

Executive Summary

The purpose of this eBook is to take the reader through areas of understanding when considering setting up a VoIP system. The background information will provide a bridge to ease the transition into the new world of Voice over Internet Protocol.

Topics Covered

- What is VoIP?
- What is the history of VoIP?
- What are the benefits of VoIP?
- What are the disadvantages of VoIP?
- What is a typical VoIP set-up?
- Conclusion
- Standard Ports
- Terms and Definitions

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What is VoIP?

VoIP stands for Voice over Internet Protocol. VoIP allows the subscriber to replace their existing landline telephone service provider and make telephone calls over existing high-speed internet connection while still using the existing telephones at a much lower cost. This technology allows two or more parties communication vocally over a standard data network. Computers communicate to each other over what is called a data network; they pass envelopes called packets back and forth. These packets contain information, such as; a web page coming from a web server to be displayed in a web browser, mail message coming from an email server to be displayed in an email program, and so on. Voice over Internet Protocol is just data going from one phone device to another.

What is the history of VoIP?

VoIP has been around longer than you think. Its inception was 10 years ago in 1995 by some hobbyists in Israel communicating between two Personal Computers. Later in 1995, Vocaltec, Inc. released a software product called Internet Phone. This software ran on a home PC (486/33 MHz) with sound cards, speakers, microphone, and modem. This software used a compression algorithm to compress the voice signal, converted the voice signal into voice packets then would transmit the voice packets over the Internet. The problem was this technology only worked if both parties had the same software and equipment. Even though the sound quality was poor, it still represented the first IP phone.

By 1998, VoIP was starting to gain a small following from entrepreneurs setting up primitive gateways allowing the first PC to phone and later phone-to-phone

communications. Some entrepreneurs provided customer facilities to make free phone calls over an existing phone. These services had advertisements at the beginning and at the end of each call and were only available in North America.

In 1998 VoIP, traffic represented less than 1% of voice traffic, in 2000 VoIP, traffic exceeded 3% of voice traffic and by 2006, it has forecasted to grow rapidly to between 25% and 40% of all international voice traffic.

Voice communications is the latest application making its way into the Internet. This technology has been growing since its humble beginnings. With business and residential phone costs rising, this infrastructure makes a lot of sense. The future will hold large-scale and widespread adoption of this technology, the new telephony standard.

What are the benefits of VoIP?

1. Cost is one of the major benefits of VoIP. Between the number of features the VoIP providers are offering and long distance savings, the cost benefits really add up. For instances before the home VoIP system, on average the household was paying \$120 phone bill each month; \$50 were for line and feature fees, the remaining portion were long distance charges. Annually, this was costing the household \$1,440. Now with the home VoIP system, the household pays \$34.95/month or \$419.40 annually. This is more than \$1,000/year of savings and the VoIP service has more features and better reporting of phone usage.
2. The existing phone wiring and all the existing phones do not have to be replaced. There are no special VoIP phones required for residential service. In the office, a VoIP phone system could be installed and yes these complex systems do require special phones but this is not the case for residential service. In our household, a phone line was needed to connect the VoIP modem to the phone line collection point existing in the garage. Once this was connected, all the phones in the house were receiving and making calls over the VoIP system.
3. Voice quality is amazing; people using the system cannot tell if they are on VoIP system or the traditional land based telephone system.
4. Some VoIP providers offer one account to possess multiple virtual numbers. Here I can add a virtual number to my account in a different area code. Anyone in that area code can call that number, which in turn is routed to your primary number and rings where the VoIP modem resides. Therefore, the caller does not incur any long distance charges because the call is local to them.
5. Some VoIP providers offer a soft phone technology. The soft phone is a piece of software that runs on some type of Personal Computer. A traveling laptop would really benefit here because all you need are the required system specifications and you can make calls just as if you were at home, wherever the laptop may be residing.
6. VoIP providers can provide a method to move the existing landline number to the new VoIP system. This method of move the landline number is called LNP (Line Number Portability). Once this is completed, outside callers will not know the difference, as they will be calling the same number as they have always called. This is a great feature because you do not need to change the existing phone number.

7. Some VoIP providers are now selling VoIP modem with a cordless phone base station built in. These VoIP modems come complete with handsets which really makes it easy to be connected and start saving.
8. 911 services are available with most VoIP providers; the VoIP provider just needs to know where the VoIP modem is currently residing.

What are the disadvantages of VoIP?

1. The Internet connection and Internet provider become more of reliance than they have been in the past. If the Internet connection goes down, the VoIP modem cannot communicate with VoIP provider's host system. Some VoIP providers offer the ability to forward calls to a phone number in case the VoIP host system cannot communicate with the VoIP modem. In this age where cell phones are commonplace, having the VoIP host system routing calls to a cell phone in case this happens is not a big problem.
2. Not everyone has a VoIP system. I know you are wondering, how is this a disadvantage. Well, if a VoIP subscriber calls, another VoIP subscriber and they both have the same VoIP provider; this is called an "in-network" call. The bonus here is any time consumed by this call is not counted against the minutes of the caller's account. If I have a plan that is 500 anytime minutes and I call a friend that uses the same VoIP provider as I do and talk to them for 60 minutes, the 60 minutes are not subtracted from my 500-minute plan.

What is a typical VoIP set-up?

There are three different implementations of a residential VoIP system.

1. The VoIP modem is just a modem with no routing capability
2. The VoIP modem has routing capability and is the only router in the environment
3. The VoIP modem has routing capability but there is an additional router

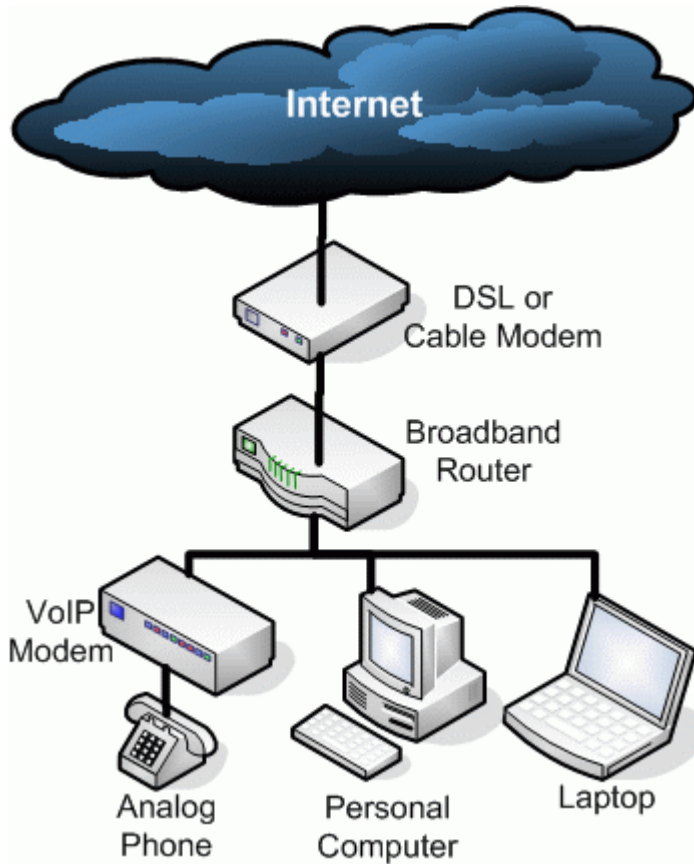
These implementations are diagramed below.

The first requirement for VoIP phone system to work is a high-speed internet connection. A dial-up internet connection will not work because the host system of the VoIP provider must be able to connect and communicate with the VoIP modem 100% of the time. There are three typical placements of the VoIP modem depending on the make and module. Some VoIP modems have broadband router capabilities built in, so these devices can act as a router where others are just a VoIP modem. If the model of VoIP modem is just a modem and has no routing capability then a separate broadband router will be required with potentially ports opened and forwarded to the VoIP modem. See the description around "The VoIP modem is just a modem", this will explain what the open ports will entail.

To gain a reasonable sound quality, the VoIP communication will consume about 90kbs of the total internet bandwidth. This is another reason why a dial line will not work.

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The VoIP modem is just a modem with no routing capability



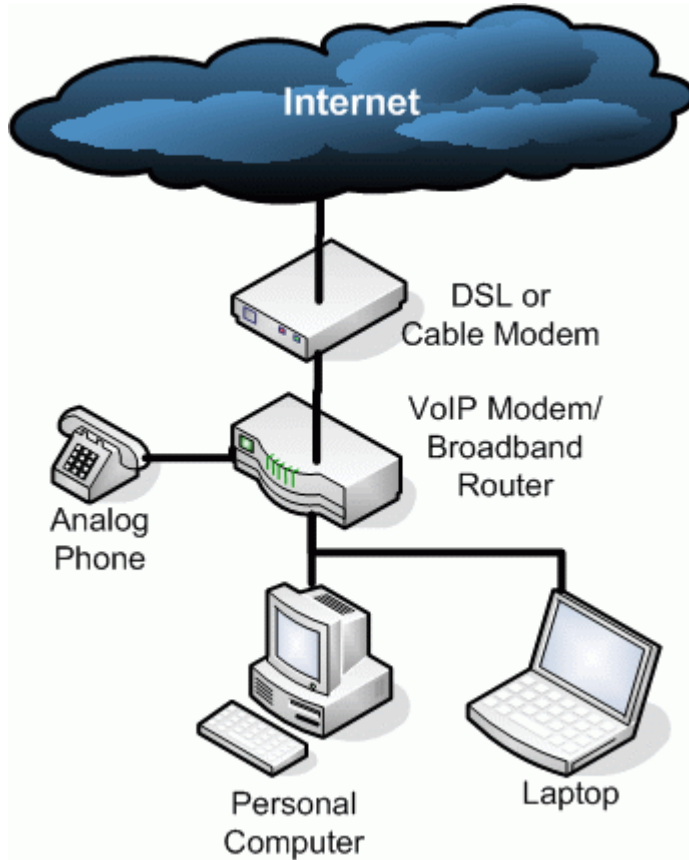
In this configuration, the VoIP modem is just a modem and a broadband router is required for two functions. The first function is to provide a path for the VoIP modem to communicate with the VoIP provider's host system. The second function is to provide a path for the VoIP provider's host system to communicate with the VoIP modem. These two functions are very important to the VoIP modem because as was explained in the VoIP history, the voice stream is broken down into data packets and these data packets need to be routed to a receiver or destination. This briefly is the basis for all Internet communication, routing data packets from the source to a destination. This particular set up may require additional configuration on the broadband

router. If the router is configured to block everything coming from the Internet then, certain ports may be required to be opened in order for the VoIP modem to communication properly. The standard ports are going to be outlined later in this document.

The set up is easy to implement because it just hooks into an existing broadband network. This is also simple because the installer is already familiar with their network components so, a base knowledge set exists.

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The VoIP modem has routing capability and is the only router in the environment

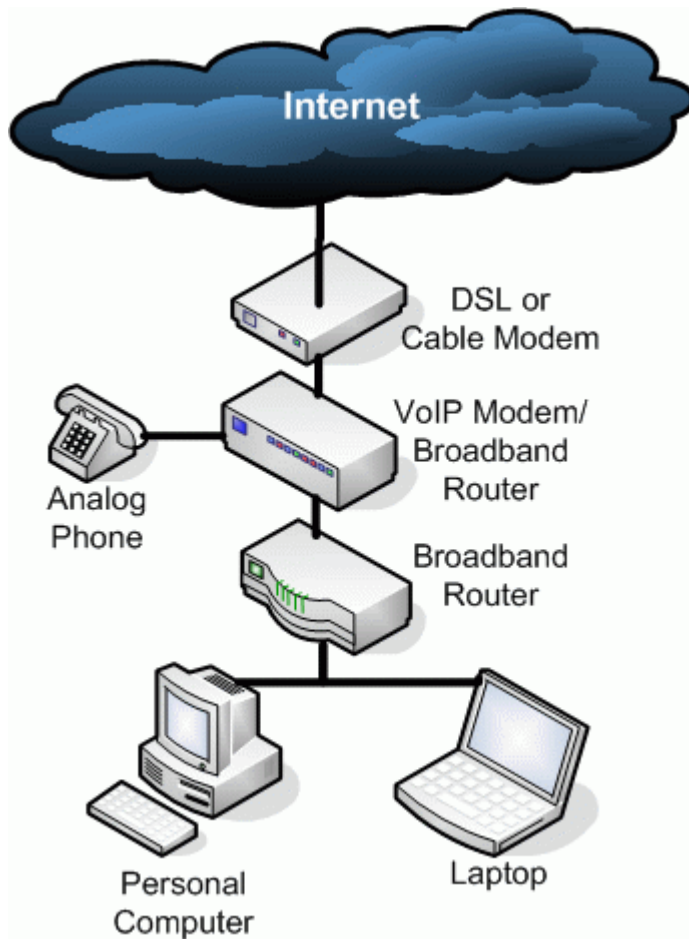


In this configuration, the VoIP modem has a broadband router capability built-in. The VoIP modem/broadband router is the center and everything is plugged into it. The DSL or Cable modem connects the home network to the Internet. The existing analog phones and any existing personal computers or laptops would also plug into the VoIP modem/broadband router. A nice added bonus to this configuration is, if a firewall is not present in the home network, having this added protection will shield any personal computers or laptops from good and/or bad adventurous Internet travelers. This set up is simple because of the number of components to manage. VoIP service providers usually configure this device so that it will be very “plug and

play”. The downfall is, if the VoIP modem/broadband router goes down you will not be able to make calls or communicate with the Internet.

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The VoIP modem has routing capability but there is an additional router



In this configuration, the implementation can be set up two different ways. The VoIP modem/broadband router and the broadband router can be reversed. It really depends on which unit is going to route the network traffic to and from the Internet. Again, in this configuration most of the VoIP providers will pre-configure the VoIP modem/broadband router. One good feature of the set up is the existence of two devices that can serve as broadband routers. If one router stops working, there is always the other one. There is no benefit to use one router over the other router in this configuration.

Conclusion

VoIP has been gaining more and more acceptance as a viable option when considering a residential or business phone system. The savings recognized in monthly fees and long distance charges cannot be ignored. I personally have had Vonage VoIP in my home residence as the primary phone service since 2003 and in the 23 months, I have saved over \$1,950. \$1,950 of my hard earned money! I have set up a virtual phone number in another area code so, the friends and family in that area code can call us for free which saves them money. With the features offered by Vonage and the savings, I have been very happy converting from the traditional landline. I will never go back!

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Standard Ports

The following ports are required to be open and forwarded to the VoIP modem if the VoIP modem is behind a router that also acts as a firewall.

Port Number	Port Type
5060 to 5061	TCP/UDP
123 to 123	TCP/UDP
69 to 69	TCP/UDP
53 to 53	TCP/UDP
10000 to 20000	TCP/UDP

Terms and Definitions

Bandwidth

Bandwidth is the amount of data that can be passed along a communications channel in a given period of time. Usually measured in bits-per-second, bandwidth is the capacity of your Internet connection to transmit and receive data.

Billed Telephone Number (BTN)

The Billed Telephone Number (BTN) is the main telephone number on your account. Typically it is the number displayed on your phone bill.

BlastMe

BlastMeSM rings all the numbers in your Ring Lists simultaneously. To create a Ring Lists, you must have a Virtual Number or Toll Free plus Number and at least two physical Vonage lines in the same account.

When BlastMeSM is activated, a call will connect to the first phone that is picked up. If all the lines in your Ring Lists are in use, the caller will hear a busy signal. To prevent this, you can activate Call Waiting on at least one line in your Ring Lists.

Cable Broadband

High-speed Internet service that comes through your cable system

Cable Modem

A cable modem is a modem that provides high-speed Internet access to your home directly through your existing cable television line.

Customer Service Record (CSR)

Customer Service Record (CSR) is a document that is required for all telephone numbers. This record shows all services associated with that particular line, including billing activity and service orders.

Dashboard

The Dashboard is usually the first screen you see when you login to your web account. An easy way to think of this is like the home page of your web account. There are many things located on your dashboard.

Some are

- the last 10 placed and received calls
- links to your voicemail
- number transfer status
- and more!

Device Portability

Device Portability is the ability to use your Vonage phone adapter anywhere there is a high-speed Internet connection. When visiting family, going on vacation or traveling for business, as long as you have your Vonage phone adapter and a high-speed Internet connection, you can make and receive calls as if you were home.

Digital Subscriber Line (DSL)

Digital Subscriber Line, or DSL, is a type of internet service that comes through your phone line.

Dynamic Host Configuration Protocol (DHCP)

Dynamic Host Configuration Protocol is used to automatically configure a host during boot up on a TCP/IP network and to change settings while the host is attached.

This means that you can store all the available IP addresses in a central database along with information such as the subnet mask, gateways, DNS servers etc.

The basics behind DHCP are the clients are configured to use DHCP instead of being given a static IP address. When the client boots up, it sends out a BOOTP request for an IP address. A DHCP server then offers an IP address that has not been assigned from its database, which is then leased to the client for a pre-defined period.

Firewall

A firewall is a system designed to block unwanted network traffic going in and/or out of your home or office network.

Firm Order Confirmation (FOC)

Firm Order Confirmation (FOC) is the finalized date for your number to be transferred. The local carrier that is releasing the number issues this date.

International Calls

International Calls are calls that terminate outside of the United States. Dialing 011 followed by the country code and phone number will place these calls.

In most service plans, calling anywhere in the United States, Canada, and Puerto Rico is considered a domestic call and is not subject to international calling charges.

Internet Service Provider (ISP)

A business that provides subscriber-based access to the Internet. Subscribers can be individuals or businesses. This is the company that supplies your high-speed Internet connection.

Interstate Calls

Interstate calls are calls that terminate out of the state that you are calling from; also known as state to state long distance.

Kilobits per second (Kbps)

Kilobits per second represents the amount of data (binary "1s" and "0s") that can be transferred in one second. The higher the number of kbps, the more data can be transferred at once.

Latency

Latency, also known as delayed or elapsed time, is an expression of how much time it takes for a packet of information to cross a network connection, from sender to receiver.

Letter Of Agency (LOA)

The Letter Of Agency authorizes Vonage to become your local, local toll, and long distance provider. It also allows Vonage to legally obtain your number without the threat of slamming.

Line Sharing

In the telecommunications industry, line sharing is when a higher-frequency DSL signal rides alongside a regular low-frequency phone call on an existing phone line, thus "sharing" the same wire.

Local Access Transport Area (LATA)

Local Access Transport Area is a geographic area defined by your local telephone company in which your local telephone provider can carry calls.

Local Exchange Carrier (LEC)

A Local Exchange Carrier is a telephone company that provides service to a local calling area. LECs also originate and terminate long distance calls for long distance carriers.

Local Number Portability (LNP)

Also known as Local Number Portability or Line Number Portability, LNP is the ability to change telecommunications service providers while maintaining one's own phone number.

Local Service Request (LSR)

Local Service Request (LSR) is the request that is submitted to the local provider to transfer a phone number.

Modem

Short for Modulator/Demodulator. Equipment that converts digital signals to analog signals and vice-versa. Modems are used to send data signals (digital) over the telephone network, which is usually analog. A modem modulates binary signals into tones that can be carried over the telephone network. At the other end, the demodulator part of the modem converts the tones to binary code.

NANP

The North American Numbering Plan (NANP) is a system for three-digit area codes that direct telephone calls to particular regions on a public switched telephone network (PSTN), where they are further routed by the local network. It is applied to the United States and its territories; Canada; Bermuda; and many Caribbean nations.

NPA-NXX

North American phone numbers are in this format:

NPA-NXX-XXXX

NPA is the area code and NXX is the exchange. The last four digits are known as the extension or actual phone number assigned to a given subscriber. For example, in the number (123) 456-7890: "123" is the NPA, "456" is the NXX, and "7890" is the extension.

Network Address Translation (NAT)

In computer networking, network address translation (NAT, also known as network masquerading or IP-masquerading) is a technique in which the source and/or destination addresses of IP packets are rewritten as they pass through a router or firewall. It is most commonly used to enable multiple hosts on a private network to access the Internet using a single public IP address.

Plain Old Telephone Service (POTS)

POTS (Plain Old Telephone Service) is basic telephone service that supplies standard single-line telephones, telephone lines, and access to the PSTN (Public Switched Telephone Network).

Point-to-Point Protocol over ATM (PPPoA)

PPPOA or PPPoA, Point-to-Point Protocol (PPP) over ATM, is a network protocol for encapsulating PPP frames in ATM AAL5. It is used mainly with cable modem and DSL services.

Point-to-Point Protocol over Ethernet (PPPoE)

PPPoE, point-to-point protocol over Ethernet, is a network protocol for encapsulating PPP frames in Ethernet frames. It is used mainly with cable modem and DSL services.

Port

This is an opening on a device where you connect a cable (like the holes on the back of this device). An Ethernet port looks like a wide phone jack.

Power Cycle

A power cycle is when you reboot your home network systems.

How do I reboot (power cycle) my network?

1. Start by powering off every device on the network (Modem, Router, Phone Adapter, Computer, and anything else you may have.)
2. Leave all these devices off for at least 30 seconds.
3. Power on the modem and only the modem
4. Wait at least 30 seconds.
5. Power on your first devices connected to the modem (Router or Firewall or Vonage phone adapter).
6. Wait at least 30 seconds.
7. Power up each device connected to the first device connected to the modem waiting at least 30 seconds in between powering up each.

Public Safety Answering Point (PSAP)

This can also be called a Public Service Access Point or a Public Service Answering Point. A PSAP is a locally operated, publicly funded facility where 911 emergency telephone calls are

received and then routed to the proper emergency services, such as police, the fire department or EMS.

Public Switched Telephone Network (PSTN)

Short for Public Switched Telephone Network, PSTN refers to the international telephone system based on copper wires carrying analog voice data.

Purchase Order Number (PON)

Purchase Order Number (PON) is issued for any service order placed on your phone number. The PON is similar to a receipt and acts as a tracking number for an order.

Random Dialing

Random Dialing rings every number in your Ring Lists in random order until your caller connects to you. If all the lines are in use, the caller will hear a busy signal. To prevent this, you can activate Call Waiting on at least one line in your Ring Lists.

Rebooting

Rebooting is the process of re-starting a particular device. In the case of the Vonage phone adapter and most routers and modems, rebooting consists of pulling the power plug out of the back of the device for 10-30 seconds and putting it back in. The device will then take a few minutes to reload its software.

Router

A router is a computer networking device that allows you to connect more than one piece of equipment to your DSL or Cable modem to share one Internet connection.

Sequential Dialing

With Sequential Dialing, your Virtual Number will ring each number you specify in the exact order of your Ring List. If a number on the Ring List is in use, the next number on the list will be dialed immediately.

Session Initiation Protocol (SIP)

Short for Session Initiation Protocol, SIP is a signaling protocol for Internet conferencing, telephony, events notification and instant messaging. The protocol initiates call setup, routing, and authentication to endpoints within an IP domain.

SimulRing®

SimulRing is a free Vonage feature that allows your incoming calls to ring your Vonage number plus up to 5 other numbers in the US, Canada, or Puerto Rico at the same time, regardless of phone service provider. Since the numbers ring simultaneously, you can ensure that you are answering your important calls as quickly as possible even if you're on the move. You can activate SimulRing from your web account.

Slamming

A telecommunications term, Slamming is the changing of a customer's telephone service, either local or long distance without their knowledge or approval.

Telecommunications Act of 1996

Signed by President Clinton in February 1996, the Telecommunications Act of 1996 provided major changes in laws affecting cable TV, telecommunications, and the Internet. The law's main purpose was to stimulate competition in telecommunication services. The law specifies:
How local telephone carriers can compete.
How and under what circumstances local exchange carriers can provide long-distance services.
The deregulation of cable TV rates.

Toll Free Service

Toll free service, also known as 800/888/877 numbers, is a service where the person receiving the call pays for the call, rather than the person making the call.

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