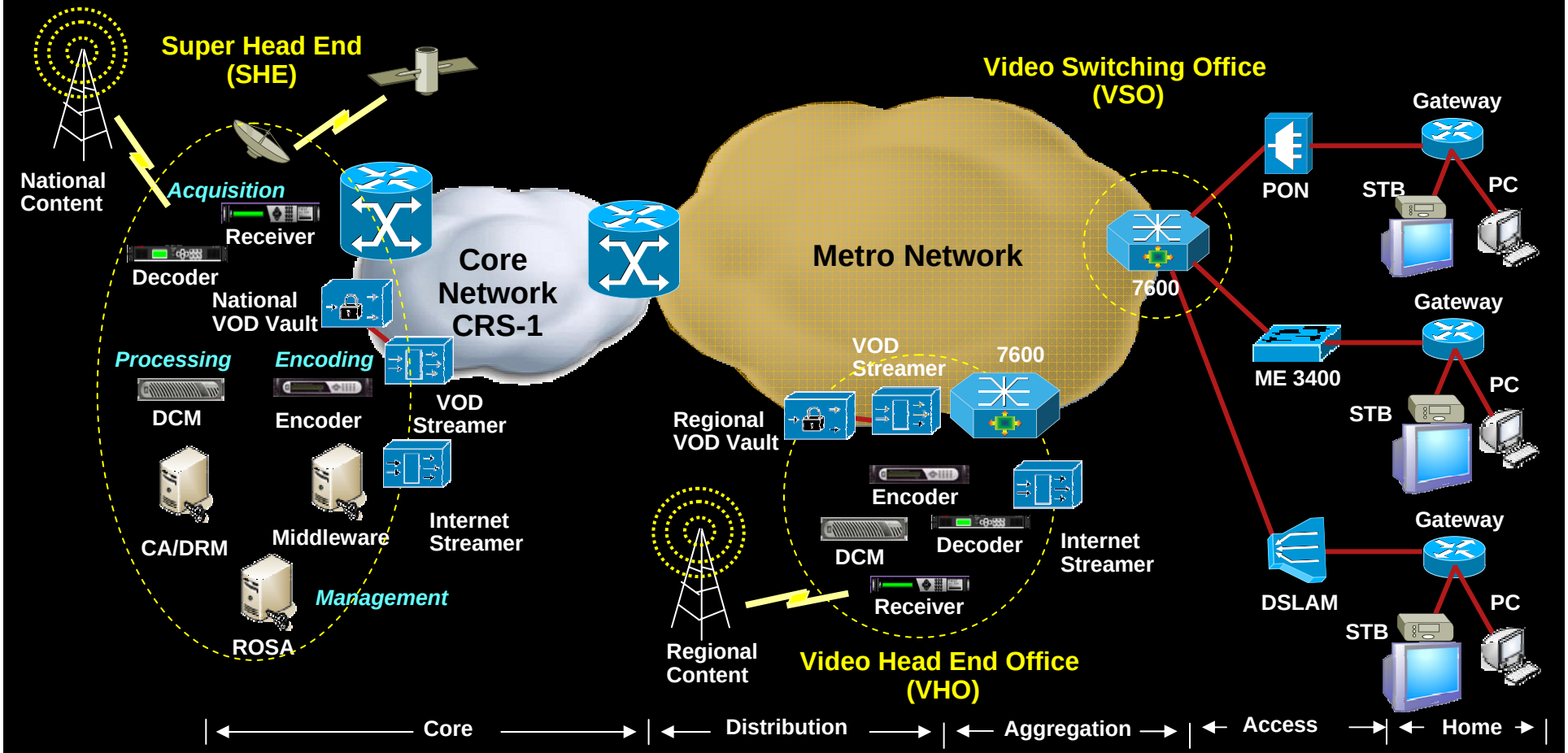
- Personalized, On Demand
- Unlimited content
- A stream per screen
- Multiple devices
- User generated content
- Rapidly changing content popularity

Video 2.0 is a Consumer Driven Experience:
What They Want. When They Want It. Where They Want It. How They Want It.

Continuously Strengthening the End-to-End

Cisco IPTV & Video 2.0 Solution For Higher End User Experience

Dec 2004	Apr 2005	Sep 2005	Dec 2005	Feb 2006	Jul 2006	Sep 2006	Oct 2006	Dec 2006
CRS-1 8-Slot SCE	SIP/SP XR12000 7604	Video-to-Network Linkages ME 3400	IP DWDM for CRS-1 SEF/IPTV over IPNGN	Scientific Atlanta Head End Set-Top-Box SciCare	Video CAC ISG with Policy Server	CRS-1 4-Slot	Arroyo VoD	Video2.0 VQE, Cisco 7600 B-RAS/ISG/SBC



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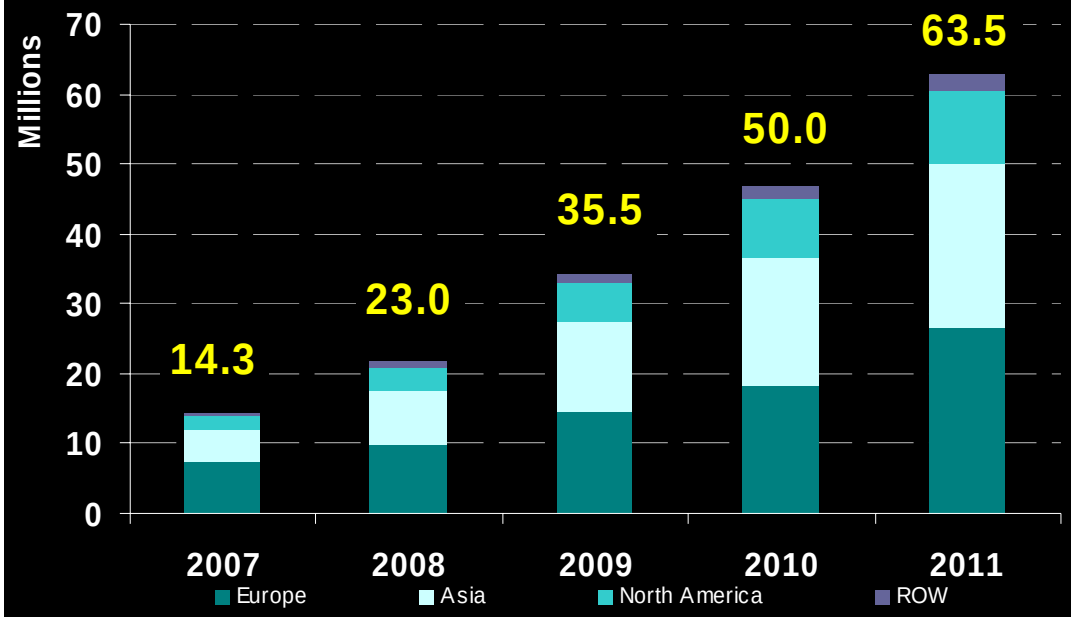
IPTV : A Market Reality
Dampened By Low ARPU

WW IPTV Subscribers Forecast 2007-2011



Source ABI De 07, IDC 2007 MRG Report April 2007, IDC, Gartner 2006,, Datamonitor 2006

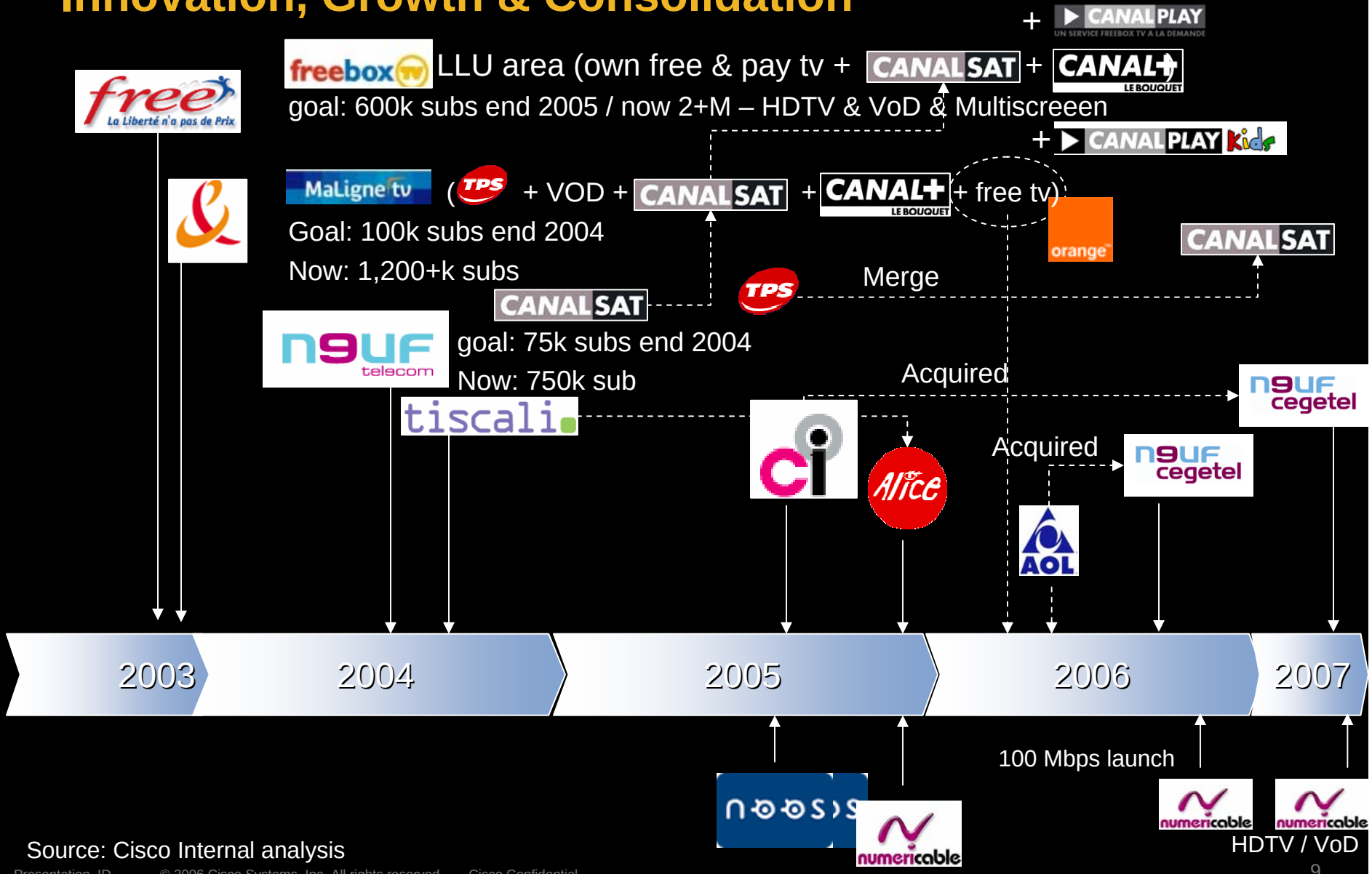
- Catalyst for Entertainment & Communications Industry transformation
- A $2.5/3 B market by 2009 in Europe
- Western Europe household penetration
  - ~ 6 to 10 % by 2009
  - ~ 10 to 25% by 2011
- Flat IPTV ARPU :
  - <20/22 $ a month a user 2011

The Content Bundle Will Evolve to an Integrated Cross-Device/Cross Access Network Offering - "Buy More, Get More"

	TV	PC	Mobile
Any Screen			
Any Broadband Access Network (DSL, Cable, Wi-Fi, 3G/UMTS, Ethernet, etc.)			
Sticky New Services	Real Time Svcs ▪ StartOver, LookBack ▪ Longtail content ▪ PauseTV	▪ Session shifting among devices	
Cross Platform Content	▪ Internet content to the TV – end of the TV walled garden ▪ Long tail content available everywhere ▪ User generated content & the Virtual Couch		
New Paradigms	▪ Monetization via cross-platform addressable ads ▪ National CDN – network sling, near real time access to any content		

French Triple Play/ IPTV Industry Example

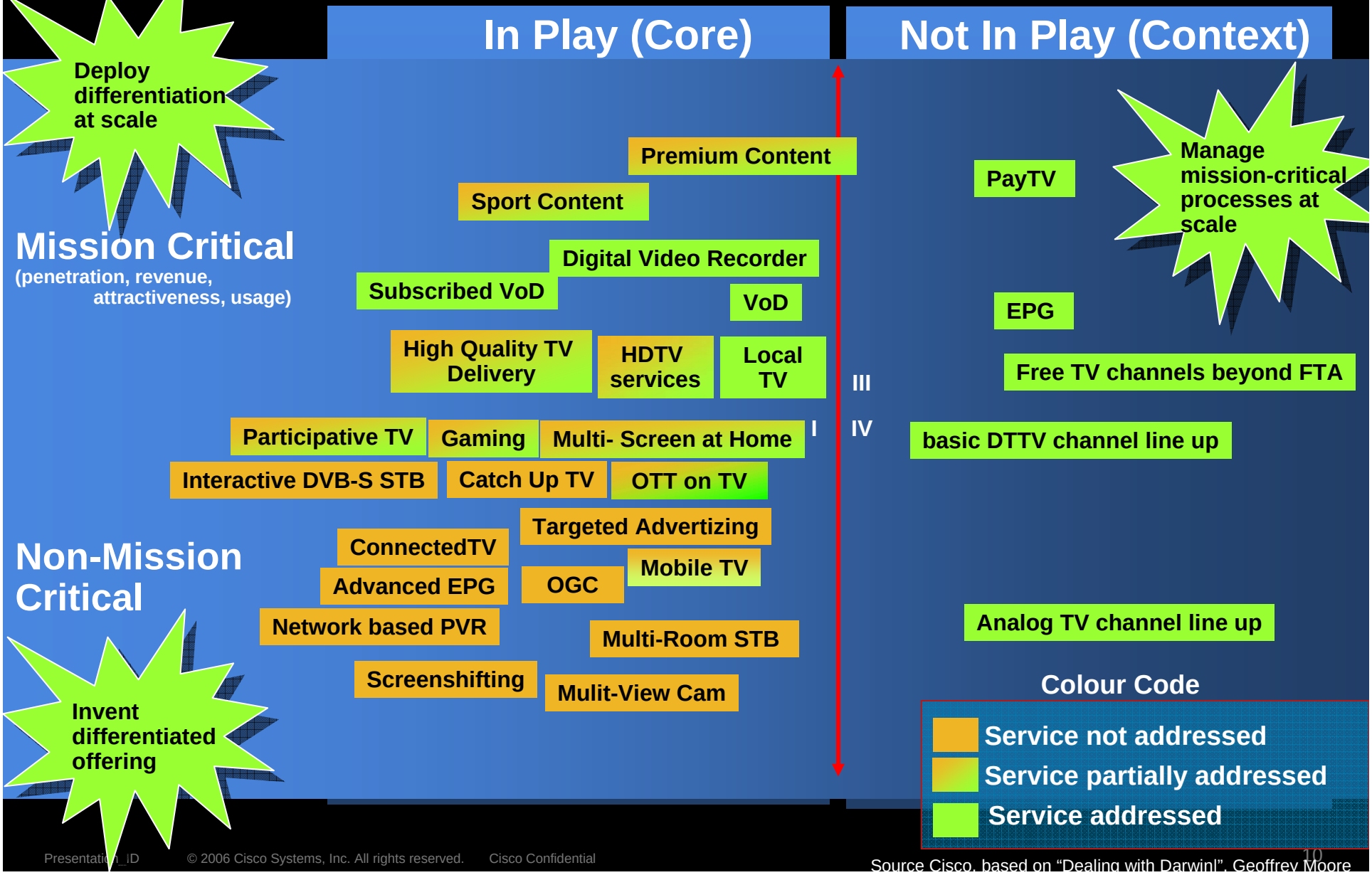
Innovation, Growth & Consolidation



Source: Cisco Internal analysis

French Market& Video Distribution

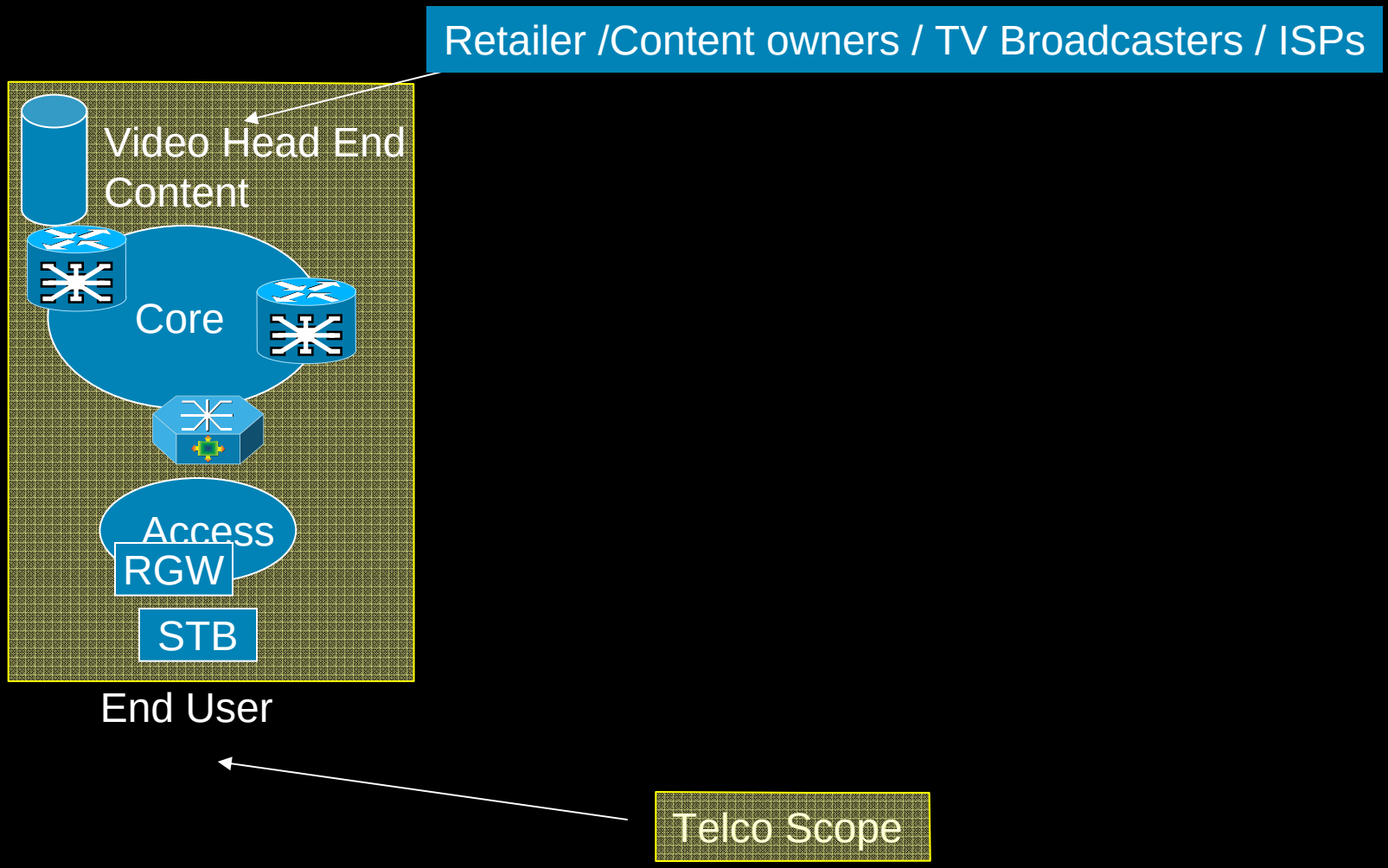
Innovation Cycle & Customer Positioning Perception



Source Cisco, based on "Dealing with Darwin!", Geoffrey Moore

IPTV Big Picture
Business Models & Infrastructures

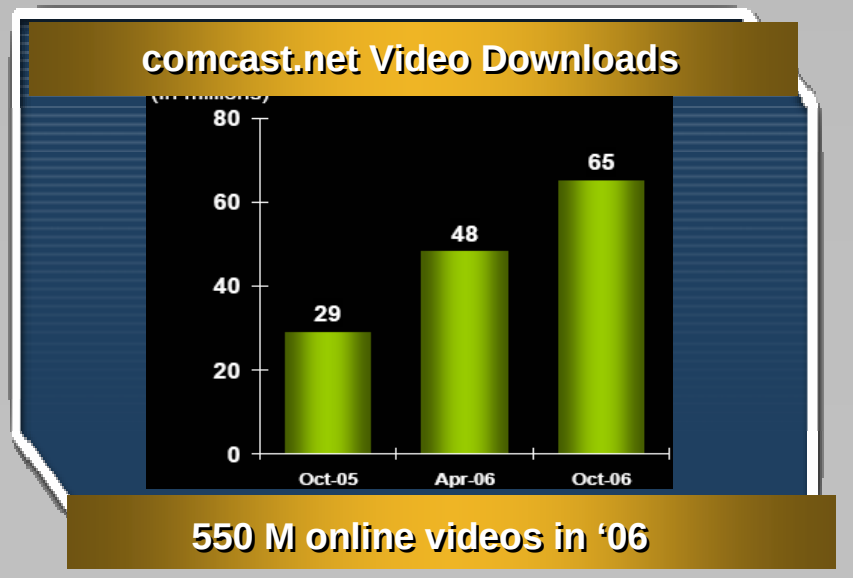
- PAYTV



New Experience Providers
Setting New Challenges *To Established Players?*

Internet/Video Streaming & OTT —Exploding Demand

- In the month of Jan ’07 (in the US):
  - 123M users viewed online videos
    - >70% of the internet audience
    - 7.2 Billion videos download
    - 57 videos/month per user on average
  - Peak viewing period for online video
    - Weekdays 5PM-8PM
    - Viewing 60% higher than average
- Today ‘prime-time’ TV viewing
  - Weekdays 8PM – 11PM
- Opportunity to double ‘prime-time’



* Source: Comscore press release – Mar 07; Comcast investor presentation, Dec 06; Hitwise 06

Video2.0 Telco , Media & OTT

A multi-faceted approach is needed

Reinforce SP value, Protect the bottom line

Ignore

- Ignore the thousands of irrelevant OTT services
- Deploy Traffic Analysis & Monitoring capabilities

Defend

- Block OTTs
- Quota, Traffic Management, Fair Use Policies
- Reassess Free Peering
- Reserve some network capacity (Private-IP)
- Triple Play = Default Service

Collaborate / Enable

- From Co-marketing to Integration of Services
- Optimised Delivery: CDN, QoS, Multicast, Quota exemption
- Improved Access to TV & Mobile
- Web Services network interface
- Precision Advertising

Become / Imitate

- Deploy Services beyond own footprint, ex. VoIP over any broadband
- Develop attractive Online Portal suitable for Fixed and Mobile access
- Develop an On-line video strategy

Grow the top line

Source: Cisco IBSG

Going “Over the Top” to reach customers

The BBC is promising a broadcasting revolution to rival the arrival of colour television as it announces a new service that allows viewers to download programmes on demand. The £130 million iPlayer will let viewers download programmes such as Doctor Who and The Apprenticeover the internet for up to seven days after they have been broadcast.

Viewers will have up to 30 days to watch a downloaded programme online, free of charge, before the file deletes itself. The iPlayer will contain 400 hours of BBC programming a week and there are plans to make the service accessible from mobile phones and other handheld devices.

- BBC is now a Global ISP
  - They prefer to PEER rather than PAY for Internet Access (~500 Peers in UK, NL, DE, US...)
- BBC iPlayer uses P2P
  - Access to Seven day TV catch-up
- BBC Simulcast uses Multicast
  - Only ISP’s who provide Multicast Peering to BBC are eligible for Internet Simulcast
- Significant Traffic Surge
  - 1 Hour Show = 0,4GB
  - Expect 3+ GB / Avg User / Month increase in traffic, resulting in £400m+ cost to UK ISPs (Ofcom)
  - BBC agreed to download overnight

Collaboration
4oD Channel 4's VoD service

Source: Channel 4, May 2007

- 4oD launched Q4 06, targeting Uk/Eire
  - 7 days catch-up on Channel 4's commissioned content
  - Seeking maximum coverage, with Telco (VM, BTVision, Homechoice) & Via Syndication on Internet
- First broadcaster to systematically make all its home-grown content available on-demand
  - 2,000 hours of archive – and growing
  - 60-70 hours catch-up every week
  - 200 hours of US first run premium programming
  - 200 films – and growing
- Over 1 M users with 20 million programs on 4oD on TV and PC over 6 months
- Demographic skewed towards 16-34 year old audience
- Higher than expected Repeat usage
- Series loyalty real evidence

Video 2.0 is about preserving End User Quality of Experience

1. Service Availability & Reliability
   - Limited Frequency & severity of impairments
2. Content Quality & Scope
   - Premium Content, live events, exclusivity, VoD catalogue quality etc..
3. Content Definition & Resolution
   - D1, HDTV, Dolby Surround, AAC, etc…
4. Customer Care & Management:
   - Time & way to solve end user video related problems
5. Video2.0 Service Usability
   - Easiness & friendliness of service discovery & selection interface
   - foundation of a new TV viewing experience
6. Channel change time
   - Satellite, Cable and DVB-T Benchmark

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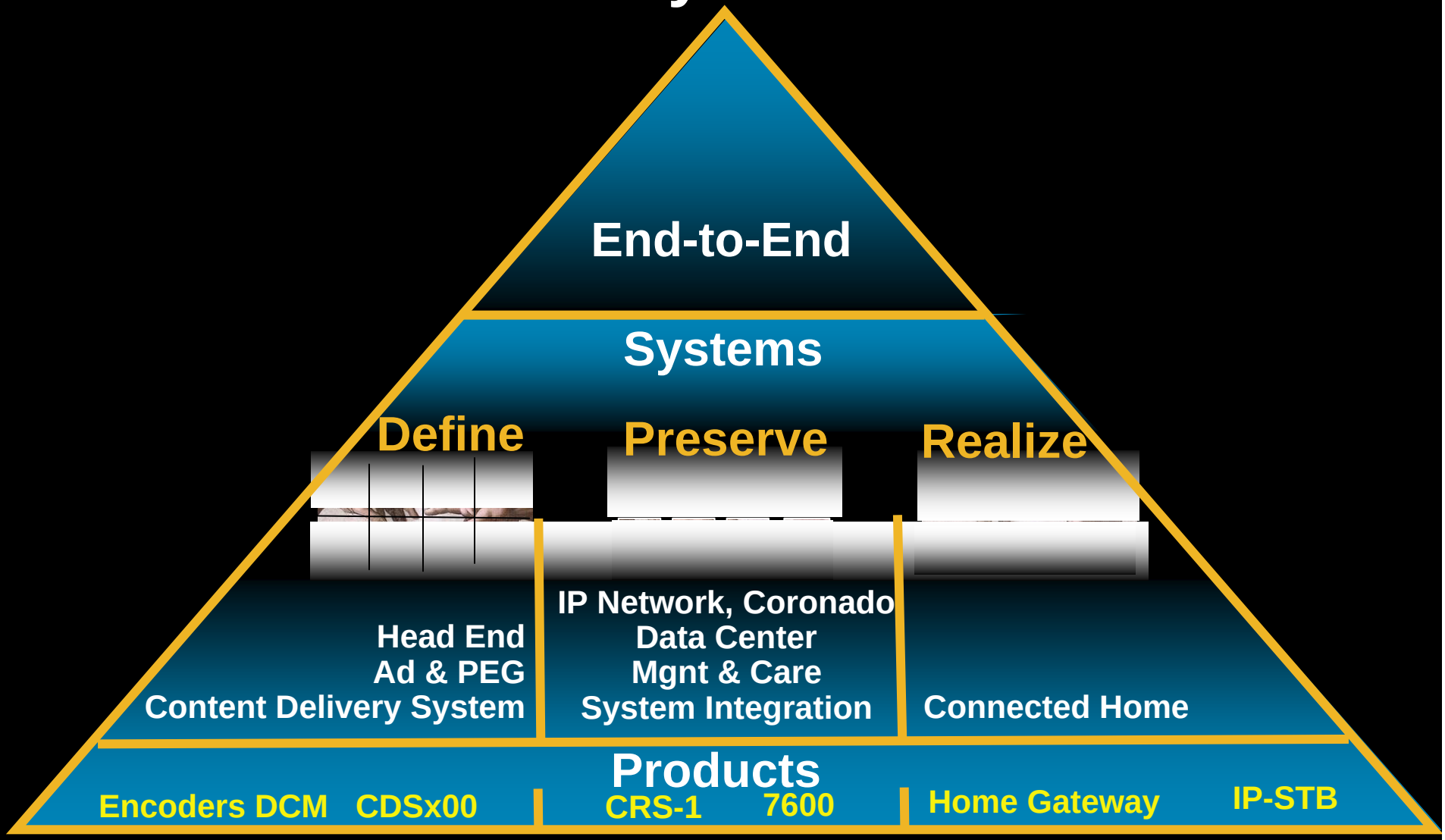
Video Product & Systems Portfolio



Enabling Video Experience
End-to-End IPTV Solution

Better Glass-to-Glass Integrated Solutions

IPTV HEAD- END and CDS	INTELLIGENT IP NETWORK	CONNECTED HOME
Video Experience	Video Experience	Video Experience
Define	**Preserve**	**Realize**

Cisco brings it ALL together

Enabling Video Experience
End-to-End IPTV Solution

IPTV HEAD- END and CDS

Video

Experience

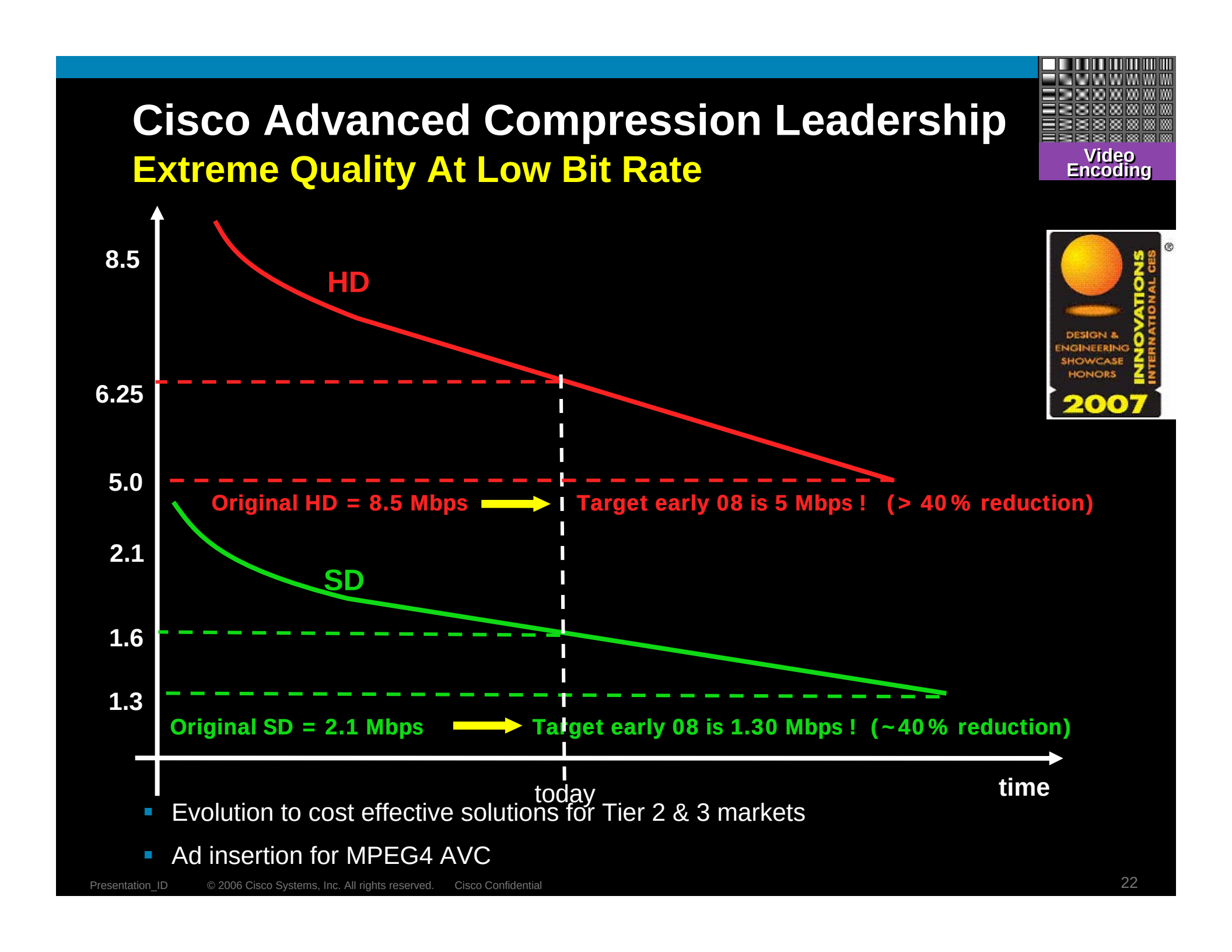
Define

- **IPTV Headend**
- **Content Delivery System**

Cisco brings it ALL together

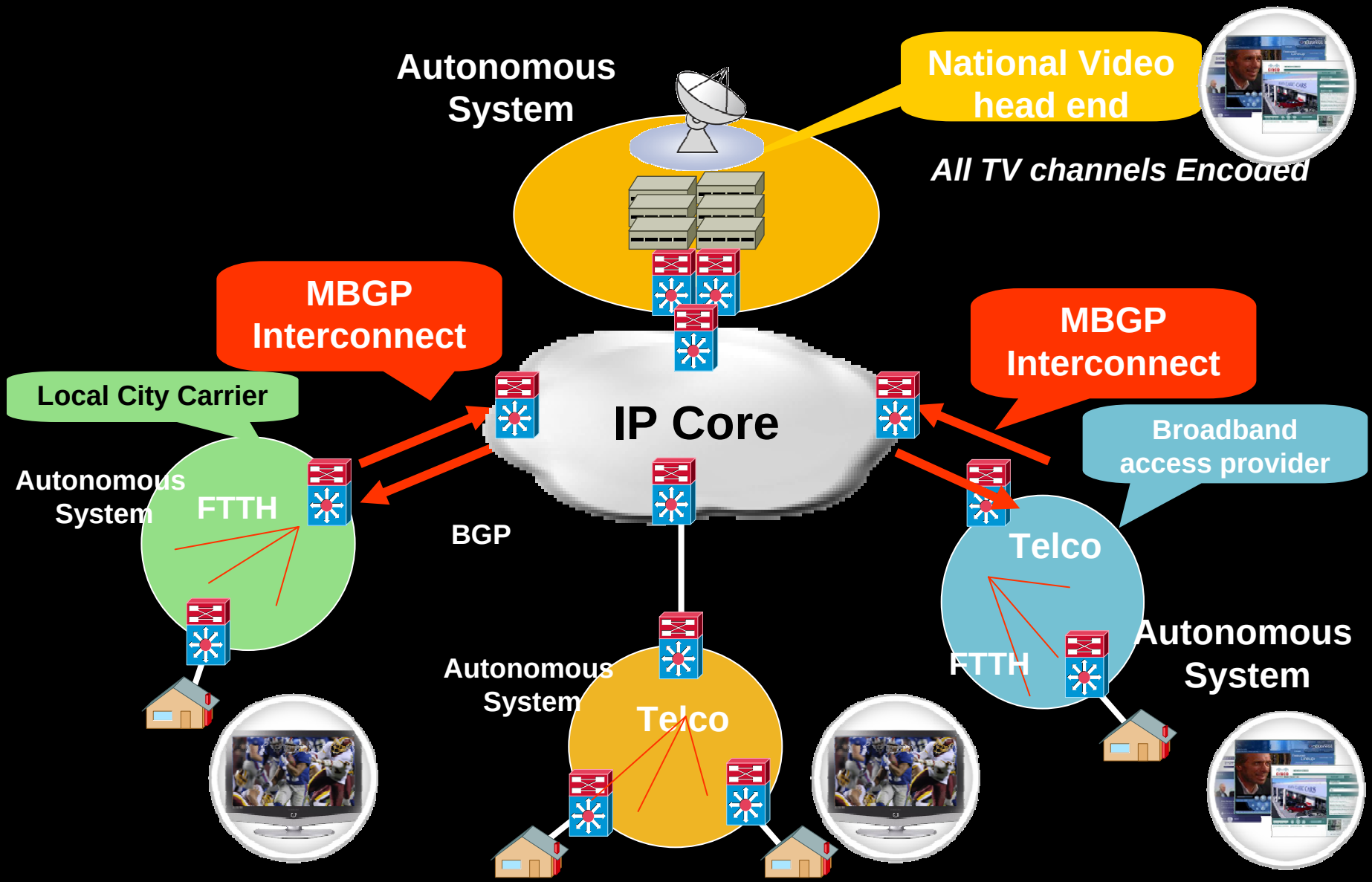
Cisco Advanced Compression Leadership

Extreme Quality At Low Bit Rate

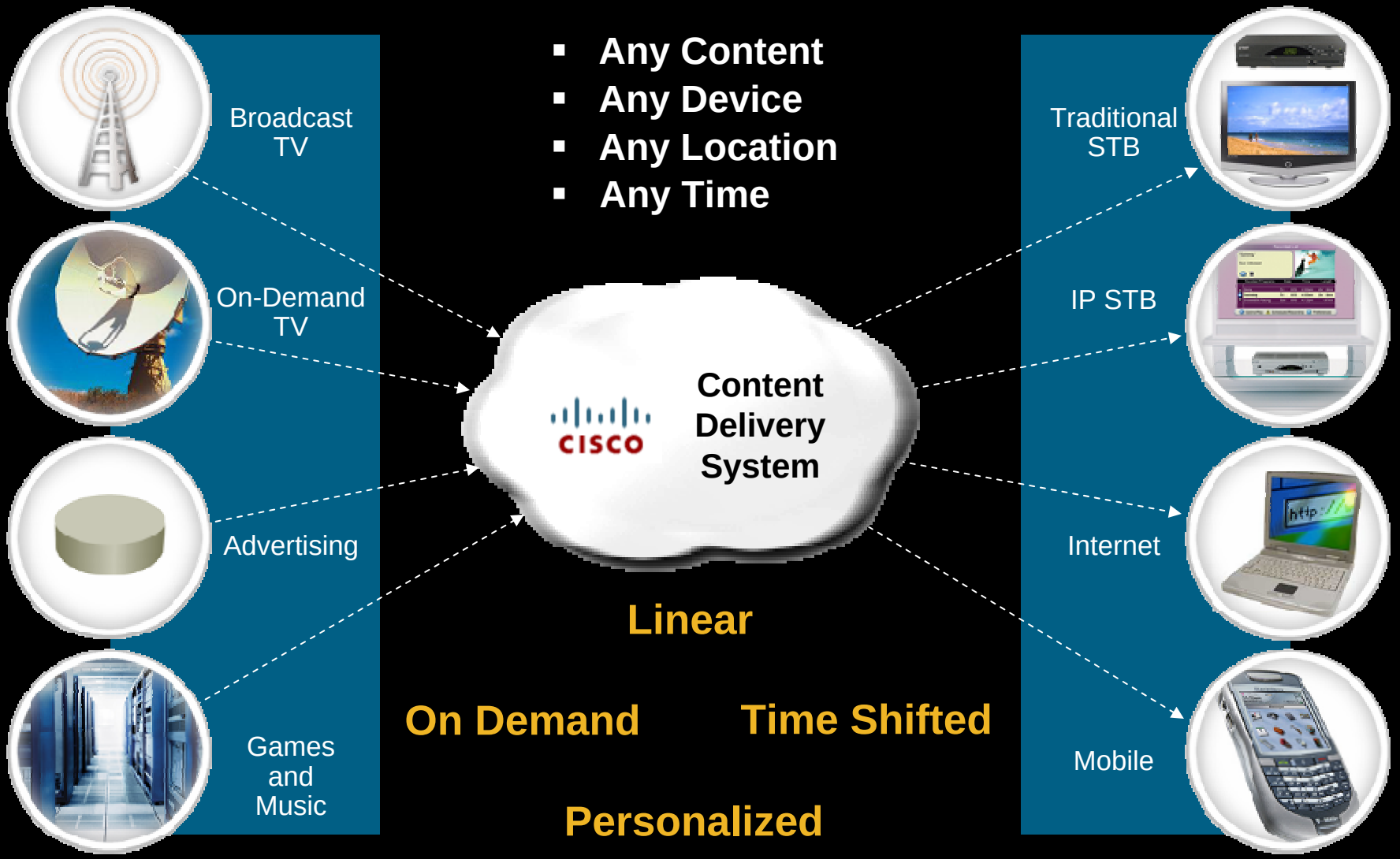


- Evolution to cost effective solutions for Tier 2 & 3 markets
- Ad insertion for MPEG4 AVC

Accelerating access to high quality content
Video Inter Domain Interconnection



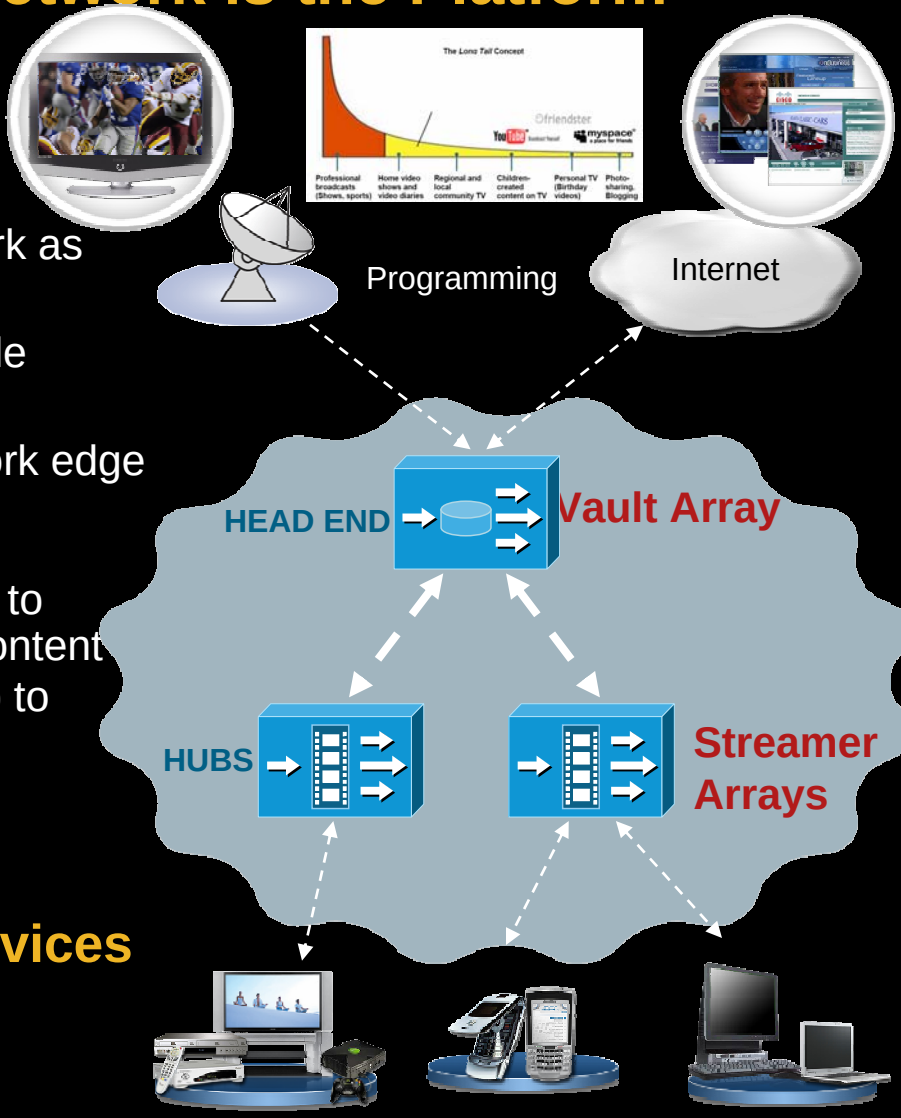
Cisco's Content Delivery System
Foundation for a Managed Media Solution



Cisco Content Delivery System

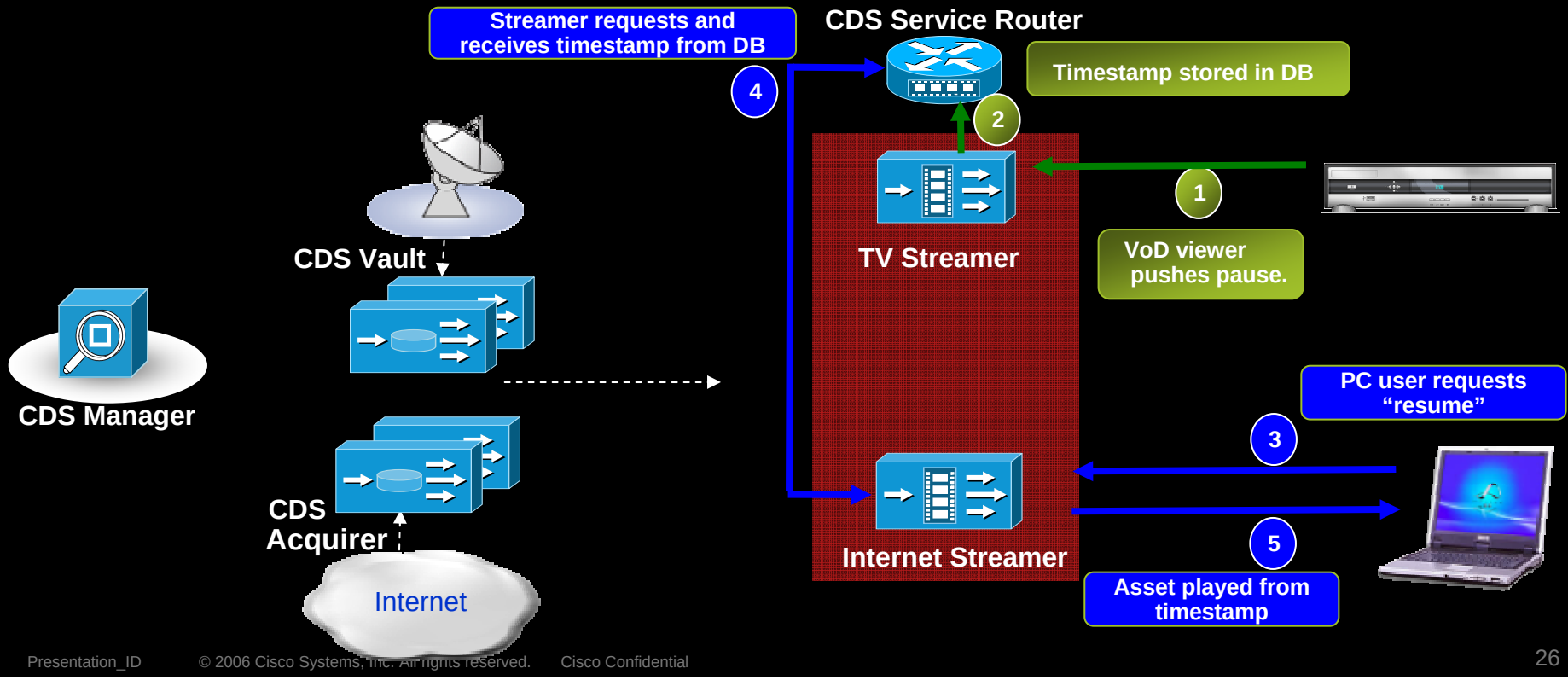
Enabling Video 2.0 : The Network is the Platform

- **Network-centric architecture**
  - Intelligent distributed architecture
  - Networked Content Delivery Engines work as one virtual system
    - Centralized, shared ingest and reliable content storage (Vaults)
    - Personalization & streaming at network edge
- **Technology base**
  - Unique caching protocol eliminates need to predict viewer behavior or pre-position content only **300ms** from ingest to play out & up to **95% Bw saving (*)**
  - Resilient design with auto-failover
  - Multi-format, multi-device
- **Optimized for real-time media services**
  - Enables converged live and on demand applications
    - Switched video & time-shift TV
    - Personalized content & advertising



(*) versus a centralised VoD deployment

“Many Services to Many Screens” Example:
CDS Pause/Resume Across Devices

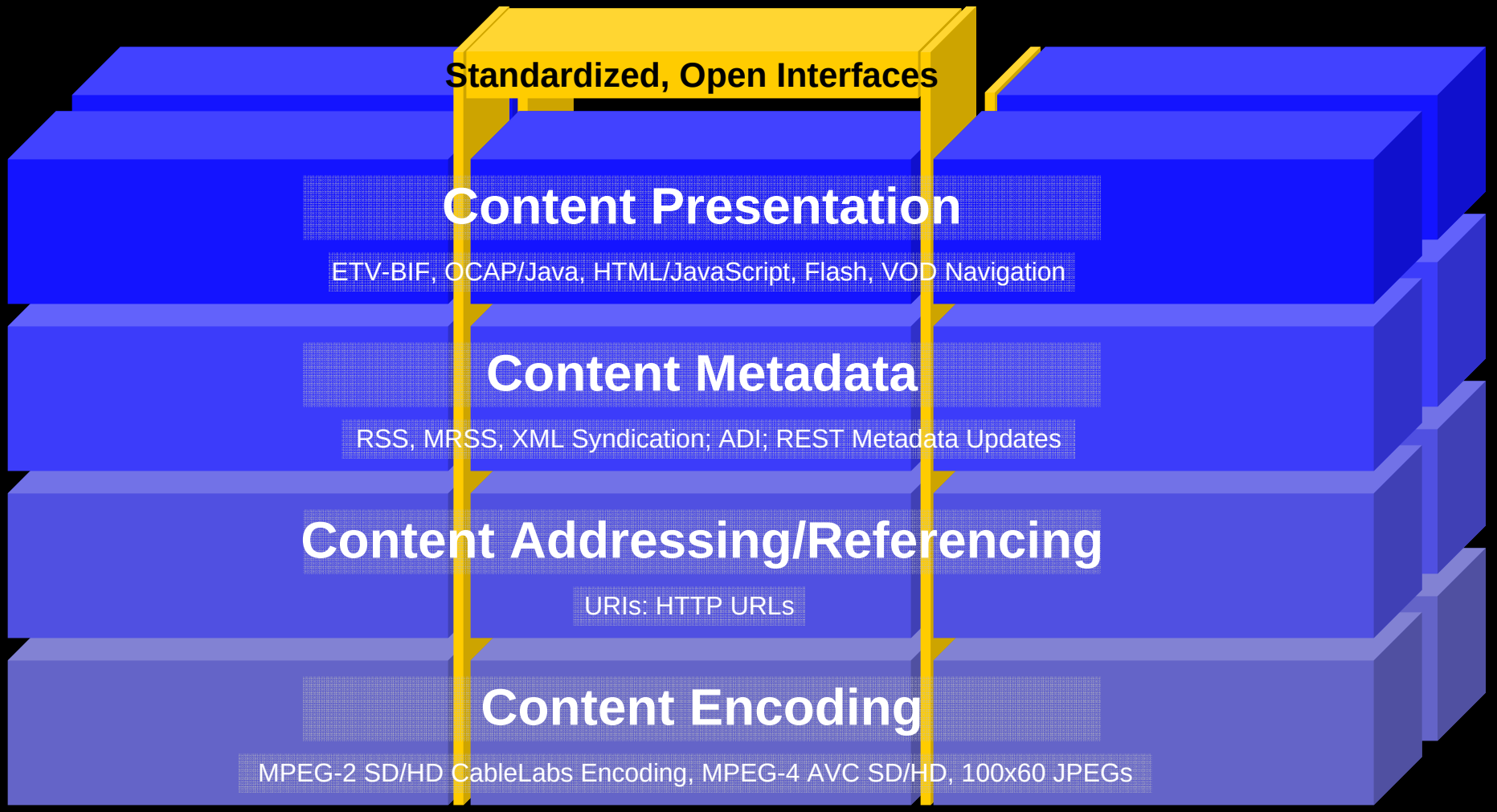


Video 2.0 Service Example

Enhancing WebTV towards a TV Experience

- Video 2.0 Services :
  - Audio slideshow PC pictures & personal videos to TV,
  - Real-time access to UGC/ OGC (YouTube, DailyMotion, ….)
  - Real-time access to Media website
- Key Benefits for Service Providers
  - ARPU increase with Advertizing or subscription fees
  - VoD Usage Increase with free VoD experience
- Key benefit for Content Providers
  - High quality TV Experience
  - Advertising Revenue split with Telco

Video 2.0 & Web Content
Content Hyper-Syndication Model



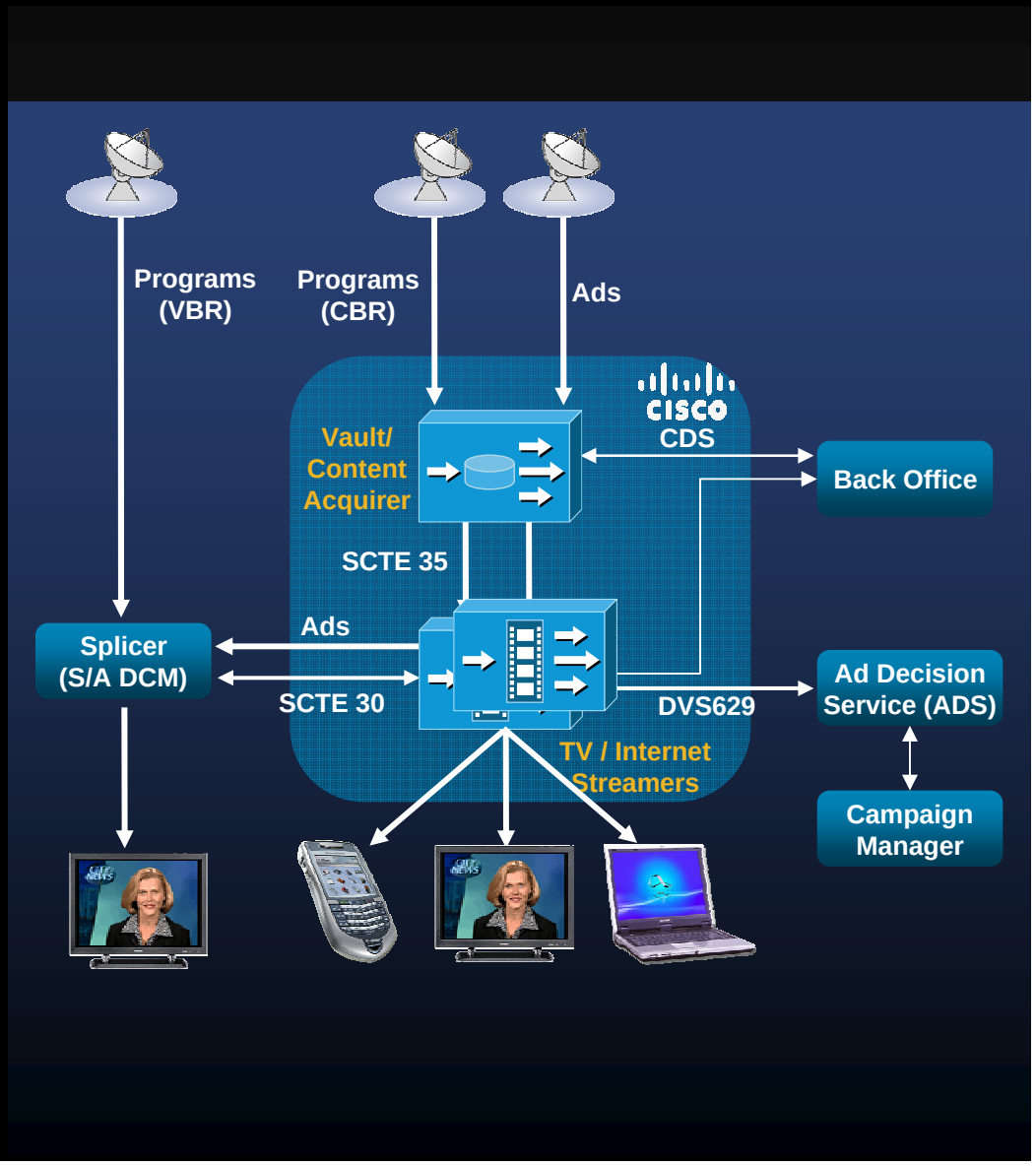
Content Providers **Content Aggregators** **Service Providers**

Service Providers

Monetizing "Many Services to Many Screens"

Example: Multi-platform Addressable Advertising Solution

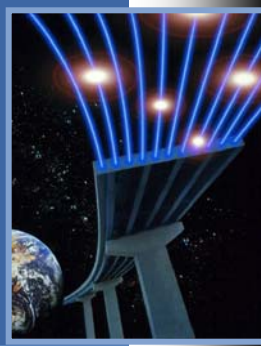
- Integrated multiplatform ad campaigns
  - Personalized CDS Ads delivered to any device
  - Uses emerging DVS629 protocol
- Session-based ad insertion (playlist)
  - VoD Bookend Ads
  - Interstitial Ads (VoD, Start Over)
  - Telescoping Ads (future)
- CBR or VBR ad insertion (triggered)
  - SDV Interstitial Ads
  - Broadcast Zoned Ad Insertion



Enabling Video Experience
End-to-End IPTV Solution

Cisco brings it ALL together

Cisco IP NGN Network Design Principles
Scaling & Preserving IPTV Quality of Experience



- **Architectural Scale with Lower TCO**
  - Simplified provisioning
  - Bandwidth Efficiency
  - L3 delivers internet scale
  - Converged biz, res, wholesale
  - Integration & distribution = scale
  - Local Sub/App/Policy intelligence

- **Higher Quality Video Experience**
  - Consistent Resiliency vs. 50ms
  - Integrated Video CAC
  - Quality Monitoring/Reliability/Availability

- **Investment Protection**
  - Monitoring, control, billing future services
  - Legal P2P model, Local content injection
  - Migration of PPP to IPoE

Lightreading and EANTC Validation

Scalability and User Experience of Cisco End-to-End IPTV Solution

Performance and Scalability

60Gb mcast replication per 7600

Line rate performance

Zero packet drop

Bus and Resi

Quality of Service

Cisco QoS ensures triple-play experience

Only best effort traffic dropped in congestion

Mcast prioritization is solid

Network Resiliency

Link, node mcast source failure

Sub-second service disruption during failure

<150ms service disruption during recovery

VQE

VQE maintains perfect video from 0-10% packet loss level

CAC For Video

CAC for multicast and VoD Services is effective

Works with application ids e.g, HD, SD

Highly scalable Low CPU uses

A ground-breaking test commissioned by *Light Reading*—the first of its kind—has shown the equipment from Cisco can scale to 1 million IPTV customers with carrier-grade features such as quality of service (QoS) and resilience.

Craig Matsumoto, West Coast Editor, Light Reading

LIGHT READING

Preserving IPTV Quality of Experience
The Need for Video Admission Control

- What happens when demand exceeds design assumptions?
  - Network design based on some allowed blocking factor
    - Blocking factor based on peak concurrency rate of subscribers at the finite take rate of the service

What if take rate of service is higher than forecast?

What if HDTV, TVoD is accelerating faster than forecast?

What if peak concurrency is higher than forecast?

- Without a “Graceful Busy Signal” for video service, excess streams result in degraded video for Many

Oversubscription leads to random packet loss for many!

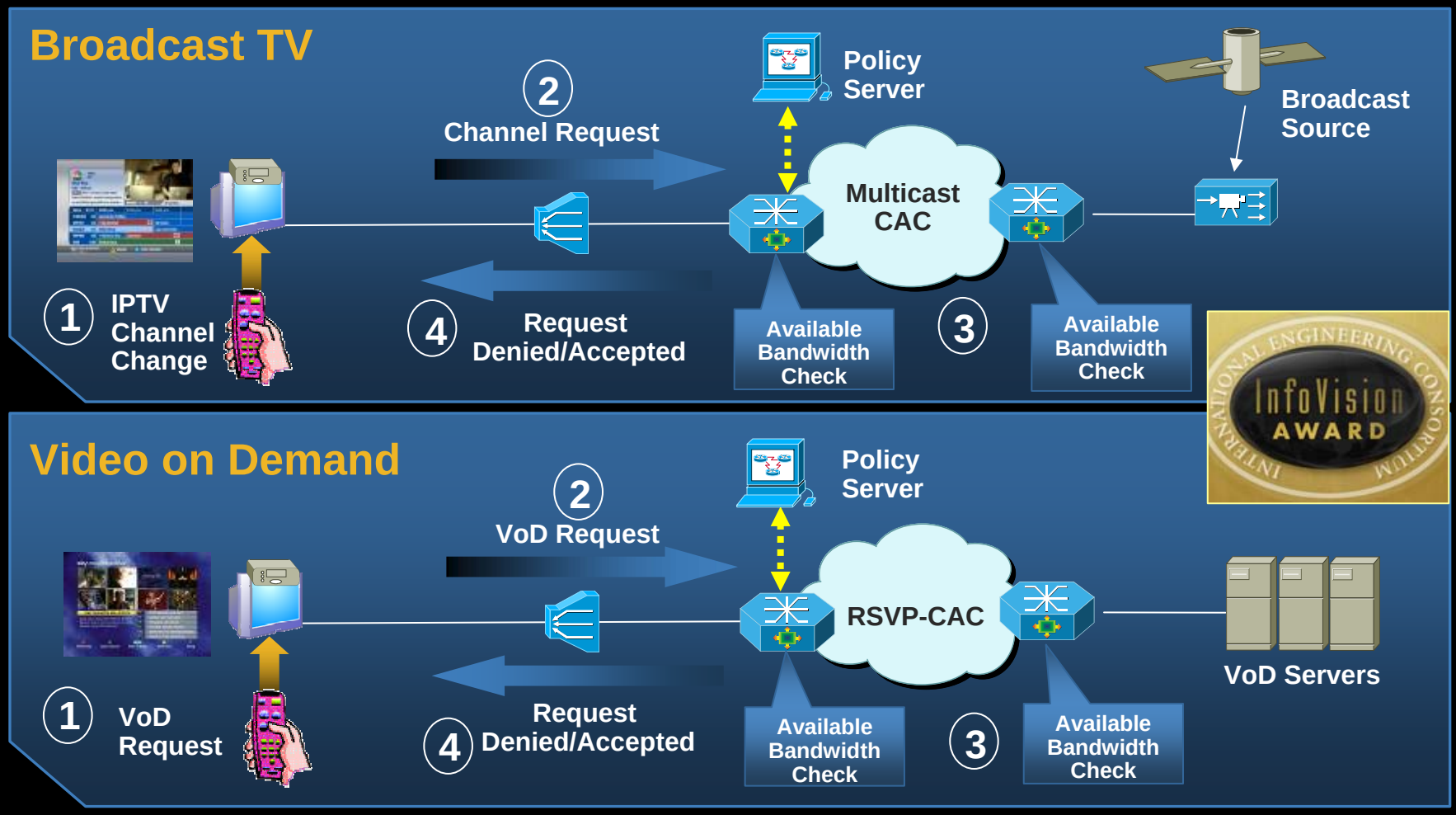
No more than one artifact per 2 hours => 10^{-6} PLR !!

Loss mean visible artifact on subs’ TV for a varying amount of time

0.5 % Packet Loss

Cisco 7600: Video and Multicast Connection Admission Control

Unmatched, end-to-end connection admission control manages Network oversubscription



Introducing the Cisco Visual Quality Experience (VQE) Technology

Preserving IPTV Quality of Experience

- Real-time video error repair
  - Eliminates effects of uncorrelated bit errors on individual DSL lines
  - Local re-transmission of dropped IP packets to STB in Sub-100ms
- Scalable, standard-based rapid channel change
  - Maintains consistent user experience
  - Sub-100ms channel change time
- Diagnoses problem areas
  - Monitoring and reporting of faults per DSL line above threshold

VQE does for Video what Dolby did for Stereo

Preserving IPTV Quality of Experience

Fast Channel Change & Dynamic Multicast

- **Common misconception :**

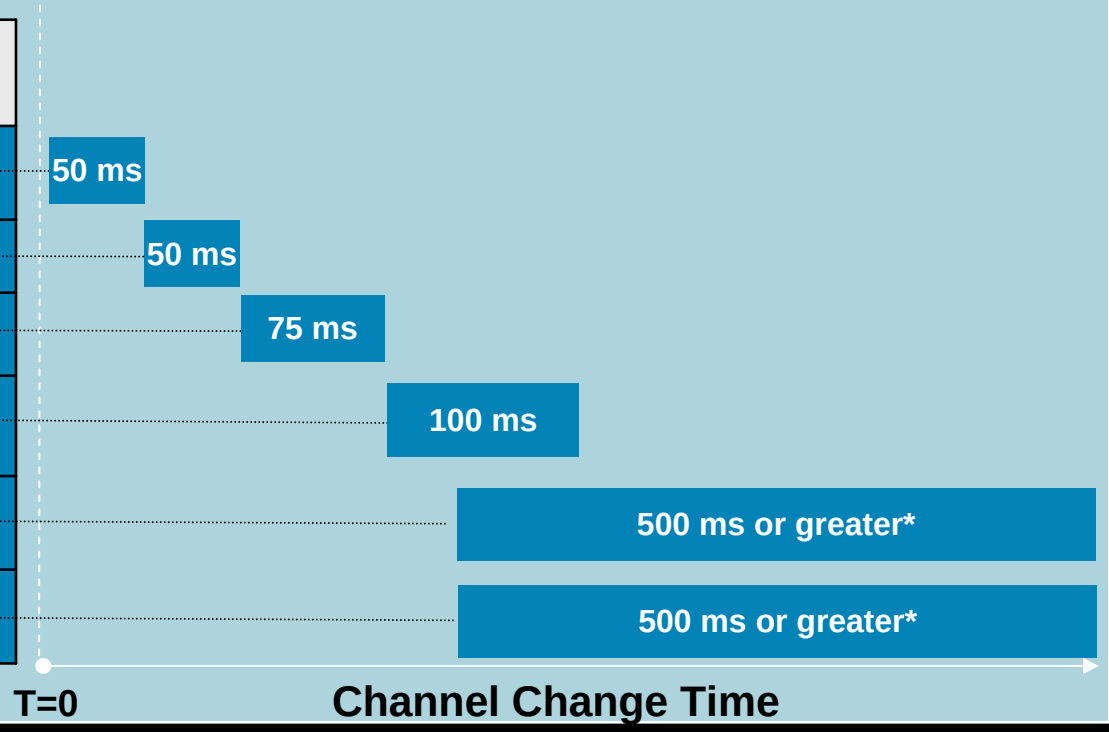
  IP multicast causes slow channel change.

- **Main culprits:**

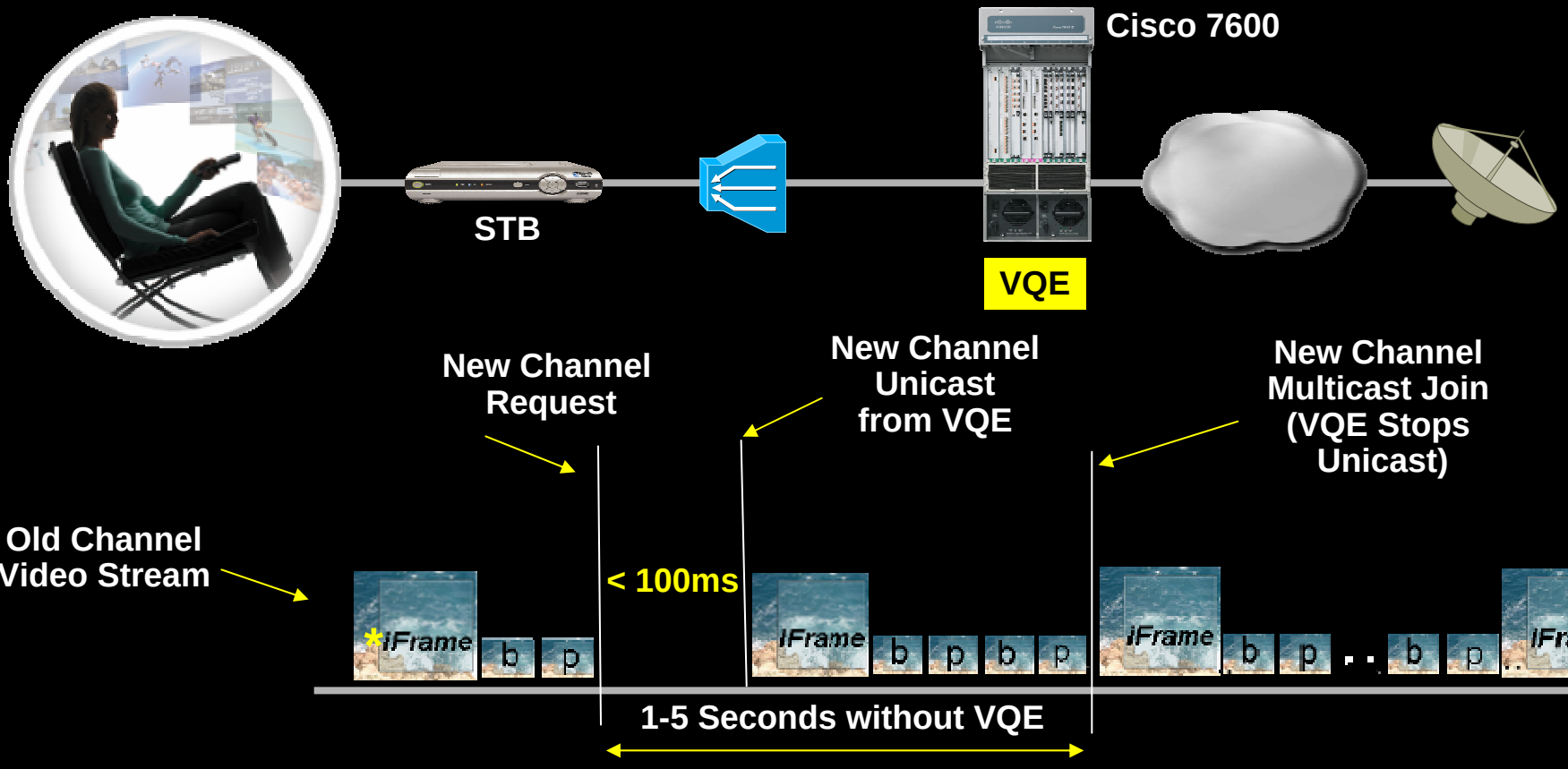
  Waiting for the Next I-Frame

  MPEG buffering (AVC)

Channel Change Latency Factor	% total budget
Delay for Mcast Stream to Stop from DSLAM	4%
Multicast Join for New Channel	4%
Dynamic Multicast Set Up Delay	6%
Jitter Buffer Fill	8%
I-Frame Delay *depends on compression	39%
MPEG Buffering *depends on STB & compression	39%



Scalable Standard-based Rapid Channel Change Maintains the Channel Surfer's Experience



VQE Technology Bridges Multicast Join Delays <1 second to Complete Channel Change

* Full frame of integrated video content

Middleware Linkages
Experience and Flexibility

SA Set top boxes and head ends are the touch points for middleware

Decades of Experience

- Middleware for MSOs
- Large scale deployment

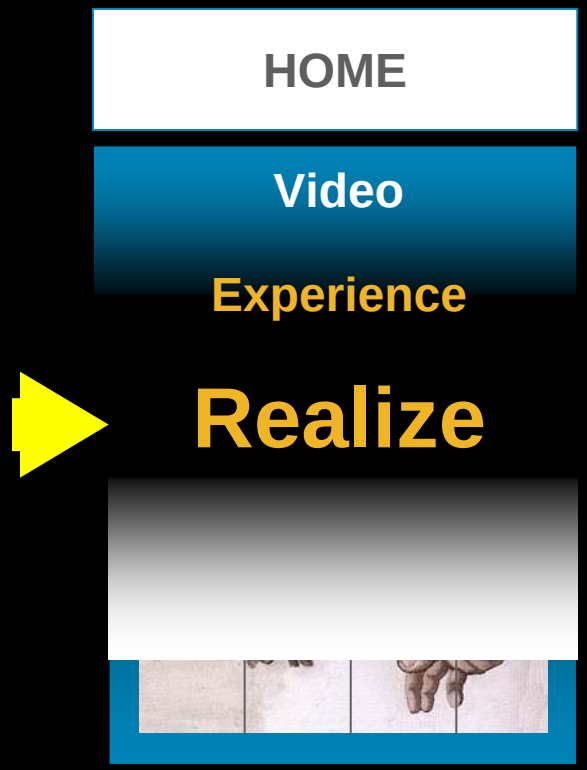
Scientific Atlanta
A CISCO COMPANY

Flexibility

- Closely working with many middleware providers
  - Microsoft, Myrio, Minerva and others

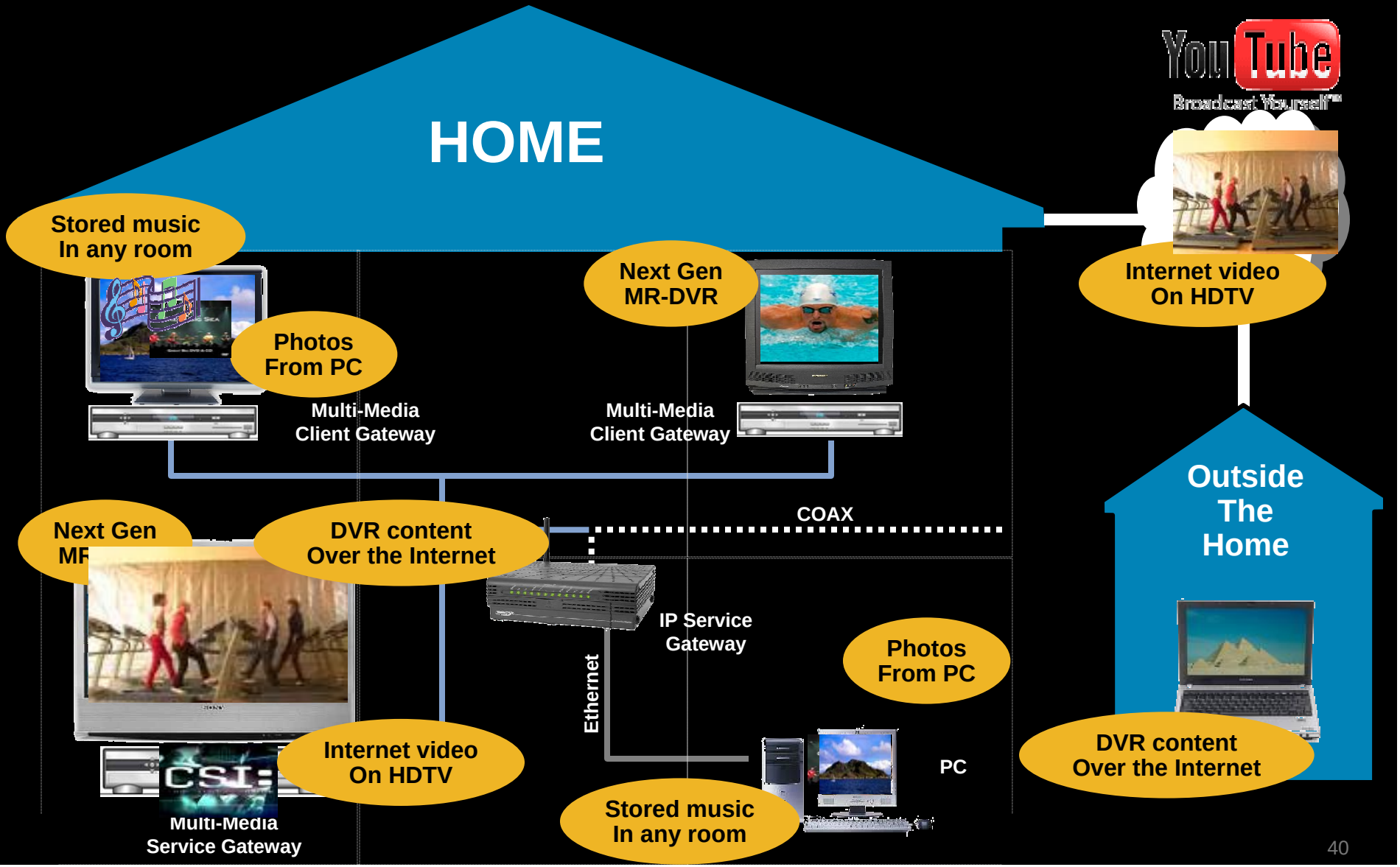
Enabling Video Experience
End-to-End IPTV Solution

- **Home Networking**
- **IP Set Top Boxes**



Cisco brings it ALL together

Next Generation Home System Example



Support for your choice of
Middleware, Conditional Access, SoC

Lowers risk and provides flexibility

Middleware		Microsoft Mediaroom	*Minerva*	MYRIO Myrio Corporation - A Siemens company
Conditional Access	verimatrix	Microsoft Mediaroom	WiDEViNE TECHNOLOGIES	NDS Synamedia
Chipset				SIGMA

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Cisco's Video 2.0 Solutions

Better End-Customer Experience

"Many Services to Many Screens"

At work, on the road,
in the connected home

Ensure Quality Experience + Create Differentiation

Better Glass-to-Glass Integrated Solutions

Open, balanced System that enables you to:
- Achieve Scale & Manage Convergence at a lower TCO
- Capitalize on 3rd party innovation

Better Partner

Unmatched expertise, resources & experience in making video and IP deployments successful

Think Video **Think IPTV** **Think Cisco**