

IPTV – an Overview



Outline

IPTV

- Not Just a STB
- Digital Content
- Bandwidth Considerations

IPTV Today

- Telco's
- Content Providers

IPTV for Cable

- Business Issues
- Problems
- Solutions - DIBA



What is IPTV?

IPTV is:

A managed network for delivering video, voice, and data with guaranteed Quality of Service.

IPTV is not:

Real time video services delivered over the public Internet.



IPTV and IP-Video are real!!!



What is the Next Generation of TV?

Converged Experiences

RECOMMENDATIONS, TIME SHIFTING, NDVR SEARCH, MULTI-SCREEN, ADVERTISING



Converged Content



RULES, RIGHTS, CONTROL

Mobility Across Networks



Deliver it *Anywhere*



Mobility Across Devices

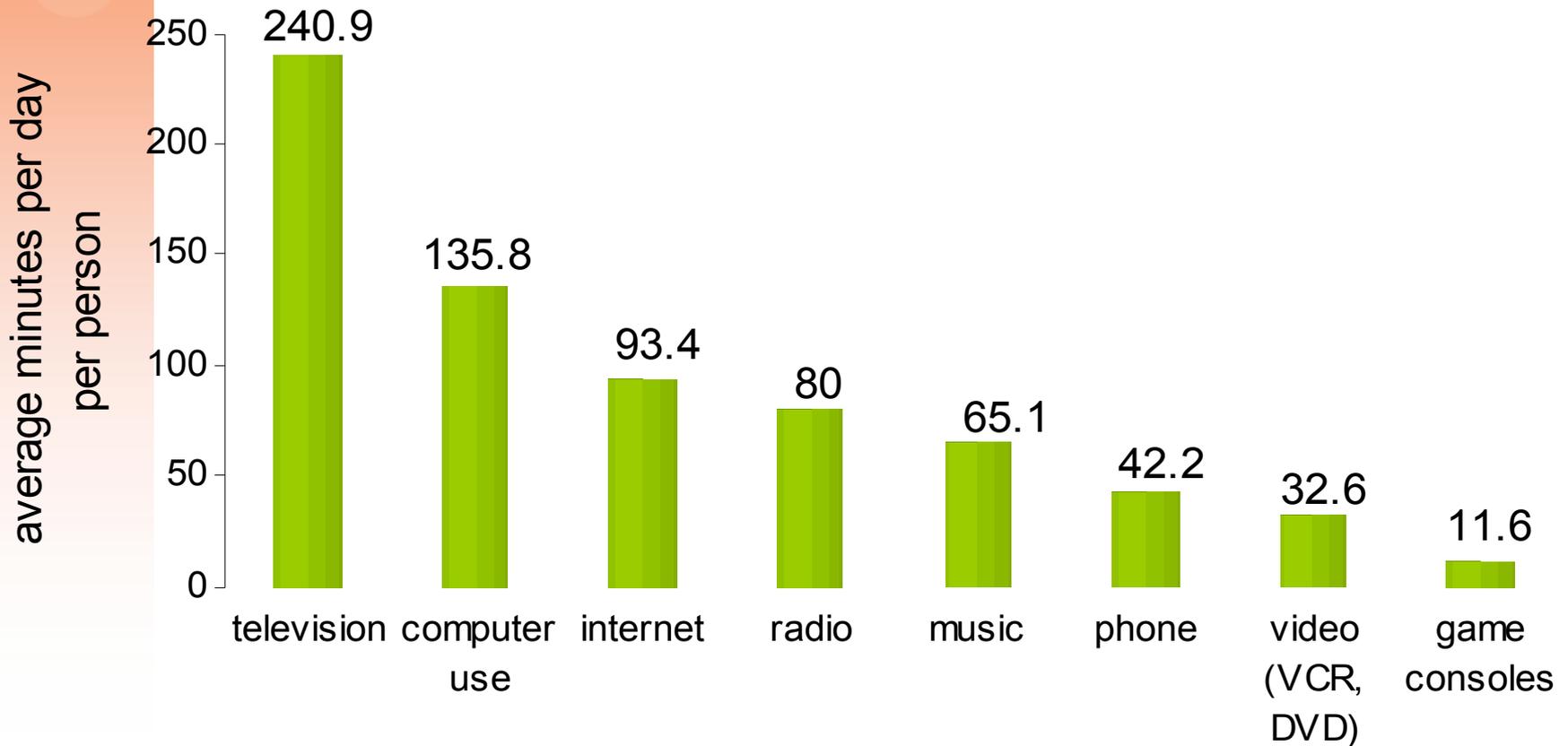


Take it *Anywhere*



THE AMERICAN MEDIA DIET

Daily Usage of Media by Source



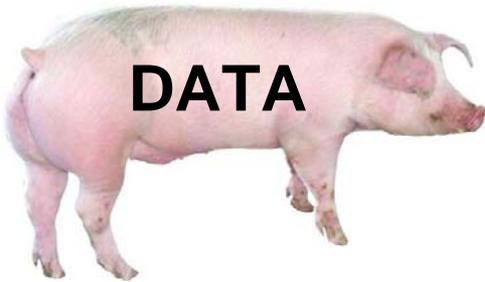
Sources: bar graph from "How the Internet is Changing Consumer Behavior and Expectations," by Lee Rainie, Pew Internet & American Life Project (5/9/06)

WHO'S HOGGING THE BANDWIDTH?



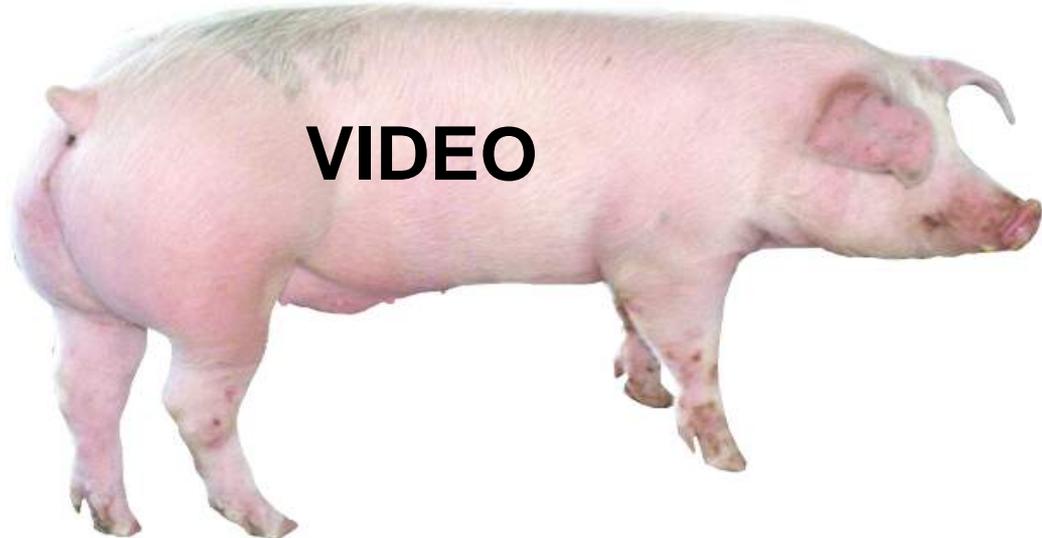
VOICE

(.120 Mbps
per stream)



DATA

(1.5 to 5 Mbps)



VIDEO

(8 - 10 Mbps for HD in
MPEG-4 or 14-16Mbps
in MPEG2)



VIDEO IS FUELING DATA DEMANDS

The screenshot shows a video website interface with several callouts pointing to specific features:

- Best Video Search**: Points to the search bar at the top.
- Download to own**: Points to a download icon in the top left.
- Branded Video on Demand Channels**: Points to a list of channels on the left sidebar.
- Playlist**: Points to a playlist icon in the left sidebar.
- User Upload & Share with "UnCut Video"**: Points to a video thumbnail in the main content area.
- Original Content**: Points to a video thumbnail in the main content area.
- Open to Anyone**: Points to a video thumbnail in the main content area.
- Top Videos by User Click**: Points to a video thumbnail in the main content area.
- New Content Platform**: Points to a video thumbnail in the main content area.
- Free Videos**: Points to a video thumbnail in the main content area.
- Hi-Q DVD quality Full Screen**: Points to a video thumbnail in the main content area.
- Streams**: Points to a video thumbnail in the main content area.
- Full-Length Shows**: Points to a video thumbnail in the main content area.

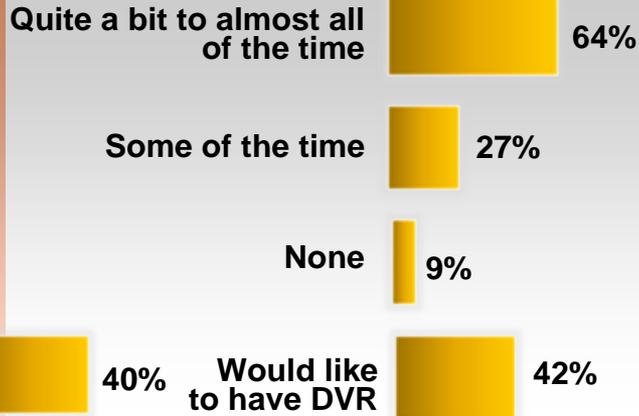


Image courtesy of www.ced.com

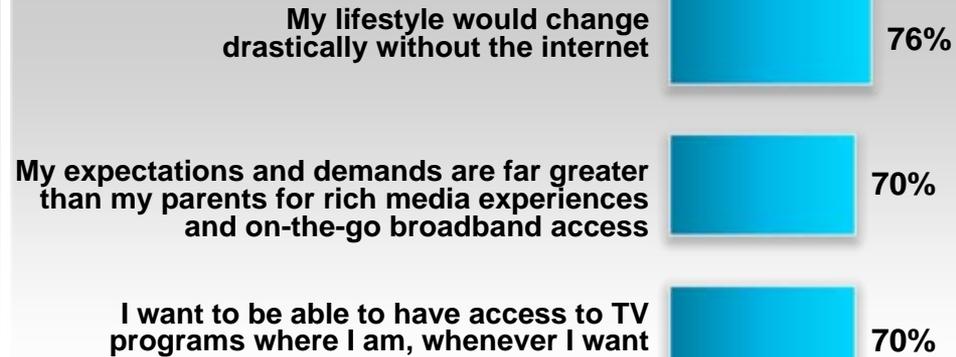


The Millennial Generation

Watching TV on DVR



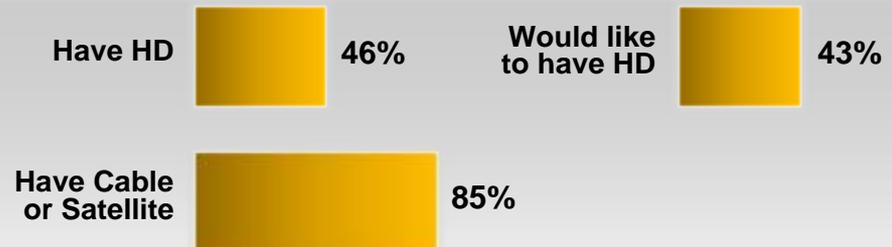
The Millennial Generation



Prime Time to My Time



HD on Demand



What is the Next Generation of TV?

Converged Experiences

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RULES, RIGHTS, CONTROL

Converged Content



Mobility Across Networks



Deliver it *Anywhere*



Mobility Across Devices



Take it *Anywhere*



AND DIGITAL CONTENT DEVICES ARE MULTIPLYING



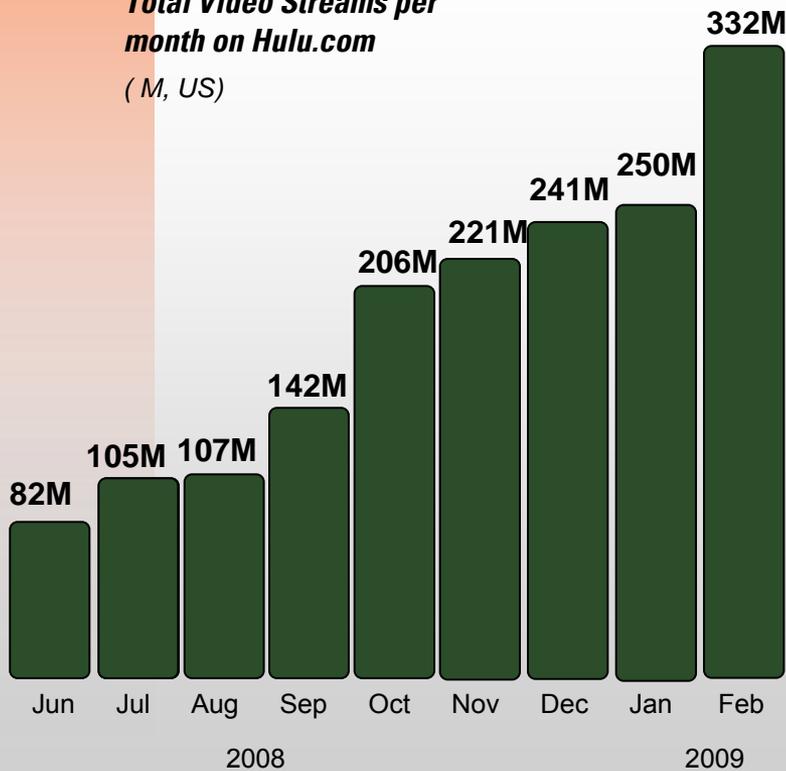
Parks Associates, "Connected Entertainment Opportunities in the Home," Harry Wang ©2006

Video Explosion

Internet – Hulu.com

Total Video Streams per month on Hulu.com

(M, US)



Internet Video

33% increase in online video watching in Nov 2008 than the previous year

Average online video viewer watched 273 minutes of video

Duration of average video viewed online at Hulu 11.9mins compared to all online videos at 3.1mins

52.3 videos per viewer on YouTube.com



From Prime Time to “My Time”

Audience for converged content viewing

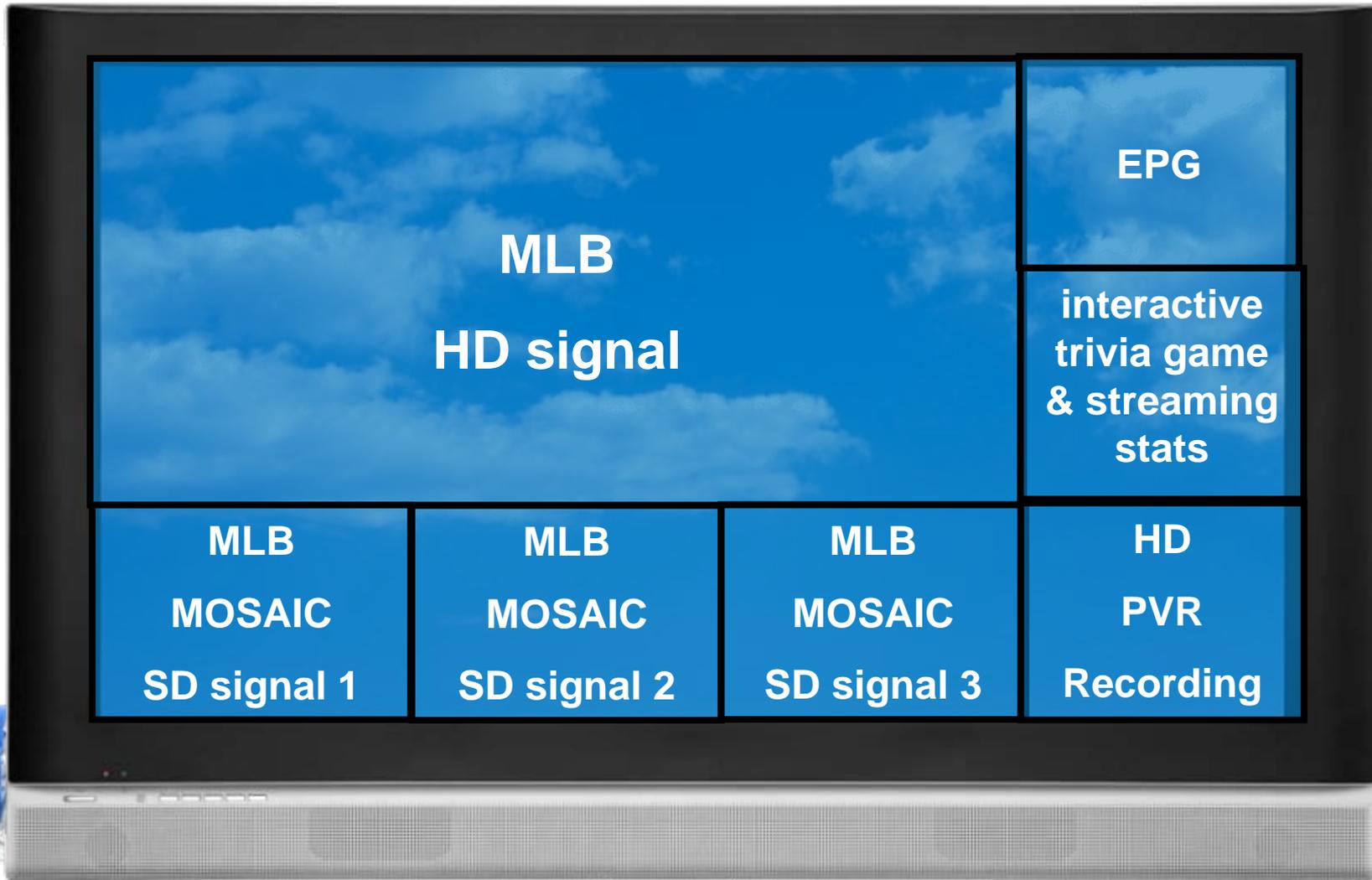
	Knight Rider	Kath & Kim	The Office	30 Rock	Lipstick Jungle	Heroes
TOTAL	17,819,260	8,334,421	21,430,528	13,988,458	7,918,873	18,524,333
VOD/Mobile/Downloads	25,398	18,128	83,713	47,925	40,286	86,805
Internet Streaming Video	956,862	325,293	5,017,815	2,311,533	1,749,587	4,794,528
Television	16,837,000	7,991,000	16,329,000	11,629,000	6,129,000	13,643,000
Episode Title	Money	A Hard Day's Knight	Employee Transfer	Do-Over	The Lyin', the Bitch and the Wardrobe	Eris Quod Sum
	10/22/08	10/30/08	10/30/08	10/30/08	10/31/08	10/27/08

NBC Universal's new Total Audience Measure Index (TAMi)



1 DEVICE ≠ 1 STREAM

= 18 Mbps



The Internet connects content providers to playback devices



Next Generation Television: Service Provider Challenges



Content to IP clients

IP Clients = PCs, IP Set Tops, Handhelds

Central transcode

Transcode at the edge

Implement DRM

SIP/ISA conversion



The Promise: A new Consumer Experience

Any content on any device . . .



. . . anywhere you want it



Content Providers



IPTV Content Providers

Who are they?

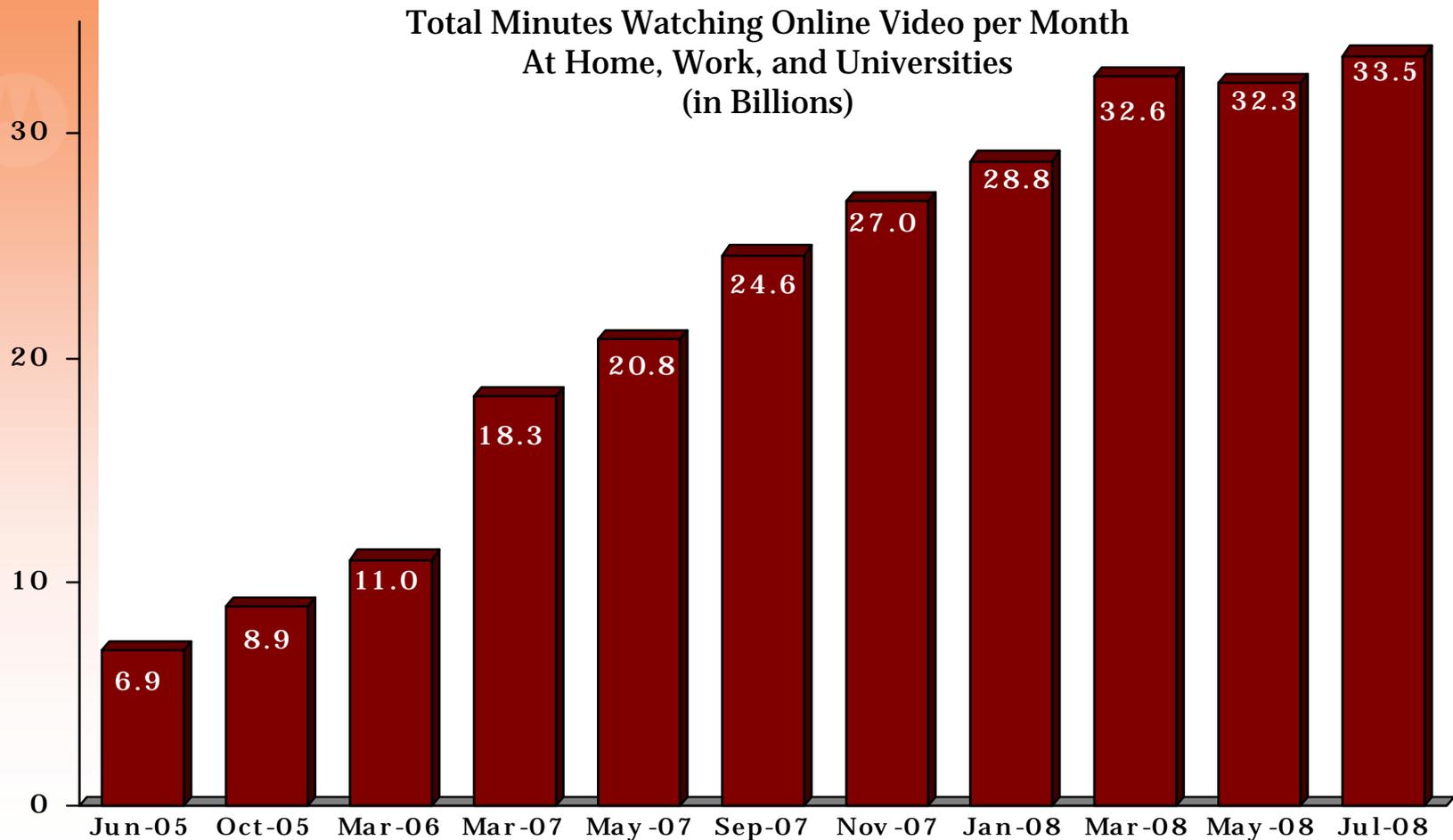
- Hulu, Netflix, Vudu, CNN, ABC, Sony, Disney.....

What are they doing?

- Delivering content directly to consumers via the Public Internet



In July, 33.5 Billion Minutes per Month were Spent Watching Video Online



- YouTube accounts for over one-third of all time spent watching online video

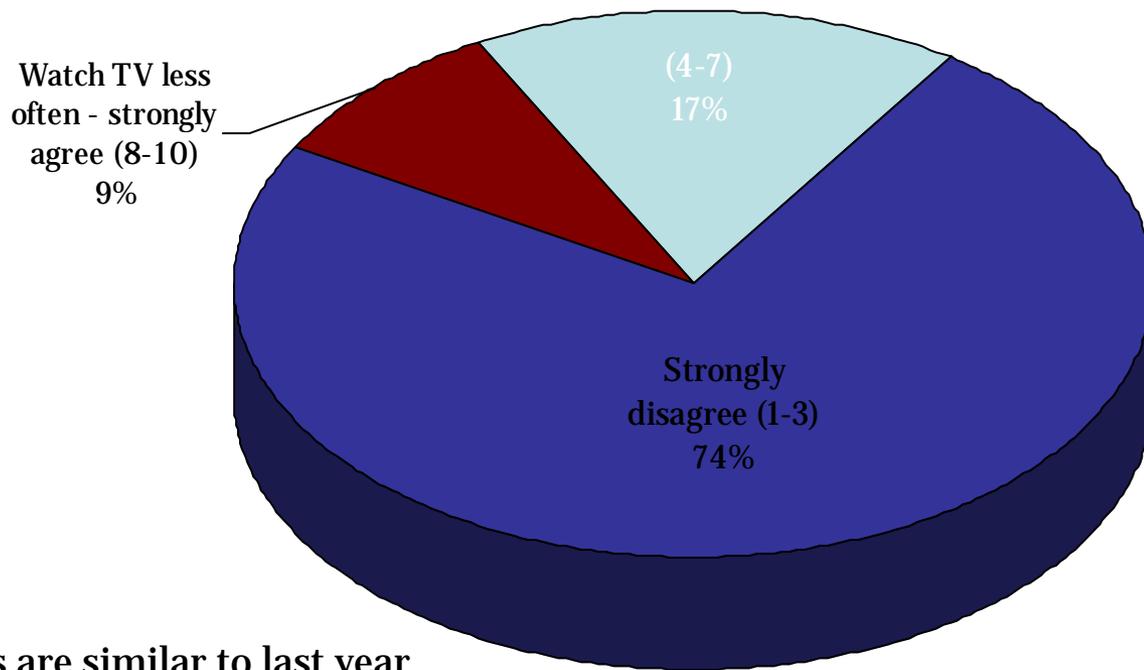
Source: ComScore



Just 9% of Those Who Watch Video Online Strongly Agree that they Watch TV Less Often

Using a 1-10 scale with 10 being strongly agree and 1 being strongly disagree, how much do you agree or disagree with... since I began watching video online I now watch TV less often

Watch TV Less Often Since Watching Video Online (1-10)



- Results are similar to last year
- 16% of men age 18-34 who have watched video online strongly agree that they watch TV less often now – compared to 6% of all others

From LRG study *Emerging Video Services II*



IPTV Content Providers – Problems

Content protection

Content monetization models

Diverse content format requirements

Network performance



IPTV Content Providers – Business Issues

Losing Ad revenue to online advertising

- Thus Hulu

Losing viewers to alternate consumption models

- ie Netflix challenged by VOD

Fragmented market with content explosion

- The dreaded “long tail”



Bandwidth Considerations

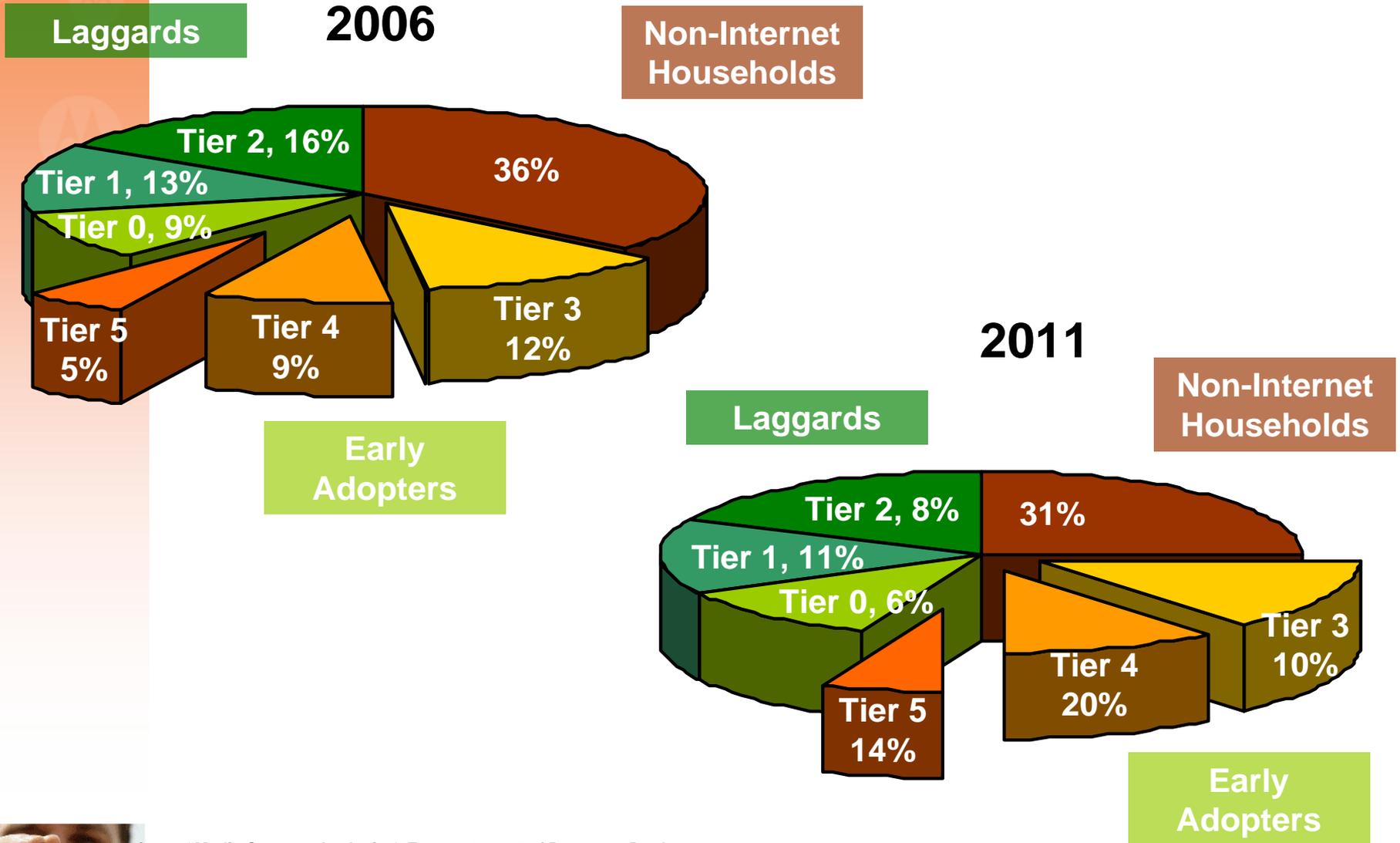




SO HOW MUCH CAPACITY DO WE REALLY NEED?

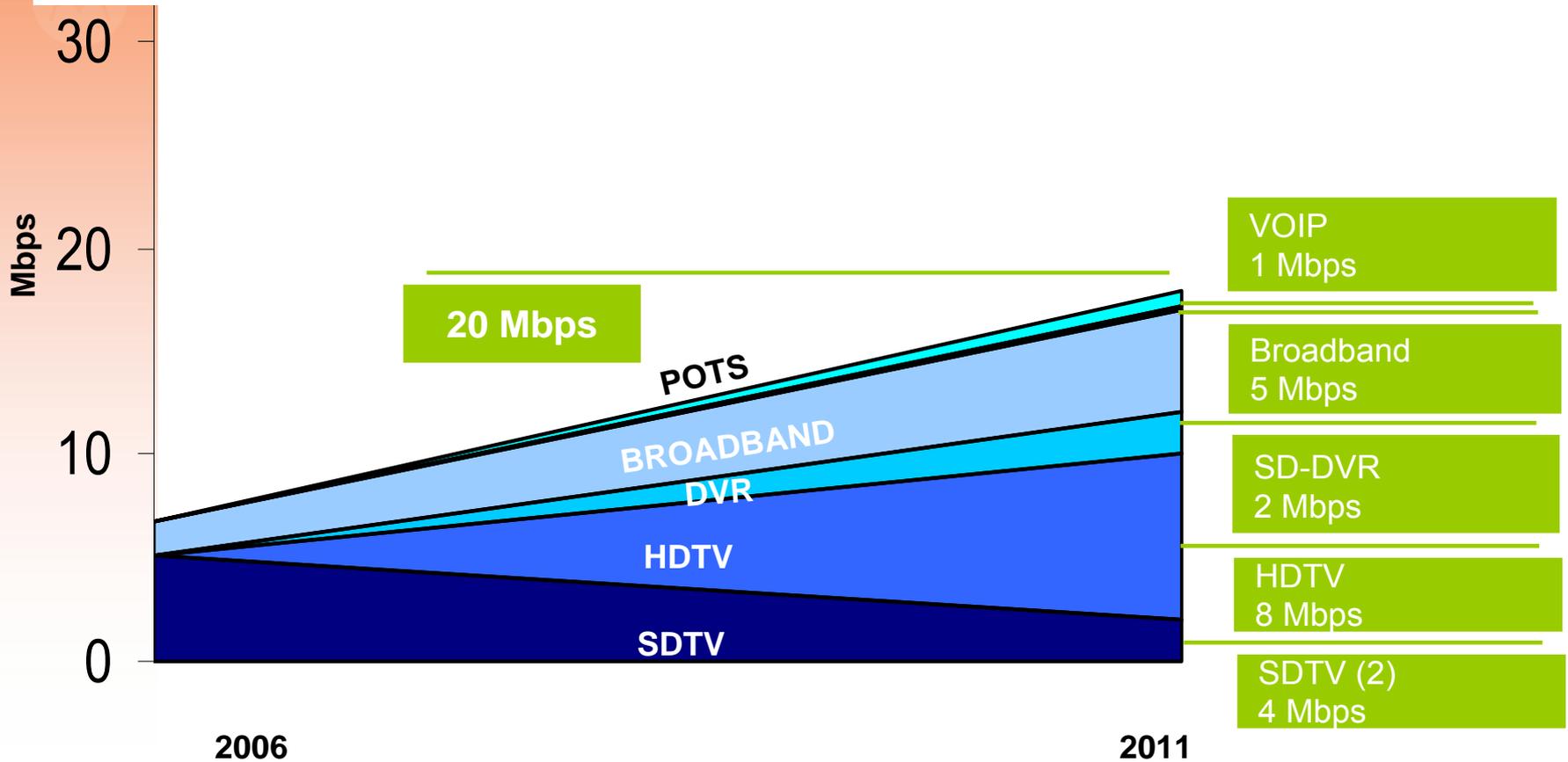


HOUSEHOLD SEGMENTED BY TECHNOLOGY ADOPTION



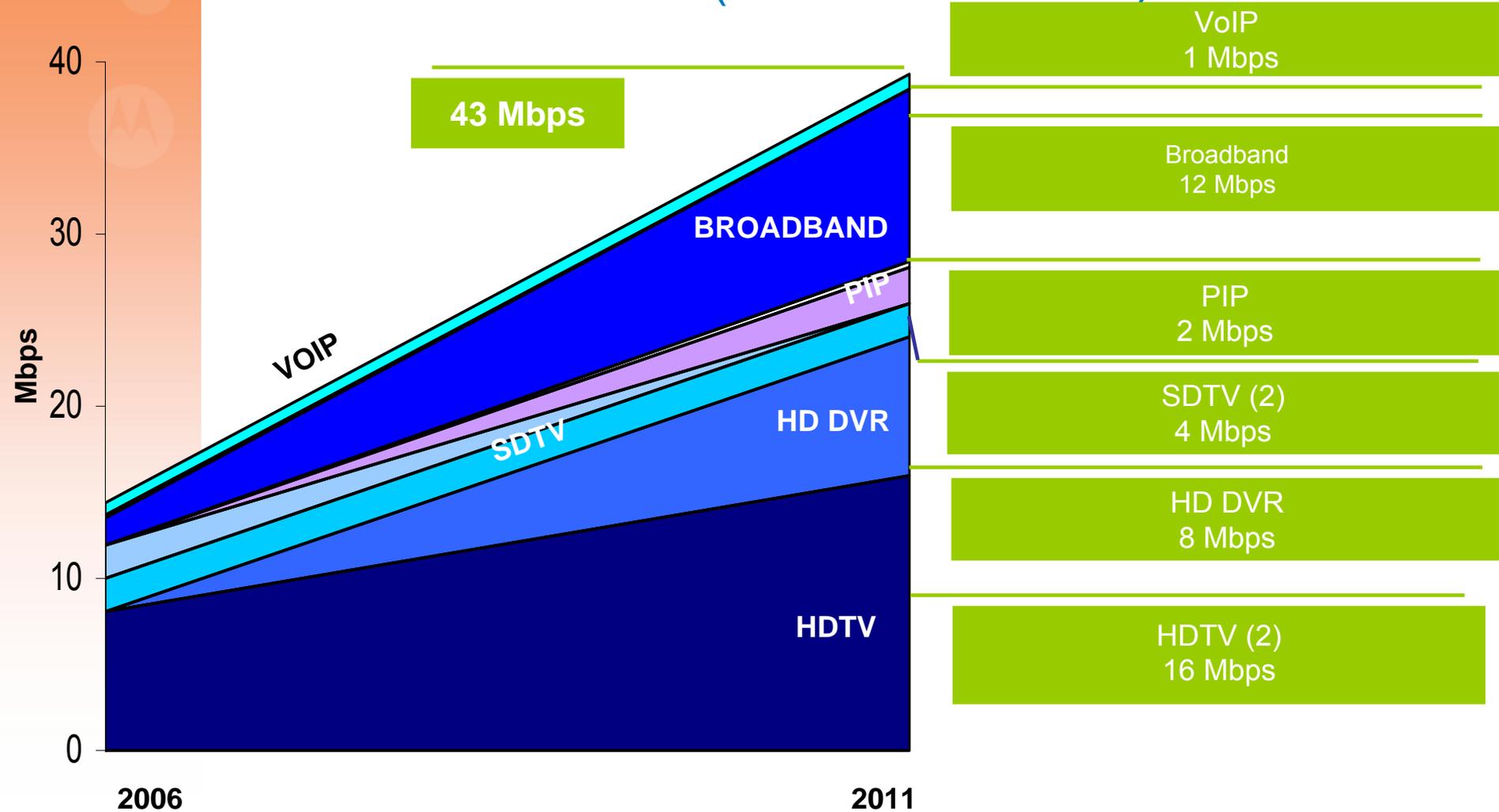
Source: Parks Associates, "Media Servers: Analysis & Forecasts, p. 2 of Resource Book

PEAK BANDWIDTH USAGE BY LAGGARDS (Tiers 0 – 2 = 25%)



Source: Parks Associates, "Media Servers: Analysis & Forecasts, p. 2 of Resource Book; Motorola 2007

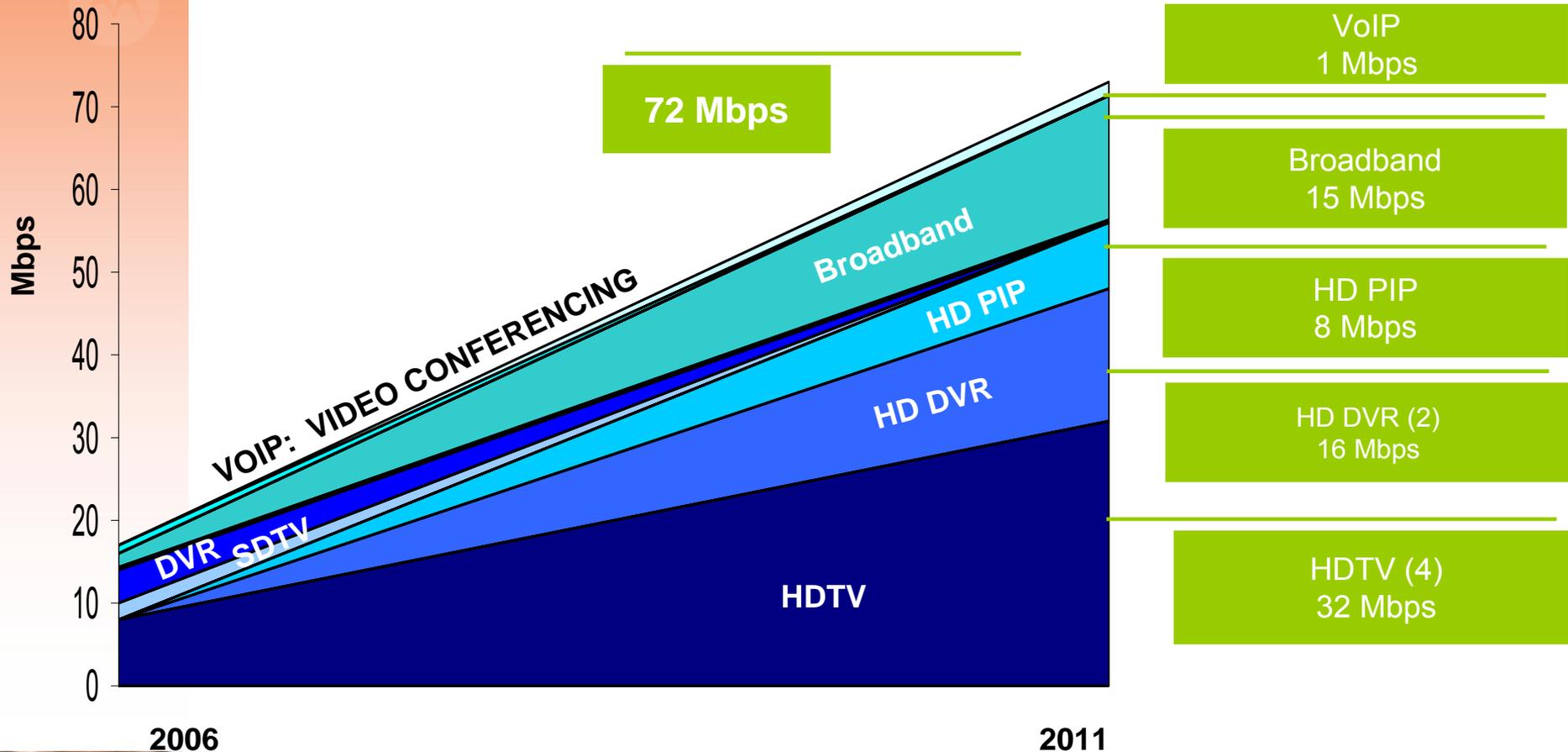
PEAK BANDWIDTH USAGE BY EARLY ADOPTERS (Tiers 3 & 4 = 30%)



Source: Parks Associates, "Media Servers: Analysis & Forecasts, p. 2 of Resource Book; Motorola 2007



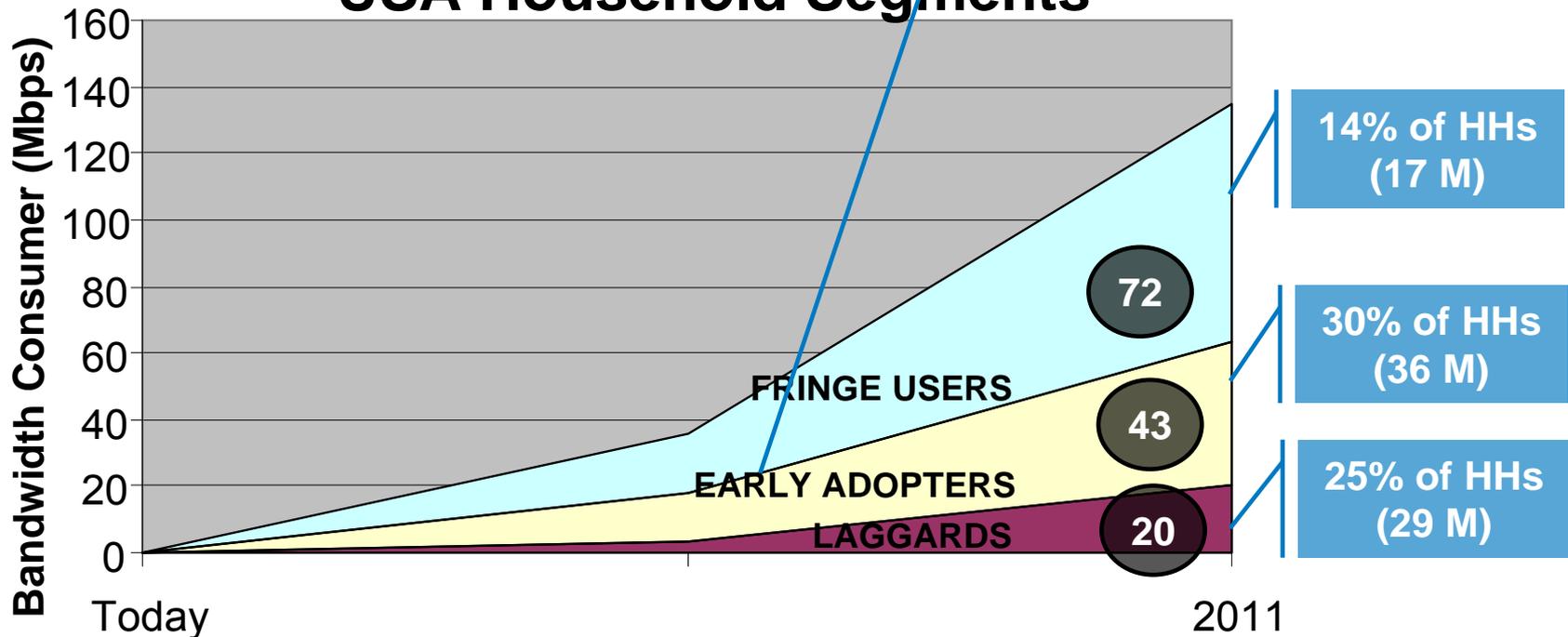
PEAK BANDWIDTH USAGE BY FRINGE (Tier 5 = 14%)



Source: Parks Associates, "Media Servers: Analysis & Forecasts, p. 2 of Resource Book; Motorola 2007

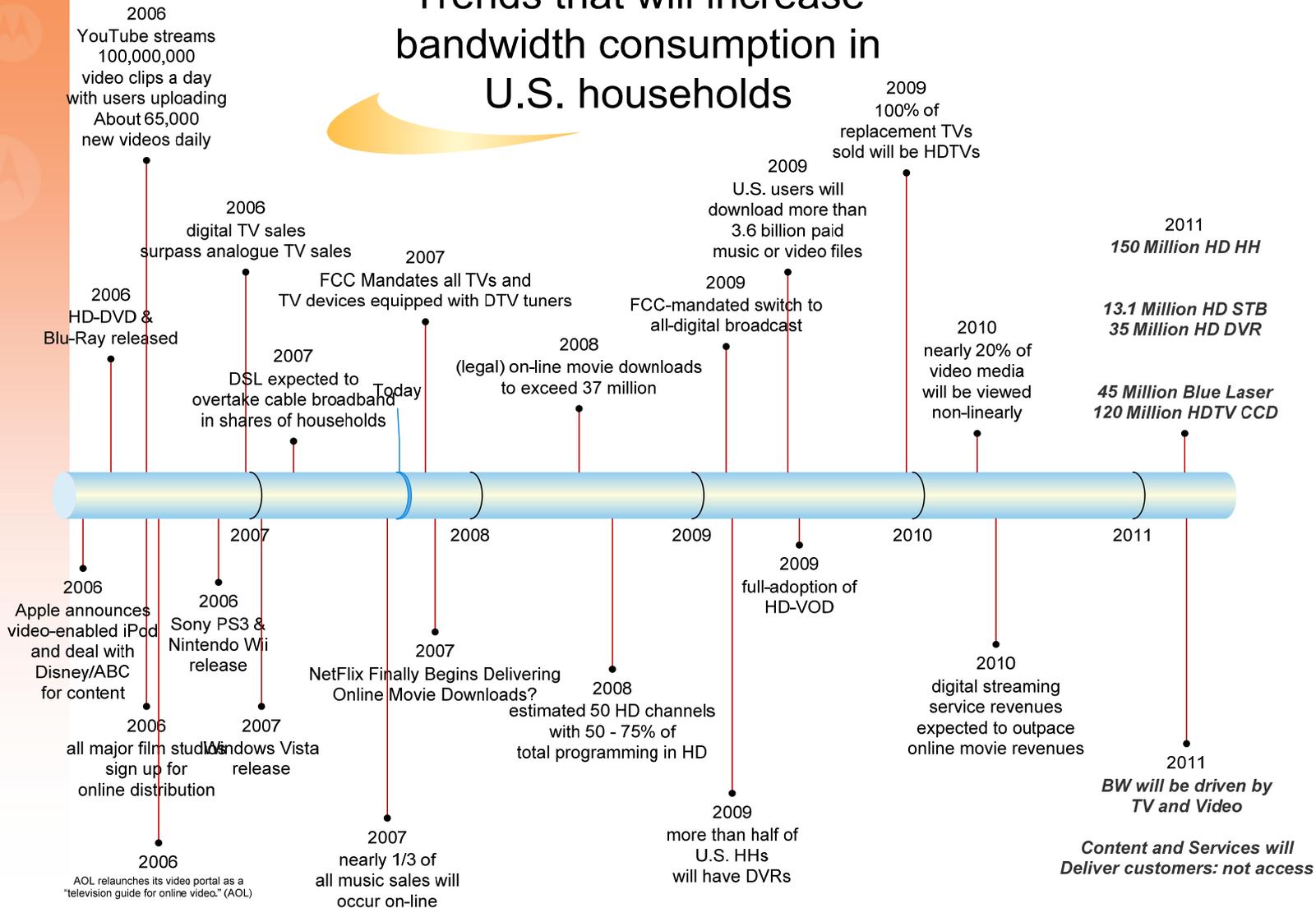
THE RESULT...

Estimate Bandwidth Usage by USA Household Segments



BUT WAIT! THERE'S MORE...

Trends that will increase bandwidth consumption in U.S. households



Source are listed in the notes



Why Ultra Broadband ?

HDTV and HD-DVR becoming more common

- Half of all TVs sold in US this year are HD capable
- The second HDTV or HD-DVR challenges typical copper deployments

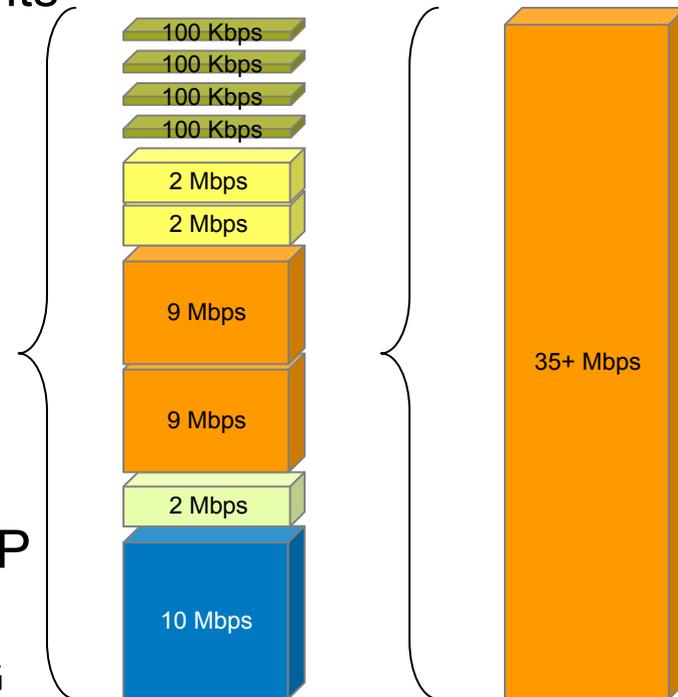
High upstream capacity

- HD quality conferencing
- Online gaming

Enabling Platform

- DOCSIS 3.0 Channel bonding
- High-speed GPON (2.4G/1.2G) FTTP service
- Gigabit Ethernet interfaces on RFoG

Service	Quantity
VoIP	4
SDTV	2
HDTV	2
VOD/Gaming	1
HSI	1



Telco IPTV



Telco IPTV – Business Issues

Losing wireline customers to Cable

- ATT losing 4% per year

Need to Develop New Lines of Business



Telco IPTV - Problems

Last mile network is bandwidth constrained

- DSL ~ 6Mbps to VDSL2+ > 48 Mbps

No experience with video

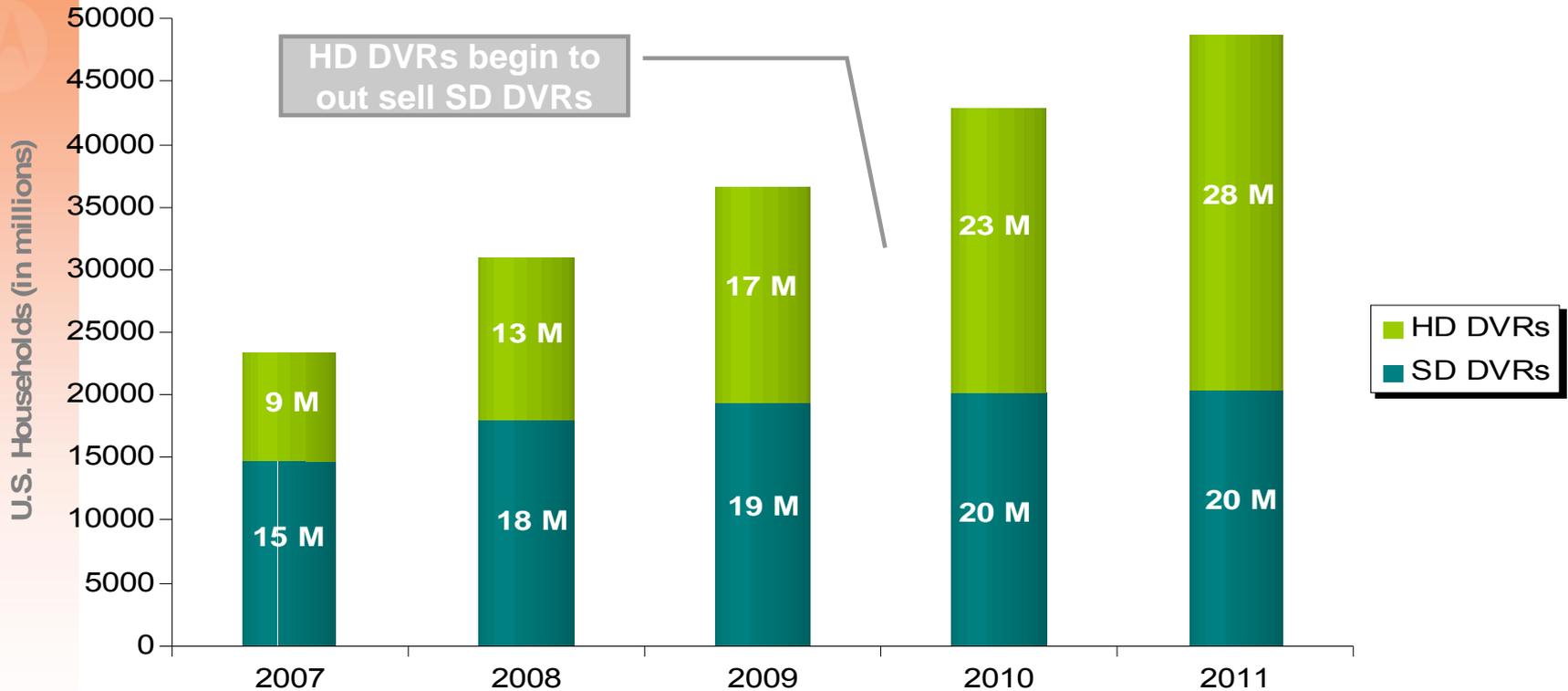
No experience with programming acquisition



BANDWIDTH IN THE BACKGROUND – THE DVR

DVR Penetration

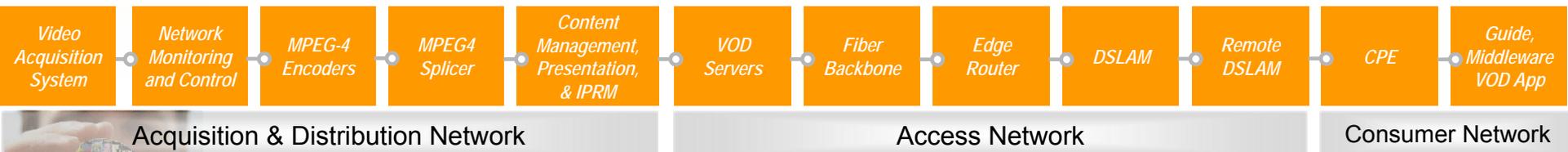
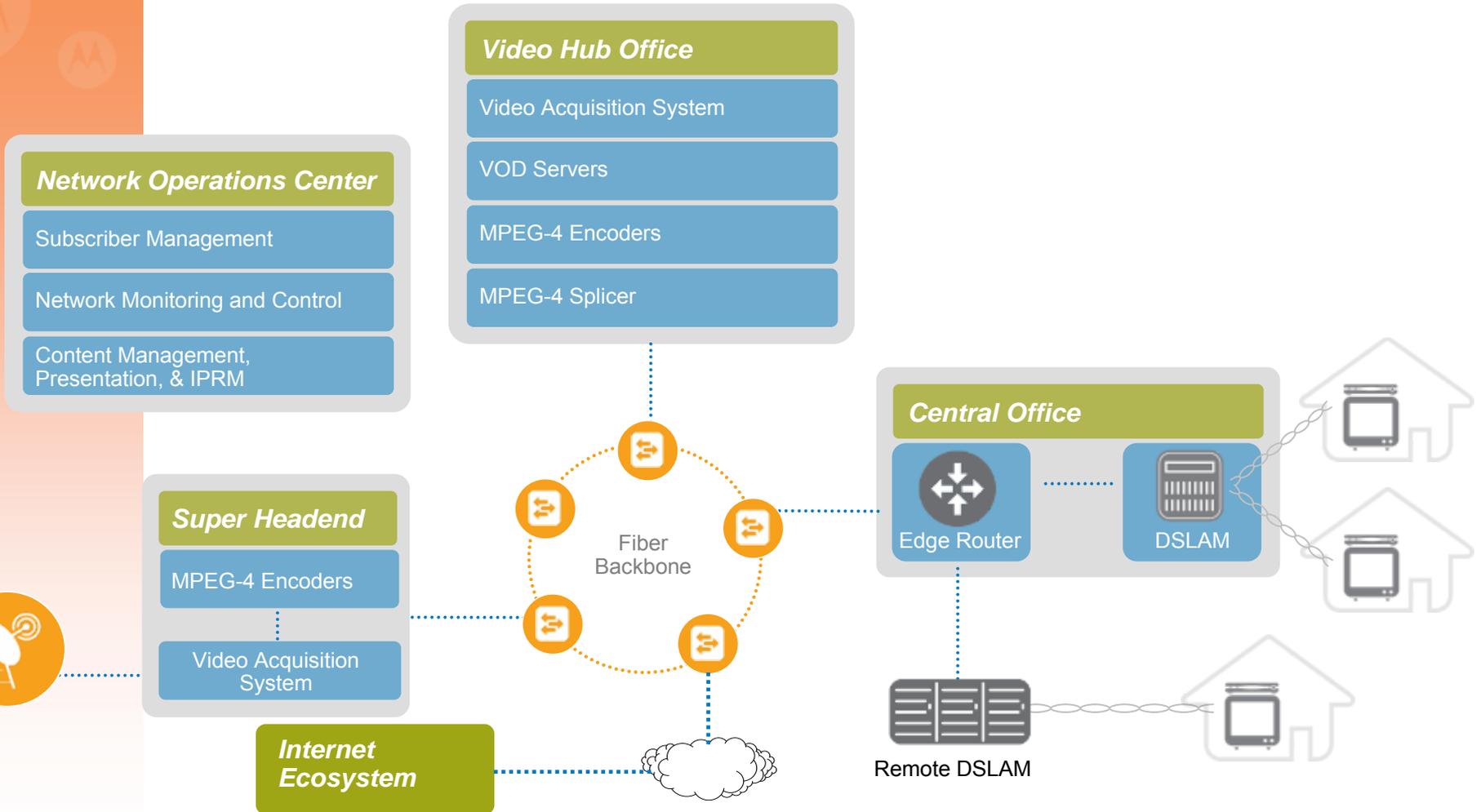
Standard Definition Units vs. High Definition Units



Able to record up to 4 streams concurrently

Source: IMS Research

A Typical IPTV Network



Acquisition & Distribution Network

Access Network

Consumer Network



IPTV for Cable



IPTV for Cable

Does Cable need to jump on the IPTV bandwagon?

Is it “IPTV”, Video over IP, or Video over the internet?

What’s involved?

Where can we assist?



IPTV for Cable – Business Issues

Losing Subscribers to Telcos

Loss of revenue to Over-the-Top services

Limited number of suppliers / perceived cost issue

Slow addition of consumer applications



MSO Perception

Comcast: “IPTV is coming and it will likely be big”*

- Comcast content (and Internet) to PC and eventually any IP client
- Comcast (and all MSOs) migrating to >> narrowcast
 - 80% of spectrum digital in 3-5 yrs
 - Considerable new spectrum for HD and SD digital services
 - At least 50% unicast + multicast
 - Serving group sizes continue to shrink
- **3-5 yr expectations**
 - 80% of spectrum digital
 - >50% unicast & multicast
- **IPTV via DOCSIS pipe requires up to 30x CMTS growth**
 - Solution needed to match MPEG/QAM video costs
 - Unified CPE
 - MPEG/QAM and MPEG/IP
 - STB/Gateway converts QAM↔IP

* July 2008 NGNA Kick-off

MSO Perception

“The VIP architecture is intended to augment the existing video distribution network to allow the delivery of TWC video services to non-traditional devices (ie: PCs, personal media devices, cellphones, IP STBs, etc)”

“The intent is to deliver live broadcast/linear video and video on demand services to IP STBs where those IP STBs do not contain RF tuners but instead use only an Ethernet port”



IPTV for Cable – Solutions

MPEG-2/RF to IPTV in Four Stages

Ecosystem Evolution

Internet applications via cable

MSO licensed content to IP clients

- PCs, IP STBs, Handhelds

Integration of IP Set Tops into the cable ecosystem

IPTV 2.0

- Sharing of content between networks and “three screen” devices



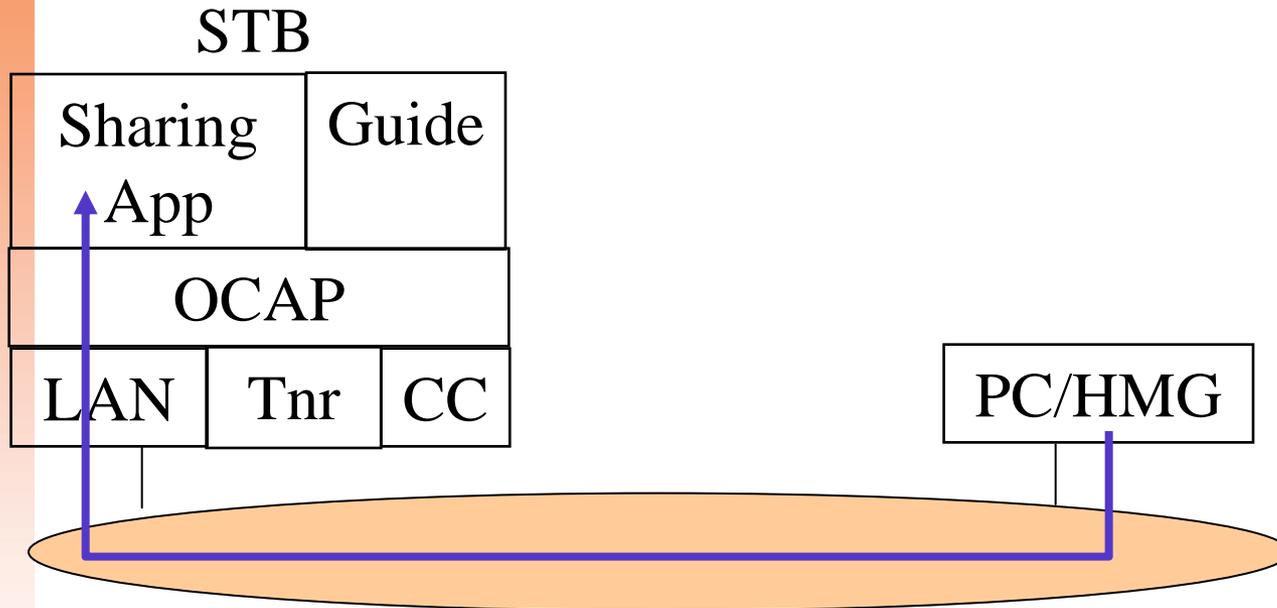
CableLabs Initiatives

Evolution of Home Networking in CableLabs and OCAP HN to an Overall Ecosystem

- OCAP HN1 Enables PC Content Sharing
- OCAP HN2 Enables Multi-Room DVR
- OCAP HN3 (now 2.5) Enables Tuner Sharing
- Other extensions to facilitate the Ecosystem over time
- Motorola is participating/contributing to the development of the all the HN extensions



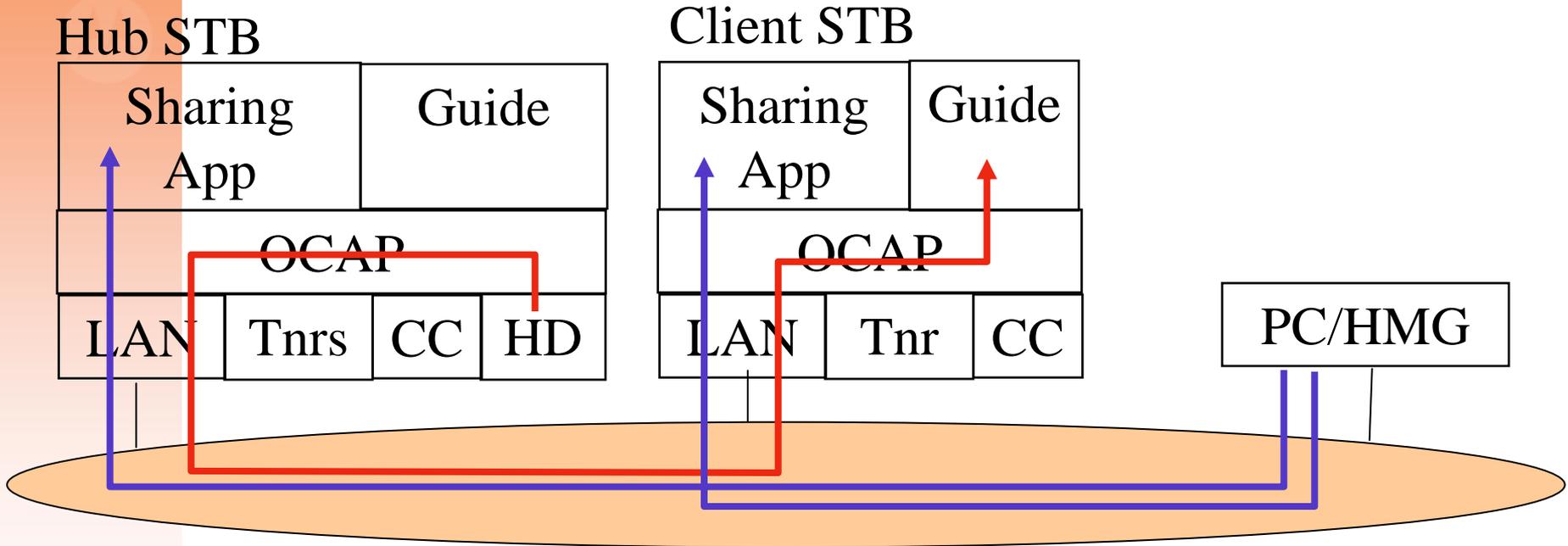
HomeNet I



Enables STB access to PC content



HomeNet II



Adds Whole Home DVR

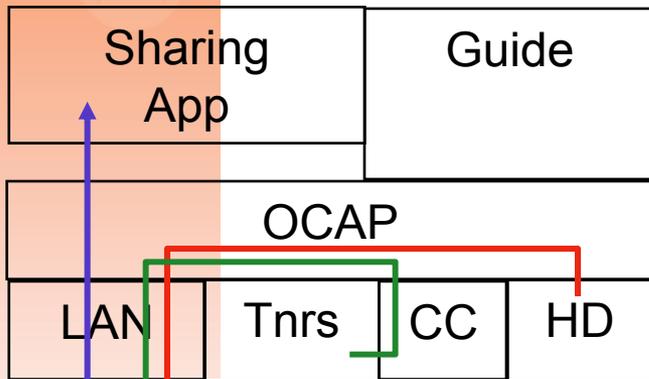
Client can get to PC content

Client can get to DVR content

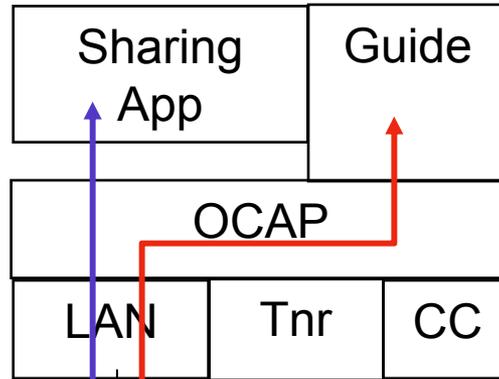


HomeNet II.5

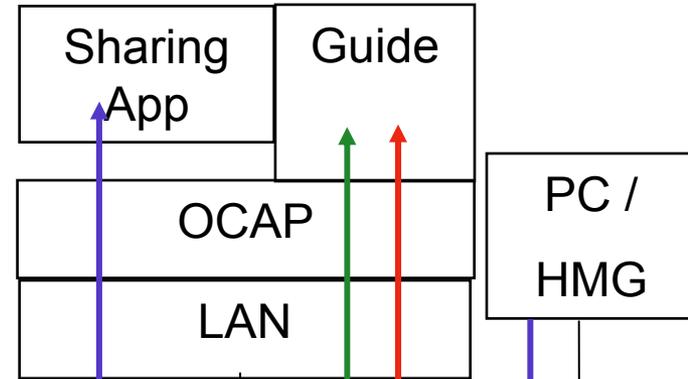
STB w/HD



Client STB



Light-weight Client STB



Enables LightWeight Client

Client can get to **PC content**

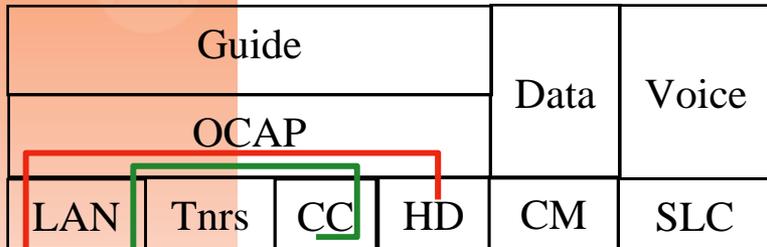
Client can get to **DVR content**

Client can get to **Tuner and Cable Card Resources**

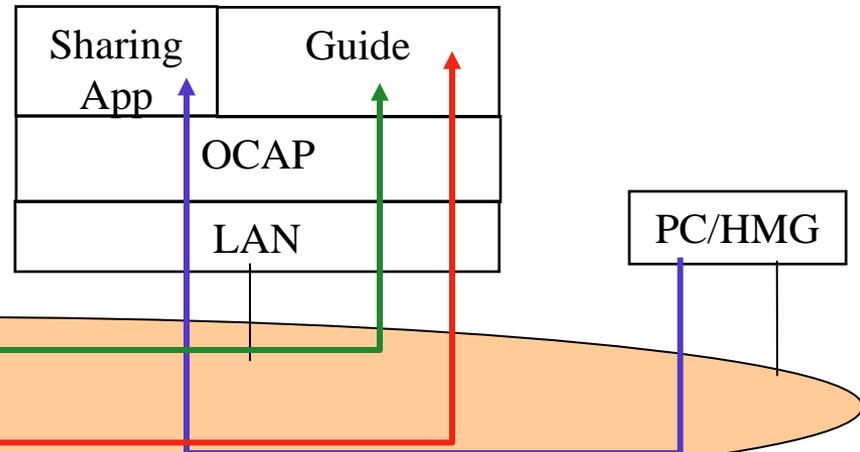


HomeNet II.5 Enables Single Triple-Play Box

SMG/HMG series



LW Client STB



Single box for triple play of services

Enables LightWeight Client

Client can get to **PC content**

Client can get to **DVR content**

Client can get to **Tuner and Cable Card Resources**



Transport Gateway

Current CPE development that can act as MPEG and DOCSIS termination

- 8 MPEG or DOCSIS tuners
- Multiple LAN and device interfaces
- DLNA protocols
- DRM bridge to IPRM or DTCP

Video distribution solutions within the Home Net exist for either MPEG or DOCSIS delivery of IP video

Solution could provide a flexible platform for serving both MPEG video and IP video/data with IP distribution over the over Home Net



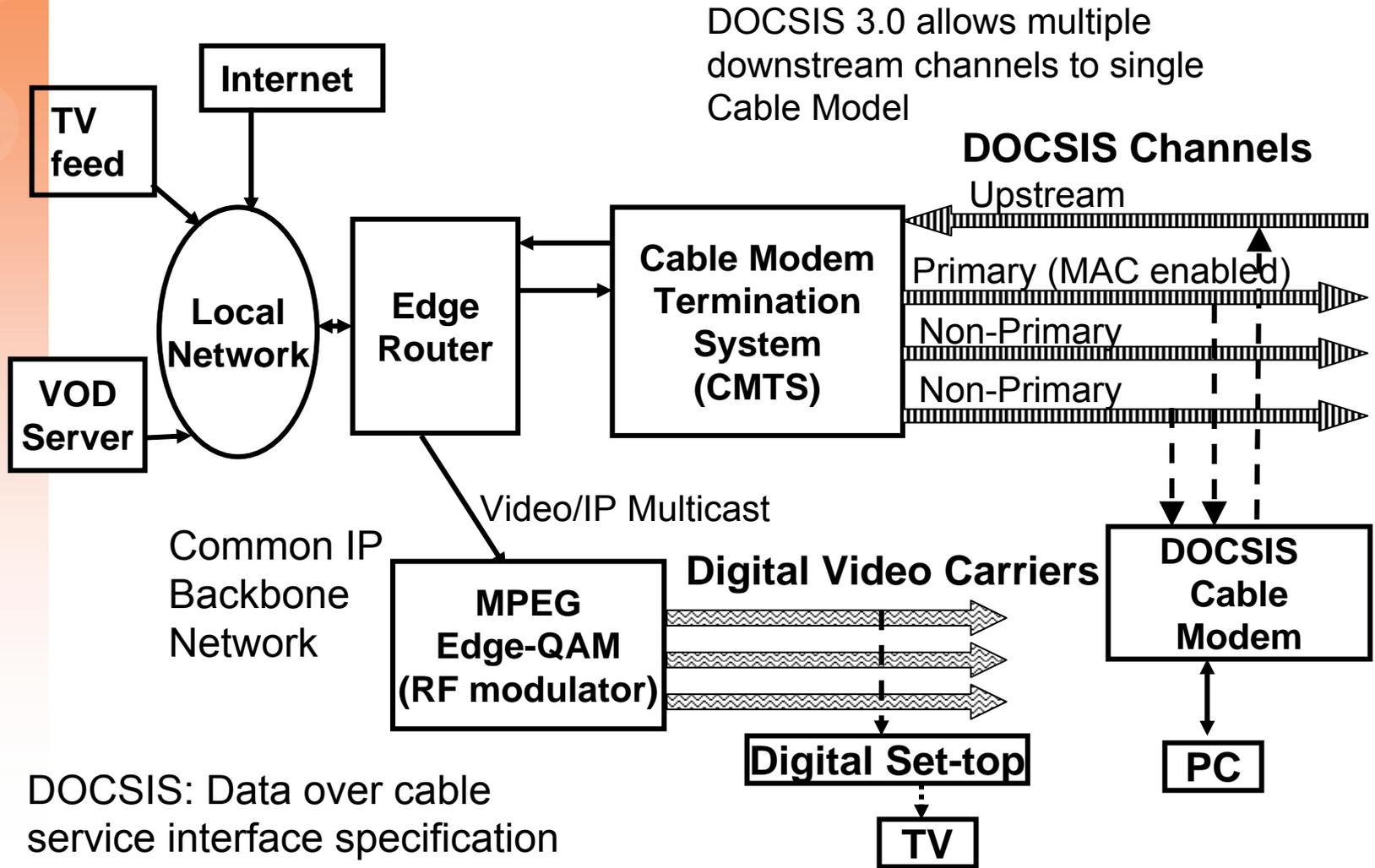
DIBA is Essential to IP-VOD and IPTV for Cable

DOCSIS IP-video Bypass Architecture

- The standard digital broadcast is distributed over an IP backbone.
 - Video packets go a last-hop router/switch and then directly to the EdgeQAM and HFC plant
- Typically, IP/DOCSIS content goes through the CMTS core
- CMTS core processing is at least 4 times as expensive as EdgeQAM processing
- With DIBA, IPTV and IP-video same path as digital broadcast
 - DIBA bandwidth cost -> digital video bandwidth cost

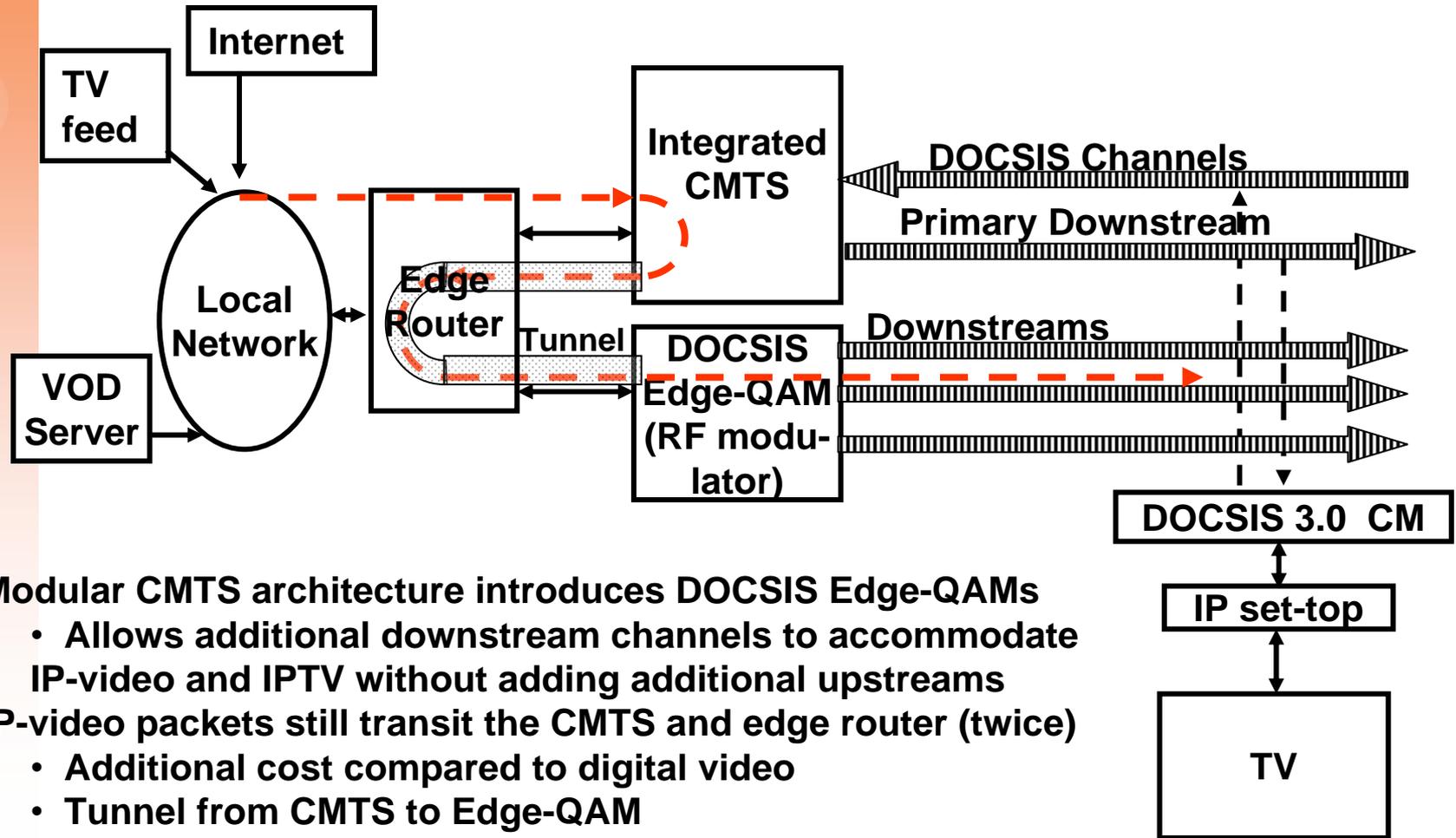


Cable Network with IP Backbone, IP/DOCSIS service and Digital Video Service



DOCSIS Bandwidth via Modular CMTS

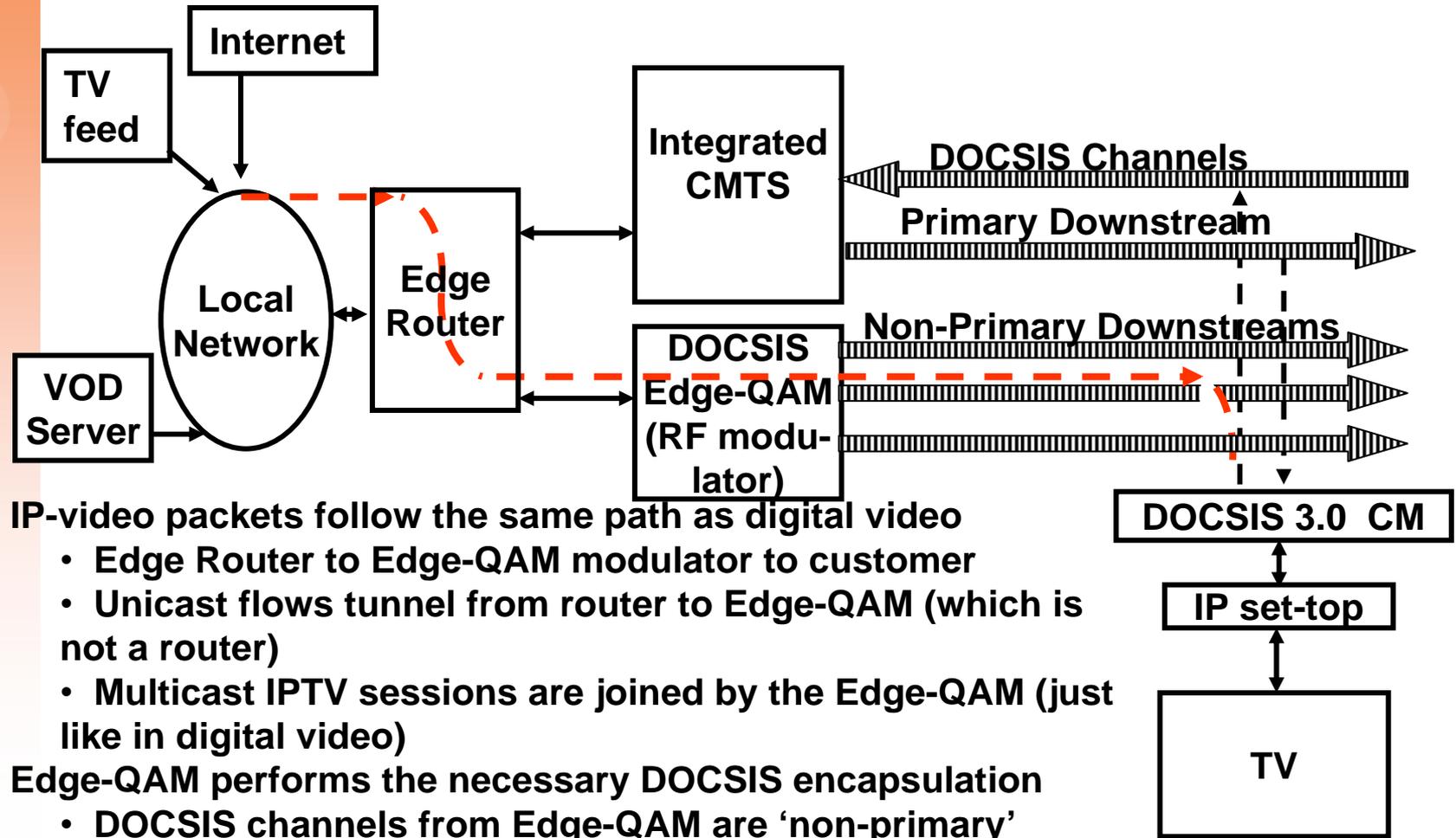
Architecture is more expensive than Digital Video



- Modular CMTS architecture introduces DOCSIS Edge-QAMs
 - Allows additional downstream channels to accommodate IP-video and IPTV without adding additional upstreams
- IP-video packets still transit the CMTS and edge router (twice)
 - Additional cost compared to digital video
 - Tunnel from CMTS to Edge-QAM



DOCSIS IP-video Bypass Architecture (DIBA) Reduces the cost of Digital Video



- IP-video packets follow the same path as digital video
 - Edge Router to Edge-QAM modulator to customer
 - Unicast flows tunnel from router to Edge-QAM (which is not a router)
 - Multicast IPTV sessions are joined by the Edge-QAM (just like in digital video)
- Edge-QAM performs the necessary DOCSIS encapsulation
 - DOCSIS channels from Edge-QAM are 'non-primary' meaning they do not have full MAC layer functionality

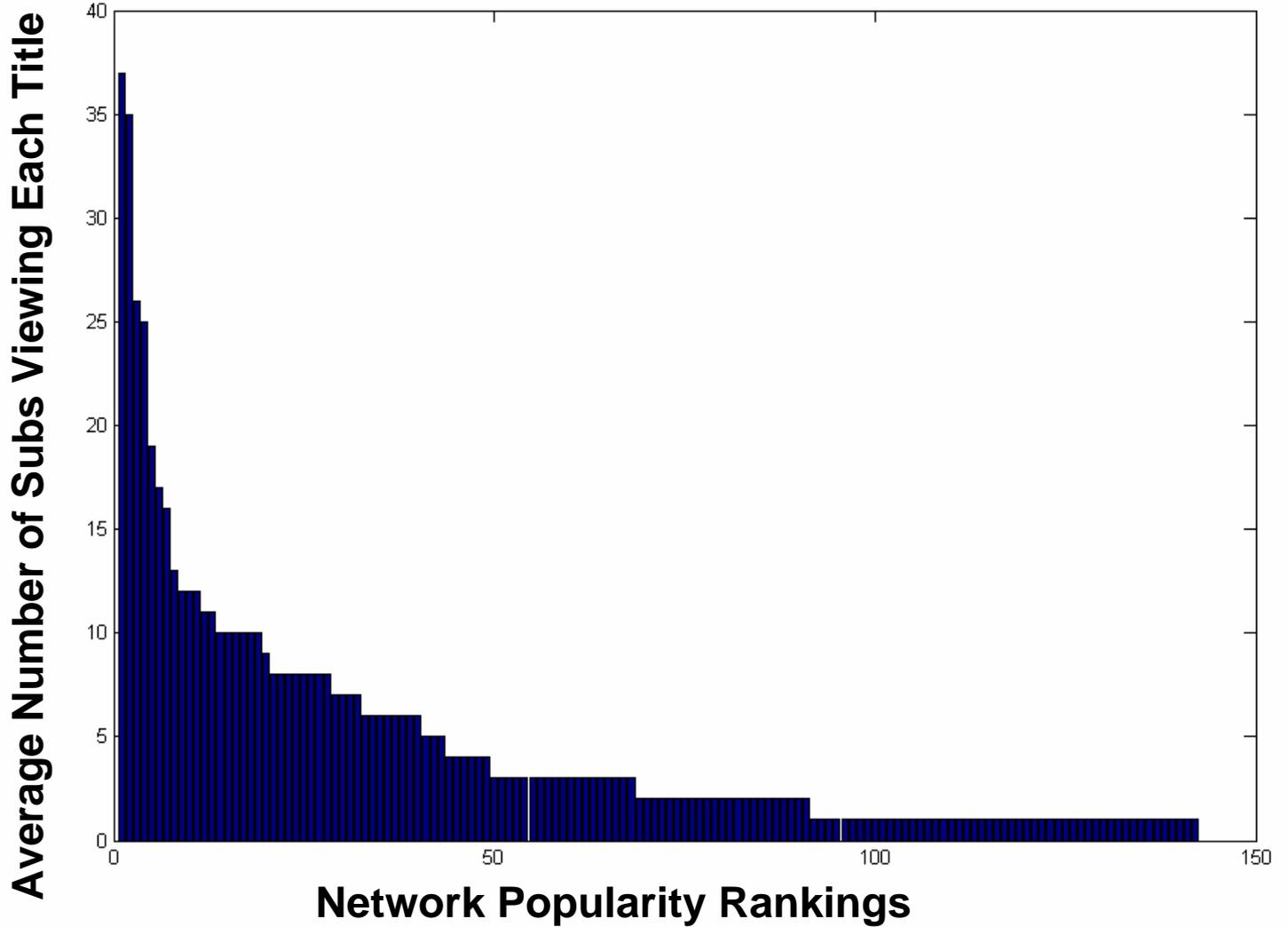


IPTV on DOCSIS with DIBA

- **Similar issues to Switched-Digital-Video**



Channel Popularity (i.e., ...NBC, CNN, ...TOON.....)



To conserve Bandwidth, IPTV is 'Switched' just like Switched Digital Video

The MSO wants to offer more networks (CNN, FOX, ...) than will physically fit into the available bandwidth

- The most popular titles (FOX, CNN, etc) are transmitted across the entire plant from one set of 'broadcast' modulators. This is the standard approach to digital broadcast.
- In addition, the plant is divided into serving areas (MAC domains), with sets of dedicated modulators for each serving area. These dedicated modulators are used for the SDV titles.
- The less popular titles (TOON, TVLand, etc) are switched. These titles are only transmitted to a serving area ("switched on") if at least one STB is tuned to that service.

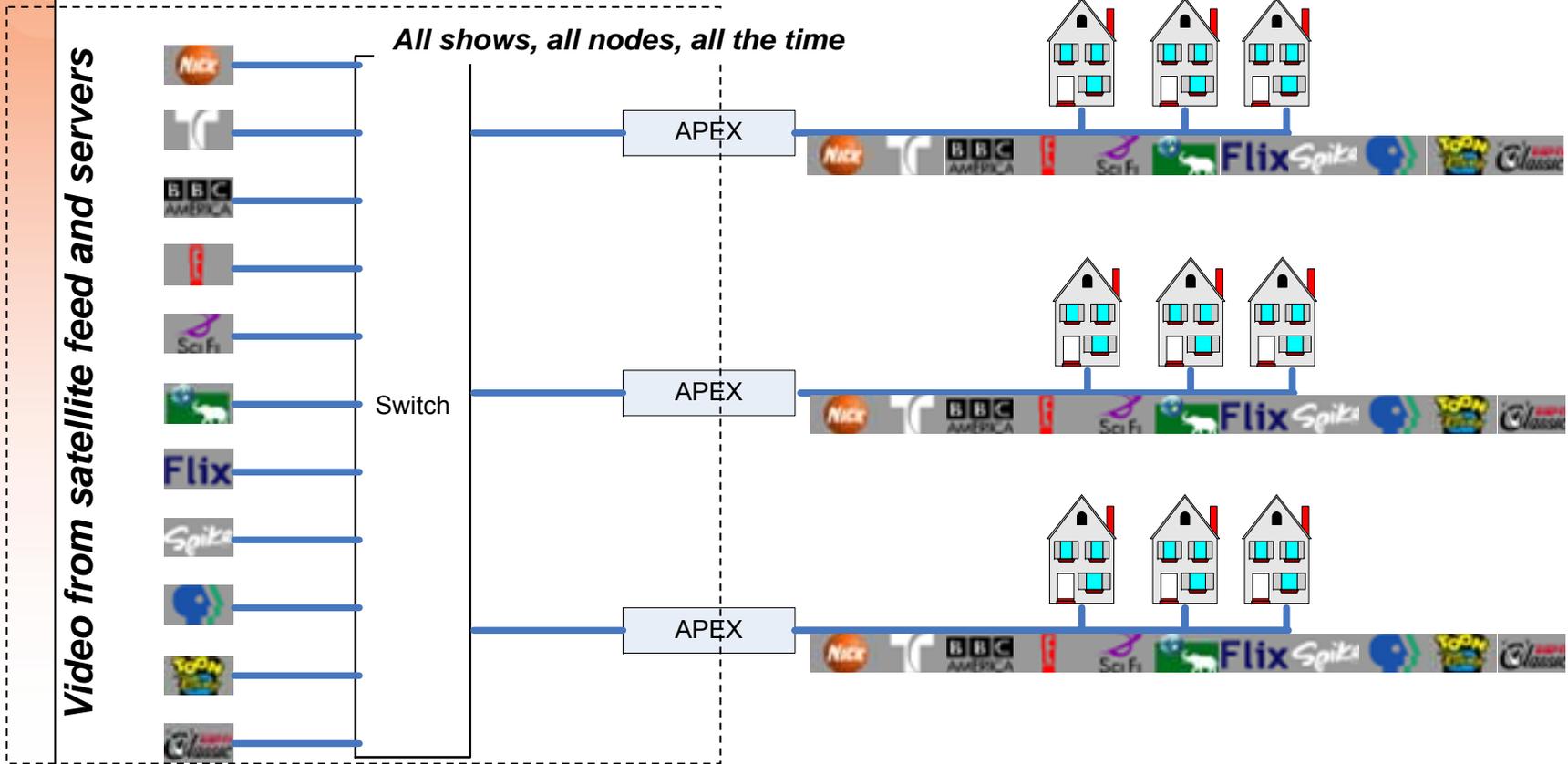


All Broadcast – Requires Too Much Bandwidth

All services go to all service areas, regardless of whether anyone is watching those services.

IP Multicast over Metro Network

Digital video over HFC plant

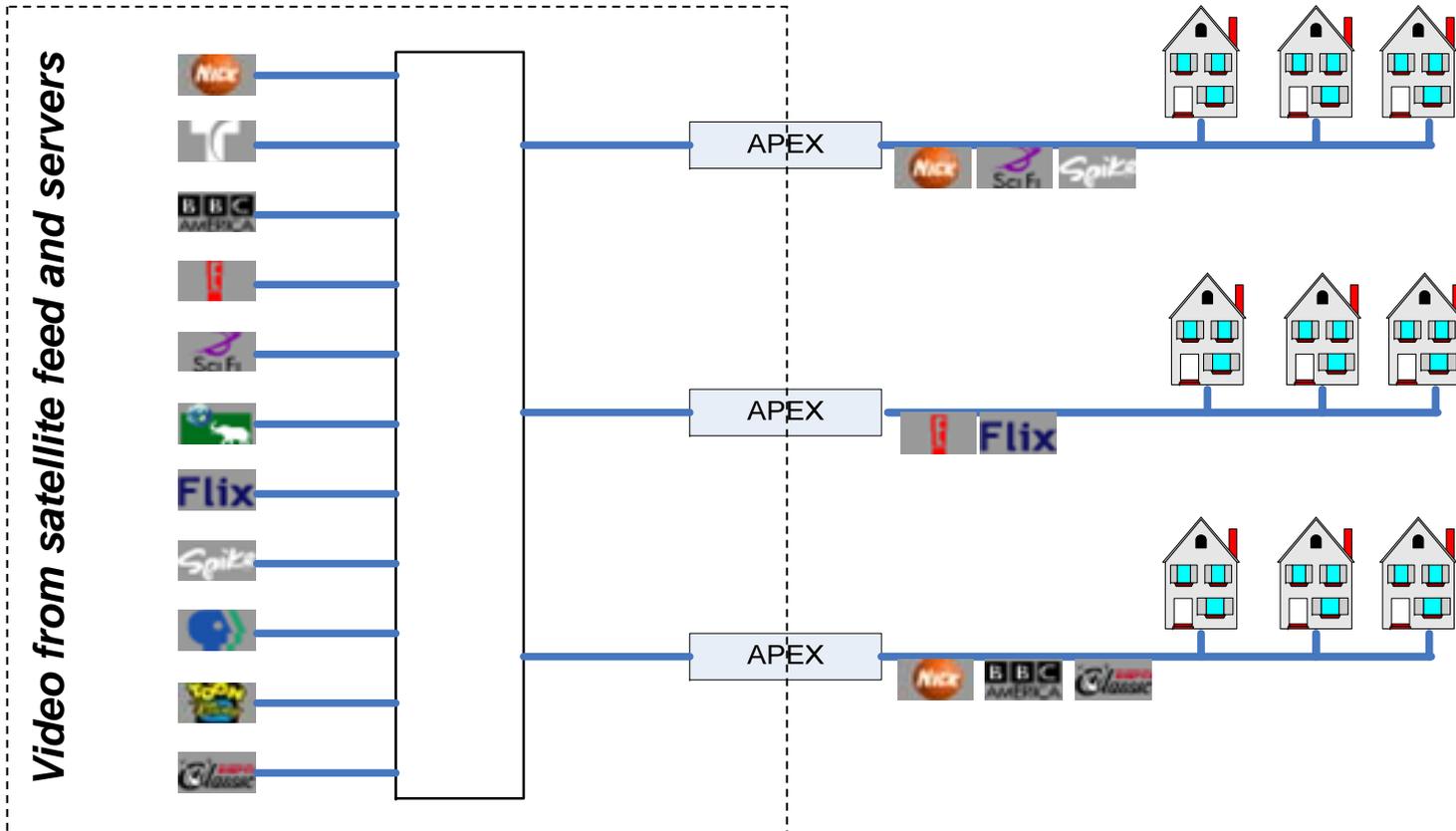


Switched Digital Video – Conserves Bandwidth

For switched services, only the services being watched in a particular service group are transmitted.

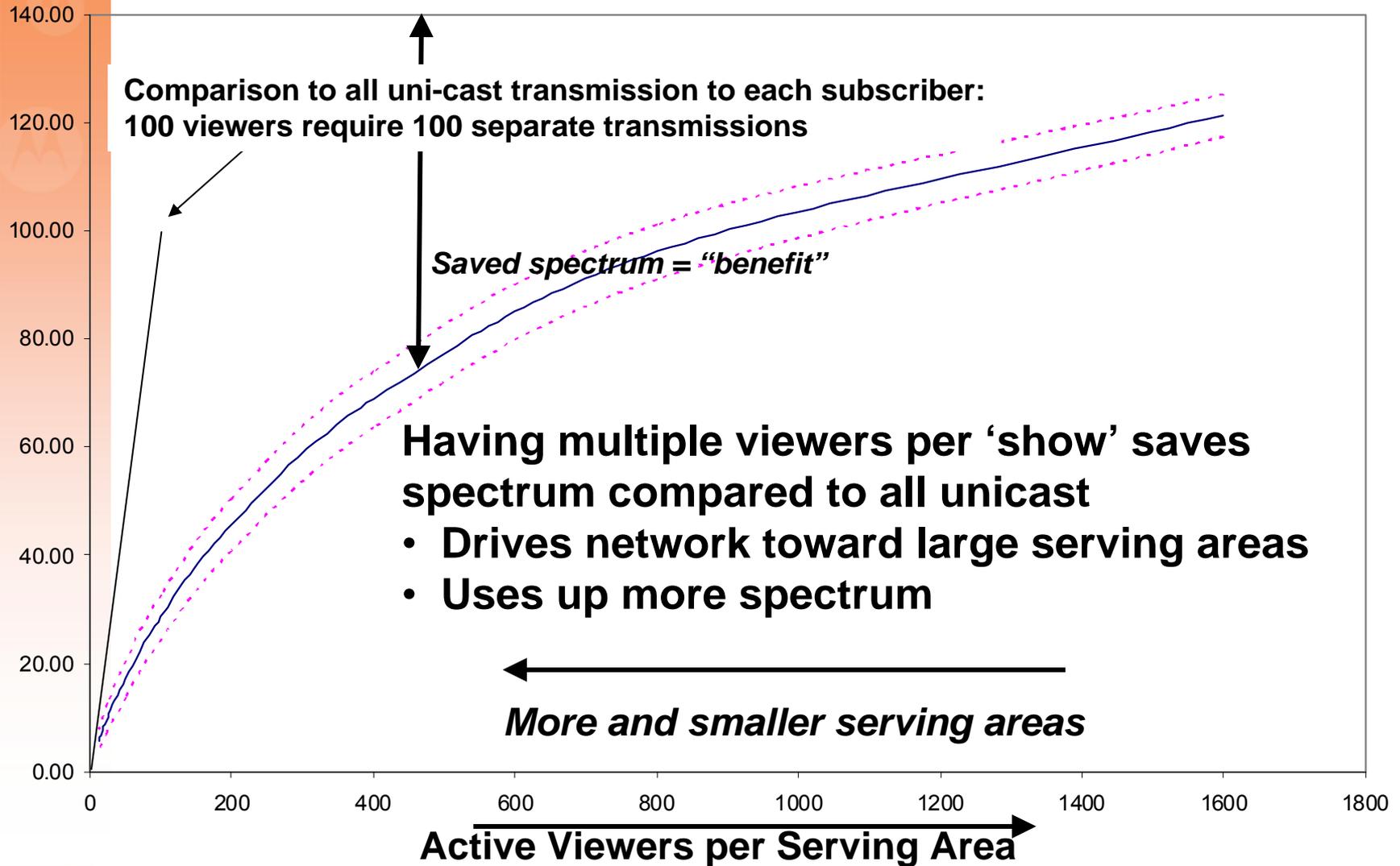
IP Multicast over Metro Network

Digital video over HFC plant



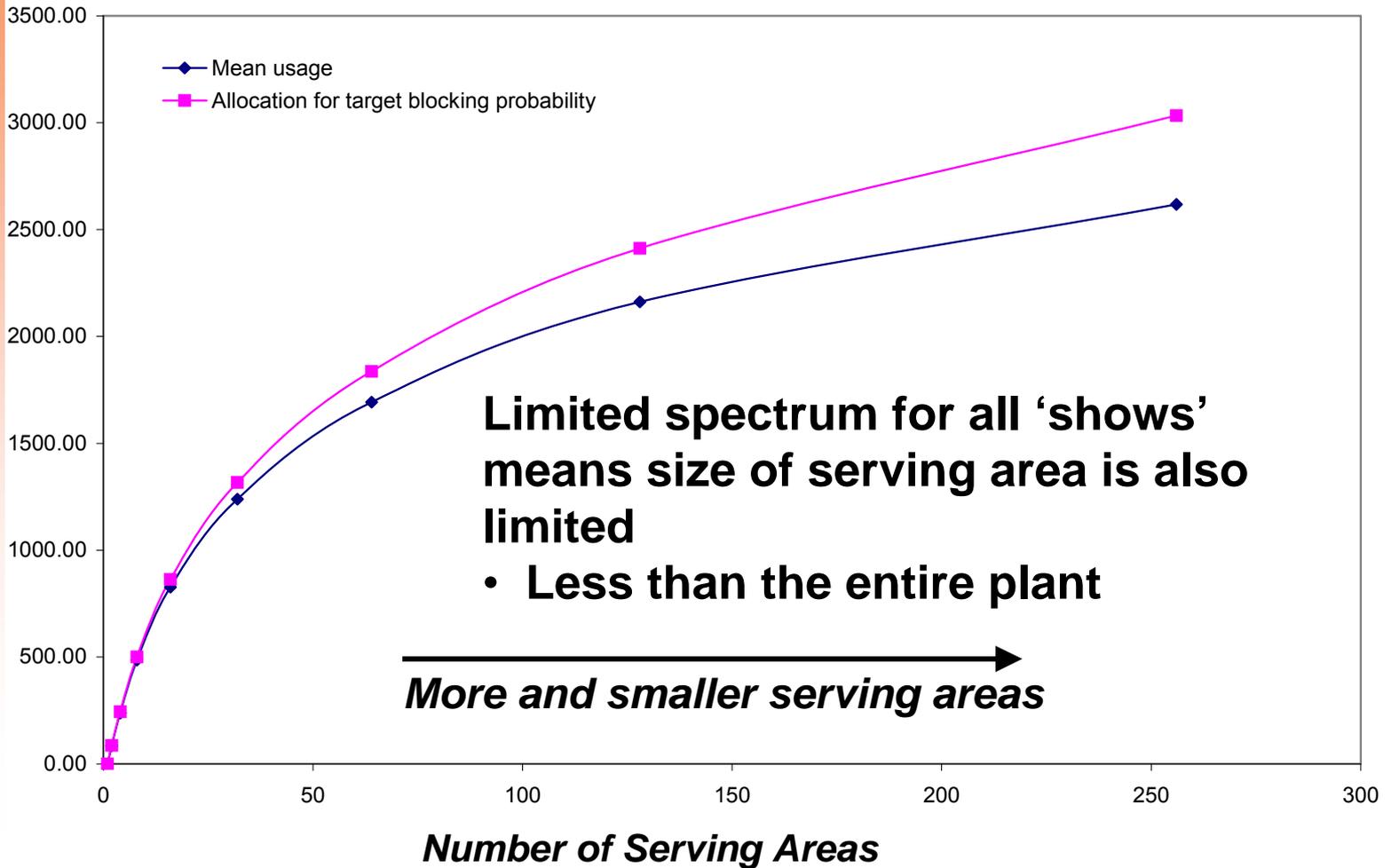
Total SDV titles to each serving area, versus number of active subs.

Average Transmitted Titles per Serving Area

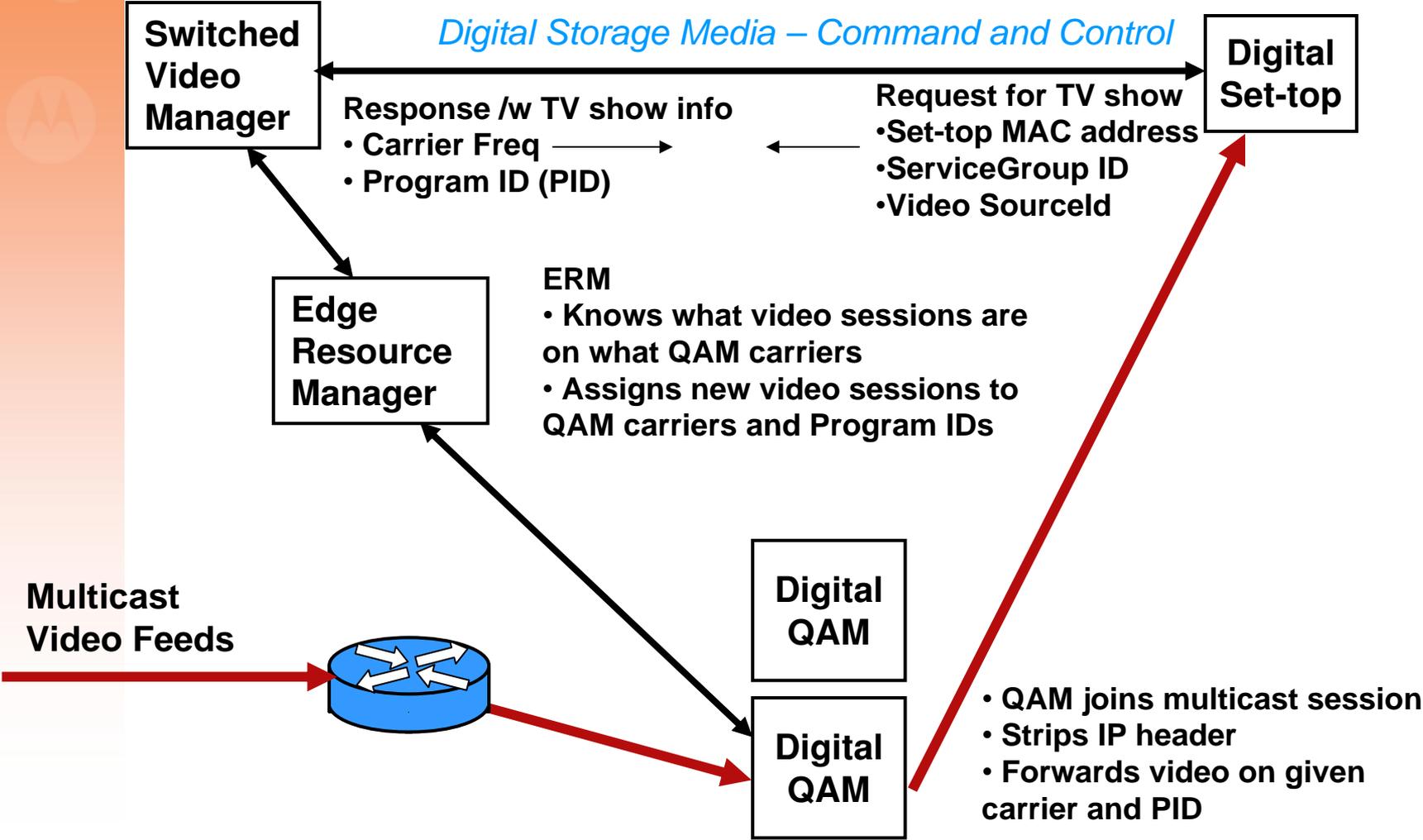


“Cost” = Number of ‘extra’ QAMs required due to same SDV content being transmitted to multiple serving areas by different modulators

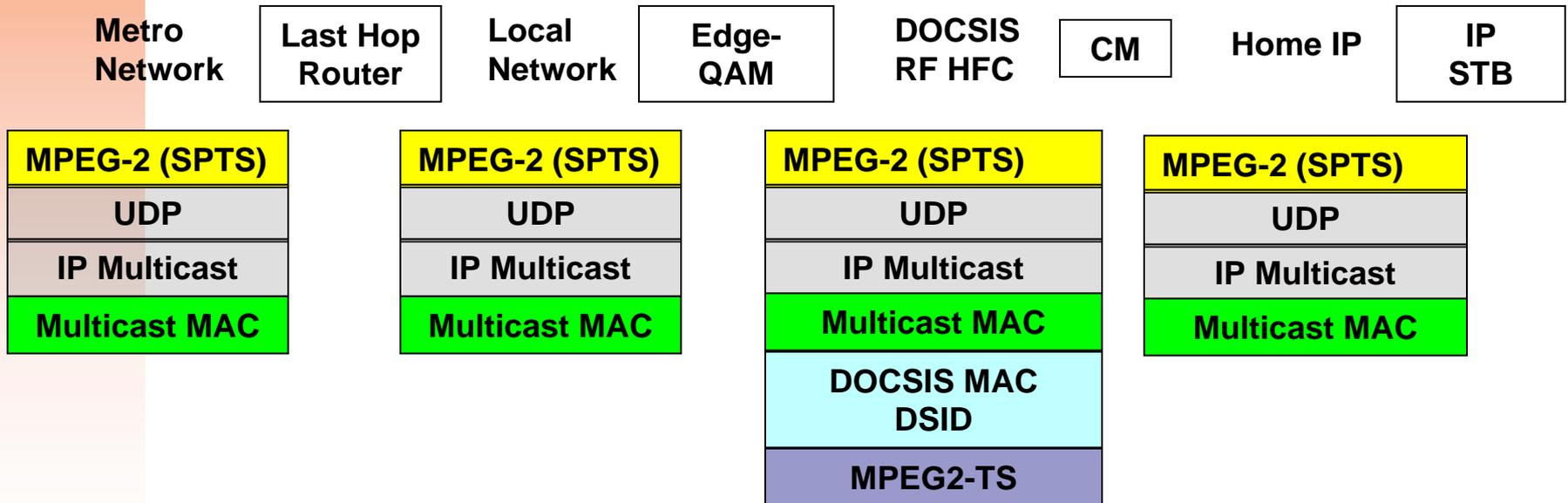
Cost = Extra QAMs Required



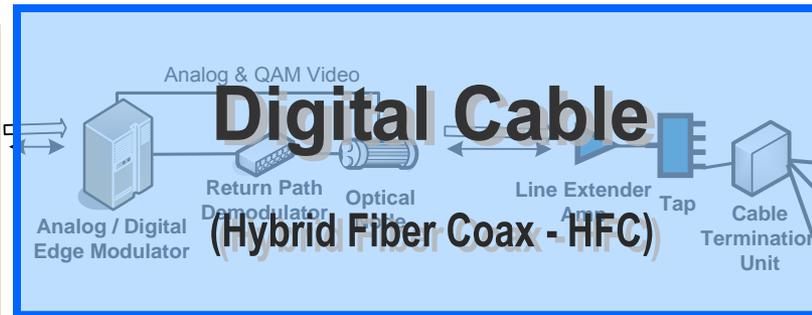
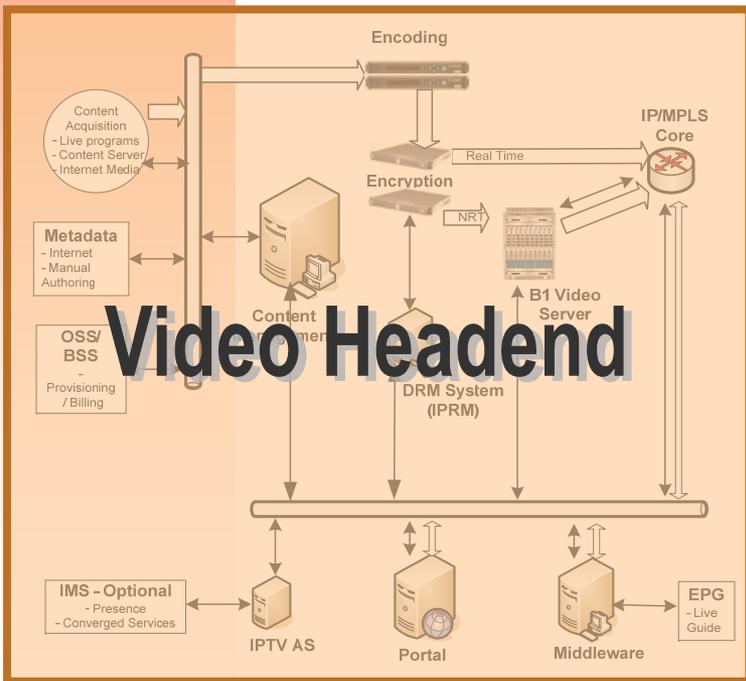
Switched Digital Video Signaling



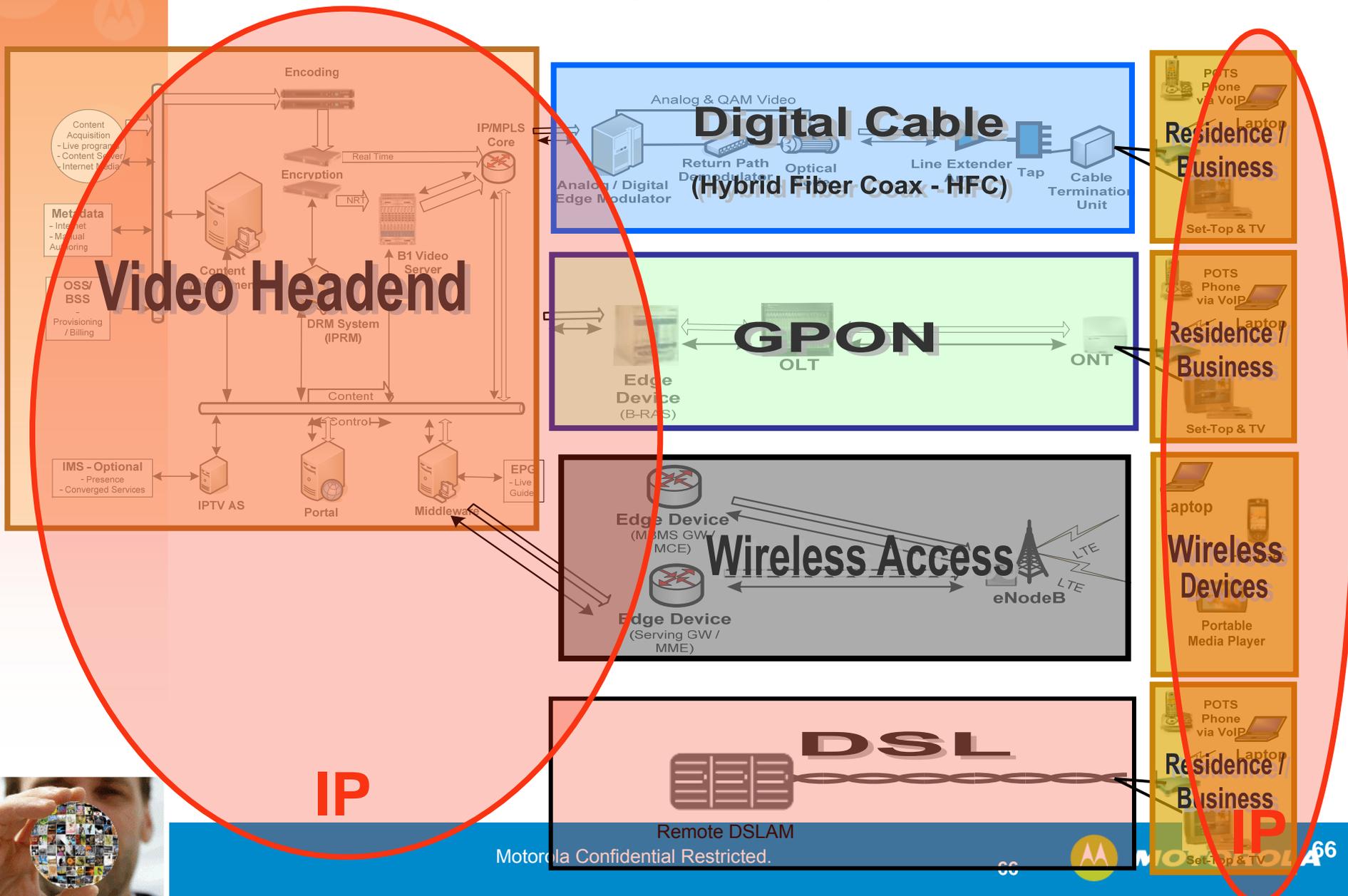
DIBA Encapsulation of IP Multicast



Current E2E Video Ecosystem

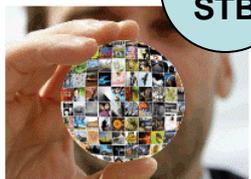
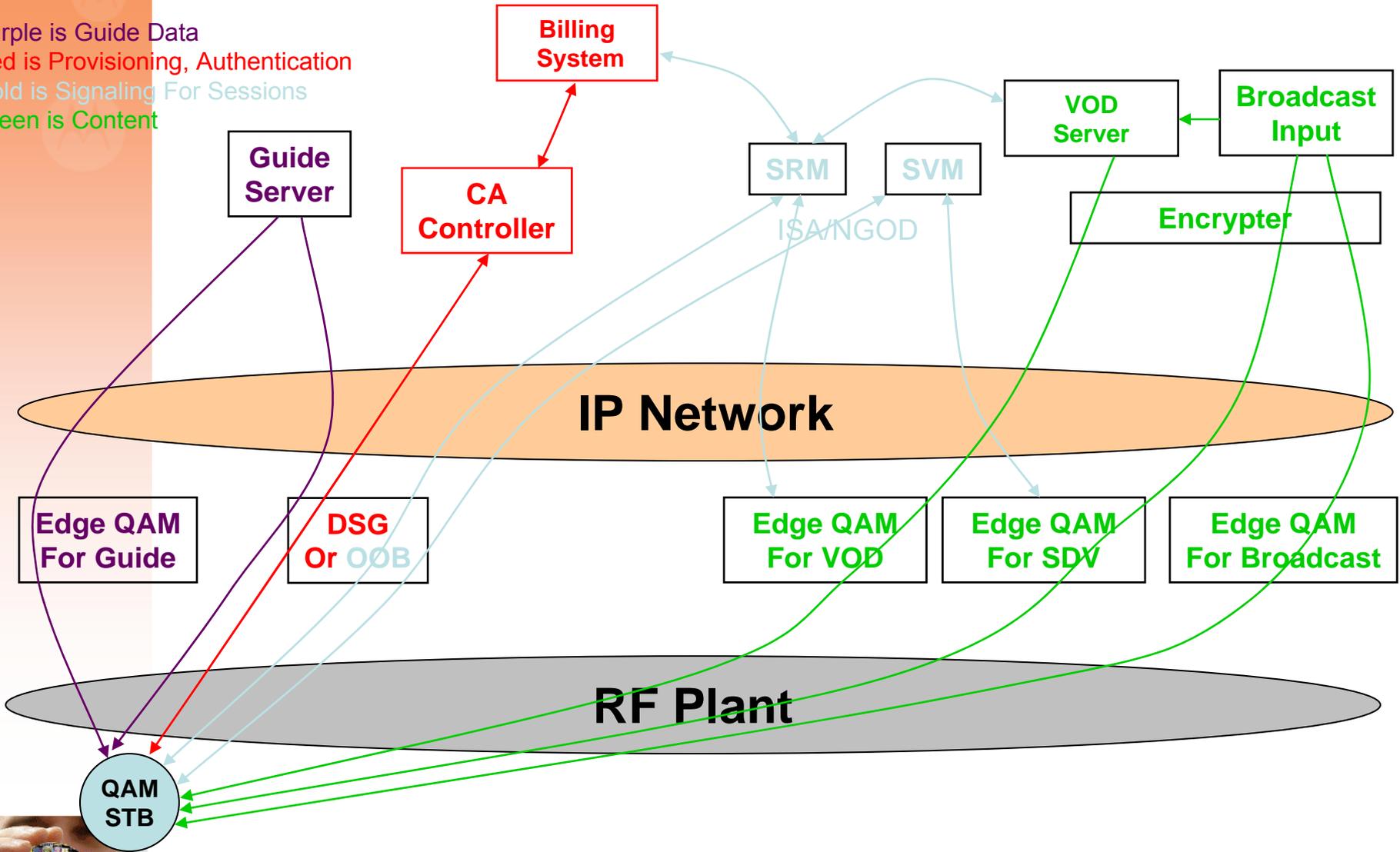


Motorola's Vision of the Evolved Ecosystem: Mostly IP today



MSOs Migrating to IP Core, QAM at the Edge

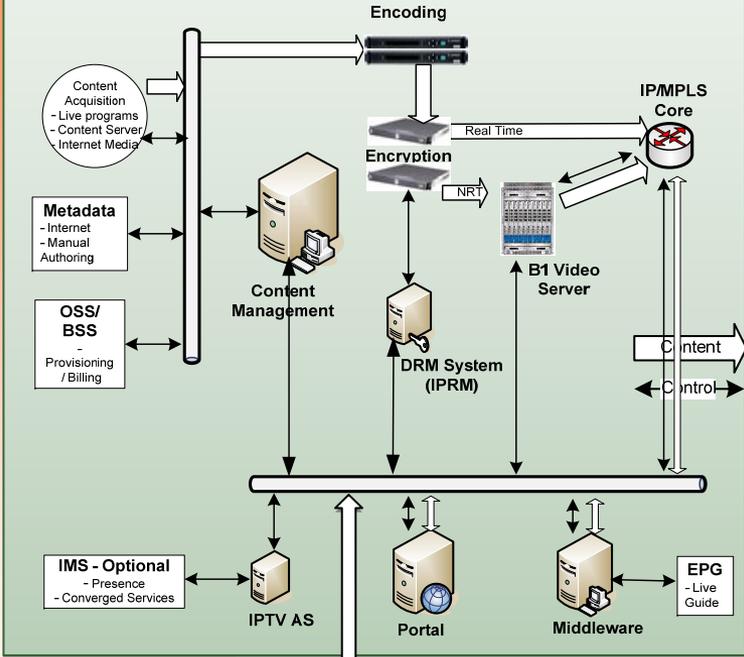
Purple is Guide Data
 Red is Provisioning, Authentication
 Gold is Signaling For Sessions
 Green is Content



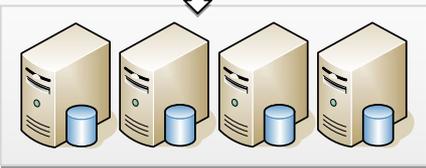
Motorola's Video Ecosystem

Goal: Add IPTV / DOCSIS. Solution: DIBA

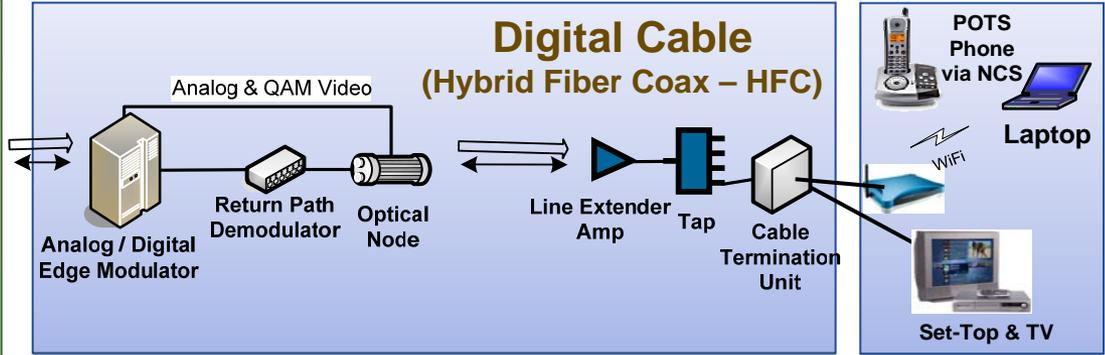
Common Digital Video Headend



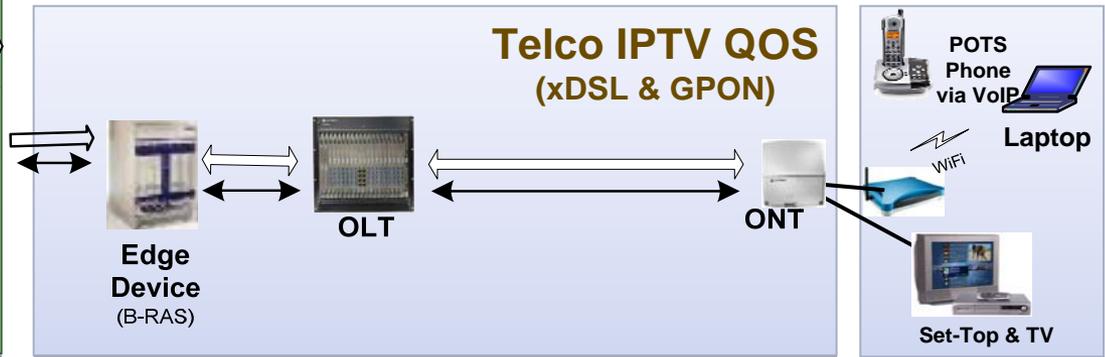
Core Services Framework (Applications cluster/Back Office)



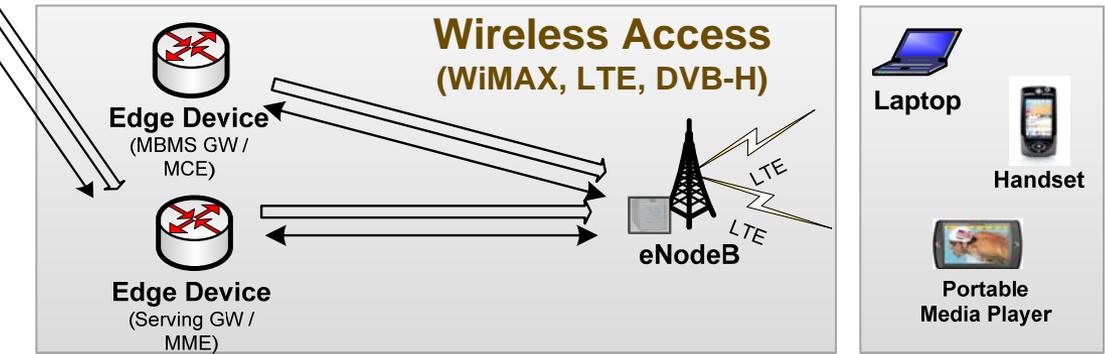
Digital Cable (Hybrid Fiber Coax - HFC)



Telco IPTV QoS (xDSL & GPON)



Wireless Access (WiMAX, LTE, DVB-H)



Provider and Platform Independence at the NCTA '09 Show in Washington, DC.

