VoIP (Voice over IP) in Plain English!

"VoIP (voip, vē'ō'ī'pē') Short for Voice over Internet Protocol. A protocol for transmitting the human voice in digital form over the Internet or other networks as an audio stream, instead of using traditional telephone lines." - Dictionary.com

"Voice over Internet Protocol (VoIP) is a technology that allows you to make voice calls using a broadband Internet connection instead of a regular (or analog) phone line." - FCC.gov

"Voice over Internet Protocol (also voice over IP, VoIP or IP telephony) is a methodology and group of technologies for the delivery of voice communications and multimedia sessions over Internet Protocol (IP) networks, such as the Internet" - Wikipedia

However you define it, VoIP or Internet Telephony (IP Telephony) requires a significant leap in our traditional thinking about voice communications. In order to gain a better understanding of Voice over IP, it's helpful to review the context in which it evolved.

We all are accustomed to our usual telephone calls carried over "Ma Bell's" copper wires from our telephone to the home or office of a friend, relative or customer. That's the way it has been ever since Alexander Graham Bell uttered those famous words in 1876: "Come here -- I want to see you" to his assistant, Mr. Watson.

ANALOG LINES – Since those early days, telephony has made use of "analog" technology that transmits its signals (your voice) by changing the shape of a continuous "wave" that is sent over the copper telephone wires.

Until very recently, all residential and most business phone lines were analog. Analog circuits are fairly simple and are still a fairly common form of voice transmission circuit in use today especially for residential use. An analog line can be connected to any brand of inexpensive analog telephone such as your typical home phone, a fax machine, a modem or another analog device like a credit card machine. Analog lines can also be connected to a business telephone system such as the one that you may have in your office.

DIGITAL LINES – A recent and significant innovation in the transmission of voice over copper wires was the development of the "digital" signal. This technology evolved during the post-WW2 era along with (and due to) the development of computer technology. A digital circuit breaks the audio information into a binary format. Your voice is represented by a series of "1"s and "0"s that are transmitted over the same copper wire as analog signals. One type of digital circuit is a T-1 or PRI circuit which is comprised of 24 "channels" or pathways or "trunks."

Digital circuits, or lines or trunks, are faster, quieter and much more efficient than analog circuits at carrying voice signals over copper wires. These circuits require special telephone equipment at both ends of the call to process the "1"s and "0"s into a meaningful dialogue. This is one of the many roles of the business telephone system.

VOIP LINES OR SIP TRUNKS –Voice over IP originated in data transmissions over a computer network. The Internet, described as "a network of many networks," uses encapsulation to send data packets over a network. Those packets carry within them the IP address of their destination as well as that of the sender along with its payload (the message) and other signature and transmission information.

VoIP technology encapsulates your spoken word into voice packets that travel across the Internet, along with data packets, to their IP destination. Special equipment is required at both ends of the conversation to manage the voice and data packet traffic, ***giving priority to the voice packets***, so that a coherent conversation can take place.
A VoIP line or SIP trunk, then, is a virtual pathway through the Internet carrying encrypted voice packets between two points. In short, your voice is encrypted for security, "packetized" for transport, "tunneled" through the maze of Internet

pathways along with a myriad of data packets, and then un-encrypted at the other end so your voice can be understood.

ANATOMY OF A VOIP PHONE CALL – VoIP telephony can refer to many, very different things depending upon the origin of the call, the phone system in use on which the call is originated, the network that will carry your conversation and the type of phone or phone system (or lack thereof) at the destination.

A VoIP phone call can originate on any phone that can be connected to a VoIP-capable phone system. Whether you have a digital or IP telephone on your desk, it is the telephone *system* that originates a VoIP phone call be it to another IP extension within your office or to an outside VoIP destination like a softphone on a laptop, another IP business phone system or a smartphone running a compatible application.

An IP telephone system is appropriately considered a "voice server" on your company's data network but it must also be connected to the local phone company's network (the Public Switched Telephone Network or PSTN) if you want to be able to reach the many destinations that don't yet have IP telephony.

Your VoIP phone equipment (system) determines which pathway or network to use.

1. If the call is destined for an analog device such as your home phone, the call will be directed over the analog ("Ma Bell") telephone lines or the PSTN and will be completed as an analog (non-VoIP) phone call.

2. If your call is to a remote colleague connected to your office by way of a VoIP connection, the call will be encrypted, packetized and routed directly over the Internet to your colleague's IP phone or softphone on his or her computer.

3. If the call is to another company that has an IP-capable communications system, it may still not be considered a VoIP telephone call since it is most likely being carried over the PSTN between locations and still incurs long distance charges (if the distance warrants.)

    a. One of the configurations that would make this scenario a true VoIP connection is the creation of one or more VoIP "trunks" or virtual lines, over the Internet, between the VoIP phone systems at each location. This would form one single communications system where all telephones at both locations are extensions on the other system.

    b. Another configuration is a VPN (Virtual Private Network) circuit to a teleworker who has an IP phone at home connected through a secure router to the phone system in your office. The common factor in these two configurations is the lack of the Public Switched Telephone Network.

A VoIP or SIP Trunk can also be a permanent connection between two (or more) VoIP phone systems (between your company's main and branch offices for instance). This same kind of connectivity can link several locations together and make everyone at all locations much more "visible" and reachable.

Voice-over-the-Internet actually has a place in many ordinary businesses today and can bring some incredible cost-saving and other benefits to even very small companies.

Here are a few examples to think about:

Imagine your Receptionist answering all of your company's incoming phone calls from home...transferring them to their proper destinations within your office, fielding inquiries from you and others in your office, even if he or she lives across town or in another city, state, or country! …and you still reach your Receptionist with the same press of a "Zero!"

Imagine being able to hire additional employees without having to come up with more office space! Imagine their productivity when they don't have to spend hours getting to and from work every day! Imagine finding the new, ideal candidate for your company but they live in another state and cannot relocate! These colleagues can be just a 3- or 4-digit extension-dial away with a VoIP business communications system!

Imagine communicating all day long with colleagues in your West Coast or Florida office, for free! You get the feeling that they are just another phone extension in your office... because they actually are! You just can't see them because they are hundreds or thousands of miles away. This scenario has an even greater impact on your bottom line when it's

your team of engineers in India or Hong Kong with whom you discuss issues several times a day! Communicating with them the old-fashioned way can be very expensive!

Imagine having to expand your company but you can't relocate to a new facility because it's either too disruptive to move or because of some other constraints. You can locate new employees in another building and, through their Internet connection, connect their phones as additional extensions to your existing phone system. They'll actually feel much closer to your operations as opposed to being "that group across town."

One of the most common misunderstandings about VoIP is that you can save much, if not all, of your long distance telephone charges by starting to use VoIP.

VoIP earned this really impressive cost-savings reputation in the days when even domestic long distance charges were very expensive. Today, these rates are quite literally approaching *zero* and these kinds of savings usually aren't the case any longer for *domestic* usage.

Instead, *proximity*, and its indirect efficiencies, has replaced the more directly-measurable long distance cost-savings as the principal focus of Voice over IP. Proximity enhances the value and productivity of the teleworker by bringing him or her much closer to you and your colleagues in the office. Together with remote computer access, the IP-connected phone on their desk gives the teleworker a much more effective business connection to the office but with all the comforts of home, literally. Truly a unique and highly productive experience!

The proximal effect of VoIP connectivity enhances the collaborative efforts among remote offices and headquarters or between an executive working from home or while traveling and his various principal and remote offices.

Proximity is the driving force of VoIP today.

VoIP technology has been evolving since the early 1990's but its vocabulary has been lagging. So let's start to define some terms to help make some sense of this new technology.

INTERNAL VOIP – When a VoIP-capable telephone system is installed with IP telephone sets throughout the office, it is making use of Voice over IP technology *within the office only*. The IP phones plug in to the data jack for your computer and your computer then plugs in to the back of the phone. (Most IP phones include an integrated 2-port data switch.) If you are cabling a new or remodeled facility, this means that you only need one cable instead of two for each office thus greatly reducing the cost of your structured voice and data cabling infrastructure. *(Numerous variables warrant in-depth discussions with your IT consultant prior to implementing a one-cable solution!)*

HYBRID VOIP – This describes telecommunications equipment that is capable of supporting both digital and VoIP technologies. Most telephone systems of the past few decades have been "digital" in design as opposed to the "analog" phones that we used to have at home. A hybrid system can be installed to function digitally, sometimes re-using your existing telephone sets and, at the same time, support a teleworker at the other end of a VoIP connection at home or in a remote office.

TELEWORKER VOIP – This applies to an individual working from home or in a remote office where it's not necessary or practical to install a complete business phone system. A SIP-compatible IP telephone and a VPN-capable router for security complete this virtual telephone and computer communications "bridge" to your office where you have a VoIP-capable phone system.

MOBILE VOIP – The travelling employee can connect to a VoIP-capable phone system at headquarters with a "softphone" that is simply an application on a laptop to make or receive calls just as if he or she were actually in the office. Similar connectivity can be achieved with many of today's smartphones. In these scenarios, one must remember that when calling the local pizza shop or Emergency number, one is doing so 'from the home office,' complete with its Caller ID and long-distance charges.

TELEGROUP VOIP – This type of Voice over IP is for small to medium groups of remote employees that need to be connected to the main office. They usually fall into two distinct categories:

1. **DISCRETE**, where a small group of remote employees share the connectivity described above by adding a voice-capable data switch to that scenario in order to increase the number of users in the remote office. Consideration should then be given to a possible need for local phone lines.

2. **INTEGRATED**, where a small to medium-sized group of remote employees have a need for multiple local phone lines but still want to be connected to the main office by using extensions. This scenario would make use of a smaller phone system that is connected to the main system with VoIP trunks over high-speed Internet connections in each office. Centralized Voice Mail and shared applications like Contact Center, Screen POPS and other such resources create a very strong return-on-investment for the entire system.

QoS – Quality of Service – Remember that all Voice over IP solutions require high-speed (broadband) Internet connectivity such as a T-1 circuit, high-speed DSL, a cable-provider connection or fiber optic connectivity. And the data network equipment at both ends of your VoIP calls *must be capable of assigning a higher priority to voice traffic than to data traffic if you are to avoid delay, jitter, dropped syllables and other common VoIP anomalies*. Quality of Service is the ability of network equipment to provide different priorities to different data flows in order to guarantee a certain level of performance of a data / voice flow. QoS guarantees are very important for the real-time streaming of Voice over IP and for maintaining an acceptable level of clarity in your conversations.

Hosted VoIP - The Hosted PBX (Public Branch Exchange or phone system) provides all of the communications services needed by a business today and it does so, remotely, from a data center. This usually eliminates the need for premise-based telephone equipment.

The only equipment to buy is the network interface equipment specified by your particular provider and of course the telephones on your desks. Beyond that, you simply pay a monthly fee per phone or per line for the service. This solution is very flexible and usually allows you to create new remote locations of any size very quickly. It accommodates mobile VoIP very well by allowing travelers to connect to the system with a softphone client on their laptop, a home phone or a cell phone from anywhere.

It is usually recommended that there be high-speed Internet connectivity at every location where the service will be used. Hosted VoIP is pure VoIP in its truest sense. The hosted PBX completely replaces your premise-based phone system and completes your calls almost as seamlessly and clearly as the most sophisticated business telephone systems.

Hybrid Hosted VoIP – This is a unique variation on the Hosted PBX described above with one notable and significant difference. The network interface equipment specified by the provider gets connected directly to your Internet Service Provider (ISP) modem at the head of your network. It is therefore in the ideal position to do the traffic shaping and voice prioritization required for high-quality Voice over IP communications. This special interface passes your *data* traffic directly through, untouched, to your existing network equipment while separating and optimizing your voice traffic thus avoiding the usual voice-data interference on the typical VoIP network. Internal (extension-to-extension) calls are also managed in this internal interface and thus don't have to be processed in the remote data center. This results in crystal clear internal calls with no lag time or interference.

What Other Advantages Does VoIP Have?

Flexibility and more flexibility! Imagine receiving a really important call meant for your desk phone while you are on vacation in a foreign country. With VoIP it's not only possible, it's easy! (And you can always pause that feature if you just want to enjoy your vacation.)

Another great application of VoIP is in heavy use by companies who provide phone support. No longer do these companies require massive contact centers full of agents. They now use a VoIP system to route calls to employees with VoIP phones on their desks at home or in remote offices. Often, these agents are scattered across the country or even the world – often purposefully in order to offer their services from multiple time zones!

So, Is VoIP Right for Your Company?

As with many business decisions, the answer is "It depends." The number of locations you support, the expense of your traditional local and long-distance services and, most importantly, the relevance of the "Proximity" of your company workforce to your organization are a few of the considerations that help to determine the effectiveness of a VoIP system for your company.

Call Double Eagle today for a free consultation and we'll help you make sense of VoIP in the life of your company