IP Network Basics
and
The Relationship
to
VoIP

- ✓ Cable was built to deliver “analog video”
- ✓ Telco was built to deliver “analog voice”
- ✓ Convergence of:
  - 1) new digital technologies and
  - 2) product / company competition

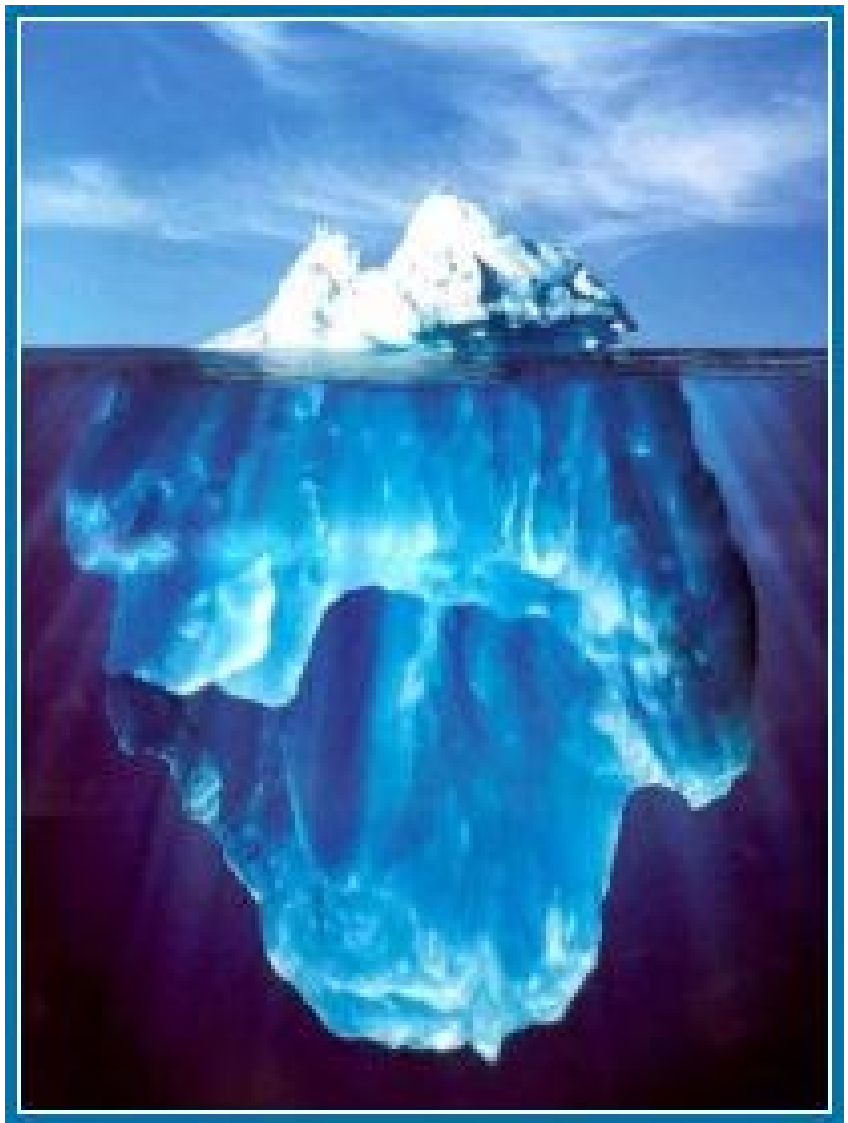
  led to a “rethinking” of network designs
- ✓ New digital technologies offered economies
- ✓ Different approaches (because of different starting places) led to need for “holy grail” technology
- ✓ Internet Protocol is one such (or maybe “the”) technology

The New Services Offered to Our Subscribers

Internet Protocol (IP) Plays a Support Role

The IP Story

The Platform That Supports New Services



IP has everything to do here!

Background – Terms - IP

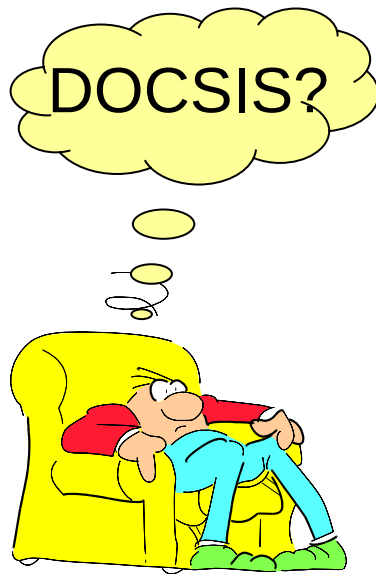
- ✓ Digital devices (i.e. computers) need a language to talk to one another on a network.
- ✓ "**IP**" is one such language.
- ✓ "**IP**" stands for "Internet Protocol." Internet Protocol is a universal language which allows devices / computers around the world to communicate - the technique by which information [data, pictures, music, and voice] is digitized into a format suitable for transport on an IP-based network.
- ✓ IP works by organizing digital information so that it travels through a network in a sequence or grouping knows as "packets". IP based networks are often also called "packet networks" for this reason.

The Value of IP – One Network – Many Services

- ✓ IP is very, very pervasive
- ✓ IP is cost effective
- ✓ Works over wired and wireless
- ✓ Leverages existing infrastructures
- ✓ IP is very flexible and ***content agnostic***
- ✓ Therefore, allows true convergence of
  - Video
  - Data
  - Voice
  - Other

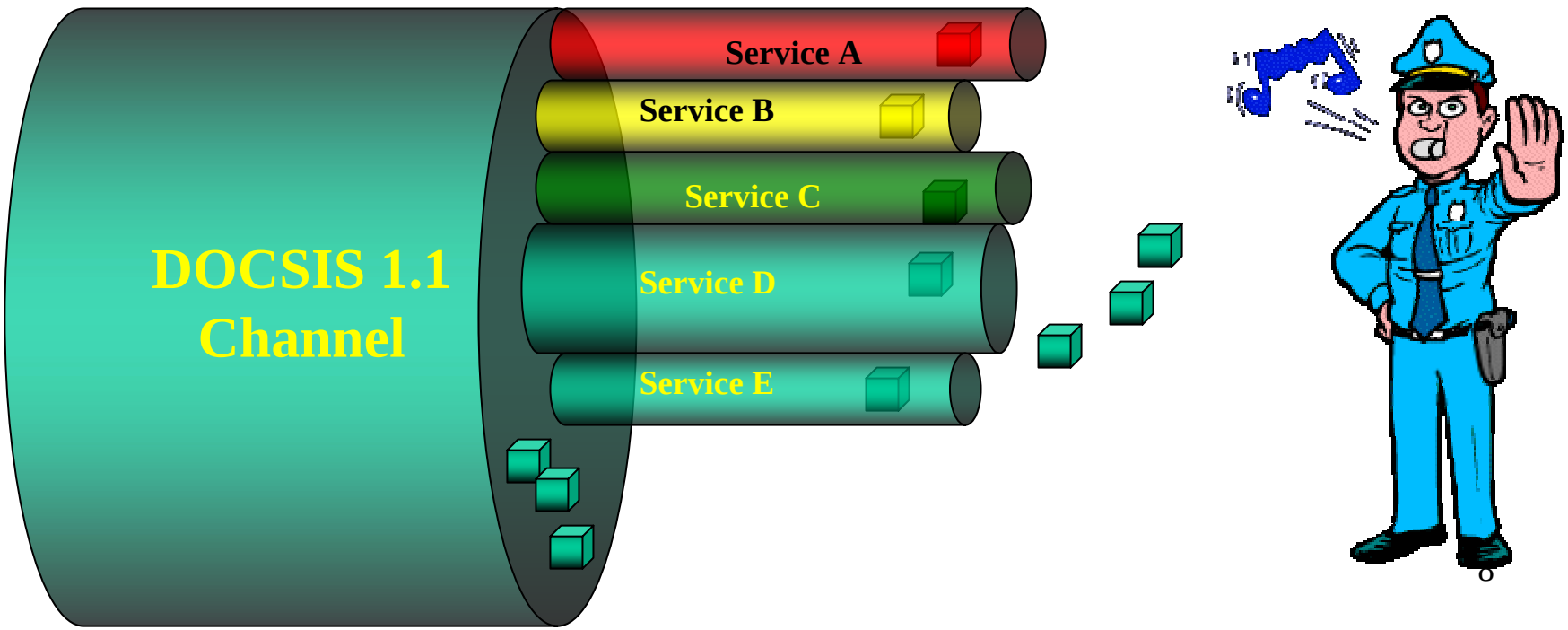
Cable Standard for IP = DOCSIS

- ✓ DOCSIS is a standard developed to define how to carry IP data packets over a Cable Television Network.
- ✓ It was initially developed at CableLabs to support High Speed Internet Service (Cable Modems).
- ✓ It is now an international standard with over 100 vendors and cable modem products.
- ✓ With some modification, IP is used for much more than just access to the public Internet.



What Can DOCSIS Do?
IP Bit Stream Management

- ✓ DOCSIS allows IP to operate on a cable network
- ✓ DOCSIS can “referee” the IP bits and the data stream
- ✓ Assigns priority between services
- ✓ Solves send/receive delay (AKA, latency issues)
- ✓ For IP Voice - those bits given “#1 priority” in stream



First Generation Services Today - "IP Based" But "Non-Managed"

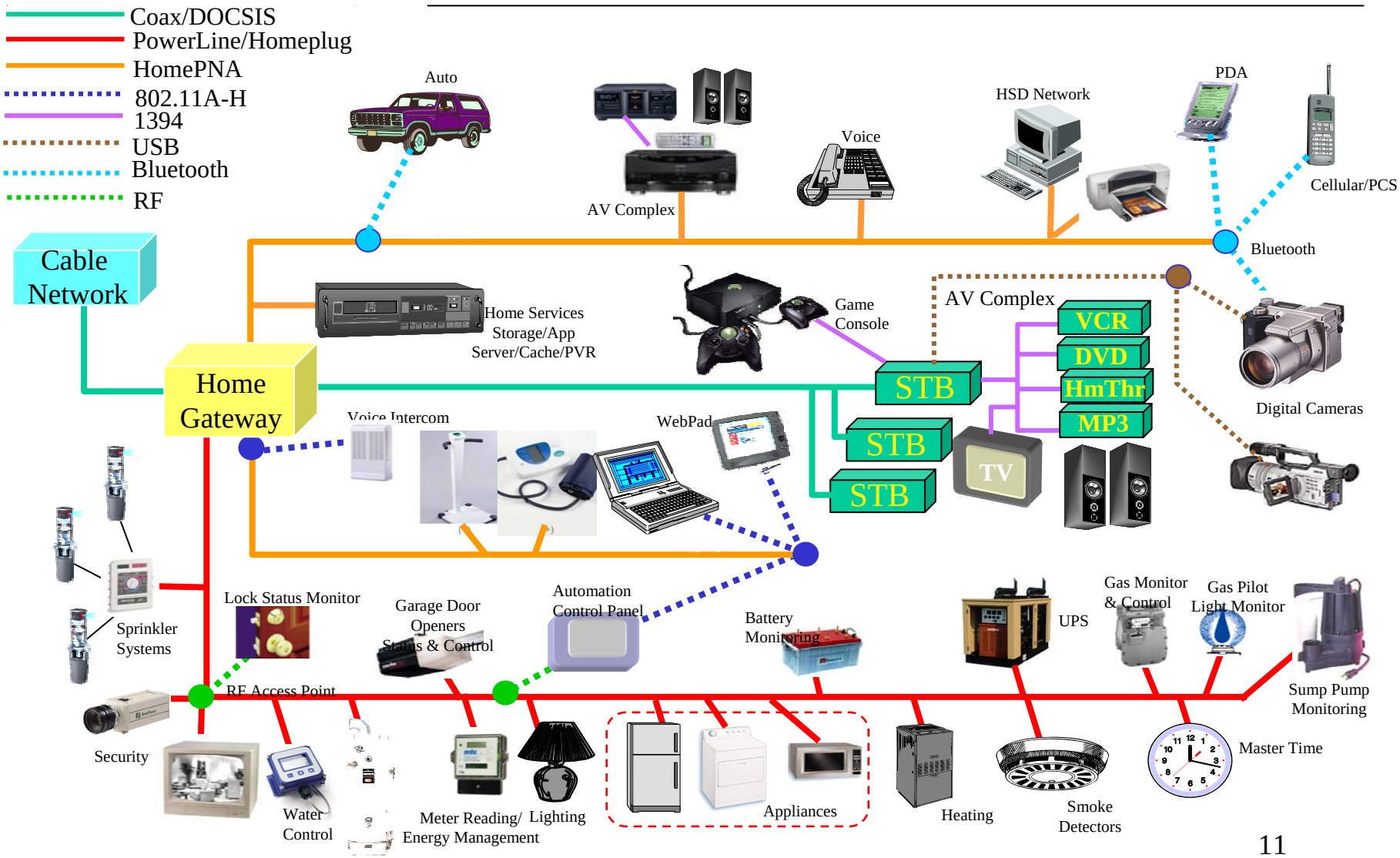
- ✓ Email
- ✓ Instant Messaging
- ✓ Web surfing
- ✓ E-commerce/banking
- ✓ Music downloads
- ✓ Some video streaming
- ✓ Non-real-time movie downloads
  - – MovieLink
- ✓ Some VoIP applications
  - – Vonage, Go2Call, Net2Phone, etc.
- ✓ These are, for the most part, "best efforts" based services that can tolerate latency.

But in the Future - Managing IP Leads to Many Potential New Services

- ✓ Energy Management
- ✓ Home Security/Monitoring
- ✓ Home Controls/Automation
- ✓ Warranty Repair Monitoring
- ✓ Education
- ✓ Telemedicine
- ✓ Home Calendaring
- ✓ Unified Messaging
- ✓ Network Gaming
- ✓ Music Library/Subscription
- ✓ Photo Library/Subscription
- ✓ Intra-Home Media Distribution
- ✓ PDA/Mobile/GPS Updates
- ✓ Mobile Content Downloads
- ✓ Video Narrowcasting
- ✓ Advanced Video on Demand
- ✓ Alternative Video Content
- ✓ Voice Services
- ✓ Self-Provisioning
- ✓ Two-Way Video Communications
- ✓ Wi-Fi “Hot Spots”
- ✓ Information Archive

- ✓ *Only examples of potential services*

In Combination with Other Transport Technologies – Many Possibilities



How Does "IP" Lead to Vo"IP"?

- ✓ "**VoIP**" stand for "**Voice over Internet Protocol**" – it is a description of the process for digitizing sound / a voice message using the IP technique or format.
- ✓ Therefore, VoIP in and of itself is **not** a "service" – it is a term used to describe the application of IP technology to transmit voice over an IP-based digital network.
- ✓ Note: the description of the term "VoIP" does **NOT** include a requirement that the digitized voice travel over the public Internet. The media often misreports this giving the impression that all IP voice products are the same.

How Does “IP” Lead to Vo“IP”?

- ✓ The largest, most used, and best known IP network is the public **Internet**.
- ✓ IP converted information is used to perform such common public Internet functions as sending email and visiting websites.
- ✓ However, any information or graphic that has been digitized via IP can travel on any IP-based network – IP is not exclusive to the public Internet but is very common to many other networks. E.g. - Many businesses (and state & local governments) are using IP networking to connect their office personal computer systems.
- ✓ NOTE: Public Internet is a “non-managed” network: best efforts only – no guarantees of latency-free data transmission.

Then, What is VoIP?

- ✓ As a platform technology, VoIP can be used to simulate, for the users, a traditional non-VoIP telephone call.
- ✓ When used to simulate a non-VoIP telephone call, VoIP imitates telephony: dialtone, ringing, busy tones, features, local, long distance calls, etc.
- ✓ As noted earlier, many press reports and public discussions have inaccurately modified the definition of VoIP to mean a telephone call that *must* traverse the public Internet. This is incorrect.

"Best Efforts" Creates Problem for Delay Sensitive Services Like Telephony

- ✓ The packetized data (IP format) traveling over the public **Internet** does so on a "best efforts" basis.
  - The Internet does not give priority to one bit of data over another.
  - This *first-come-first-served* system adds delay to the trip for any one IP packet, and packets may arrive out of order / sequence from how they were created.
- ✓ For an IP-based telephone call to sound normal (i.e., no delay between speakers), *the IP packets must arrive within a limited time and their sequence must be preserved*.
- ✓ Therefore, use of the public Internet as part of the network for a telephone call has the potential to interject delay and low sound quality into the conversation.
- ✓ The Internet is not designed to transmit IP voice digital information with the same quality as the traditional telephone network.

What is VoIP Telephony?

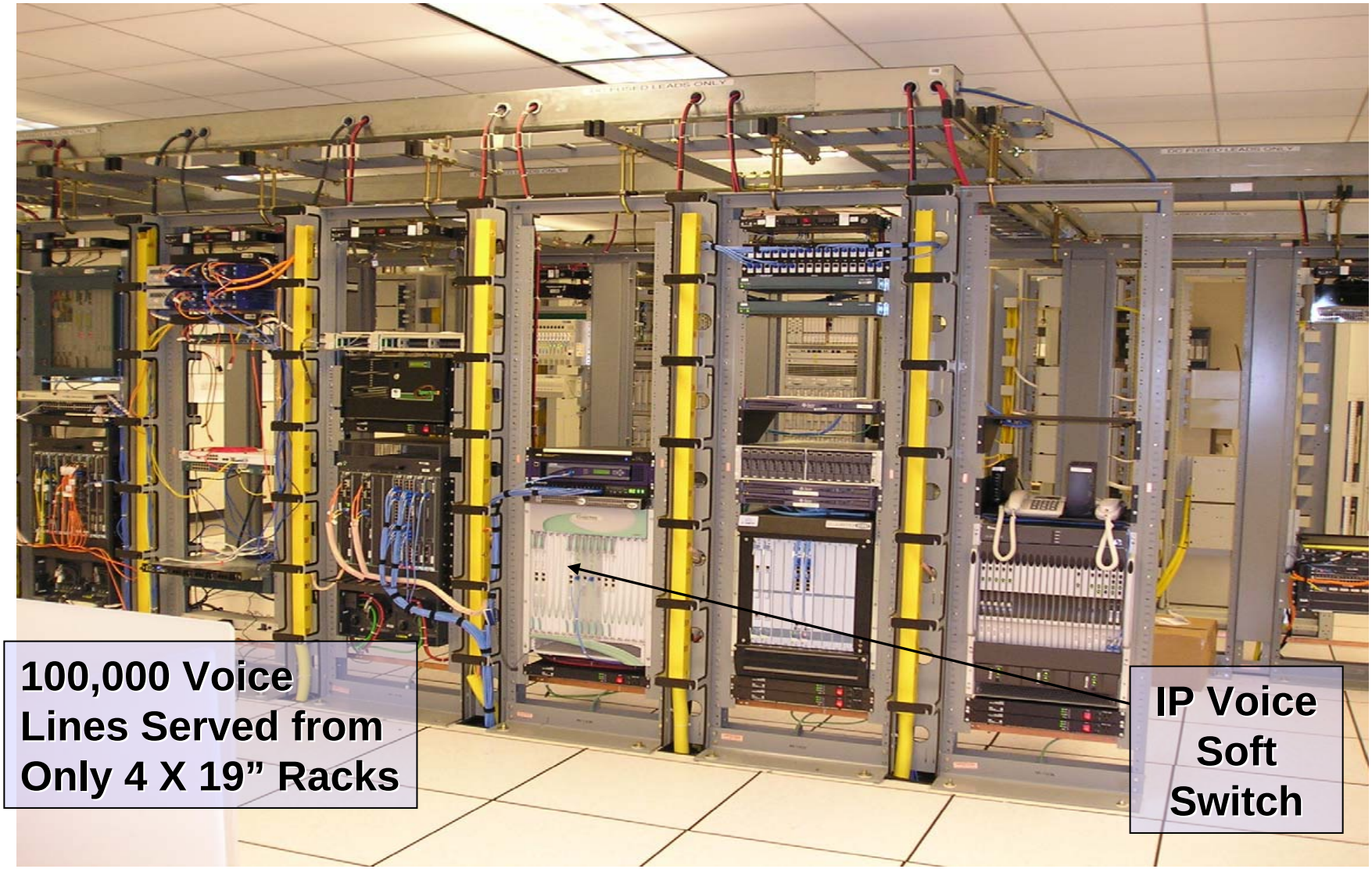
- ✓ Today, there are **two** major "classes" of VoIP telephony:
  1) those that use managed networks, versus
  2) those that are transmitted using a 3d party's broadband connection and the public Internet.
- ✓ Cable companies are in the first class – to distinguish them, these cable-based services are often called "**IP Phone**" or "**IP Voice**". Comcast's product is Digital Voice.sm
- ✓ The second class of services can more appropriately be called **Internet Phone**, because they use the public Internet to transmit calls (ex., Vonage, 8X8).

What Equipment Makes IP Voice Work?

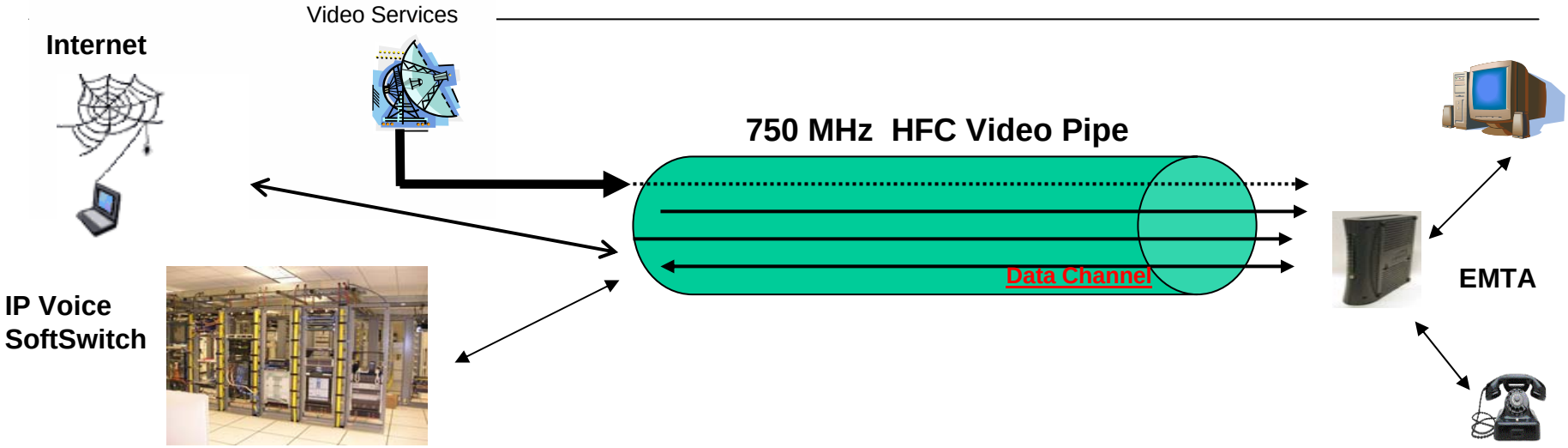
- ✓ Two Pieces Of Equipment Make IP Voice work:
  1) VoIP-enabled cable modem. The cable modem is located in the subscriber's house as Customer Premises Equipment (CPE).
  2) "Soft Switch". The soft switch is a specialized router located at the cable "Headend"
- ✓ Cable plant remains unaltered by the addition of IP Voice to the system.

EMTA - Touchstone™ Voice Modem TM402P

IP Voice Soft Switch Site

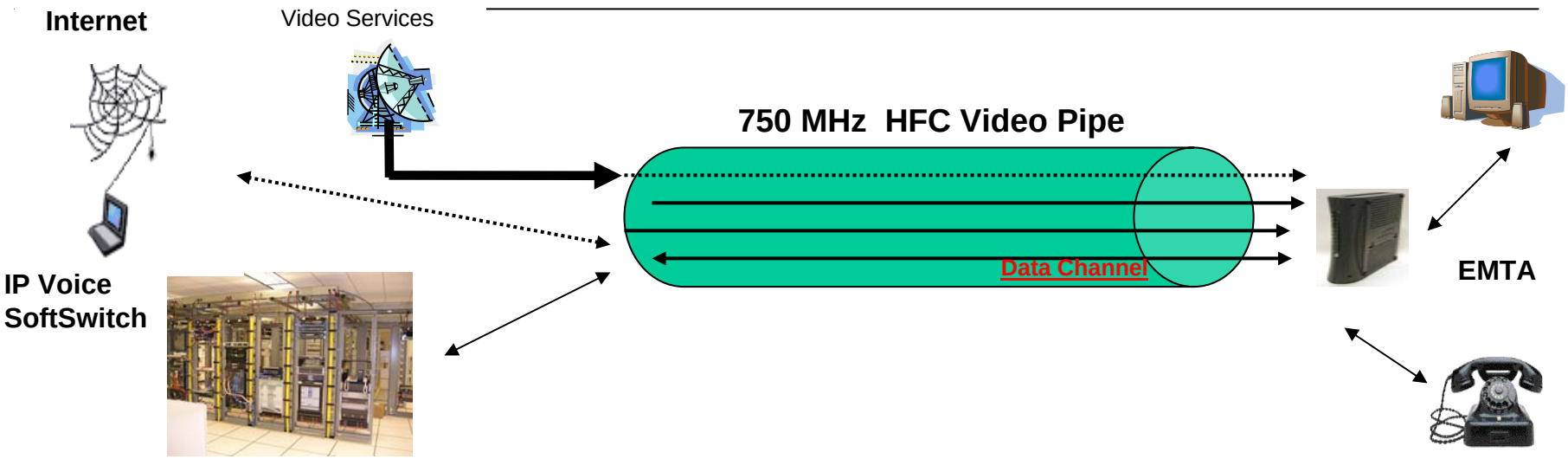


How Does IP Voice Work?



- ✓ Today, the equivalent of a cable “channel” is used as the data channel for public Internet access
- ✓ The **Enhanced Multi-Media Terminal Adapter** **[EMTA]** will now control / referee / manage the data channel.
- ✓ The EMTA will insure that IP Voice packets are given *priority* in the bit stream (voice packets leave and arrive *first* in the bit stream). This is called **Quality of Service** (QoS).

How Does IP Voice Work?



- ✓ **QoS** gives the user the same timing and voice quality as a traditional non-VoIP transmission.
- ✓ VoIP traffic represents a *very small* amount of the total bit stream and of the total capacity of the system.
- ✓ Most of the traffic capacity will continue to be used for non-VoIP services (e.g., video and HSD).

Compare Internet Phone V. IP Voice

	Uses IP Format?	Uses Internet As Part Of Network?
Internet Phone	YES	YES
Comcast Digital Voice SM	YES	NO

Tentative - Comcast IP Voice Product(s)

- ✓ Residential product
- ✓ “Any” distance and unlimited domestic usage
- ✓ Custom calling features
- ✓ Battery powered back-up
  - ✓ E-911 - compliant
  - ✓ CALEA – compliant for telephone
  - ✓ Disabilities / Hearing Impaired Accessible
  - ✓ Universal Service – will collect and remit
  - ✓ Taxes / Fees – will collect and remit
- ✓ Same inside wiring as used today
- ✓ Same telephones as used today
- ✓ Same telephone number as customer has today

-Thank You –

Rhonda Weaver
Rhonda_weaver@cable.comcast.com
360-357-1215