IPTV
Technology, Trends and Challenges

EE233 Class Presentation

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Bala Pesala

Outline

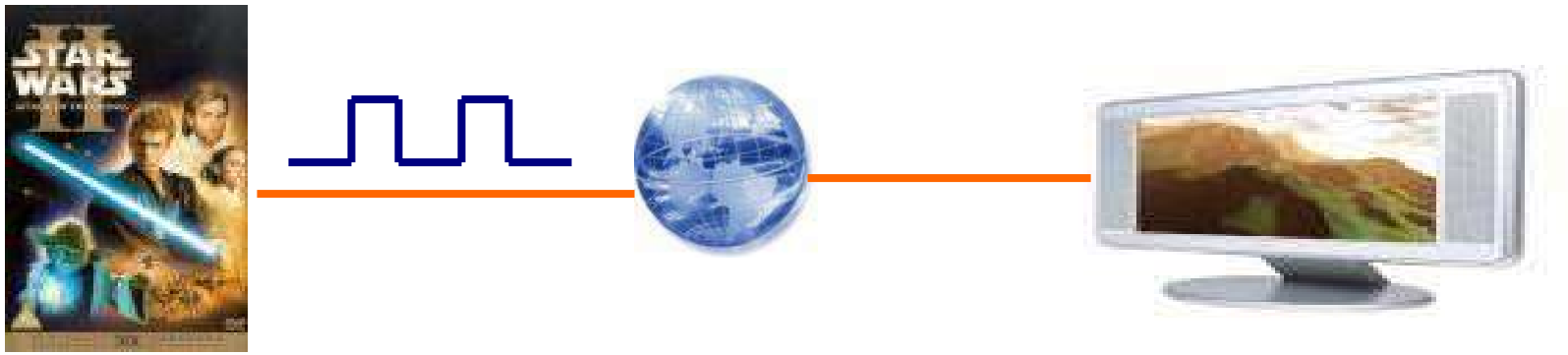
The “WWW” of IPTV

- What is IPTV ?
- Why IPTV ?
- When IPTV ?

What is IPTV

IPTV: Internet Protocol Television

Television through Internet



Why IPTV

The “AAA” of what consumers want ??

Content

Any where

Any time

Any device

Why IPTV ?

Digitizing the info enables the AAA's easily

Source Sanford Bernstein & Co.

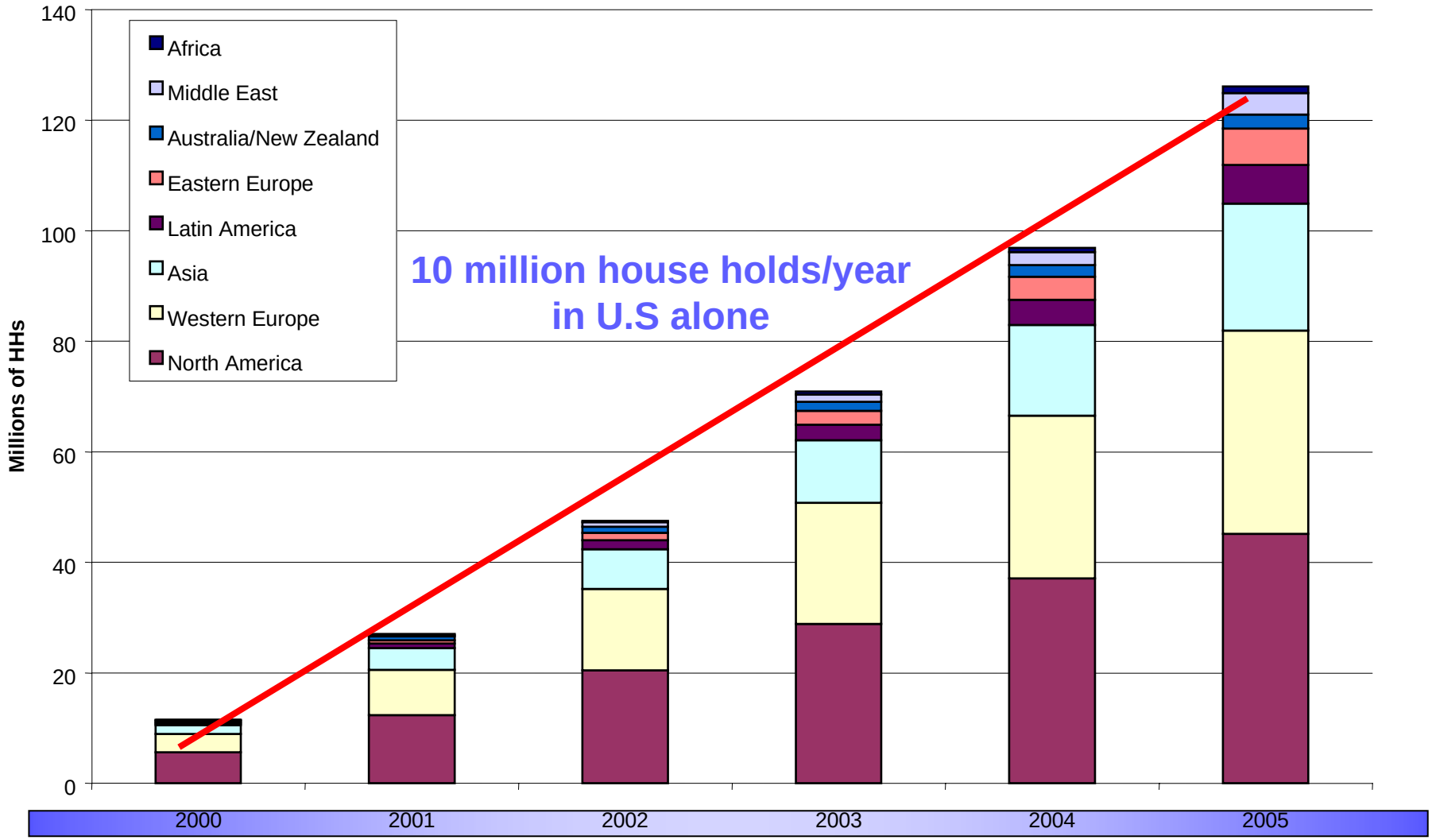
Why IPTV ?

Imagine a World

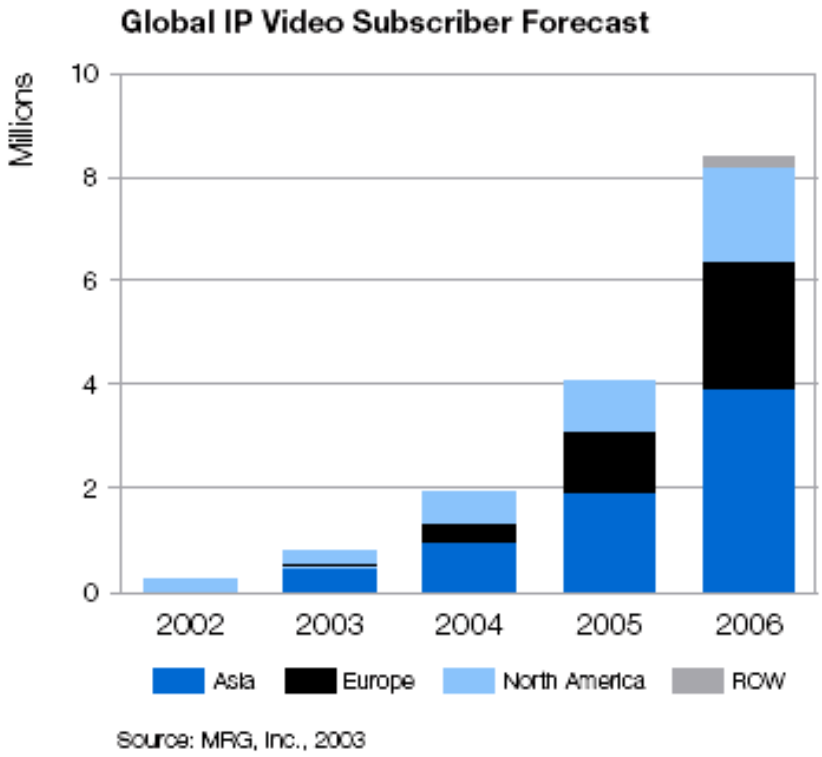
- Video on Demand with hundreds of Channels
- Interactive program guide
- Picture-in-Picture
- Search Functionality
- Event Notification
- Integrated Caller I.D.
- Integration w/ Data
- Multiple Angle/Pictures

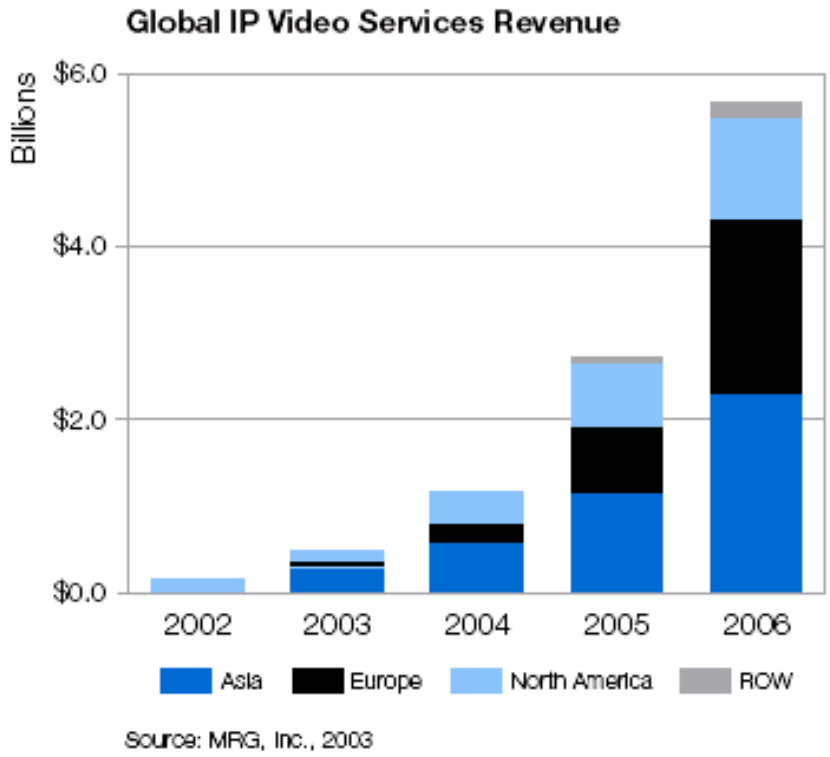
SBC/AT&T IPTV
Demonstration of Key Features

Worldwide Broadband Households by Region



IPTV Market


Global IP Video Subscriber Forecast
Millions
10
8
6
4
2
0
2002
2003
2004
2005
2006
Asia
Europe
North America
ROW
Source: MRG, Inc., 2003


Global IP Video Services Revenue
Billions
$6.0
$4.0
$2.0
$0.0
2002
2003
2004
2005
2006
Asia
Europe
North America
ROW
Source: MRG, Inc., 2003

Recent IPTV Roll outs

AT&T

- Offering IPTV to consumers in the San Antonio, Texas market.
- 200 channels, including ESPN, HBO, Disney, MTV, and CNN, along with video-on-demand titles and set-top boxes with DVR capabilities.
- AT&T also plans to allow customers with video-enabled cell phones to watch programs stored at home through a digital video recorder.
- In addition AT&T began offering fiber-based, high-speed Internet, but the fiber is not extended to homes,.

VERIZON

- Began offering its fiber-based FiOS TV service in seven communities in North Texas
- Verizon expects to have 400,000 subscribers in the North Texas area -- more than one million potential viewers.

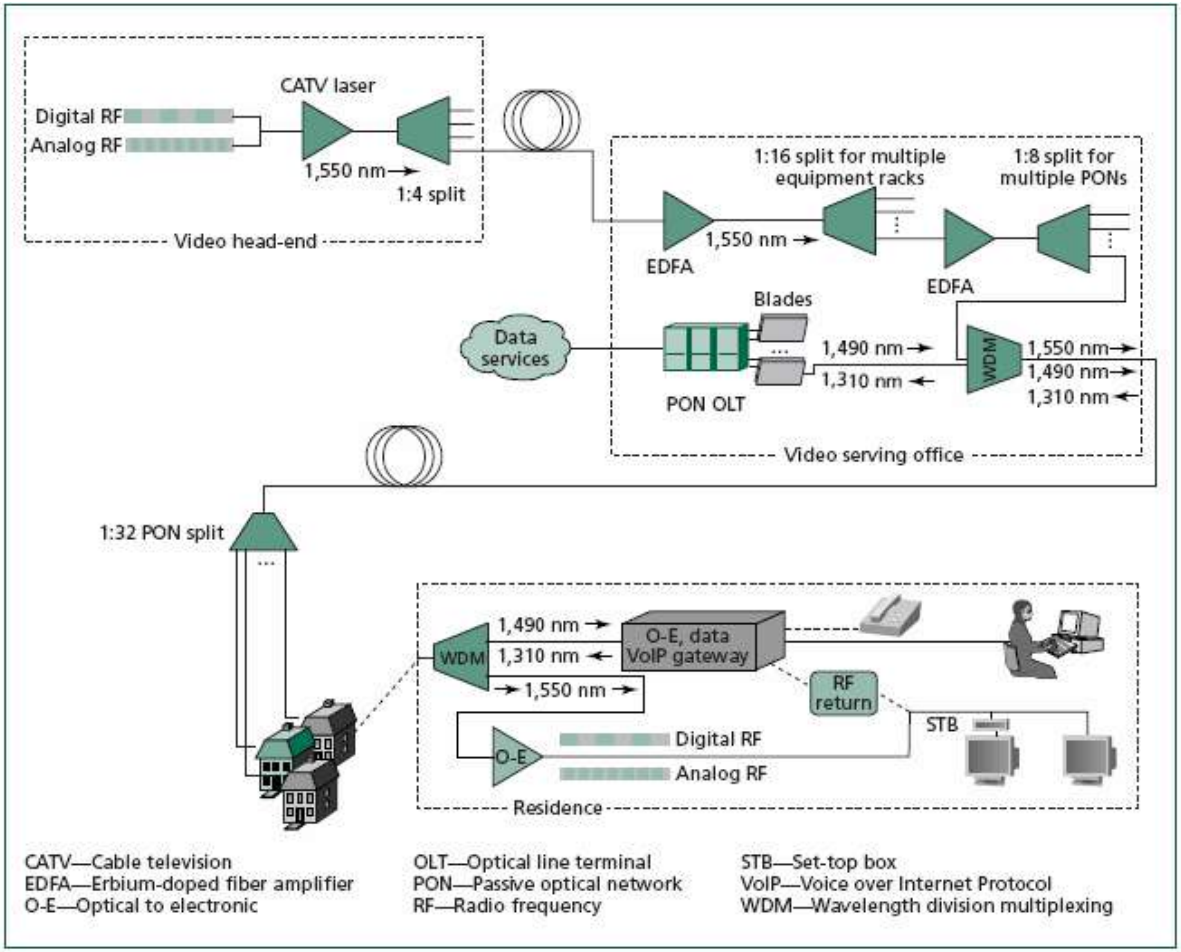
IPTV: TECHNOLOGY

What is IPTV?

- What is IPTV?
  - Uses broadband internet for delivery of television programming.
- How is it different?
  - Digitally switched architecture, ***NOT*** channel based.
  - No tuning. Set top box (STB) decodes IP video. Content delivered as needed.
  - Interactive, personalized, robust.
- VOD vs IPTV

  IPTV is a type of VOD service

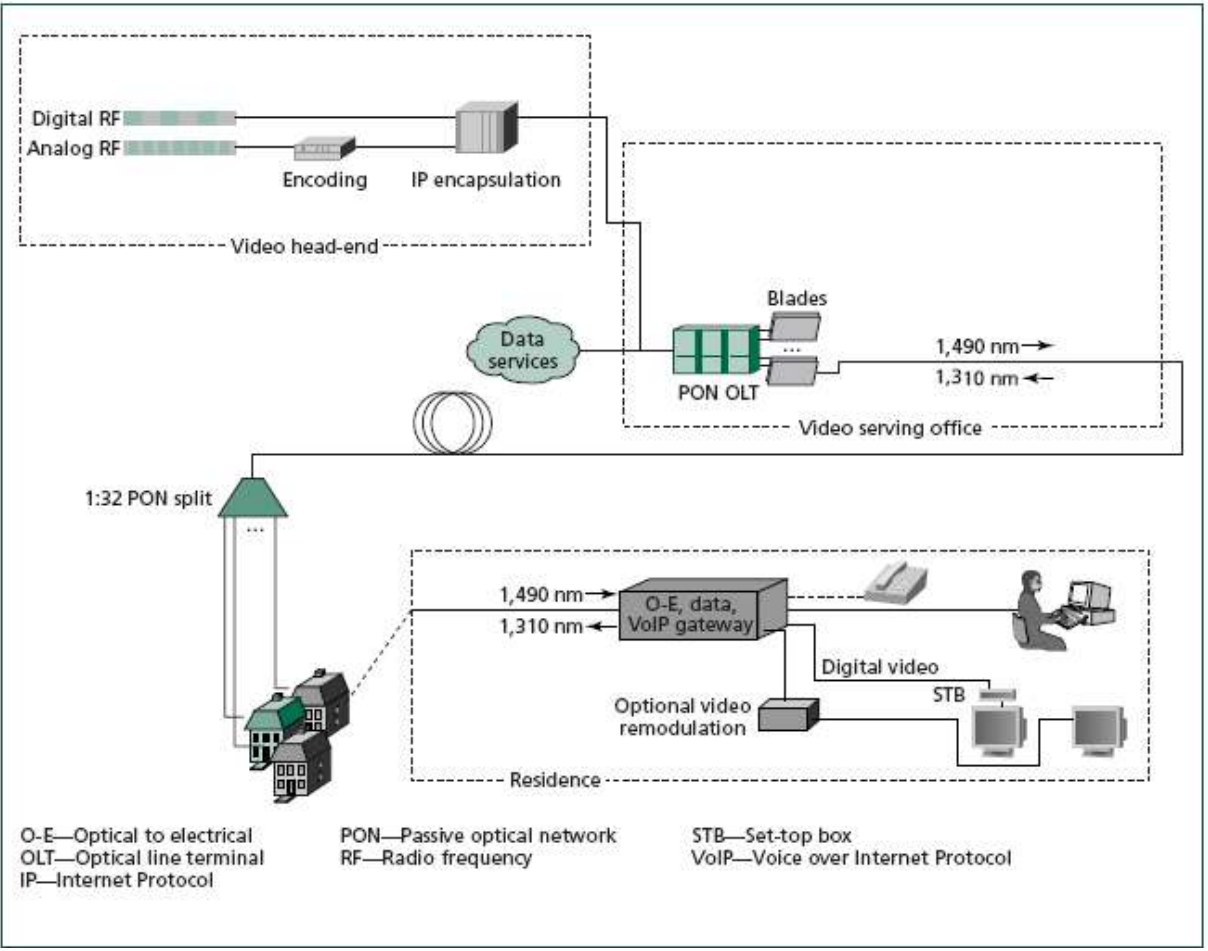
CATV Architecture (e.g. PON RF overlay)



- 54-870 MHz spectrum with 6 MHz bandwidth (~134 potential carriers)
  - Lower 65: analog
  - Upper 65: digital
- Entire bandwidth delivered to homes

Van Veen, et al. Bell Labs Technical Journal, 10 (1), 181-200 (2005)

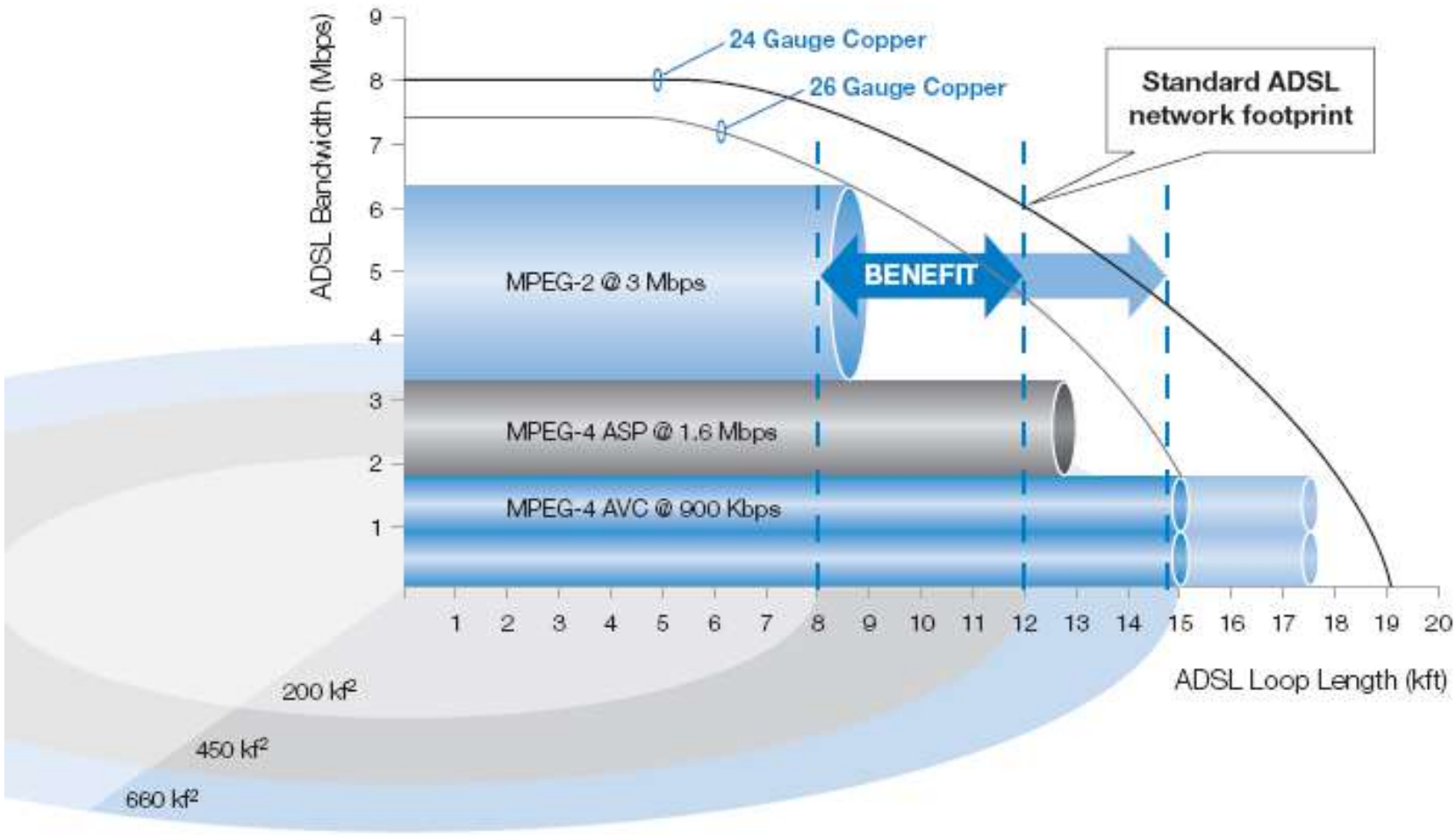
IPTV Architecture



- Signals encoded and multicast via IP packets
- Digital encoding and decoding required
- Eliminate CATV lasers and EDFAs
- Efficient bandwidth use

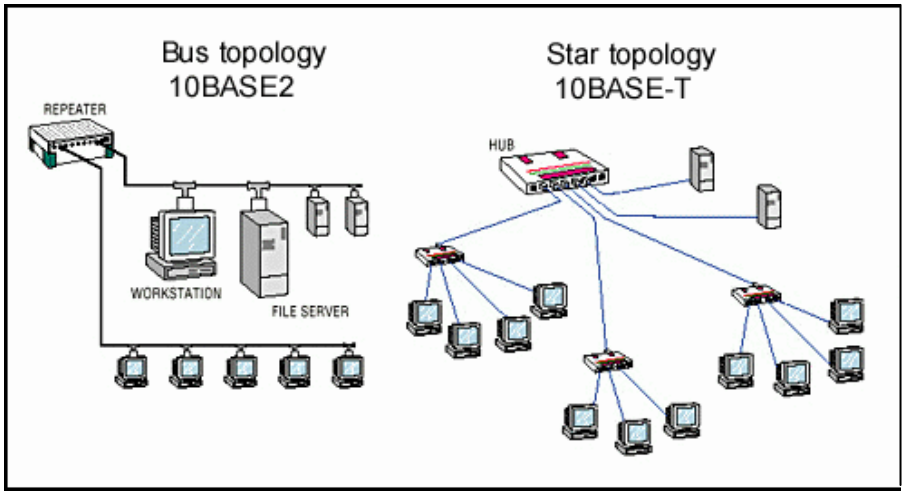
Van Veen, et al. Bell Labs Technical Journal, 10 (1), 181-200 (2005)

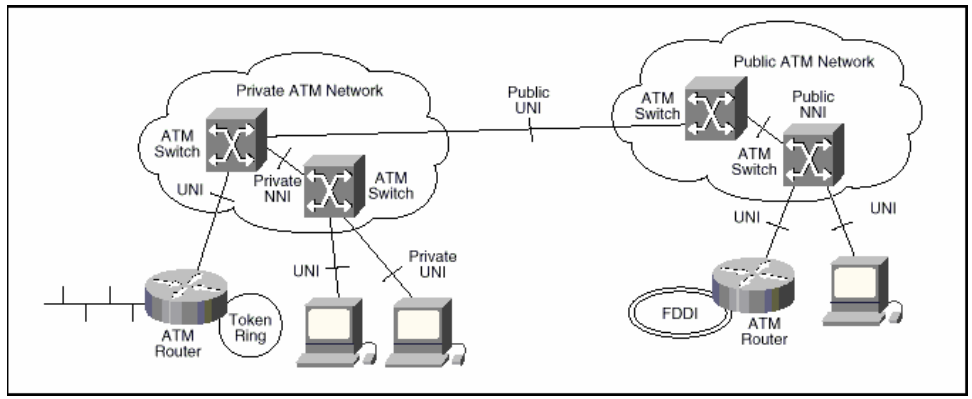
Bandwidth Vs Length



IPTV Broadcast Technologies

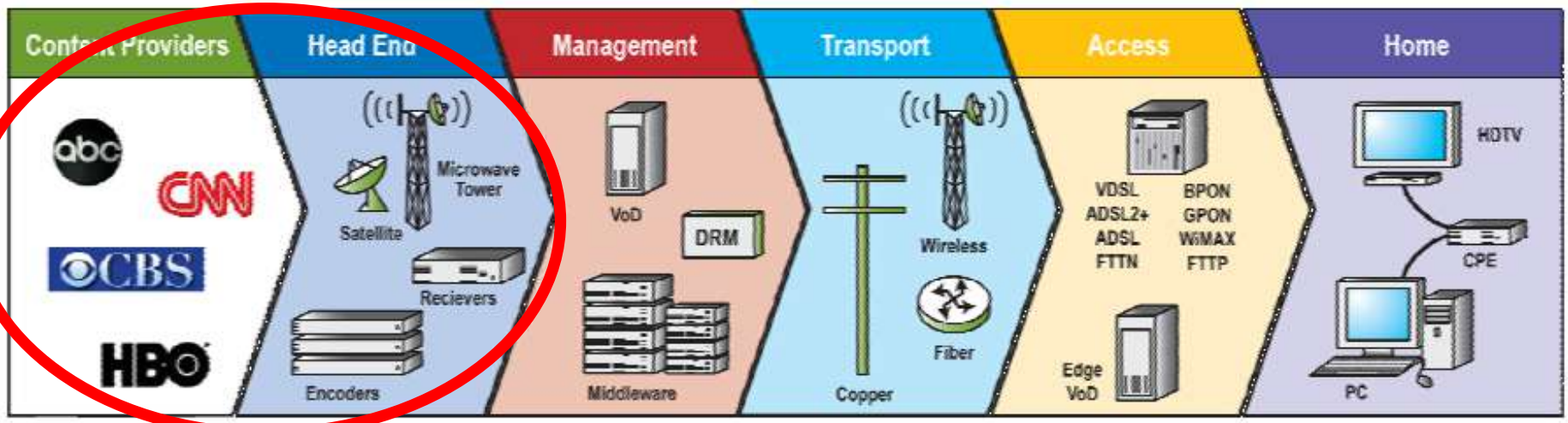
- Ethernet vs ATM (Asynchronous Transfer mode)





- Ethernet is dominant LAN technology while ATM is used in Internet Backbones
- ATM is a solution that fits all: WAN/MAN/LAN and offers higher QOS (Quality of Service)
- ATM is a complex technology that needs higher installation times and is also more costly

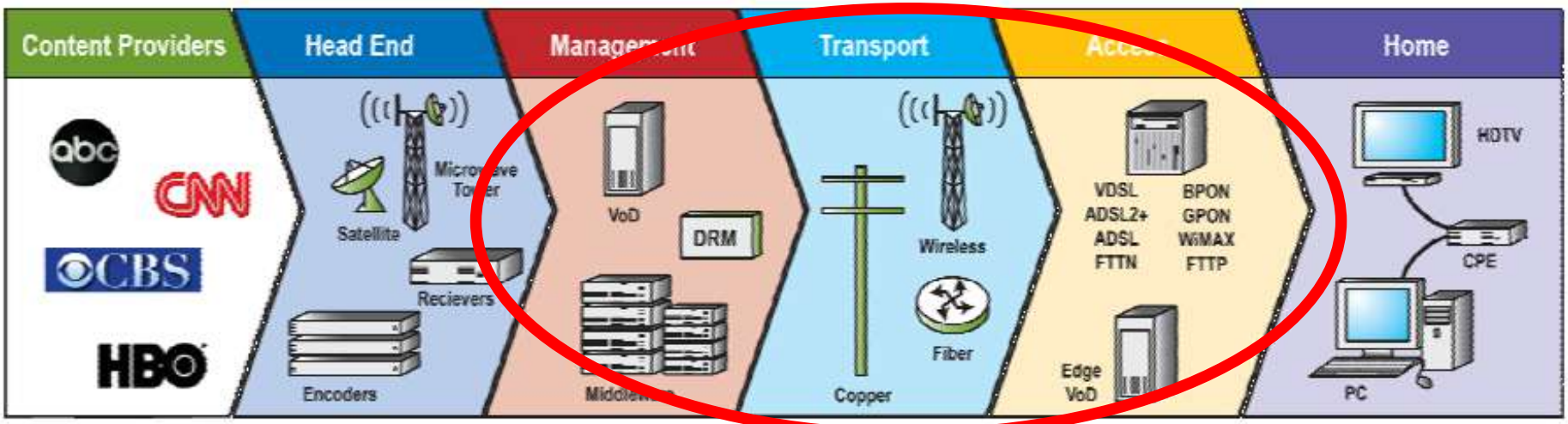
Technological Overview



Supportsoft, "IPTV- The Clear Picture"

- National Headend
  - Pulls content from satellite and encodes video stream to compressed IP packets
  - Telco ownership of entire system ensures QoS
  - Multicast to local offices
    - Forward Error Correction to ensure delivery of packets

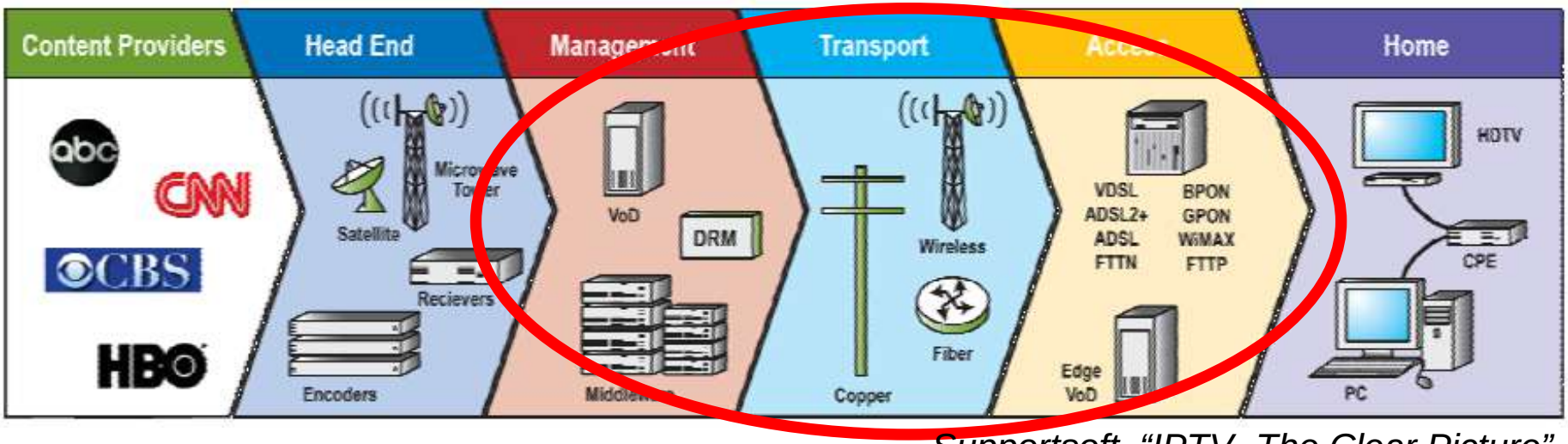
Technological Overview



Supportsoft, "IPTV- The Clear Picture"

- Local Office
  - Mixes in local tv stations, advertising, VOD
  - Middleware handles
    - User authentication
    - Channel change requests
    - Billing
    - VOD requests
  - Unicast VOD via Real Time Streaming Protocol (RTSP)

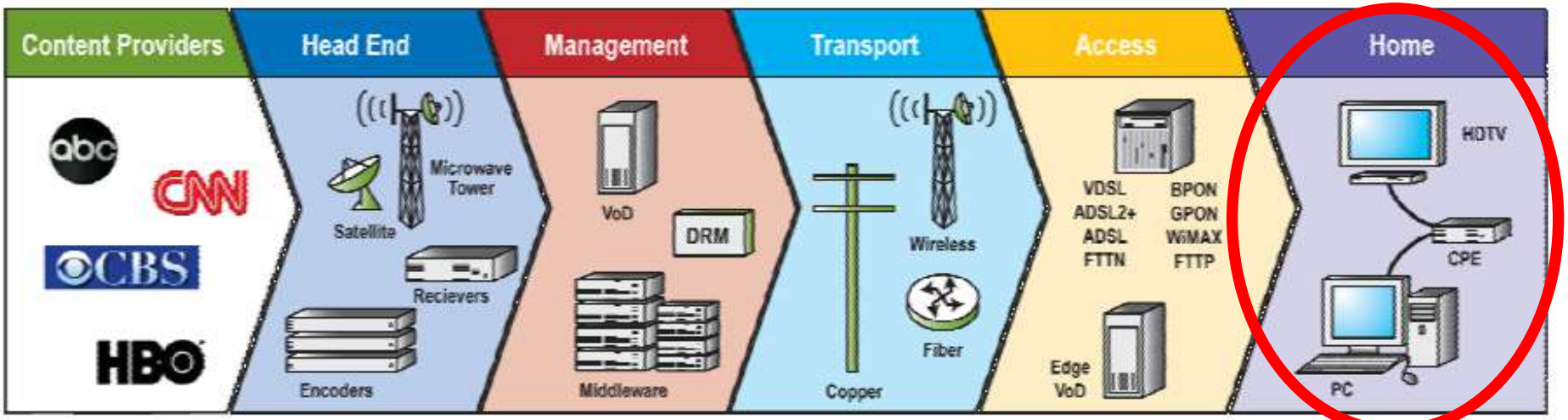
Technological Overview



Supportsoft, "IPTV- The Clear Picture"

- Local Office (continued…) - Bandwidth issues
  - Currently, AT&T offers 1.5-6Mbps high speed internet via DSL
  - Newest ADSL+ max bandwidth 25Mbps
  - Delivery of multiple streams (for PIP, multiple program recording, multi TV households) required
  - Standard definition TV
    - 1-1.5 Mbps in Windows Media encoding
    - 3.5 Mbps in MPEG-2
  - High definition TV
    - 7-8 Mbps in Windows Media encoding
    - 18-20 Mbps in MPEG-2
  - MAJOR upgrades to infrastructure are required and underway (e.g. FTTH)

Technological Overview



Supportsoft, "IPTV- The Clear Picture"

- End User – Set Top Box (STB)
  - Reassembles IP packets, decodes video
  - Communicates with local office
  - Change channels via IP Group Membership (IPGM v2) protocol to join multicast

IPTV: Economics

The IPTV Eco System

Content Provider (TV Channels)

Equipment Provider

Delivery Network

Software

Enabling Device

The Old TV Model

- Programs delivered through the cable or Satellite

How do different parties earn money ?

Content – Advertisement

Distribution – Subscription

Equipment/Device – one time Buy

So, what's wrong with this model ??

Not Movies with commercials but…
commercials loaded with bits of movies

It's a lose-lose situation for both content providers and consumers

John Wanamaker the pioneer of departmental store

"50% of my advertising expenditures are wasted. I just don't know which 50%"

Increased sales of PVR reinforces this point

Delivery Network for TV

- The old ways

  Cable or Satellite

- The new ways

  Phone line, Cable, Satellite, FTTH

The battle is on between the Cable companies and Telecom companies

Why the battle ??

- Every one wants a piece of others Pie

VoIPTV

Revenue from wired network and Long distance Calls

Telcos Vs Cables

Telcos

Advantages

- Huge installed network
- Trusted for it's QOS

Disadvantages

- Existing infrastructure is Low speed
- Need to obtain permissions from local communities to roll out service

Cable

Advantages

- Trusted delivery network for TV

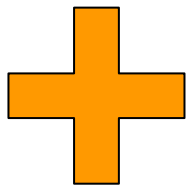
Disadvantages

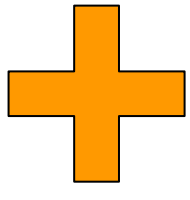
- Doesn't have huge installed base
- Cannot support the huge upfront investments

Cost

Triple Play of Services

- Offer three services for less than $100





VoIP

Internet

IPTV

Bottle Necks

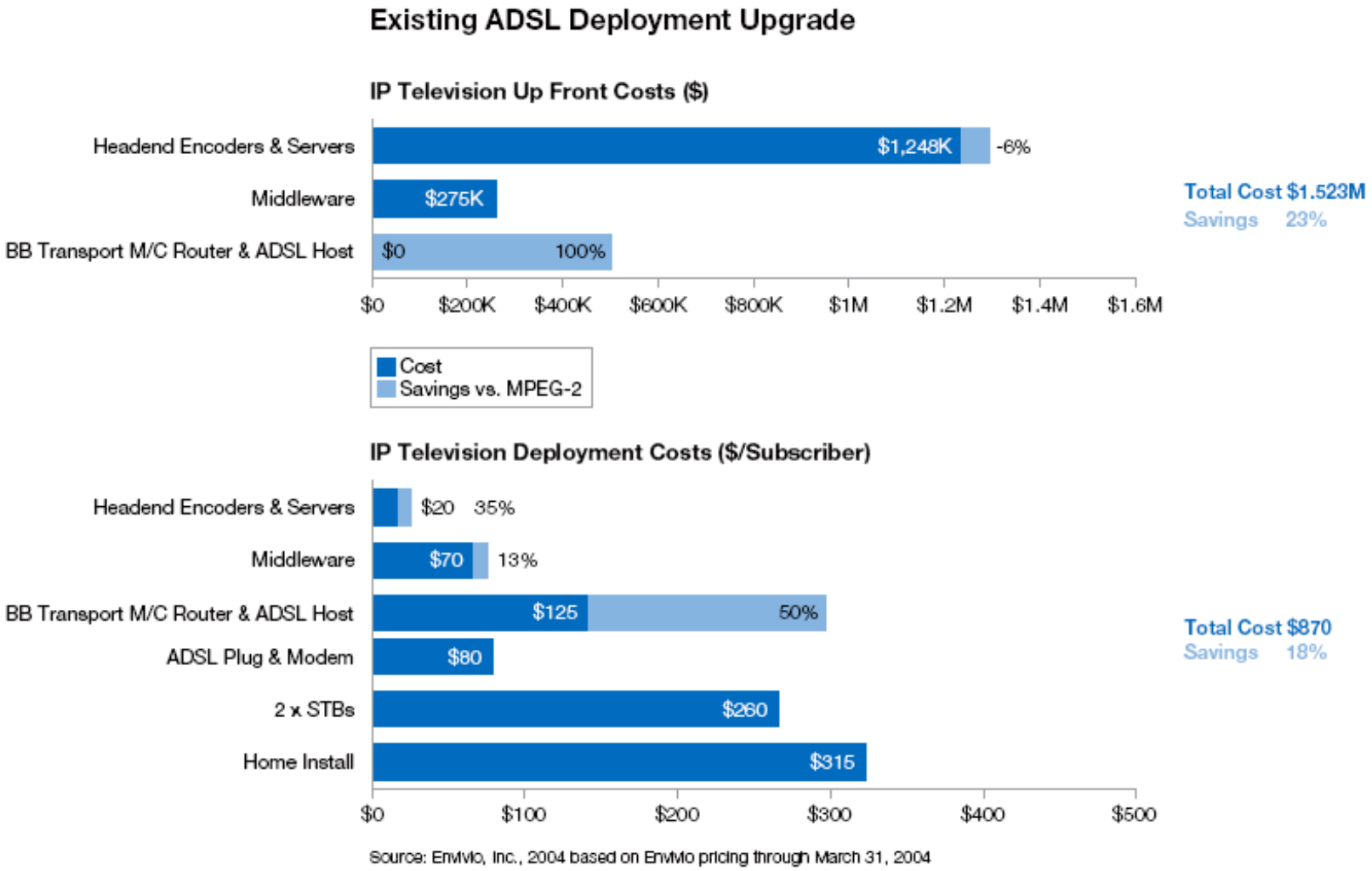
- Installation costs high
- Customer Service

  European market research estimates that it costs €15-17 (US$18-20) for every customer call to a Customer Service Representative (CSR).
- DRM (Digital Rights Management)
- New coding schemes to support high definition TV channels

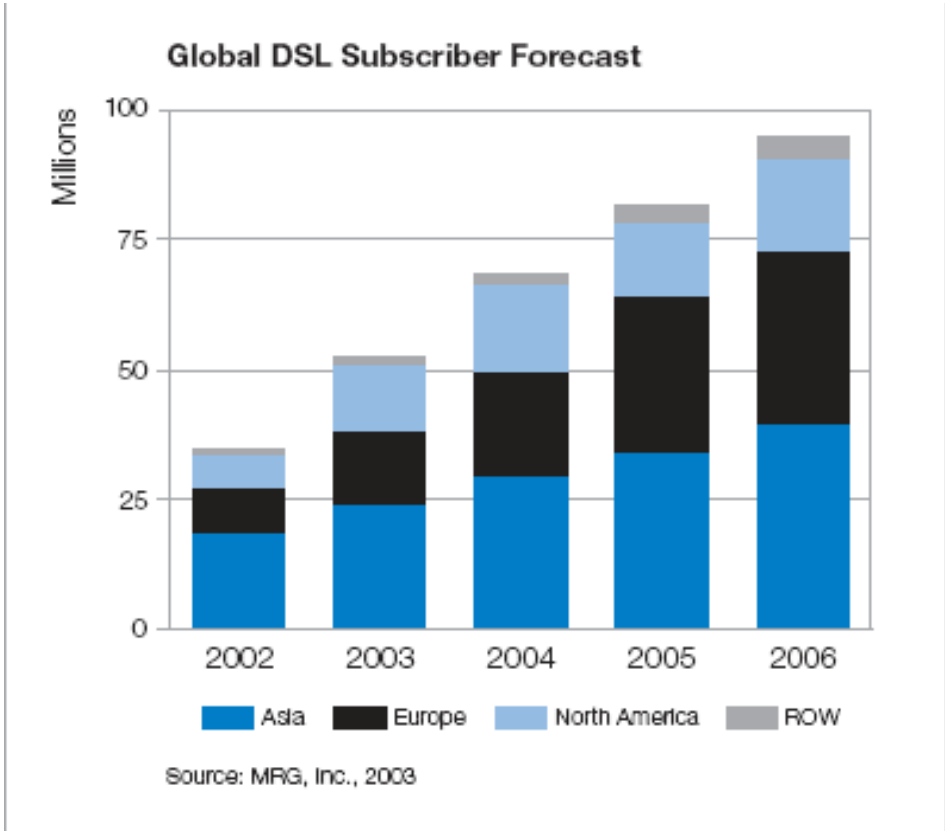
Thank You !!

Questions ??

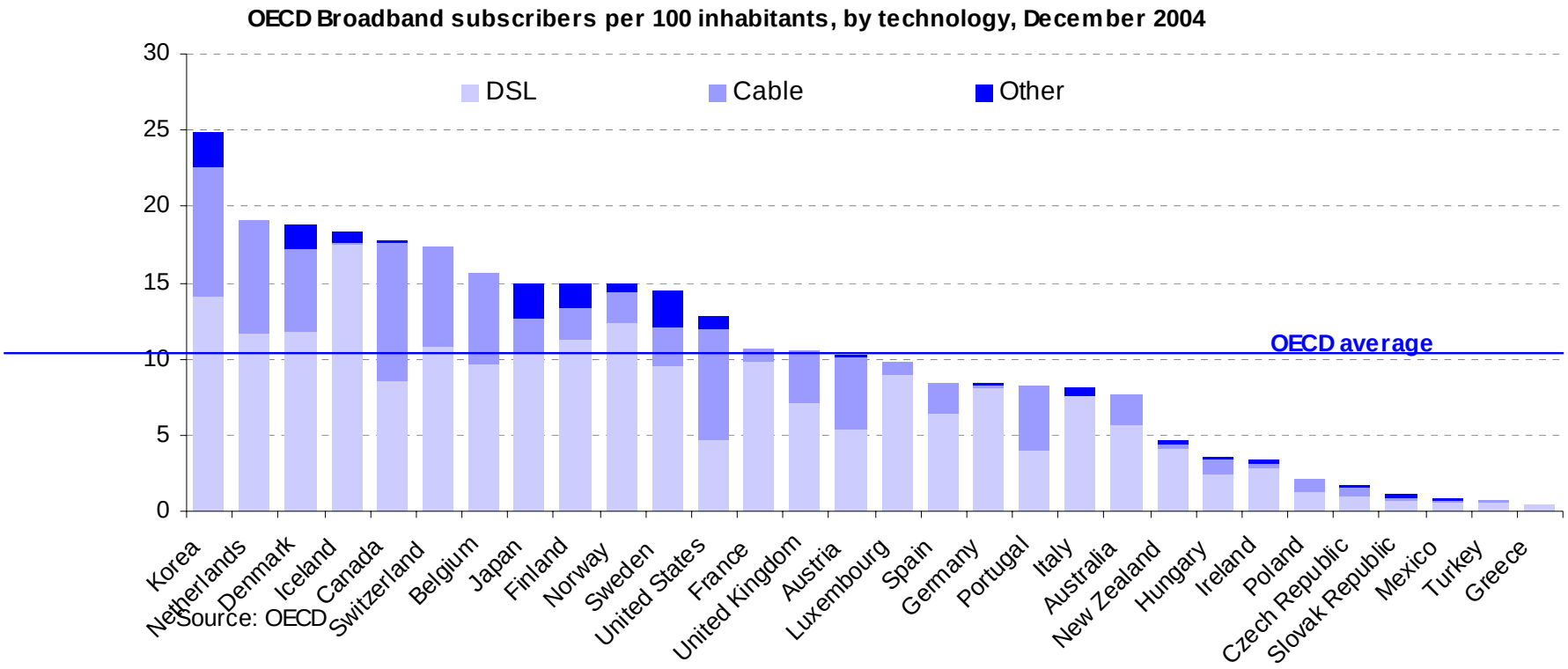
Back Up


Existing ADSL Deployment Upgrade
IP Television Up Front Costs ($)
Headend Encoders & Servers
Middleware
BB Transport M/C Router & ADSL Host
$1,248K
-6%
$275K
$0
100%
$0
$200K
$400K
$600K
$800K
$1M
$1.2M
$1.4M
$1.6M
Total Cost $1.523M
Savings 23%
Cost
Savings vs. MPEG-2
IP Television Deployment Costs ($/Subscriber)
Headend Encoders & Servers
Middleware
BB Transport M/C Router & ADSL Host
ADSL Plug & Modem
2 x STBs
Home Install
$20
35%
$70
13%
$125
50%
$80
$260
$315
$0
$100
$200
$300
$400
$500
Total Cost $870
Savings 18%
Source: Envivio, Inc., 2004 based on Envivio pricing through March 31, 2004

Back Up


Global DSL Subscriber Forecast
Millions
100
75
50
25
0
2002
2003
2004
2005
2006
Asia
Europe
North America
ROW
Source: MRG, Inc., 2003

Back up


OECD Broadband subscribers per 100 inhabitants, by technology, December 2004
DSL
Cable
Other
30
25
20
15
10
5
0
OECD average
Korea
Netherlands
Denmark
Iceland
Canada
Switzerland
Belgium
Japan
Finland
Norway
Sweden
United States
France
United Kingdom
Austria
Luxembourg
Spain
Germany
Portugal
Italy
Australia
New Zealand
Hungary
Ireland
Poland
Czech Republic
Slovak Republic
Mexico
Turkey
Greece
Source: OECD

Cable TV Bandwidth

- A single downstream 6 MHz television channel may support up to 27 Mbps of downstream data throughput from the cable headend using 64 QAM (quadrature amplitude modulation) transmission technology.
- Speeds can be boosted to 36 Mbps using 256 QAM.
- Upstream channels may deliver 500 Kbps to 10 Mbps from homes using 16QAM or QPSK (quadrature phase shift key) modulation techniques, depending on the amount of spectrum allocated for service.
- Using 64 QAM, upstream speeds can be raised to 30 Mbps.
- This upstream and downstream bandwidth is shared by the active data subscribers connected to a given cable network segment, typically 500 to 2,000 homes on a modern HFC network.