

# VoIP Basics Guide

A COMPREHENSIVE GUIDE FOR VOIP BEGINNERS

**onsip**

## What is VoIP?

Voice over Internet Protocol (VoIP) is the method for delivering phone calls “over IP.” IP covers the public Internet, telecom carriers, office networks and private clouds, which means that VoIP can transmit pretty much anywhere.

Until about the 1980s, traditional phone calls were made via the Public Switched Telephone Network (PSTN) over copper wiring and switches. With the invention of VoIP, phone calls could be made over the same IP data networks that your computer (and now smartphone and tablets) leverages for web browsing, email, etc.

Common VoIP applications that you may know include: Skype, Google Hangouts, and Apple FaceTime. Not only is VoIP able to leverage IP data networks, but it also allows for more enhanced user experience, such as high definition voice and video.

At its core, VoIP technology digitizes voice and video into packets of data that looks like 0s and 1s and sends these packets over Ethernet cables. Ethernet has much more bandwidth than traditional copper lines, giving VoIP communications the advantage of high definition audio and video. But the significant difference for VoIP is found in the flexibility and capabilities of the Internet.

More than audio content can be sent alongside the voice signal with VoIP. This added content might regulate the call by telling the audio where to go and when to terminate. The more complex data allows you to find anyone on an IP network. That’s why you can Skype other computers, phones, tablets... you name it. Many VoIP services offer sending chat messages, video streams, and file sharing along with the voice data, too.



Another advantage to VoIP calling is that, technically, you are no longer restricted to dialing phone numbers. VoIP-to-VoIP calls can be made to user addresses, e.g. bob@acme.com, via a service provider instead of a phone number. (Think: Skype IDs, Google Hangout usernames, and more.)

Still not impressed? Don't worry. We will touch on all of the advantages of VoIP later on in this guide. For now, it is important to know that VoIP provides more advanced features—anything from complicated call routing to much, much more.

The way in which data is encoded and routed depends on the VoIP provider. Some businesses, like Skype, have developed unique, proprietary solutions to translate call data, but the industry standard is called Session Initiation Protocol (SIP).

For over a decade, SIP is the de facto communications protocol for signaling and controlling multimedia communication sessions. SIP excels at managing video, people, and protocols on the fly, enabling callers to switch locations and devices, add participants, and negotiate digital features— all seamlessly within the same call. The emphasis is on connectivity, which is fundamentally what communications are all about.

## What is Business VoIP?

If you are familiar with Skype, Google Hangouts, and FaceTime, you might be wondering: What is the difference between those three applications and business VoIP? A lot. The key understanding, though, lies within the context of a phone system.



Businesses with more than a few employees typically need a phone system to handle their calls. The phone system connects the employees' phones, allowing them to dial extensions and reach each other's voicemail. Phone systems also handle when customers call the business' main number with features such as an auto attendant to greet callers, a dial-by-name directory to allow callers to "Press 1 to dial the Sales Department..." etc.

Furthermore, business VoIP typically refers to a VoIP-based phone system, or a phone system that delivers calls to employees over their office IP data network.

## The Components of a Business VoIP Phone System

A major components of VoIP-based business phone system are IP phones and what's known as a Private Branch Exchange (PBX).

### IP Phones

IP phones are desk or software phones that communicate over the Internet. Most IP phones today are based on the SIP protocol.



### Private Branch Exchange (PBX)

In plain terms, a PBX is a lot like a phone operator. It answers calls on the business' behalf and routes the call to the proper extension or destination that the caller is trying to reach.

Technically, an IP PBX is a server, or set of servers, with telephony software installed—specifically the applications that handle and route phone calls. Here are common features of today's IP PBXs:

- **Call Management:** All the standard features of a traditional PBX, including hold, mute, redial, speed dial, extension dial, 3-way calling, call forwarding... everything.
- **Personal Attendant:** “Thank you for calling our business! Dial “0” for an operator, or “1” to speak with a sales representative...”

- **Dial-by-name Directory:** A company directory that allows callers to spell out employee names on their touchtone keypad to reach the right employee.
- **External Phone Numbers:** Automated call forwarding sends calls to any extension, and even out of network when you are Work From Home (WFH) - to your cell phone or home.
- **On Net Conferencing:** Allows multiple callers to share a group discussion.
- **Busy Lamp Field:** A traditional PBX feature that shows you what lines are in active use with flashing lights. If the boss is used to this oldie-but-goodie feature, this one's smart to keep.
- **Voicemail to Email:** Messages are automatically encoded as .wav files and delivered to your inbox to keep your messages all in one place.
- **Business Hours Routing:** Applies special rules to calls that come in after office hours, like forwarding to voicemail, or out-of-office numbers.
- **911 Emergency Calling:** E911 is available on all extensions.
- **Announcements:** Delivers important messages to callers at strategic points in the phone system. Tell old customers about new deals when they pay over the phone, or remind employees to have a great weekend.
- **Automatic Call Distribution (ACD) Queues:** Send incoming callers to the first available representative within a selected group. Great for sales teams.
- And more...

## “Hosted” Versus “on Premise” Phone Systems

One of the first decisions businesses face when they decide to “go VoIP” is the question of installing a PBX in their office (a.k.a. On-Premise PBX) or using a service on the Internet (a.k.a. Hosted PBX or Cloud PBX).

### **On Premise PBX**

An On Premise PBX is a physical piece of IT hardware that will be installed at an office location and programmed as the business wishes. Only one is necessary - even for multiple offices - because incoming calls can be routed anywhere.

Beyond the office’s PBX and LAN, there’s one more component to make the phones work with an On-Premise PBX: Primary Rate Interfaces (PRIs) or SIP Trunking service. These are services a business can buy to connect their on premise IP PBX to the Public Switched Telephone Network. That way, the business can make calls to and from their office to the outside world.

If you haven’t gathered yet, to maintain an on-premise IP PBX, you will need the help of an IT professional. The costs associated to an on-premise IP PBX include: equipment (PBX and phones), SIP Trunking or PRI service, and the IT professional’s time to deploy and maintain the phone system.

### **Hosted PBX**

A Hosted PBX is when a third-party owns the physical hardware for the phone system. This kind of deployment is also called “Cloud” PBX because it allows the business to use service for a monthly fee and customize their service using a website portal— similar to, say, Google Apps for Business or a Wordpress website. Take or leave features; configure preferences and extensions.

The hallmark of this approach is low upfront capital expenditure, making it often the best fit for small and medium sized businesses. Most hosted PBX providers do not require customers to purchase any equipment beyond IP phones.

In case you were wondering, the SIP Trunking service (connectivity to the PSTN) is also handled by the hosted PBX provider. If you make a phone call via a hosted PBX provider, the call will travel over the Internet to the provider, and then back out to the PSTN.

On Premise PBX vs. Hosted PBX		
	On Premise	Hosted
<b>PRO</b>	Total control	Low capital expenditure and monthly cost
<b>PRO</b>	Integration capabilities with existing systems	Professional grade services and automatic upgrades
<b>CON</b>	High upfront investment and long-term maintenance hassle	Reliant on phone service provider. (Important to choose wisely)

Historically, larger businesses installed private system, whereas smaller businesses chose to avoid the upfront investment and leverage a Hosted PBX. But even that is changing, and more and more companies are outsourcing their communications because it is so easy.



## What's Needed for Hosted VoIP

Most businesses prefer hosted VoIP for its flexibility, cost structure, and advanced features. But the added convenience is the real deal-breaker. It is so easy to setup a Hosted PBX, we can include everything you need in this one section.

- **IP Phones:** Traditional phones do not “speak” in 0s and 1s, so businesses can either replace their old deskphones with new IP hardphones, or they can use softphones, which are either applications or accessed via web browser.
- **Business-Grade Broadband Connection:** The only constraint on a VoIP phone system is bandwidth. So ensuring high-quality communications at all times requires some high-quality office equipment, such as a broadband connection. This is managed by your Internet Service Provider (ISP).
- **Business-Grade Router:** Sized appropriately for your business.
- **Miscellaneous:** Some VoIP providers require the purchase of additional on-premise equipment, such as Quality of Service (QoS) devices or PBX devices. It's important to ask, so you know exactly what the provider will charge.

With the flexibility, cost efficiency, and advanced features that VoIP brings to businesses across the U.S., magazines like Network World are saying: “...business VoIP adoption is not a case of if but when; we have long expected that business voice services will transition away from to the legacy PSTN to VoIP..” (“Replacing the PSTN with VoIP: Not If, But When”, April, 2014).

As more and more businesses are switching to digital communications, the best thing you can do is slow down and take the time to make the right choice, the first time.

With that in mind, this might all seem like a blur; this guide has thrown a lot of new jargon at you. And you will probably read more material with even more jargon in the future. So, in case this is not enough, the following glossary should help. Good luck on your journey!

## Key Terms

- **Voice over Internet Protocol (VoIP):** Initially, protocol that allowed voice data to be converted and transmitted via digital signal (0s and 1s), VoIP might now refer to any one of the protocols that digitize voice and video communications nowadays.
- **“On-premise” (or “On-Site”) VoIP:** A type of business VoIP deployment that requires physical hardware to be installed and maintained at the business location.
- **“Hosted” (or “Cloud”) VoIP:** A type of business VoIP system in which a third-party VoIP Provider will maintain the hardware and software and provision the VoIP service to subscribers.
- **Private Branch Exchange (PBX):** A component of a business-grade phone system. A business needs access to a PBX to handle call routing and connect to the telecom carrier. PBXs can “own” many numbers, extensions, route calls, provide high-level features, and they can be owned on-premise or hosted in the cloud.
- **Packet:** A collection of bytes of digital data, which can be transmitted over the Internet.
- **Packet Loss:** When packets are lost during transmission of a VoIP call, call quality degrades.
- **Jitter:** As the speed of transmission fluctuates, individual packets of data can arrive out of synch, harming call quality.
- **Latency:** The time between the moment a voice packet is transmitted and the moment it reaches its destination. A latency of 150ms is barely noticeable so is acceptable.
- **Network Address Translation (NAT):** A technology most commonly used by firewalls and routers to allow multiple devices on a Local Area Network (LAN) with ‘private’ IP addresses to share a single public IP address. Many businesses use NATs for security purposes.

- **Session Initiation Protocol (SIP):** A protocol that was designed to enable real-time, multimedia applications to any device with an active IP address.
- **Tier-1 ISP:** An Internet Service Provider (ISP) that can communicate data to every other network on the Internet without paying for transmission.
- **Redundant:** In the context of Information Technology (IT), redundancy refers to multiple backup pathways that achieve the same end, so that if the primary pathway is blocked, service will continue. This adds reliability to any IT solution because a server can malfunction without interrupting service.
- **Geographically Distributed:** Describes a network that has multiple locations. A geographically distributed VoIP provider will be able to offer two advantages: 1) Reliability/redundancy; and 2) More efficient call routing.
- **IP Phone:** Phones that can “speak” in Internet Protocol (IP) come in many forms - from using the built-in microphone and speakers on a desktop, to advanced “hard phones.” Many IP phones can also communicate via traditional analog signal to support hybrid communications platforms.
- **Broadband Internet:** The Federal Communications Commission (FCC) defines broadband Internet as connectivity via any one of the following high-speed transmission channels: 1) Digital Subscriber Line (DSL); 2) Cable; 3) Fiber; 4) Wireless; 5) Satellite; 6) Broadband over powerlines. Broadband Internet access is extremely important for business VoIP, due to the data requirements of business communications.
- **Power over Ethernet (PoE):** A specific type of ethernet cable that provides data connectivity and power through the same connection - very convenient for Wireless Access Points.
- **Bandwidth:** You might hear major telecoms advertise “download speeds up to 100 Mbps...” They are referring to bandwidth, which measures the sheer volume of data

that can transmit into and out of a connection. In the industry, they say “100 over 20” to mean 100 Mbps download capacity, and 20 Mbps upload. The greater the bandwidth, the more Internet traffic a network can handle.

- **Direct Inward Dial (DID):** A phone number.
- **Local Number Portability:** The ability to move (port) your phone number from one carrier to another. If you currently own a fixed-line number through a Local Exchange Carrier (LEC - most phone numbers in the United States are...), and you want to move the number - either to another geographic location, to another carrier, or change the type of service, it is important to check with your current carrier for Local Number Portability. In many cases, it is possible to keep the same number when making a change, but not always.