Voice over IP (‘Internet Telephony’)
Introduction

The technology that makes it possible to have a voice conversation over the Internet or through a specific Internet Protocol (IP) network is known as Voice over IP, also called 'Internet telephony'. This new type of telephony has introduced a more efficient method of transferring voice signals other than our largest electronic communication medium, voice transmission lines. This allows the elimination of circuit switching and the associated waste of bandwidth. In this process the voice of the speaker is sent to the receiver in the form of packets and returns back to its original form when it reaches the receiver. To change the voice into packets the voice is converted to digital form from the analog form and later while receiving the digital voice again converts back into the analog form. VoIP can be connected to any cell phone and also can be used in a PC atmosphere.

Applications

Although few office environments and even fewer homes use a pure VoIP infrastructure, telecommunications providers routinely use IP telephony, often over a dedicated IP network, to connect between their switching stations, where they convert the dedicated voice signal to IP packets and back. The result is a data-abstracted digital network which the provider can easily upgrade and use for multiple purposes. Corporate customer support centers which provide support over telephone often use IP telephony exclusively to take advantage of the data abstraction that comes with it. The benefit of using this technology is the need for only one class of circuit connection and better use of the available bandwidth. IP telephony is commonly used to route traffic that may be originated from and terminated at conventional public telephone networks. VoIP is now widely deployed by carriers, especially for international telephone calls. Users are typically completely unaware that their telephone call is being routed over IP infrastructure for most of its distance calls. VoIP is also used by large companies to eliminate call charges between their offices, by using their data network to carry inter-office calls. Another widely used method of VoIP is to simply dial a conventional telephone number and the telephone call will be routed over an Internet connection to the company that operates the gateway, and they will bill him/her, not the local phone company. This makes it possible to dial traditional phone numbers, but be connected entirely over the Internet. When the other party uses this service, one does not incur any expenses aside from the Internet connection fee. Companies can acquire their own gateways to eliminate third-party costs — very cost effective in some situations.

A new development has been the introduction of mass-market VoIP services over broadband Internet access services, in which subscribers make and receive calls as they would their normal telephone transmission lines. This requires an analog telephone

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adapter (ATA) to connect a telephone to the broadband Internet connection. Companies in the US and Canada, such as, Verizon, Vonage, and Northern Telecom, use IP to offer unlimited calling to the US, and sometimes in Canada or to selected countries in Europe or Asia, for a flat monthly fee. One advantage of this is the ability to make and receive calls as one would at home, anywhere in the world, at no extra cost. As calls go via IP, this does not incur charges as call diversion does via general telephone lines, and the called party does not have to pay for the call.

For example, somebody may call someone on a number with a Canadian area code but one could be in London, and if someone were to call another number with that area code, it would be treated as a local call, regardless of where that person is in the world. However, the broadband phone is likely to complement, rather than replace typical phone lines, as it still needs a power supply, while calling the Canadian emergency services number 911, may not automatically be routed to the nearest local emergency dispatch center, or be of any use for subscribers outside of Canada.

There is also a free service called Free World Dialup (FWD), that permits users to make free telephone calls to other FWD users. Although this has only limited connections to and from the public switched telephone network. This is the type of service that will benefit VoIP users for years to come.

**Challenges**

Because IP does not by default provide any mechanism to ensure that data packets are delivered in sequential order, or provide any quality of service guarantees, implementations of VoIP face problems dealing with latency and possible data integrity problems.

One of the central challenges for VoIP implementers is restructuring streams of received IP packets, which can come in any order and have packets missing, to ensure that the current audio stream maintains a proper time consistency. To help with this, the network provider can ensure that there is sufficient bandwidth end-to-end to guarantee low-latency, high quality voice. This is easy to do in private networks, but much more difficult to do with less than 256 kbit/s without a fragmentation mechanism. Keeping packet latency down to acceptable levels on satellite circuits can also be a problem, simply due to the distance of the transmissions.

The other main challenge is getting VoIP traffic to traverse firewalls and intermediary devices called Session Border Controllers (SBC) are often used to achieve this, though some proprietary systems such as Skype do firewall and NAT traversal without the need for an SBC.

Another challenge for these services is the proper handling of outgoing calls from fax machines, TiVo boxes, satellite television receivers, alarm systems, conventional modems or FAXmodems, and other similar devices that depend on access to a voice-grade telephone line for some or all of their functionality. At present, these types of calls
sometimes go through without a hitch, but in other cases they will not go through at all. And in some cases, this equipment can be made to work over a VoIP connection if the sending speed can be changed to lower bits per second rate. If VoIP and cellular substitution becomes very popular, some equipment makers may be forced to redesign equipment, because it would no longer be possible to assume a conventional voice-grade telephone lines.

**Advantages**

Some advantages of VoIP over traditional telephony include:

- Unlike traditional telephony, VoIP innovation progresses at market rates rather than at the rates of the multilateral committee process of the International Telecommunications Union (ITU).
- Lower costs per call, or even free calls, especially for long-distance calls.
- Lower infrastructure costs: once IP infrastructure is installed, no or little additional telephony infrastructure is needed.
- New advanced features.
- A higher degree of reliability and resilience.
- "Future proof" system upgrades, since the functionality is software (protocol) based and does not require hardware replacement.

**Conclusion**

Voice over IP traffic does not necessarily have to travel over the global Internet; it may also be deployed on private IP networks, for example on a LAN inside a single building.

This new technology will for the most part, lead our communications into the next century. Consumers are thirsting for both a cheaper and more reliable telephone service, and VoIP might just be the answer. In the near future, telephony will be much more competitive in pricing and hopefully, the monopolies of the telephone industry shall no longer be able to control their individual sectors. With some fine-tuning and additional research, VoIP can become the new wave in communication.