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What is POTS?

Plain Old Telephone Service

• POTS, is a term which describes the voice-grade telephone service that remains the basic form of residential and small business service connection to the telephone network in most parts of the world. The system was originally known as the ***Post Office Telephone Service*** or ***Post Office Telephone System***. Today the term ***Plain Old Telephone Service*** is used, after the services were removed from the control of national post offices.

• The pair of wires from the central switch office to a subscriber's home was called the subscriber loop. It was typically powered by 40V(DC) and backed up by a large bank of batteries in the central office, resulting in continuation of service during most commercial power outages.

• This 64Kbps service is a bi-directional, or full duplex, voice path with limited frequency range of 300 to 3400 Hz: in other words, a signal to carry the sound of the human voice both ways at once. Today, it is also used for internet access via a dial modem, DSL, fax, credit card terminals, etc.

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What is PSTN?

Public Switched Telephone Network

• PSTN (public switched telephone network) is the world's collection of interconnected voice-oriented public telephone networks, both commercial and government-owned. It's also referred to as the Plain Old Telephone Service (POTS). It's the culmination of circuit-switching telephone networks that has evolved from the days of Alexander Graham Bell ("Doctor Watson, come here!"). Today, it is almost entirely digital in technology except for the final link from the central (local) telephone office to the user.

• The basic PSTN network link, or POTS line supports 64 Kbps bandwidth. In residences, the phone line carrying this bandwidth is typically a copper cable. Traditional dial-up modems utilize nearly 56 Kbps of this bandwidth when connected to a phone line. The PSTN utilizes the SS7 signaling protocol.

What is the Internet?

The History of the Internet

• The Internet began as ARPAnet, a U.S. Department of Defense project to create a nationwide computer network that would continue to function even if a large portion of it were destroyed in a nuclear war or natural disaster.
During the next two decades, the network that evolved was used primarily by academic institutions, scientists and the government for research and communications. The appeal of the Internet to these bodies was obvious, as it allowed disparate institutions to connect to each others' computing systems and databases, as well as share data via E-mail.
The nature of the Internet changed abruptly in 1992, when the U.S. government began pulling out of network management, and commercial entities offered Internet access to the general public for the first time. This change in focus marked the beginning of the Internet's astonishing expansion.
According to a survey conducted by CommerceNet and Nielsen Media Research in early 1997, nearly one out of every four Americans over the age of 16 is an Internet user. And the number of users worldwide is believed to be well into the tens of millions.

How Does the Internet Work?

• The Internet is a worldwide collection of computer networks, cooperating with each other to exchange data using a common software standard. Through telephone wires and satellite links, Internet users can share information in a variety of forms. The size, scope and design of the Internet allows users to:

* connect easily through ordinary personal computers and local phone numbers
* exchange electronic mail (E-mail) with friends and colleagues with accounts on the Internet
* post information for others to access, and update it frequently
* access multimedia information that includes sound, photographic images and even video
* access diverse perspectives from around the world.

An additional attribute of the Internet is that it lacks a central authority—in other words, there is no "Internet, Inc." that controls the Internet. Beyond the various governing boards that work to establish policies and standards, the Internet is bound by few rules and answers to no single organization.

What is the World Wide Web?

www

• The Internet is a worldwide, publicly accessible series of interconnected computer networks that transmit data by packet switching using the standard Internet Protocol (IP). It is a "network of networks" that consists of millions of smaller domestic, academic, business, and government networks, which together carry various information and services, such as electronic mail, online chat, file transfer, and the interlinked web pages and other resources of the World Wide Web.

The History of the Web

• The first rumblings toward this concept began immediately after World War II, when scientists were desperately seeking ways to organize and share their accumulated wartime research. In 1945, noted scientist Vannevar Bush published an essay in Atlantic Monthly titled "As We May Think," which proposed a massive information index that people from all over the world could access and search. Although Bush's system was mechanical (and was never developed), his essay had a profound impact on many who would one day help design the Internet and the World Wide Web.

• Given this background, the actual Web was originally conceived as a way for physicists to share their research data. In 1989, Tim Berners-Lee led a team at Switzerland's European Particle Physics Laboratory (CERN) in developing the initial World Wide Web standards. Key among these was the use of hypertext or "hot" portions of an online document that, when selected, take the user to a related, or "linked," document.

• Computerized hypertext was pioneered by researcher Ted Nelson in a system called Xanadu, which he created in the early 1960s. Although Xanadu was never fully realized, many Web's developers have cited it as an influence on their work.

• The next great innovation for the Web came in 1992, when programmers from the National Center for Supercomputing Applications (NCSA) at the University of Illinois developed the Mosaic browser, Look it up! a software application that displayed not only the text of a Web document (or page), but embedded graphic elements as well. By bringing multimedia to the Web, Mosaic vested it with enormous potential.

• Today, several Web browsers are available for IBM, Macintosh and UNIX-based computers, and most of the major online services include Web browsers in their standard software packages. The Web is growing at a phenomenal rate. According to Interactive Week magazine, the number of Web servers (computers that store Web pages) surged from fewer than 3,500 in April 1994 to more than 40,000 in July 1995. And in February 1997, the computing firm Network Wizards determined the number of commercial domains alone to be well over 700,000.

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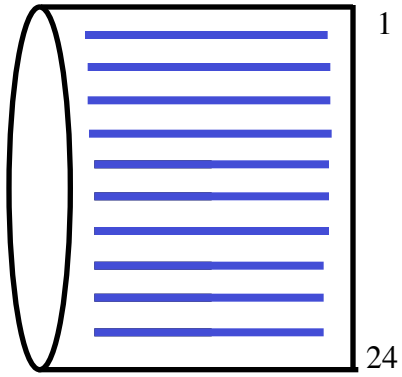
What is a T1?

T1 Circuit (1.5 MB)

T1 Circuits are part of the building block for today's telecommunications



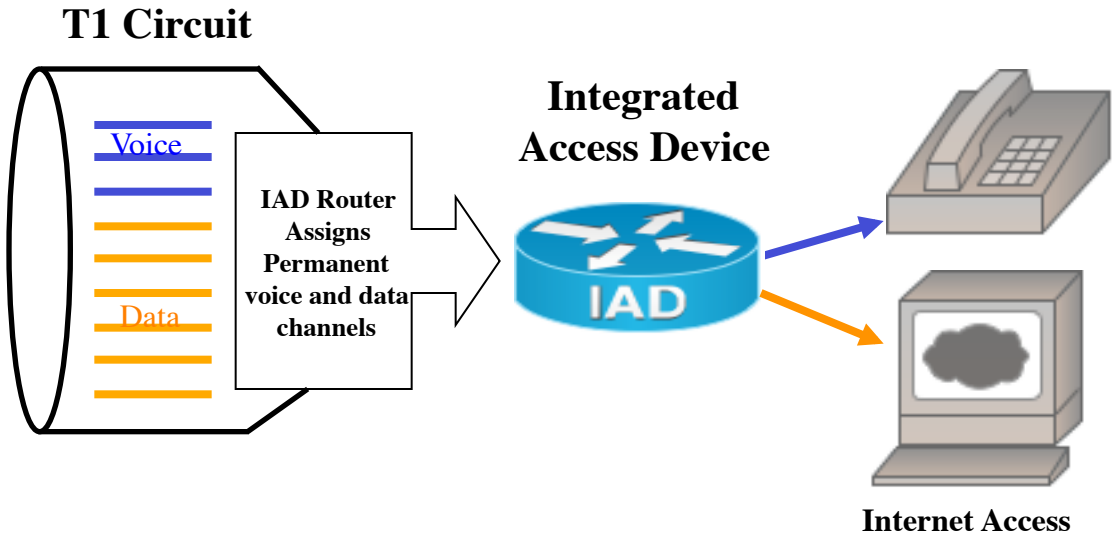
T1 Circuit
24 Channels

- A T1 basic circuit is comprised of 24 channels, 64kbps each, totaling 1.5 MB
- Developed in 1964 by Bell Labs on behalf of the U.S. Military
- Primarily used for small to medium business services
- A T1 is a 'multi-use pipe'. Its applications can include: voice, data, video, Internet access, VoIP, VPNs or any combination of these services.

What is an Integrated T1?

Integrated T1 Circuit (1.5 MB)

Integrated T1 Circuits provide voice and Internet access on the same circuit



- An IAD divides the channels for voice and data services
- Provides multiple services and therefore lowers end user costs
- Primarily used for small to medium business services
- Applications include Voice, Internet, MPLS and VoIP

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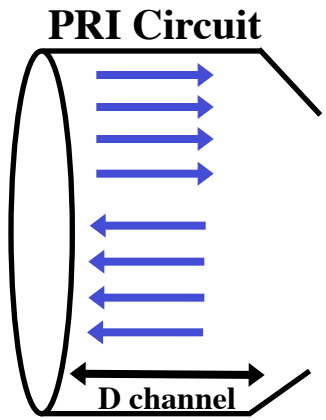
What is a PRI?

PRI/T1 Circuit (1.5 MB)

PRI T1 Circuits are used by businesses for maximum voice capacity for the lowest Investment dollar



1 D Channel for call routing
23 B or "Bearer" Channels

Inbound calls

Outbound calls

The D channel acts as a 'traffic cop' assigning inbound and outbound calls to open channels on the circuit.
No pre-programming is required by the customer

- A PRI (Primary Rate Interface) is a T1 circuit comprised of 23 B channels and 1 D channel for 1.5 mb
- Used for business services of all sizes and applications
- Applications include voice, integrated services and VoIP

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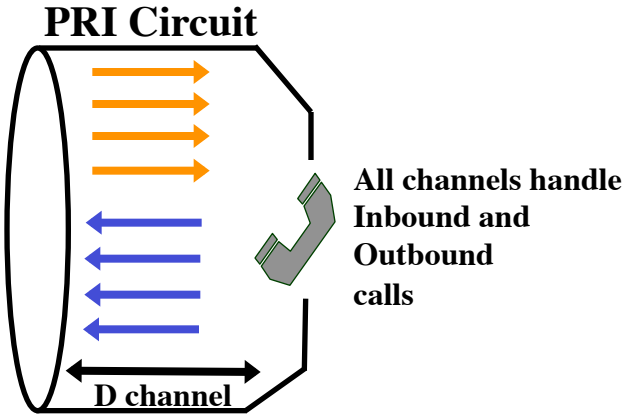
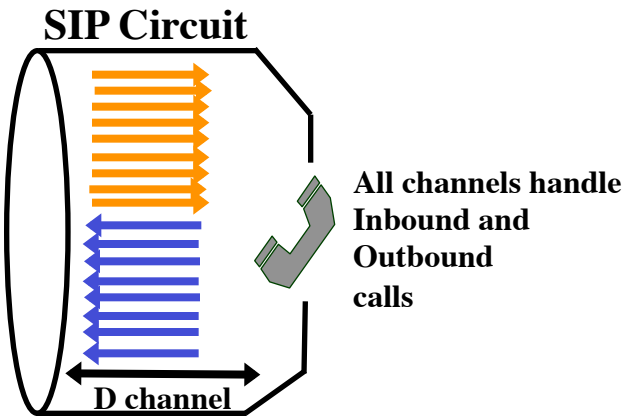
SIP T1 vs. PRI

PRI/T1 Circuit



PRI T1 provides
23 voice channels

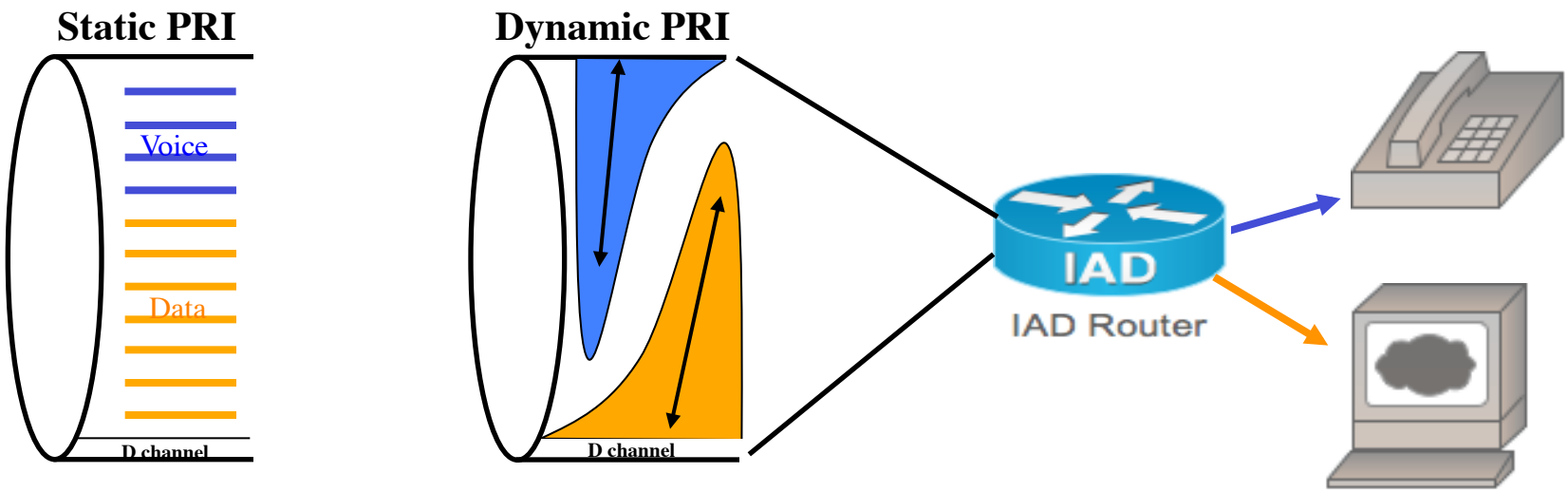
SIP/T1 Circuit



SIP T1 can provide up to
46 voice channels

- A SIP T1 uses a compression protocol called G.729
- This protocol compresses the size of a single phone call to 32k vs. 64k on a PRI
- SIP doubles the amount of calls possible –from 23 to 46 calls on a single T1
- SIP allows for integration of mobile devices on your phone system

What is a Dynamic integrated PRI?



- A Static integrated PRI has pre-determined or 'fixed' voice and data channels.
- A Dynamic PRI allows each of the 23 channels to be used for voice or data on an: *as-needed basis*.
- Example: If we only have two channels in use for voice calls, dynamic allocation will put the other 21 channels in the data mode to increase the data speed. As soon as a voice call is attempted, it automatically assigns a B channel for that call and reduces the data speed by 64K.

In a nutshell, all channels are carrying data to increase bandwidth, but voice traffic has priority.

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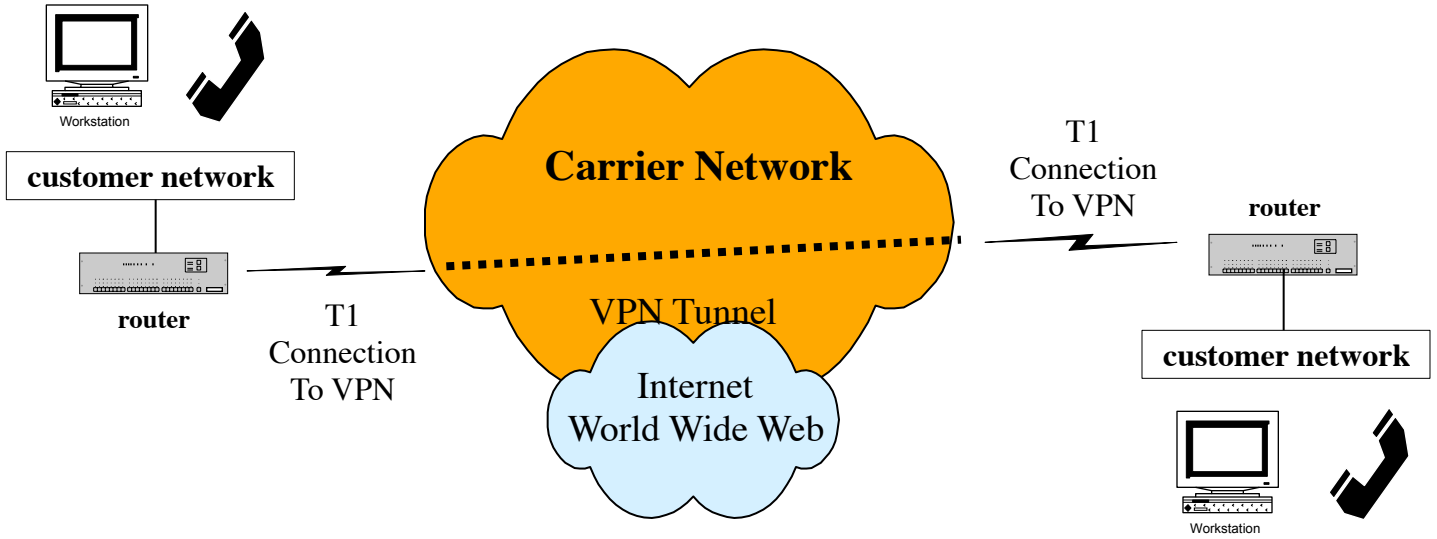
What is a VPN?

A VPN provides a private, end to end, secure connection for sharing data between company locations.



- A VPN is a *Private Virtual Network* that uses a public (internet) or carrier network to connect remote sites & users.
- Primarily used by business with multiple locations and home-based staffers.
- VPN prevents hackers and other users from accessing your communications.

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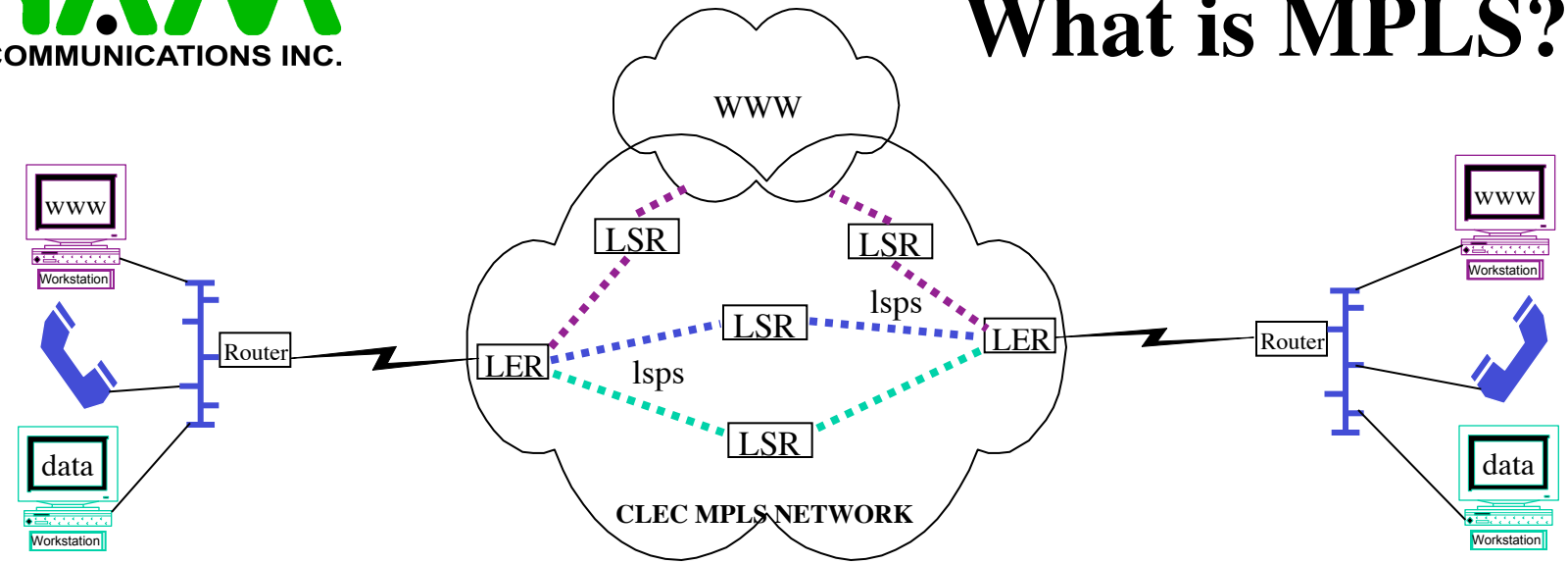
What is MPLS?



•Short for **Multi-protocol Label Switching**, an IETF initiative that integrates Layer 2 information about network links (bandwidth, latency, utilization) into Layer 3 (IP) within a particular autonomous system--or ISP--in order to simplify and improve IP-packet exchange.

•MPLS gives network operators a great deal of flexibility to divert and route traffic around link failures, congestion, and bottlenecks.

•From a QoS standpoint, ISPs are better able to manage different kinds of data streams based on priority and service plan.

•When packets enter a MPLS-based network, Label Edge Routers (LERs) give them a label (identifier). These labels not only contain information based on the routing table entry (i.e., destination, bandwidth, delay, and other metrics), but also refer to the IP header field (source IP address), Layer 4 socket number information and differentiated service. Once this classification is complete and mapped, different packets are assigned to corresponding Labeled Switch Paths (LSPs), where Label Switch Routers (LSRs) place outgoing labels on the packets.

•With these LSPs, network operators can divert and route traffic based on data-stream type and Internet-access customer.

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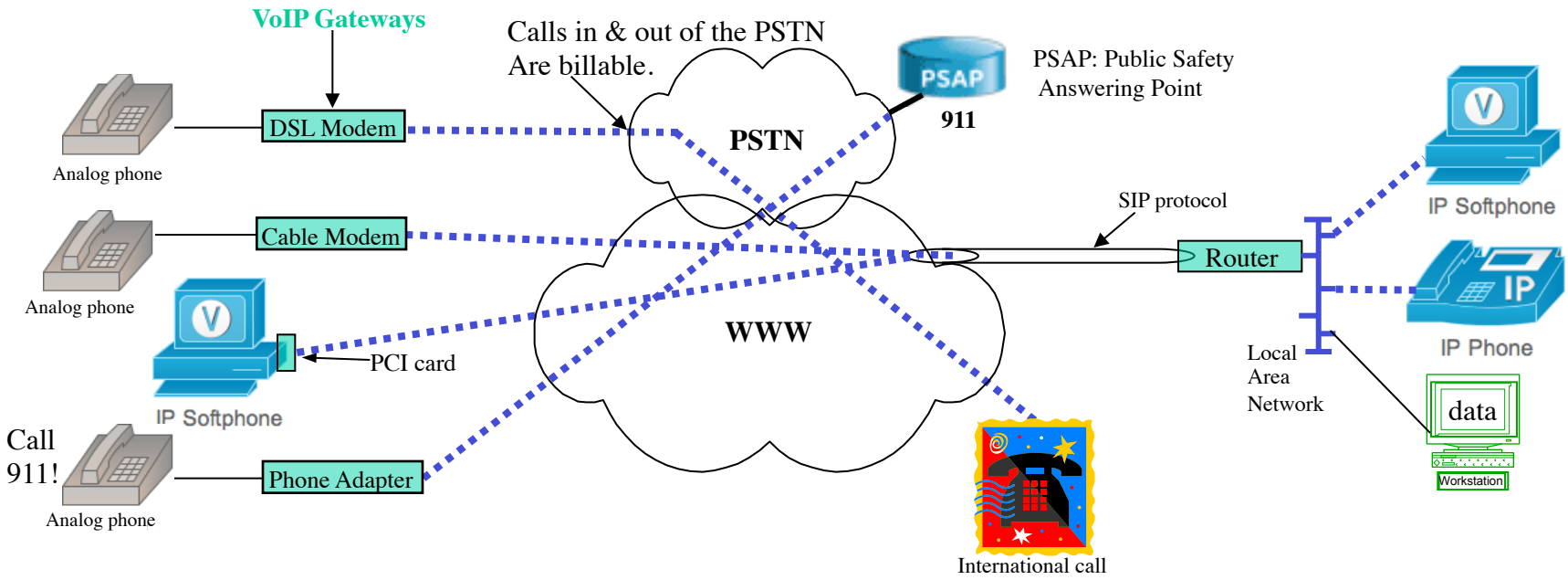
What is VoIP?



VOIP

•***Voice over Internet Protocol (VoIP) is a protocol optimized for the transmission of voice through the Internet or other packet switched networks***. VoIP is often used abstractly to refer to the actual transmission of voice (rather than the protocol implementing it). VoIP is also known as IP Telephony, Internet telephony, Broadband telephony, Broadband Phone and Voice over Broadband. "VoIP" is pronounced *voyp*.

•SIP, short for Session Initiation Protocol is an IP telephony signaling protocol used to establish, modify and terminate VOIP telephone calls.

•A *VOIP gateway* is a device which converts telephony traffic into IP for transmission over a data network. They are used in 2 ways:

1. To convert incoming PSTN/telephone lines to VOIP/SIP:

In this manner, the VOIP gateway allows calls to be received & placed on the regular telephony (PSTN) network.

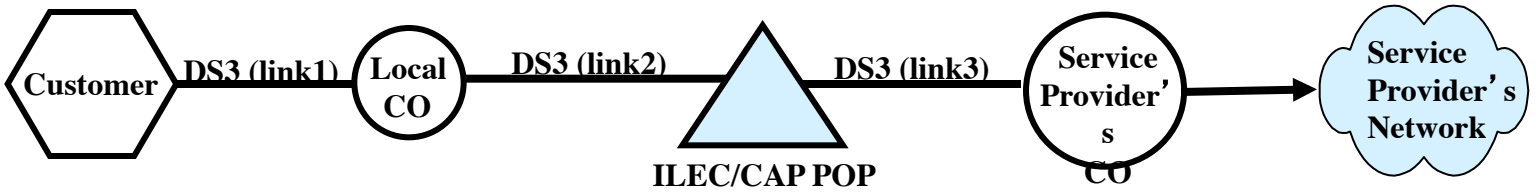
2. To connect a traditional PBX/Phone system to the IP network:

In this manner the VOIP gateway allows calls to be made via VOIP. Calls can then be placed via a VOIP service provider, or in the case of a company with multiple offices, inter office calling costs can be reduced by routing the calls via the Internet. VOIP gateways are available as external units or as PCI cards. The vast majority of devices are external units. A VOIP gateway will have a connector for the IP network and one or more ports to connect the phone lines to it.

What is Ethernet Local Loop (ELL)

DS3 vs ELL

Traditional Standard DS3 Routing
*Has multiple single links between the customer premise, the local serving offices.
*The circuit may have multiple carriers per circuit.
*DS3 requires special investment and set-up.



Ethernet Local Loop Routing
*The ELL links to providing carrier's Ethernet cloud via UNI (user network interface), which is connected via a NNI (network-to-network interface) to the service provider's network.

Ease of Implementation/use
*Widely available, well understood technology
*Simplifies network configuration (physical & interface)
*'Pay as you drink' - scalability
*Lower equipment, service and operational costs