

telephony • internet access • remote access • modems



Voice Over IP

Technology Guide

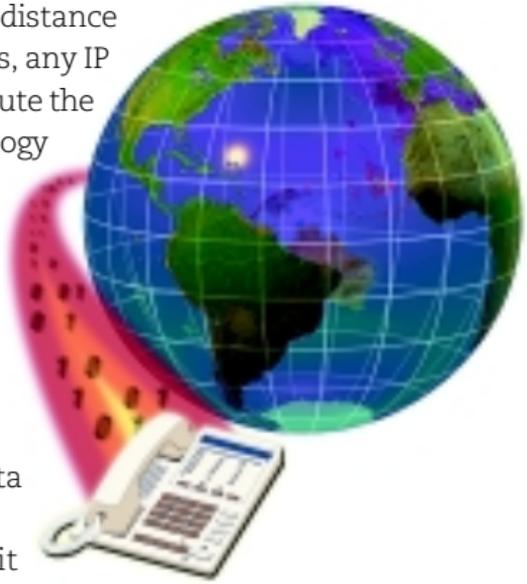
VoIP \ 'voip\ n : emerging technology allowing systems and wires that connect computer networks to perform as an alternative to phone lines - delivering real-time voice to standard telephones

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Toll-bypass Long Distance Calling

Now multi-location businesses can use the Internet or a private network (Intranet) for long distance voice and fax communications and save thousands of dollars annually. Instead of paying your long distance carrier to route long distance calls between offices, any IP data network can route the calls using a technology called Voice over IP (VOIP). It doesn't matter if you are using the Internet, a private Intranet, ISDN, DSL, frame relay, wireless, or satellite for your data communications network, as long as it uses the Internet Protocol (IP).



If you make frequent long distance calls to a remote site, you already know the charges can add up quickly. Voice over IP is designed to help you maximize the investments you've already made in your data and telecommunications network infrastructure by bridging them together to provide toll-free communications.

This guide provides telecommunication managers and data communications managers with an introduction to Voice over IP and how they may benefit from voice and data convergence.

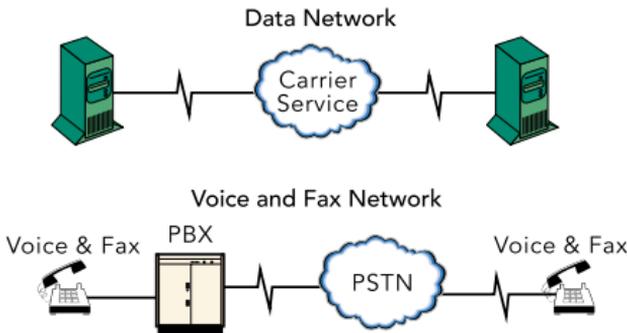
What is VOIP?

VOIP lets you make toll-free long distance voice and fax calls over existing IP data networks instead of the public switched telephone network (PSTN). Today businesses that implement their own VOIP solution can dramatically cut long distance costs between two or more locations.

That Was Then...

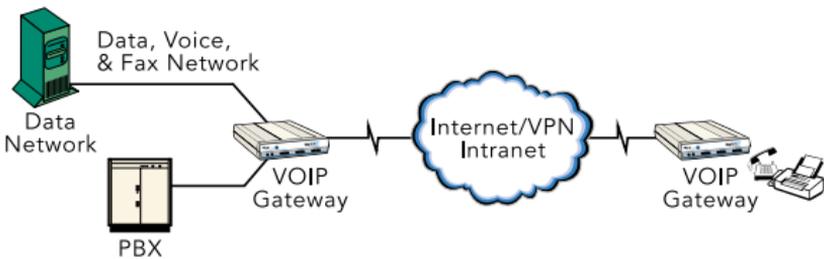
For the past 100 years people have relied on the PSTN for voice communication. During a call between two locations, the line is dedicated to the two parties that are using it. No other information can travel over the line, although there is often plenty of bandwidth available.

Later, as data communications emerged, companies paid for separate data lines so their computers could share information, while voice and fax communications were still handled by the PSTN.



This Is Now...

Today, with the rapid adoption of IP, we now have a far reaching, low-cost transport mechanism that can support both voice and data. A VOIP solution integrates seamlessly into the data network and operates alongside existing PBXs, or other phone equipment, to simply extend voice capabilities to remote locations. The voice traffic essentially "rides for free" on top of the data network using the IP infrastructure and hardware already in place.

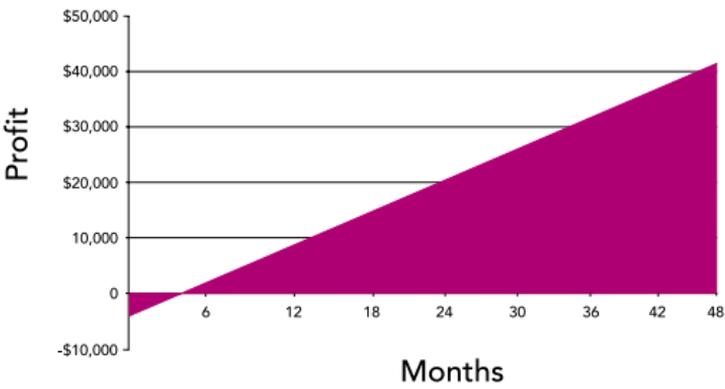


Immediate Cost Savings

VOIP solutions provide the potential to save substantial amounts in long distance charges. Businesses with remote offices worldwide or just in a different area code miles away can profit from a VOIP solution. Even with the most inexpensive calling plans, a VOIP network, such as Multi-Tech's MultiVOIP gateway solution, can quickly return your investment and begin paying you back.

Locations	MultiVOIP Cost	Long Distance Cost/Minute	Minutes/Line/Day	MultiVOIP Payback
Corporate Site/ Minneapolis	\$1,999 MVP410 (4 lines)	\$0.04	90	139 days
Branch Site/ Los Angeles	\$1,099 MVP210 (2 lines)	\$0.06	60	153 days
Branch Site/ London	\$1,099 MVP210 (2 lines)	\$0.08	60	115 days

In fact, after the one-time investment is paid off, the VOIP solution begins to create profit for your company.



Applications

Voice over IP is ideal for multi-location businesses looking to reduce toll charges associated with intra-office calling. It is designed to help you maximize investments you've already made in your data and voice network infrastructure. Some examples of the many applications for a voice over IP network include the following:

Office-to-office Communication

A VOIP network can be as small as two offices or as large as hundreds of offices. Each office installs and configures a VOIP solution on their network to begin placing calls or sending faxes to the other offices on the VOIP network.

Off-net Calling

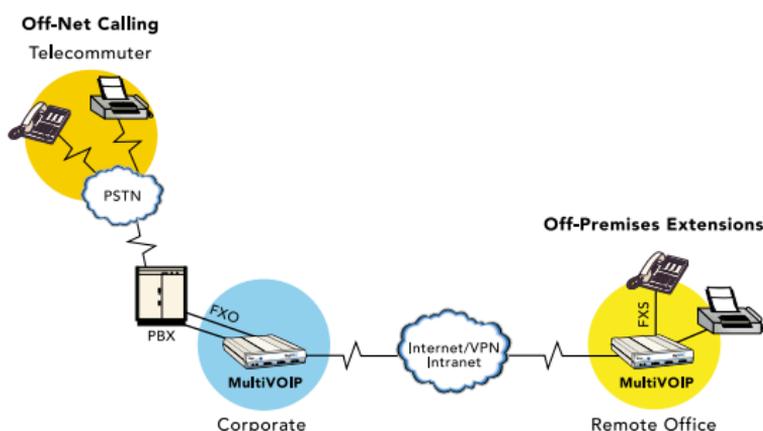
Telecommuters or customers off the IP network can make toll-free long distance calls by dialing into a local VOIP solution and placing calls to any other location on the VOIP network. You can even have a VOIP solution at a remote site dial a local phone number for a free person-to-person long distance call.

Create Off-premise Extensions

Extend the reach of your PBX into home office locations. Simply connect a VOIP solution to the PBX at the corporate office, and another VOIP solution at the remote office. Now, anyone can place calls to the remote office by simply dialing an extension number.

Replace Expensive Tie Lines

A company that utilizes tie lines to connect branch office PBXs to the corporate PBX can now use their own IP-based Wide Area Network to complete the call.



Business Quality Voice

Independent tests of VOIP systems have shown that they are perfectly capable of delivering “toll-quality” voice. The actual voice quality your business will experience, however, is affected by a number of factors: WAN bandwidth (the higher the better), voice compression and network conditions such as latency (average “travel” time it takes for a packet to pass through the network). On a private Intranet you can control all of these factors to achieve near toll-quality voice connections. When using the public Internet, you can control everything but the latency factor. Latency, however, can be managed to enhance your voice quality with a quality of service guarantee from your ISP.

When network traffic is at peak levels, voice can be given priority over data to ensure consistently high voice quality using the Differentiated Services (DiffServ) Quality of Service (QoS) protocol. Other features such as forward error correction, bad frame interpolation and dynamic jitter buffers, can further enhance voice quality.

“We made hundreds of test calls using the (MultiVOIP’s) outside lines, and most people we called couldn’t tell that we weren’t on a standard long distance line.”

—PC Magazine Test Center
February 9, 1999

Bandwidth Requirements

One common misconception about VOIP is that it is a bandwidth hog, when, in fact, voice is a very efficient type of traffic. Voice compression standards like G.729 (8:1) and G.723 (10:1) are used to minimize the bandwidth required for voice. G.723, for instance, is the maximum compression rate and requires only 5.3K bps (plus an added 7-8K bps for IP overhead). Even at maximum compression, your VOIP solution will still provide near toll-quality voice.

As a rule of thumb, 14K bps of bandwidth per call is ideal. This includes the compressed voice packet and the IP overhead. To determine total VOIP bandwidth needed per location, take the number of VOIP channels being used and multiply by 14K bps. Then double this number to accommodate for both voice and data traffic.

It should also be noted that bandwidth is used only when someone is speaking. A silence suppression/Voice Activation Detection (VAD) feature is an option that frees unused call bandwidth for data traffic. This is significant, since callers are usually silent for 60 percent of the call.

Interoperability

Standards are still emerging that ensure VOIP features work with different vendor solutions. The H.323 standard is the one most widely deployed and is the only approved protocol adopted by the International Telecommunications Union (ITU). The H.323 standard provides support for audio calls to other H.323 clients, gateways, gatekeepers and conference servers. Another emerging standard is the Session Initiation Protocol, or SIP. Look for products that are adopting these two standards.

VOIP Solutions

From the wide variety of VOIP solutions available today, the one you select depends on the size of your business, the level of networking expertise available, the amount of integration with legacy equipment, and the level of voice quality you require.

Routers

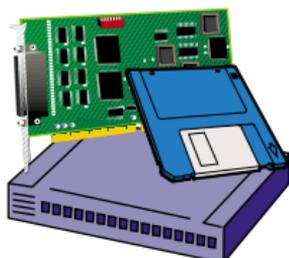
Router solutions usually replace an existing network router and keep voice and data all in a single box. However, this solution requires networking expertise, and can be costly to install, while placing network services at risk during deployment and maintenance.

VOIP Server Cards

VOIP server cards can be an economical VOIP solution. However, they must be compatible with the server and operating system and installations can be complex.

IP-based PBX

The IP-based PBX is usually software running on a computer based server. However, it often requires a forklift upgrade of the existing PBX, or at a minimum, an extensive software and/or hardware upgrade. An IP-based PBX is typically marketed to new installations where no legacy system is in place.



PC-based Telephony

PC-based telephony software is by far the cheapest VOIP solution, but it is also the clumsiest. It requires users to make phone calls using their PC instead of a phone. This usually involves user training and an investment in speakers and microphones for each PC. Plus, many users complain that voice quality for this solution is not adequate for business communications.

IP Gateways

An IP gateway, like Multi-Tech's MultiVOIP, is often the most suitable VOIP solution for small to midsize businesses and remote sites. It does not disturb your existing data infrastructure because it simply drops into the Ethernet network. Furthermore, it operates alongside existing PBXs or other phone equipment to extend voice capabilities to remote locations or users. An IP gateway requires only a minimal investment in product, installation, and user training.

Planning a VOIP Implementation

- *Encourage data communications managers and telecommunications managers to work together.*
- *Choose a solution compatible with existing and planned systems.*
- *Ensure that the VOIP product utilizes industry standards (ITU G.711, G.729, G.723, H.323, SIP, etc.).*
- *Manage your bandwidth by giving priority to real-time traffic, like voice and video.*
- *Keep VOIP calling as easy and seamless as possible by selecting a product that has calling procedures similar to your existing phones.*

The Multi-Tech VOIP Solution

Multi-Tech's award-winning MultiVOIP provides an easy and low-risk way for your business to save on long distance voice and fax costs.



Easy to Install

You don't have to change your PBX, data network, or Internet/Intranet access to implement the MultiVOIP solution. There is no integrating this device with a PC, a server, or operating system. And to simplify installation, the central site can preconfigure all units before sending them to the remote sites.

MultiVOIP:

- eliminates toll charges between offices
- requires no changes to phone or network systems
- installs in minutes
- easy to use

Low-risk

MultiVOIP allows you to implement VOIP without interfering with your network infrastructure or phone system. If there are problems with the VOIP installation or the IP network goes down, you can still pick up your phone and use the PSTN to place a long distance call.

Scalable

The MultiVOIP design allows you to expand VOIP support as needed. Add more VOIP ports at a busy site with another MultiVOIP. Add another office to your VOIP network by installing a MultiVOIP at that office.

Easy to Use

Placing calls with MultiVOIP is like using your existing phone system. No end-user training is required.



Requirements

You probably already have what you need to deploy a MultiVOIP network and start saving on long distance calls.

MultiVOIP Site Requirements

- Ethernet LAN
- IP network
- IP addresses

To determine the number of ports that you need, first determine what percentage of the long distance bill is used for intra-office communication (typically between 25-40%), then multiply the percentage by the number of lines at the location. If you are using tie lines, for every line that you support, you will need one port on the MultiVOIP.

MultiVOIP Models

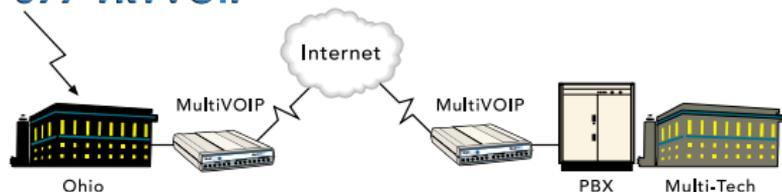
Model	Description
MVP110	1-Port VOIP Gateway (FXS)
MVP120	1-Port VOIP Gateway (FXO)
MVP210	2-Port VOIP Gateway
MVP410	4-Port VOIP Gateway
MVP810	8-Port VOIP Gateway
MVP2410	24/48-Port T1/PRI VOIP Gateway
MVP3010	30/60-Port E1/PRI VOIP Gateway

To learn more about the MultiVOIP family visit our web site at www.multitech.com/products/multivoip.

Try VOIP Now!

You be the judge! Call our toll-free demo (in the USA) **1-877-TRYVOIP** and hear for yourself how clear the connection can be.

1-877-TRYVOIP



VOIP Terms

bad frame interpolation interpolates lost/corrupted packets by using the previously received voice frames. It increases voice quality by making the voice transmission more robust in bursty error environments.

compression is used at anywhere from 1:1 to 12:1 ratios in VOIP applications to consume less bandwidth and leave more for data or other voice/fax communications. The voice quality may decrease with increased compression ratios.

DiffServ (Differentiated Services) is a quality of service protocol that prioritizes IP voice and data traffic to help preserve voice quality even when network traffic is heavy.

dynamic jitter buffer collects voice packets, stores them, and shifts them to the voice processor in evenly spaced intervals to reduce any distortion in the sound.

E&M (Ear and Mouth) is the interface on a VOIP device that allows it to be connected to analog PBX trunk ports (tie lines).

forward error correction increases voice quality by recovering lost or corrupted packets.

FXO (foreign exchange office) is the interface on a VOIP device for connecting to an analog PBX extension.

FXS (foreign exchange station) is the interface on a VOIP device for connecting directly to phones, faxes, and CO ports on PBXs or key telephone systems.

H.323 is an industry-standard call setup protocol designed to standardize VOIP communications between other H.323 telephony solutions.

ITU G.723, G.726/G.729 and G.711 are some of the standards developed for compression technologies.

latency is the average “travel” time it takes for a packet to pass through a network. The lower the latency, the better the voice quality.

PSTN is the public switched telephone network that traditionally routes voice calls from one location to another.

SIP (Session Initiation Protocol) is a signaling protocol for Internet conferencing, telephony, multimedia and other types of communications over the Internet.

Who's Multi-Tech?

Success is about communication. Multi-Tech is about making it easier. We create better ways of sharing information — remotely and over the Internet.

Multi-Tech solutions set the standard for efficient and effective communication in an information-hungry age. Our products are known for their reliability, performance and flexibility. With Internet access, remote access and telephony products, Multi-Tech is creating a world where technically, everything's possible.

At Multi-Tech we've built our reputation on reliable products and our customer-centric approach — listening to our customers and anticipating their needs. We also continue to offer full-service technical support at no additional cost to you; a policy almost unheard of in the industry. We provide unlimited telephone technical support and 24-hour web site support. You can rest assured that assistance and support are just a phone call away. You'll find responsive, technically savvy professionals eager to answer your questions.

Trademarks: MultiVOIP, Multi-Tech, and the Multi-Tech logo: Multi-Tech Systems, Inc. / All other products or technologies are the trademarks or registered trademarks of their respective holders. / Model numbers, product specifications, and prices are subject to change without notice.

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