

What is VoIP?

The basic idea in VoIP is to convert an analog voice conversation from a microphone or telephone handset into compressed digital form so that it can be sent over the Internet in packets. VoIP uses an analog telephone adaptor (ATA) -- a device used to connect a standard telephone to a computer or network so that the user can make calls over the Internet. The ATA contains a codec, which stands for coder-decoder. A typical VoIP codec samples an analog voice conversation 8,000 times a second and converts each sample into digital bits. The bits are grouped together into a payload packet that is sent 30 to 50 times per second. Each packet looks something like this:

Flag: Packet Ends Here	Packet # & Controls	Payload: Webpage, TV, VoIP or Email	Address: To where?	Flag: Packet Starts Here
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To reach another person's telephone, each packet contains an address that is read by the routers on the Internet and used to send the packet to where it is going. Each Internet user has an Internet Protocol (IP) address that looks like this: 192.158.10.7. This can be the address of a computer, a router, a switch, a gateway or a telephone. The person starting the VoIP phone call probably has no idea of the IP address he is trying to reach. What he may know is the phone number: 1-954-767-4558.

When you pick up a VoIP telephone, you typically hear a dial tone. That lets you know you are connected to the Internet. You dial the number you want to call. The tones sent by your telephone are converted by your ATA into digital data, put into a packet, and sent to a soft switch on the Internet.

The soft switch contains a database of users. It checks the database to look up the IP address that matches the phone number. If it cannot find the desired IP address in its database, it sends the request downstream (at the speed of light) to the next soft switch until one is found that has the answer. Once the correct IP address is found, a packet is sent to your friend's ATA which rings his phone. When your friend picks up his phone, his ATA knows that it will be receiving VoIP packets from your ATA. His ATA starts sending packets back to your ATA that lets you know that the call has been answered, and you can begin to talk. This return packet contains the IP address of your friend's ATA, so all the packets your ATA sends from now on for this phone call will contain this address. Your ATA is sending packets containing your voice to your friend and his ATA is sending packets with his voice back to you.

During the conversation, your codec is receiving thousands of packets. Because the Internet is so huge and complicated, some of the packets may have taken very different routes to get to you. Some will get to you earlier than others. Fortunately, each packet is numbered. Your codec assembles the packets in the proper order and converts them back into analog so you can hear them. The transmission process and the packet rearranging

may take some time. For this reason, there is often a time delay in a VoIP call that you don't hear in a regular circuit-switched phone call.

For your ATA to communicate with other ATAs on the Internet there has to be some protocol – an agreed upon system for how the packets should be organized and what the soft switches and routers will do with them. There are four protocols in common use today: H.323, SIP, MGCP and SCCP (never mind what they mean). They are not always compatible. This incompatibility may cause problems in expanding worldwide VoIP. No standards have yet been agreed upon. Meanwhile, however, VoIP is growing like mad.

Of the four protocols, SIP is modeled on Hyper Text Transfer Protocol (HTTP) that helped create the World Wide Web by establishing how PCs accessed and displayed Web pages stored on central servers. Like HTTP, SIP moves control of applications to the users. A VoIP caller and the person being called have complete control over their session. This eliminates the need for a central switching station.

Most VoIP customers want features like voicemail, call waiting, caller ID, second lines, and online account management. Since no physical equipment other than a phone and an ATA are needed at the VoIP caller's phone, these features are provided by software owned by the company providing the VoIP service.

There are several classes of VoIP providers:

- Stand alone independents like Vonage or Skype who assume that the consumer already has broadband from some other company. There are many such companies in existence today.
- Cable companies and electrical utilities that provide VoIP as a part of a triple play.
- Telcos who may provide VoIP as a new class of cheaper phone service along with their more expensive regular circuit switched service. VoIP does not have to be inferior to circuit switched phone service – it has been used by phone companies for their backbone architecture for years – the quality depends on the quality of the voice encoder (vocoder) used.
- Wireless cell companies who add VoIP to their cell phone service. Sprint, for example, upgraded their Sprint Power Vision NetworkSM network with the faster EV-DO Radio Access Network (RAN) technology. RAN applications can provide high-speed video telephony, music on demand, video messaging and large file uploads.

VoIP lets Cable TV companies compete with phone companies. It may help electric utilities enter the telecommunications market. It will help wireless companies to greatly reduce the cost of roaming calls, enabling them to compete more forcefully with wired

phone companies. It has led to the creation of several independent VoIP services such as Vonage and Skype. Will these independent services survive?

Forrester Research predicted that VoIP pure plays like Skype and Vonage will affect the pricing of telecom services but that they have no chance of removing Telcos from their consumer non wireless phone market leadership. When Forrester did their study 70% of Europeans had never heard of VoIP — and only 1% used it for their calls from home. Forrester concluded that VoIP pure plays could not survive as independent companies, because they did not offer a truly disruptive and transformational service. Some of Forrester's key reasons were:

- Telcos will respond with their own consumer VoIP services
- Consumers will not adopt VoIP very quickly
- VoIP will be less disruptive than many analysts expect

Supporters of VoIP are already focusing on the next big thing: video over the Net. *"While we've been watching VoIP mature and go mainstream, we're now seeing another opportunity arise,"* said Jeff Pulver, co-founder of Vonage and president of Pulver.com. *"I think that video on the Net will be even bigger than VoIP. I predict that within five years video on the Net will be more disruptive than VoIP has been in the past 10 years."*

On the other hand, I have been using video with Skype for several months. After the novelty wears off, it is really a nuisance. Regular Skype voice calls almost always go through. Skype video calls fail to work half the time. After you have seen your friends on your PC screen a few times, you realize that voice is the heart of true communication, not a picture. A PC image is not worth a thousand words.

VoIP is in many ways similar to long distance service in the early 1980s. At that time MCI used long distance to challenge and break up AT&T. In the process, MCI became very big and powerful. But, in the end, MCI disappeared because it did not control the access to the customers. All the phone companies had to do was to reduce the price of their long distance service, and MCI was dead.

The same thing may happen with VoIP. When VoIP services get big enough to become a threat, phone, cable and electric companies can offer it as an almost "give away" service, bundled with their other products. The independent VoIP services could simply wither away as MCI did years ago.

History may not repeat itself, however. eBay is a very smart company – one of the few that survived the dot com crash of 2000. Viral marketing brought Skype more than 100

million members in only three years. History is made by entrepreneurs like Zennström and Friis who founded Skype, not by market forces. Success of independent VoIP will depend on how it is marketed in the next few years.

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