

# How to Successfully Select and Implement a Hosted VoIP System

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# How to Successfully Select and Implement a Hosted VoIP System

By

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## *Executive Summary*

In writing this white paper we set out to answer the questions of “How to select” as well as “How to implement” a hosted VoIP solution. We have not spent much time discussing the benefits of this solution and assume that the decision has been made to use this technology and service. There are many articles discussing the reasons that people are migrating to this solution in such large numbers and we thought it more valuable to focus on the steps following that decision.

We also wanted this document to be a useful tool for both technical and non-technical readers alike. Usually the selection and implementation process involves business owners, C-level executives, office managers, executive secretaries as well as IT managers. To make sure that the content was valuable to people across all business roles we chose to minimize any technical jargon and included a definition of terms for anything technical in nature or technology specific.

Telephony has followed many other services in its path to the cloud. The first wave of changes focused on moving the services away from the traditional copper phone lines and unto the internet connections that all businesses were investing in. This transition away from POTS lines and to a VoIP-based service allowed companies to leverage the internet and their other technology investments to roll out a set of telephony features and functionality previously only available to enterprise level organizations.

The last barrier for small and medium-sized business to this VoIP technology was the purchase and maintenance costs associated with the on-premise PBX solution. Over the last decade hundreds of VoIP providers have sprung up offering the VoIP experience using the Software-as-a-Service (SAAS) model. This approach does not require the purchase of an on-premise PBX or a technical employee to maintain it. The entire service is simplified to a monthly payment that is usually lower than the existing phone / internet bill. Also the phones are usually delivered pre-configured allowing you to ‘plug and play’ so very little additional effort is required to set them up.



Although plentiful, not all VoIP providers are the same. Using some very basic criteria of financial viability and years in business you should quickly narrow your search to a dozen or so qualified candidates. You can then use the additional criteria in the sections below to further bring down that number. We have found that when you get your final list to 10 or less the differences will become less obvious. In the end there is no one right choice and there are multiple qualified providers. Providers will differ in things like pricing models, specific functionality, technology and support models. Your specific requirements and business models will drive the final selection. For example, if you operate a doctor's office then you may need many phones that will have little usage, like those for the reception area and patient rooms. In that situation you may favor a pricing model that gives you a significant discount on low usage, or metered, phones as compared to the regular office phones. Our recommendation is to never begin your selection process by focusing on prices and functionality. Only after narrowing the options down to financially stable, reputable companies with strong support should other criteria be considered.

Once the selection of the appropriate VoIP provider has been completed the implementation process may begin. User adoption of the new system will depend on establishing a strong Quality of Service (QOS) and training methodology. Think of a conversation on a VoIP system as a sentence where each word is sent across the internet in a separate packet. The goal is to deliver each packet from the sender to the receiver without delay and in the same sequence that they were sent. Delayed or lost packets will affect the quality of the call and thus the user's experience. Proper configuration of the network is key to ensuring a high QOS. There are also functional differences between the POTS and VoIP systems that users must be prepared for. A secretary expecting to tell her boss to pick up a call on line one will be confused and disappointed to discover that VoIP phones work with extensions and not lines unless she is prepared for the change.

### ***What is Hosted VoIP?***

Traditional phones systems use plain old telephone service (POTS) lines. POTS lines transmit voice as analog data on communication lines that are much slower when compared to today's integrated services digital network (ISDN) and fiber distributed data interface (FDDI) lines. However, not long ago delivering POTS via the public switched telephone network (PSTN) was the standard in telephone service worldwide. Voice-over-Internet Protocol (VoIP) is the newest technology that is used to transmit voice data over the Internet. The voice is first converted into digital data which is then organized into small packets. These packets are stamped with the destination IP address and routed over the Internet. At the receiving end the digital data is reconverted into voice and fed into the user's phone.



Regardless of if you use traditional phone service or the newer VoIP technology, it's the private branch exchange (PBX) that pulls it all together for your office. A PBX is a telephone switching system that interconnects telephone extensions to each other in-house as well as to the outside telephone network. This PBX is a combination of hardware and software to allow you to manage your lines, extensions, voicemails, and features. Whether you currently employ POTS, or an on-premise VoIP solution, it is likely that you have a piece of hardware in your server closet that is providing the PBX functionality.

Hosted VoIP, also referred to as Hosted PBX, is an internet telephony solution that follows the Software-as-a-Service (SAAS) model by hosting phone system equipment in remote data centers so that it can be managed from a web interface rather than through the administration of physical on-premise equipment.

### ***Selecting the Right Solution***

Every day there are industry announcements like; "For the second time in less than a month, Amazon's Northern Virginia data center has suffered an outage and is impacting many popular services..." and "Salesforce.com hit with second major outage in two weeks..." Does that mean that the SAAS model is bad and the Cloud is falling? I don't believe so.

The decision to move any of your services or applications to the cloud should be a well thought, measured process to be discussed with your IT support team. For the purposes of this white paper, we will assume that you have gone through that process and decided that this is the right move for your business. The point here is why it is important to select the right hosted VoIP provider.

The fact of the matter is that there were 1.5 million customers in the D.C. area, with nearly 500,000 in Northern Virginia that lost their power for an extended period of time due to a line of storms packing winds of up to 80 mph. Trees, phone, and power lines were down everywhere. Regardless if you were using a POTS system, VoIP, or hosted VoIP you were probably down. The question then becomes, how quickly you can recover.

The difference is that POTS or on-premise VoIP systems could not be restored until physical lines were re-run or fixed, while the mobile nature of hosted VoIP solutions had users up and running with minimal downtime, by allowing users to access another internet source, such as their home office. Additionally, while your service was down, your calls could be automatically routed to your cell phone. Your callers would never experience a busy signal because the auto-attendant would still be answering the calls and voice mails would still be available. But not all hosted VoIP providers have the



technology, redundancy, functionality and experience to provide this level of service and execute when you need them most.

### ***Selecting a Hosted VoIP Provider***

This white paper started as an internal search for a hosted VoIP provider for us as well as our clients. We had so many requests from our client base that it became obvious that this was an accepted technology and method of delivery. So we decided to educate ourselves on the options and bring it in-house. The following are the eight key considerations we used for our own selection process;

1. **Stability of Publisher** – there are hundreds of VoIP providers out there and the first question should always be the stability and size of the publisher. It does not matter how functional the solution is if the publisher does not have the financial stability and organizational structure to support their long-term efforts.
2. **Innovative Proprietary Technology** – Out of hundreds of VoIP providers, only a few manage and maintain their own platform technology. We made a decision early on that open source technology was not going to be an option. Proprietary technology allows for the best control of code, flexibility in design and timeliness in reacting to customer requests.
3. **Reliability & Quality of Service** – Reliability and quality of service are the most commonly asked questions regarding switching from traditional dial tone providers to a hosted provider. Our response to that is that when deployed properly with the appropriate bandwidth requirements and network configurations Hosted PBX and VoIP solutions are just as reliable if not more reliable than traditional dial tone.
4. **Affordable Scalability** – Hosted VoIP solutions are much more affordable to own and maintain than traditional on-premise PBX systems. We focused on providers that allow you to purchase only the lines and features you need, when you need them.
5. **No Commitments** – There are many business VoIP providers that require annual contracts, making it difficult to switch if your needs or expectations change. Our selection focused on providers that require no contracts.
6. **Superior Business-Class Support** – When introducing any technological advancement to your business you want to be sure you have the support you

need when you do inevitably need assistance. We interviewed many vendors, attended user groups and spoke with references to make sure that our provider's support was timely, courteous and effective. Another major consideration is that support is US-based and not outsourced, which provides a level of consistency among the support teams and end-user experience.

7. Robust Features – VoIP providers are known to provide all the traditional features we've grown accustomed to, as well as a comprehensive list of advanced features. We wanted a provider that offered a compelling feature set including online dashboards, remote call queue management, mobility solutions and CRM integrations.
8. Key Features – We had identified some key features which must exist in a hosted VoIP solution that we would recommend. One of those is the ability to automatically failover to a cell phone or other number in case there is a break in communication anywhere on the line between the provider and your phone. Internet connections will go down from time to time and the solution must be able to properly handle the outage without losing calls.

### ***Implementing a Hosted VoIP Solution***

In order to ensure a smooth transition and increase user adoption, you will need to prepare your environment and your staff for the change to VoIP from a traditional POTS system. As with any change, proper planning, design, testing, and training are key for a successful outcome. Your network will have to be prepared for the additional network and internet traffic. Your people will have to be trained on the new features, functionality, and mechanics of the new system.

A VoIP solution is not complicated; it's just different from a POTS system. Whereas a POTS system is focused on the management of phone lines, a VoIP solution is more about managing calls and extensions. Features like call forwarding, transferring calls, putting callers on hold, and conference calls are all available, and similar in both solutions, it's only the steps to accomplish them that will differ. Your VoIP solution may also have many additional features that may be unfamiliar to a user. It is critical, that enough time is allocated towards training before and after the implementation. In addition, provisions should be made for access to support resources following the transition so that users do not become frustrated. After a few short weeks, your small office should feel completely comfortable with the new hosted VoIP solution.



A properly configured network is instrumental in achieving a high Quality-of-Service (QoS). When making a Voice-over-Internet Protocol (VoIP) phone call, the sound of your voice is broken into thousands of packets. These packets travel through the Internet and are routed through many devices on to their final destination. Many factors can affect packets and call quality. The three most common issues that affect VoIP Quality-of-Service (QoS) are latency, jitter, and packet loss.

Latency refers to the time it takes a voice packet to reach its destination. Jitter measures the variation of packet arrival times—or simply put, how much latency varies within the network. Jitter is often caused by network congestion, timing drift, or route changes. Packets are sent over the Internet and reassembled at their destination. Packet loss occurs when some packets are dropped by congested network routers or switches, or discarded by the jitter buffer. If you miss one out of every 10 words, or 10 words all at once, chances are you won't understand the conversation. The Internet connection and devices you use to connect to the Internet can affect your QoS. Here are a few ways you can improve your VoIP QoS:

1. Upgrade your Internet connection.

VoIP QoS depends on the upload and download speed of your Internet connection. Each concurrent VoIP call consumes about 85 kilobits (kbps) of upload *and* download bandwidth or speed. Therefore, this number is the number of consistent calls your connection can support. Speak with your Internet service provider (ISP) if you've experienced any VoIP call quality issues. Many ISPs will upgrade your connection speeds for free simply to keep you as a customer. Otherwise, consider paying for a faster Internet connection, adding a second connection dedicated to voice or moving to another ISP that offers more speed at the same price.

2. Get a new headset.

Consider upgrading your headset if you use a soft phone to make calls. The thin cable connecting the headset to your computer doesn't last long, and there are many quality headsets in the market. Also consider ergonomics and comfort, especially if you'll be using the headset for extended periods.

4. Improve your WiFi signal.

You can improve your VoIP QoS—if you're on a WiFi connection—by boosting your WiFi signal. There are several antennas on the market designed specifically to extend range and improve signal. Alternately, consider upgrading your router and access card to the latest WiFi standard, 802.11n. It's faster, and prone to less interference.



5. Drop WiFi, use Ethernet.

WiFi networks can be spotty, especially in environments surrounded by concrete walls or floors. Electrical devices and also add interference. Try a wired Ethernet connection if you haven't been able to improve your WiFi signal. A wired connection greatly reduces interference, and handles data intensive calls better.

6. Pause any large downloads while on a call.

You may experience delays or dropped calls if you're downloading large files over the same network you use to make calls. Your Internet connection may not have enough bandwidth to handle the increased load. Pause any non-essential downloads before making a call.

7. Design your network for voice and use QoS-enabled network equipment.

There are special considerations when designing your network to support voice traffic. For example, QoS-enabled routers prioritize voice traffic over lower priority network traffic, such as large downloads. QoS-enabled switches perform the same function in the switch. Here are some concepts to consider when optimizing your network for VoIP traffic:

- *Compatible Routers* - Some routers on the market are simply incompatible with SIP based VoIP traffic. Check with your VoIP provider or IT support team for both compatible and incompatible equipment.
- *Multiple Routers* - Having multiple routers in your network is often problematic for VoIP. There are various reasons for this, but in short, routers do many jobs. Some of these jobs can have an explicit impact on VoIP traffic in particular. The more routers, the more likely one of them will affect your VoIP system. Your IT support team can guide you on best practices to configure multiple routers.
- *Modems/Router Combinations* - Continuing the "Multiple Routers" point, it is not uncommon for a DSL or cable provider to send a Modem with a Router built in. If you have your own router as well, this may cause problems. Often, the Modem/Router combination can have the router portion disabled. This is called "bridging".
- *Firewall Configuration* - Most routers will include a firewall. A filter which blocks traffic it believes should not be allowed in or out. For smaller offices with off the shelf routers, these firewalls may need to be modified or turned off. On

enterprise level equipment, certain rules may need to be added to allow traffic. Your IT support team can assist you in making these adjustments, which are necessary.

- *Switches vs. Hubs* - These two devices look identical but operate in extremely different ways. A hub should NOT be used in a VoIP network. If you need to expand the number of ports on your router, please purchase a switch.
- *Network Restarts* - With the amount of traffic that goes in and out of a router, it is not uncommon for them to get a bit out of "Sync". To avoid odd problems we recommend you restart your modem, then router, once every 2 weeks. Often, customers schedule this on a Friday evening when everyone is out of the office. This is a simple and practical solution for a small office. For a larger environment that may be more sensitive to downtime, speak with your IT support team for network management best practices.

## Summary

Hosted VoIP has been accepted by small to medium sized businesses as an affordable and scalable telephony solution to replace the traditional POTS lines systems. It can provide features and benefits never before available to companies at a price that is usually lower than what they are paying today.

After deciding to move to a hosted VoIP solution the selection and implementation process become critical to a successful user experience and vendor relationship. More weight should be given to the size and financial stability of the provider, support structure and technology then the pricing and specific functionality of the solutions. Proper time should be allocated to user training and an expectation of a two week window is normal to fully adjust to the new solution. A stable, properly designed network with sufficient bandwidth will be key to achieving a high level of Quality-of-Service (QOS).

## Definition of Terms

### *Business VoIP Network / Hardware*

**ATA:** Analog Telephone Adaptor (ATA) is the hardware device that connects the conventional telephone to the Internet through a high-speed bandwidth line.

**Cable modem:** The cable modem is a device that is used to connect a computer to the high-speed coaxial cable run by cable TV companies to provide access to the Internet.

**DSL modem:** A DSL modem is a device that is used to connect one or more computers to the high-speed DSL line provided by a DSL operator to gain access to the Internet.

**IP Phone:** An IP phone is one that converts voice data into digital packets and vice versa to make phone calls over Internet possible.

**Jitter:** Jitter measures the variation of packet arrival times—or simply put, how much latency varies within the network. Jitter is often caused by network congestion, timing drift, or route changes. Jitter is measured in milliseconds (ms)—thousandths of a second. Jitter greater than 50ms can increase latency and result in packet loss.

**Latency:** Latency refers to the time it takes a voice packet to reach its destination. Latency is measured in milliseconds (ms)—thousandths of a second. Latency of 150ms is barely noticeable and generally acceptable. Latency higher than 150ms adversely affects VoIP QoS, while latency higher than 300ms is generally unacceptable.

**Packet Loss** A VoIP conversation is broken down and “packaged” into many packets that are sent over the Internet and reassembled at their destination. Packet loss occurs when some packets are dropped by congested network routers or switches, or discarded by the jitter buffer. If you miss one out of every 10 words, or 10 words all at once, chances are you won’t understand the conversation.

**Quality-of-Service (QoS):** In the field of telephony, quality of service was defined by the International Telecommunication Union ITU in 1994. Quality of service comprises requirements on all the aspects of a connection, such as service response time, loss, signal-to-noise ratio, cross-talk, echo, interrupts, frequency response, loudness levels, and so on. In laymen terms, it is the quality of the call.

**Router:** A router is a network device that that handles message transfer between computers that form part of the Internet.

**SIP phone:** A SIP phone is a telephone that uses the Session Initiation Protocol (SIP) standard to make a voice call over the Internet.

**Softphone:** This is a software application that is installed in the user’s PC. It uses the VoIP technology to route voice calls over the Internet. The audio is provided through a microphone and speakers plugged into the sound card. The only limitation of a Softphone is that the phone call has to be made through a PC.



**Switch:** Networking hardware used to increase the amount of RJ45 Ethernet jacks within a Local Area Network (LAN).

### *Internet*

**Bandwidth:** Bandwidth is the volume of data that can be transmitted over a communication line in a fixed amount of time; expressed in bits per second (bps) or bytes per second for digital devices and in cycles per second, or Hertz (Hz) for analog devices.

**Broadband:** It is a term used to define high-speed Internet connection, generally provided by cable TV, DSL or dedicated telecom lines.

**Data compression:** This is the process that is used to compress large data files into small files so that they use less bandwidth during transmission and less disk space when stored.

**IP address:** An IP address, also known as Internet Protocol address, is the machine number used to identify all devices that are connected to the net. Each device has its own unique number which it uses to communicate.

**IP mapping:** IP mapping is the process of identifying IP addresses on the basis of their geographical locations. The mapping enables web administrators to pinpoint the location of any computing device connected to the Internet.

**IP:** Internet Protocol (IP), defines the way data packets, also called datagrams, should be moved between the destination and the source. More technically, it can be defined as the network layer protocol in the TCP/IP communications protocol suite.

**Kbps:** Kbps is the acronym for kilobits per second and is used to indicate the data transfer speed. For instance, if the modem speed is 1 Kbps then it means that the modem can route data at the speed of one thousand bits per second.

### *Telephony and VoIP*

**DID (Direct Inward Dialing):** A service that provides a block of telephone numbers for calling into a company's private branch exchange (PBX) system. Using DID, a company can offer its customers individual phone numbers for each person or workstation within the company without requiring a physical line into the PBX for each possible connection.



**E911:** E911 is the short form of the term Enhanced 911, and is used for providing emergency service on cellular and Internet voice calls.

**Hosted PBX:** An internet telephony solution that follows the Software-as-a-Service (SAAS) model by hosting phone system equipment in remote datacenters so that it can be managed from a web interface rather than through the administration of physical on-premise equipment.

**IP telephony:** IP telephony refers to the two-way transmission of voice over Internet. The voice is transmitted in real time by using the packet-switched technology over the IP network.

**On-Premise PBX:** Physical telephony hardware that enables multiple handsets to share phone lines along with a common set of features and functionality.

**PBX (Private Branch Exchange):** A telephone switching system that interconnects telephone extensions to each other in-house as well as to the outside telephone network.

**POTS:** POTS is the short form of plain old telephone service. It transmits voice as analog data on communication lines that are much slower when compared to today's ISDN or FDDI lines. However, not long ago POTS, which is also known as the public switched telephone network, was the standard telephone system across the world.

**SIP:** Session Initiation Protocol (SIP) is an IP telephony signaling protocol. It is primarily used for Voice-over-IP (VoIP) calls, though with some extensions it can also be used for instant messaging.

**Voice-over-Internet Protocol (VOIP):** VoIP is the technology that is used to transmit voice over the Internet. The voice is first converted into digital data which is then organized into small packets. These packets are stamped with the destination IP address and routed over the Internet. At the receiving end the digital data is reconverted into voice and fed into the user's phone.

### ***About IT Help Central***

IT Help Central, Inc. ® is the tri-state area's leading provider of comprehensive IT services for small to mid-size companies. Our unique methodology, knowledgeable staff, and flexible programs enable us to design IT solutions that provide our clients with a stable, dynamic, and powerful platform from which to grow their business. We focus on educating our clients so that together we can make informed decision on strategic technology initiatives. For more information visit [www.ithelpcentral.com](http://www.ithelpcentral.com) or email us at [info@ithelpcentral.com](mailto:info@ithelpcentral.com).

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