

# Video Over IP

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# Moving Picture Experts Group or MPEG

# MPEG

- The Moving Picture Experts Group or MPEG, is a working group of ISO/IEC charged with the development of video and audio encoding standards.

# MPEG History

- Its first meeting was in May of 1988 in Ottawa, Canada. As of late 2005, MPEG has grown to include approximately 350 members per meeting from various industries, universities, and research institutions. This organization has built the foundations of digital content delivery with its highly successful standards.



# MPEG Standards

- MPEG standards are open standards, representing lots of work shared by hundreds of companies. No one company can hope to match the technical and intellectual resources of an entire competitive market. No other technology has the potential to become as deeply developed and widely supported by multiple industries, vendors and service providers, and to be trusted by end users with their video and multimedia needs.

# MPEG-1:

- Initial video and audio compression standard. Later used as the standard for Video CD, and includes the popular Layer 3 (MP3) audio compression format. Combining a good compression ratio with high quality and universal deployment on PCs, these formats have been very popular for many years. MPEG-1 is the basis for the multimedia revolution on PCs. MPEG-1 was originally designed for
- CD-interactive and video-on-demand-like applications, and is still hugely popular in the form of Video CDs.

# MPEG-2:

- MPEG-2 is the audiovisual standard most widely used for entertainment video applications. MPEG-2 enables digital television and DVDs, and there are several hundred million MPEG-2 decoders deployed in Digital Satellite and Cable set-top boxes, DVD players and PCs. It is a more powerful format than MPEG-1, capable of achieving higher compression ratios and supporting interlaced video. MPEG-2 decoding and encoding are more CPU-intensive than for MPEG-1, especially for video.

# MPEG-2:

- Virtually every image you see on television today, even on an analog receiver, has at some point been coded and decoded in MPEG-2.
- MPEG-2 delivery rates have come down dramatically since the early adopters first went on air, without any changes to the standard. When the standard was just released, it took over 6Mbps to get a picture quality acceptable for broadcast. Today, many service providers successfully deliver quality images with bitrates between 2-2.5 Mbps – using the same, unchanged decoders.
- MPEG-4 has started its ascent on the same quality/bitrate curve, driven by a force only present in standards that are open for anyone to implement and improve: free competition on a level playing field. And note that the mechanism works for audio just as it does for video.

# MPEG-3:

- Originally designed for HDTV, but abandoned when it was realized that MPEG-2 (with extensions) was sufficient for HDTV. (not to be confused with MP3, which is MPEG-1 Audio Layer 3.)

# MPEG-4:

- Expands MPEG-1 to support video/audio "objects", 3D content, low bitrate encoding and support for Digital Rights Management. Each version has provided higher efficiency video standards - it keeps getting better.
- MPEG-4 is considered the media standard today. It dramatically advances audio and video compression, enabling the distribution of content and services from low bandwidths to high-definition quality across broadcast, broadband, wireless and packaged media.

# MPEG-4:

- MPEG-4 is an open toolbox to build bitstreams and decoders for all multimedia content - providing a standardized framework for many other forms of media — including text, pictures, animation, 2D and 3D objects – which can be presented in interactive and personalized media experiences.
- To support the diversity of the future content market MPEG- 4 offers a variety of so-called “profiles,” tool sets from the toolbox, useful for specific applications, e.g. in audio-video coding, simple visual or advanced simple visual profile. Users need only implement the profiles that support the functionality required.



# Advantages of MPEG-4:

- The best way to understand MPEG-4's new paradigm is by comparing it to MPEG-2. In the MPEG-2 world, content is created from various resources such as moving video, graphics, text. After it is "composited" into a plane of pixels, these are encoded as if they all were moving video pixels. At the consumer side, decoding is a straightforward operation.

# Advantages of MPEG-4:

- MPEG-2 is a static presentation engine: if one broadcaster is retransmitting another broadcaster's coverage of an event, the latter's logo cannot be removed, also for example, viewers may occasionally see the word "live" on the screen when a broadcaster is showing third party live footage from earlier in the day. You can add graphic and textual elements to the final presentation, but you cannot delete them.

# Advantages of MPEG-4:

- The MPEG-4 paradigm turns this upside down. It is dynamic, where MPEG-2 is static. Different objects can be encoded and transmitted separately to the decoder in their own elementary streams. The composition only takes places after decoding instead of before encoding. This actually applies for visual objects and audio alike, although the concept is a little easier to explain for visual elements. In order to be able to do the composition, MPEG-4 includes a special scene description language, called BiFS, for Binary Format for Scenes.



# One Billion Web Video Viewers Predicted by 2013

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Tuesday, May 27, 2008

### One Billion Web Video Viewers Predicted by 2013

[ABI Research](#) has an interesting new study out that forecasts at least one billion in 2013 viewers will access video via the web - this is approximately four times the number of viewers who currently use the web t watch video. Here's a [quote](#) from ABI Senior Analyst Cesar Bachelet:

*The rapid expansion of broadband video creates opportunities across a number of market sectors..... A wide variety of actors aim to gain a share of this fast-growing market: not only content owners such as the [BBC](#) and [NBC Universal](#), and Internet portals such as [AOL](#) and [Yahoo!](#), but also a range of new entrants including user-generated content sites such as [YouTube](#) and [Dailymotion](#), broadband video sites such as [CinemaNow](#) and [Lovefilm](#), and Internet TV providers such as [Apple](#) and [Zattoo](#)."*

Technologies discuss include *content distribution networks that cache content closer to the user, peer-to-peer networks which leverage users' PCs, and hybrid networks which combine these two approaches*. This is serious business for service providers - how should they react? Bachelet recommends the following:

*Pay-TV providers should refrain from knee-jerk responses, or adopting defensive measures aimed at discouraging consumers from using those services. That would only produce resentment from subscribers and likely defections from their services.*

He recommends an "if you can't beat them, join them" approach, in an attempt to turn the threat into an opportunity. Here's more:

Digg submit

# Inside the Verizon FTTP Network

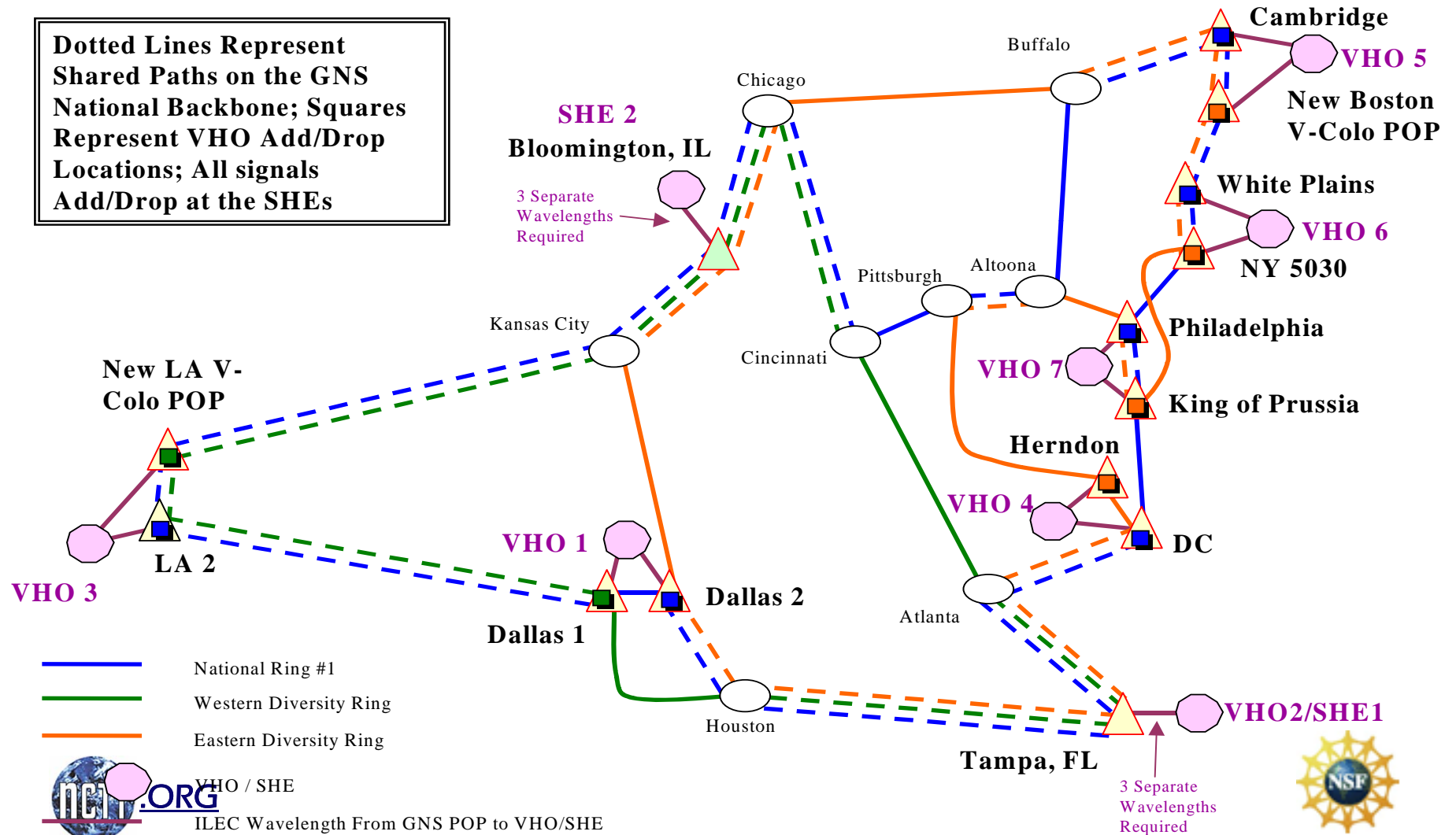
# As of March 31, 2008:

- Verizon passes 10.4 million homes and businesses with its fiber optic network, FiOS.
- FiOS Internet: Verizon added 262,000 new customers in Q1-08, with a total now of 1.8 million who are getting up to 50 Mbps downstream and up to 20 Mbps upstream.
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- FiOS TV, is now available to 6.5 million premises and added 263,000 new FiOS TV customers at a rate in the quarter also of 4,100 per day.
- Total FiOS TV: 1.2 million customers.
- Verizon expects to continue passing 3 million new premises a year through 2010, when the company expects to have passed 18 million premises, or more than half the homes it serves.
- For more info [follow this link](#).



# Broadcast Video

**Dotted Lines Represent Shared Paths on the GNS National Backbone; Squares Represent VHO Add/Drop Locations; All signals Add/Drop at the SHEs**



# Consisting of:

- Broadcast Video
- Video on Demand (VOD)
- Data Network
- PSTN or Voice Service

# Broadcast Video

- Two National Super Head Ends (SHE)
  - Diversely located
  - Satellites collect video feeds
  - Video is converted to digital MPEG2 and packaged in a 10-GigE payload
  - VOD servers “pitch” data to the Video Hub Office (VHO)
- Three OC-192 SONET (long haul) rings that drop and continue GigE to VHOs



# Broadcast Video Cont.

- Video Hub Office (VHO) ex. Burlington MA
  - Combines
    - National Channels
    - VOD Servers “catch” data from the SHE servers
    - Off-Air, program guide, public, education, and government (PEG) channels, and local ads are injected
    - Encrypts all content
- Content sent over several 1-GigE links to local Video Serving Offices (VSO, ex. CO) over SONET (medium haul)



# VOD

- Content is requested by user via the IP network (private subnet)
- Content is then streamed from the video pumps to the Video Distribution Routers (VDR) in the VHO (ex. Burlington)
- VDR then sends 10-GigE links to Video Aggregation Router (VAR)
- The Video Aggregation Router (VAR) then sends it to the Gateway Router (GWR) in the VSO (ex. CO)
- GWR then sends it to the OLT and then to the PON network



# VOD

- Stored and only sent when requested by users Set Top Box (STB)
- Sent over the IP network from the VHO to the GWR as an IP unicast stream using MPEG-2.
- STB converts MPEG-2 signal.
- Traffic travels over a private subnet that is independent from public internet although it goes through same GWs.
- Since VOD streams are IP traffic they must be routed just like Verizon's data network.
- The Video Distribution Routers (VDRs) are deployed in pairs and are connected back to the Video Aggregation Router (VAR) via 10-GigE links.
- The primary purpose of the VDRs are to aggregate the content from the video pumps in the VHO. This content is then sent to the VAR and then sent to the GWR for distribution to the OLT.

# Data Network

- The Internet connection to the OLT consists of two GigE feeds per shelf back to the GWR. The GWR is then connected to a pair of Lata Core Routers (LCR) via two 1-GigE links. These LCRs connect to the Verizon Business (formerly MCI network) for long haul transport and peering via 10-GigE interfaces.
- Lata Core Routers (LCR) connect to MCI/GNS network for peering to other Tier 1 providers (ex. AT&T, Level 3, etc) via OC-48 and OC-192 links
- LCRs (ex. Franklin St. and Cambridge) then connects via various 1-GigE links to a GWR (ex. CO)
- GWR then connects to the OLT and then to PON network.



# Voice Service

- The voice service backend of the FTTP network is identical in many ways to the legacy systems of digital loop carriers of the early 80s.
- There are two ways to which you connect the FTTP network to the telephone network: GR-303/TR-008 and Session Initiation Protocol (SIP).

IPTV



# The Set-Top Box Runs All Communications



# How IPTV will work

- At Telco national head end, video feeds are pulled from network satellites and encoded in MPEG-2/H.264 or Windows media format.
- Video is then divided into IP packets and placed with data and voice traffic in the network core.

# At this point.....

- All video feeds are multicast simultaneously to the local central offices.
- Local programming and commercials are added
- Local central offices also deal with channel change and VOD requests as well as billing and authentication needs.
- At the home a set-top box receives and decodes the packets just as a computer would do.



# Verizon Offerings

- \$47.99
- 200 digital channels
- Premium packages - sports, movies, karaoke, etc
- HD and multi-room DVR (allows different recorded shows to be viewed on up to 3 TVs at once with ability to pause) set-top boxes

# Discussion



# Contact Info

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