VOIP

THE ULTIMATE GUIDE

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onevoiceinc.com

WHAT'S IN THIS GUIDE?

INTRODUCTION

WHAT IS THIS GUIDE?

This guide will be a continuous and ongoing project from OneVoice to create an all encompassing guide to VoIP Communications. The world of VoIP can often be a confusing area to understand - and we hope that this guide will provide some high level understanding, with supplementary technical information for those that want to understand more detail.

WHAT DOES IT COVER?

This guide is initially intended to cover the business application of Hosted VoIP. We hope to eventually turn this into an all encmopassing guide to all types of VoIP Communications, but that's going to take quite a while to accomplish.

While the primary focus of this guide will be on Hosted VoIP - we will try to cover as much of its counterparts as possible. As you read this guide, many of the concepts of Hosted VoIP can be applied to On Premise solutions. As we discuss, the only real difference is where the "brains" of the system are housed.

With that said, we will be releasing an ultimate guide to SIP, which will primarily focus on non-hosted solutions.

WHO SHOULD READ IT?

This guide is intended for anyone in a small to medium sized business who is involved with the purchase or use of a VoIP platform.

In this guide, we're going to address the concept of VoIP as a means for placing and receiving phone calls that are to and from the PSTN (Public Switched Telephone Network) or at least seem as if they are. Since two end users may be on the same Hosted VoIP Network, the call may technically never leave the Hosted VoIP provider's network – but as far as the end user is concerned the call did.

There are different protocols that could be used to transmit VoIP – we're going to focus on one of the dominant protocols - SIP.

Don't worry - if none of this makes sense right now, it will by the time you're done with this guide!

1 WHAT IS VOIP

V VOICE
O OVER
I INTERNET
P PROTOCOL

VoIP, in its very basic sense, is the transmission of any voice across any communication method that uses the Internet Protocol.

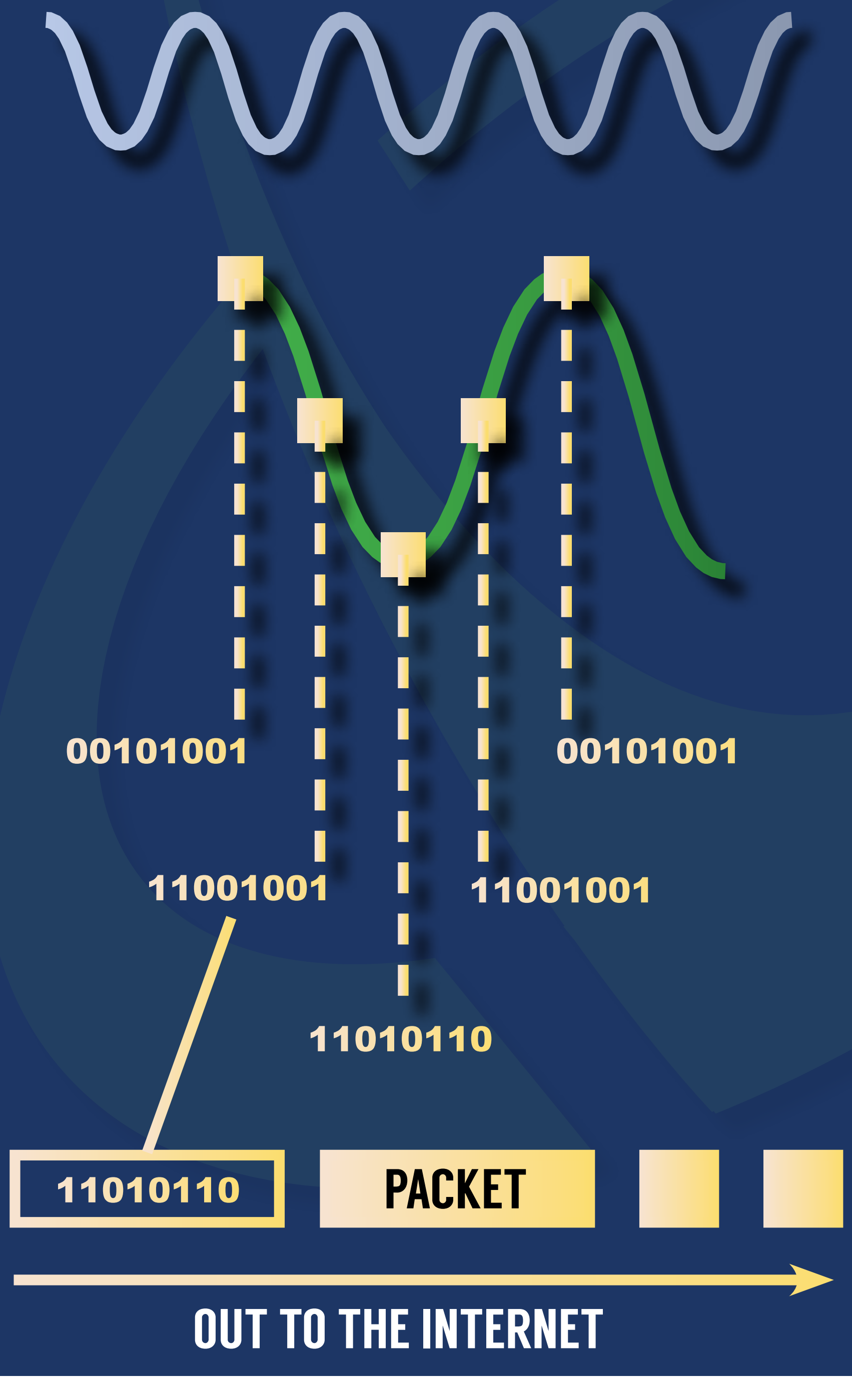
The Internet that we use every day uses the Internet Protocol to connect all of our computers and devices together.

So most people associate VoIP with placing a phone call over the internet.

Although most people associate VoIP with placing phone calls over the internet, VoIP calls can be placed across private networks as well. As long as the voice is being transmitted as packets using the Internet Protocol, it is considered VoIP.

For the purposes of this guide we will be primarily talking about calls made using the public internet as the means of transportation. It's also fair to note that most of this guide will try to focus on cloud based VoIP services; also known as Hosted PBX or Hosted VoIP.

IMPORTANT: **For the remainder of this guide we will be using the term IP Network; or rather any network that uses the IP Technology. This term includes the Internet as a whole. If for some reason we need to refer to something specific about the public internet, we will directly refer to it. Otherwise, IP Network will include all networks (Including private networks and the public internet) that uses the IP.**



Your voice enters a device as a sound wave

The device samples parts of the wave, turning the sample into bits (computer code)

The device takes these bits and puts them into packets to send across to the internet

This procedure is then reversed on the receiving end. That is how VoIP works

This is the foundation of the VoIP process at a very basic level.

NEXT: What a Typical VoIP Setup Requires in Order to Work

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2 REQUIREMENTS OF A VOIP SYSTEM

CONVERTER

COMMUNICATION

CONNECTION

Any VoIP system requires three basic components: a device to turn your voice into digital packets (converter), a device that controls what to do with those packets (communication), and a digital path (connection) to send the packets along.

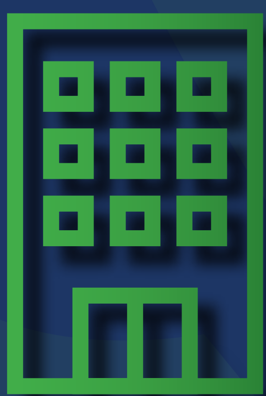
In a typical business VoIP setup these devices are the IP Phones, IP PBX, and Internet Data Connections, respectively.

The IP Phones are what handle the conversion of your Voice into Data Packets. The IP PBX is the “brains” of your phone system, handling what actually happens with those data packets and your phone system as a whole (including features like voicemail). The Data Connections are what allows you to send your Voice Packets from your IP Phone to the IP PBX and out to the internet.

NEXT: The Main Types of VoIP

3 IMPLEMENTING A VOIP SYSTEM

ON PREMISE



PHONES AND IP PBX ARE LOCATED IN YOUR OFFICE

HOSTED

PHONES ARE LOCATED IN THE OFFICE WHILE THE IP PBX IS LOCATED IN THE CLOUD

The main difference between an On Premise solution and a Hosted solution is where the IP-PBX is located.

The Hosted Solution is much like any other Hosted Service provider out there. For example, traditionally, a company had to keep all of their files on a server that was managed and maintained in the company's building. Employees would use their computers to access the data on the company server.

Today, many companies are moving to cloud file storage. While they're still able to access their files from their same computer, the files are now physically stored on the service providers servers.

Hosted VoIP and On Premise VoIP work the same way.

NEXT: The Main Methods of VoIP

4 METHODS OF VOIP

PC to PC
One of the most commonly used methods of VoIP today. Google Talk, Skype and Teamspeak are all PC to PC Methods.

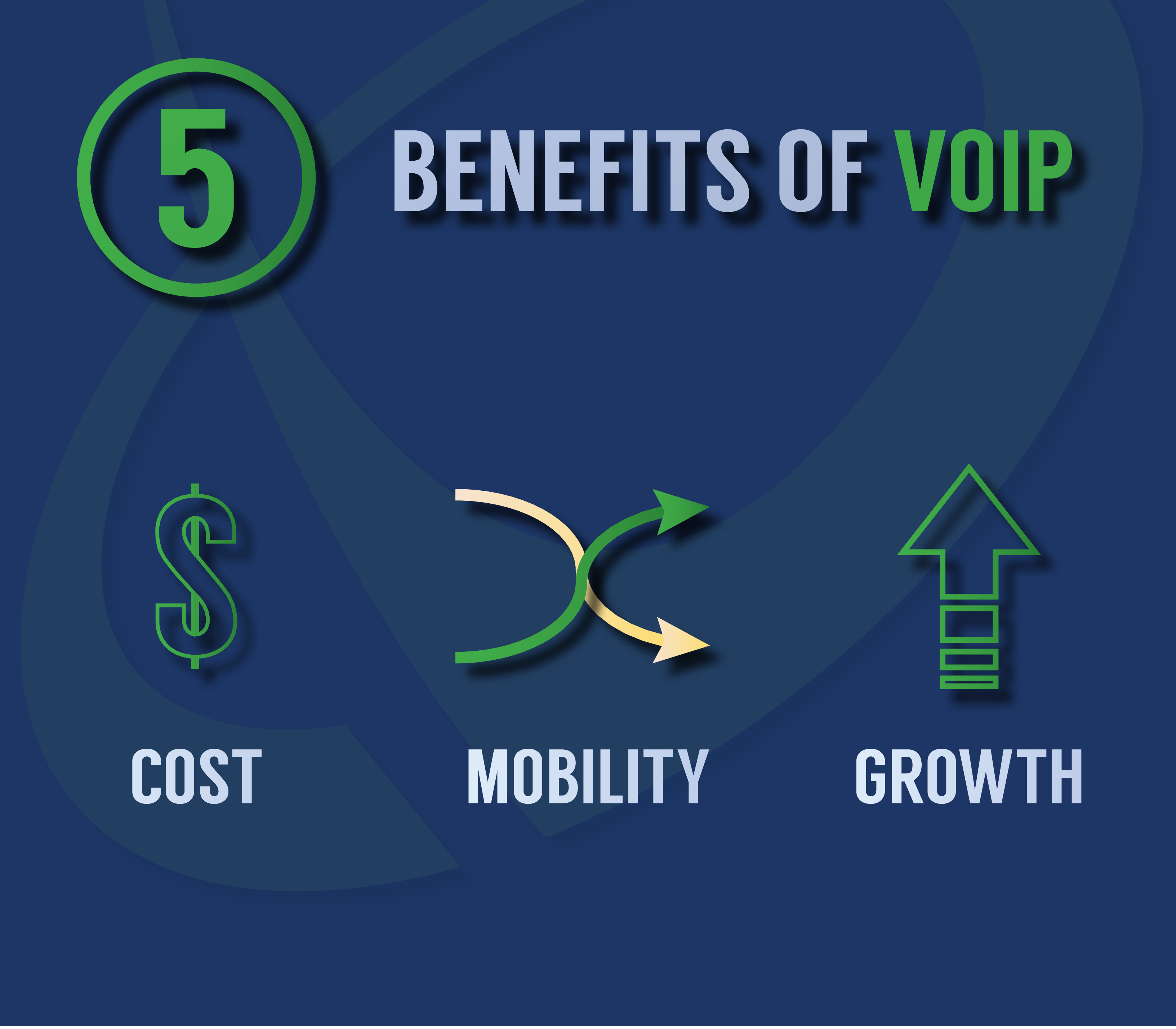
ATA Device
Analog Telephone Adapter (ATA) allows you to connect an old fashion telephone to a VoIP platform.

IP Phones
These phones have the VoIP technology built into them and are most commonly used in business settings.

There are three main methods of implementing VoIP. In all three cases the goal of the device is to convert the sound waves of your voice (analog sound) into digital packets to be sent across an IP Network.

In all three scenarios the three main components of a VoIP System are covered.

NEXT: The Benefits of VoIP



While there are many benefits that VoIP Solutions can offer businesses, VoIP Solutions offer three main benefits for businesses across the board.

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$ COST OF VOIP

VOIP

1 Call Per Seat

Per Seat Cost

$20 - $30 / Seat

Connection + Features

Comparative Alternatives

POTS LINE

1 Call Per Line

Per Line Cost

$20 - $50 / Line

No Extra Features

PRI

23 Calls Per Circuit

Per Circuit Cost

$300+ / Circuit

Connection Only

There are some additional costs to each of the options listed above. A regular pots line requires the purchase of any regular phone that will receive a regular dial tone.

A VoIP system requires that you have IP based Phones or an ATA device. IP phones are usually more expensive than a regular telephone. Many hosted providers can sell you phones upfront, or you can rent phones from them for an additional monthly cost.

A PRI circuit, although the cheapest per call option, requires an expensive upfront investment in a PBX. There are some free open source PBXs on the market, however it would still require some sort of investment in a staff member or outside IT Consultation service to implement and maintain the PBX.

MOBILITY OF VOIP

Remember that VoIP systems only require 3 things

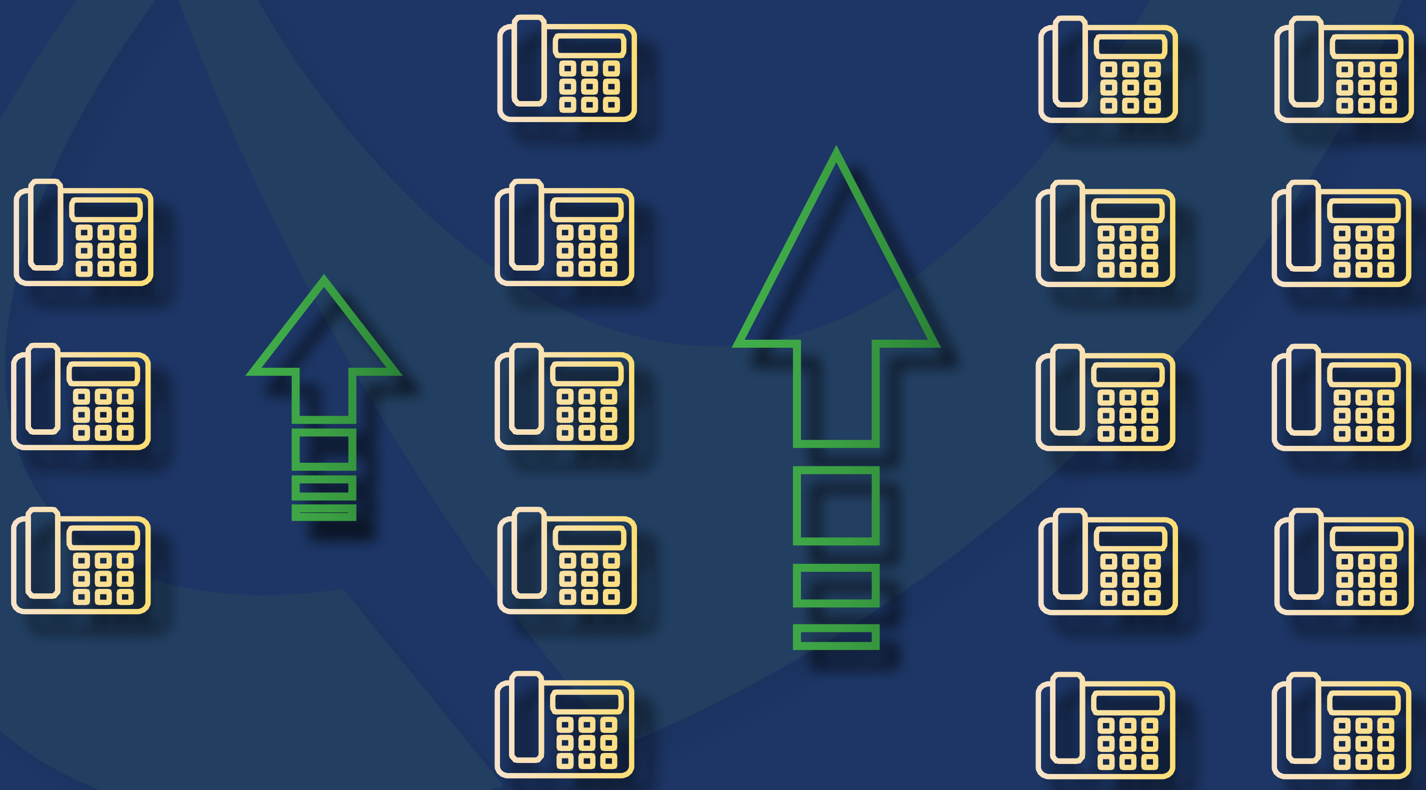
1) A Device to Convert your Voice
2) A Device to Handle the Calls
3) A Data Connection between the two devices

Because of that - as long as your IP Phone can communicate with a PBX (Hosted Provider) you can use your phone anywhere that you have an internet connection.

With an on premise PBX system, the ability for remote users across the Internet will need to be configured. With Hosted PBX solutions, this is a native feature.

You are able to take your IP Phone home, allowing you to make calls as if you were sitting at your desk.

GROWTH WITH VOIP



Since Hosted VoIP is usually sold on a Per User basis, the ability to scale the system can be as simple as adding another user and phone.

In Theory - there isn't a limit to the number of users that you can put onto a VoIP System. The practical limitation is the amount of bandwidth required for each concurrent phone call. There are also some hardware limitations that could come into effect with some extremely high call volume.

The best way to think about it is like using the internet at home, the more people that are using it, the slower it gets.

As long as you are aware of the hardware requirements and data connection requirements, your VoIP System can grow with your company.

NEXT: The Problems of VoIP

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6 PROBLEMS OF VOIP

LATENCY

JITTER

LOSS

QUALITY OF SERVICE IS ONE OF THE BIGGEST OBSTACLES TO OVERCOME WITH VOIP SOLUTIONS

Latency is the overall time it takes for a single packet to go from the speaker to the listener. In the VoIP world the recommended maximum latency is 150ms. Anything above 150ms and you begin to have quality issues with the call.

Jitter is the change in the latency during a given call. While your overall call may have a latency of 50ms, any spikes in latency would be the Jitter on the call. If Jitter is high, it can cause packets to arrive out of sequence and be discarded. This discarding of packets can lead to...

Packet Loss is anytime a packet doesn’t make it to the reciever or doesn’t make it in time. Since VoIP is a Real Time communication protocol, if a packet is lost then a small piece of the conversation is lost. While generally a few packets here and there won’t be a problem, large packet losses can sound like the person is “breaking up” on the other end.

NEXT: VoIP Security

7 VOIP SECURITY

ISSUES

Know the threats that your system can be vulnerrable to

ENCRYPTION

Encryption is available, but you have to weigh the costs

PROCEDURES

Every security system has the same weakest link

VoIP solutions are wonderful, cost effective options that can provide your company with communication options to help run your business.

However, since VoIP is over an IP Network, some of the same Data Security concerns now also apply to Voice traffic.

In this section we go over some of the issues specific to VoIP, some popular Encryption options, Procedures and Policies that can help your VoIP solution stay secure and the Hardware most likely involved in all of these areas of security.

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COMMON VOIP SECURITY ISSUES

TOLL FRAUD

DOS ATTACK

MITM ATTACK

Toll Fraud happens when an unauthorized user makes long distance phone calls from your system, causing you to be billed for the charges.

DoS Attack, Denial of Service Attack, is when an outside user floods your system with so many packets that it causes a network traffic jam. In many cases this can lead to a complete loss of service until the DoS attack is finished.

MITM Attack, Man it the Middle Attack, happens when an unauthorized user is able to intercept voice packets. If these packets are not encrypted the unauthorized user can use programs to decode the packets and listen in on the conversation.

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VOIP ENCRYPTION

Quality of VoIP is already susceptable to latency issues. Adding Encryption will increase the latency in the system - as each packet will need to be encrypted and decrypted.

Ask your hosted VoIP provider for what encryption methods they offer.

Transport Layer Security (TLS) helps to encrypt the SIP messaging, but does not actually encrypt the voice packets. TLS is still beneficial because it will make it harder for someone to know the two endpoints of the VoIP call.

Secure Real-time Transport Protocol (SRTP), is a protocol that actually encrypts the voice packets themselves. Since there are millions of voice packets, and each one needs to be encrypted, this can compound other latency issues that may exist.

Virtual Private Network (VPN), VPN creates a secure “tunnel” through the internet. While this remains to be a possible solution, it’s not viable for large call volumes.

Multiprotocol Label Switching (MPLS), is another type of private network. This is more commonly used for VoIP calls between multiple business locations.

SECURITY VOIP PROCEDURES

NUMBER 1 SECURITY PROBLEM?

THE HUMAN!

You can have the strongest and most secure system - but if you leave the keys on the dashboard, then it won't matter.

Procedures, it's vitally important that your company has procedures in place that limit the number of people who have administrative access to your system.

Passwords, Ensure that all default passwords are changed immediately! This includes passwords on routers, switches, firewalls, phones, online portals and voicemail accounts. Choose something that's hard to guess, with a mix of uppercase, lowercase, numbers and special characters. The longer and more random the password, the more secure the system is.

Policy, Sometimes things go wrong - have a policy in place to minimize the damages that could occur if your system is compromised.

NEXT: VoIP Purchasing Guide

7 VOIP PURCHASING GUIDE

1 ASSESSMENT

2 EQUIPMENT

3 VENDOR

This final section is broken up into 3 subsections.
Each sub-section of this part of the guide will contain a one page checklist that you can print out and use for yourself.

Assessment- It's important to take note of your current setup as it works today. Your new VoIP system should do everything that you can do today.

Equipment- Once you know what you want to do, you need the Equipment that will do the job.

Vendor- Choosing the right vendor that covers everything you need is Crucial!

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ASSESSMENT CHECK LIST

(print and fill out)

___ **On Site Employees**
Number of Employees requiring individual phone use on site

___ **Remote Employees**
Number of Employees requiring remote phone use

- [ ] **Single Company**
- [ ] **Multiple Companies**

Sometimes multiple companies may share the same phone system.
This can alter the type of system you need.

Inbound Call Flow

Employees Can Be Reached

- [ ] Directly
- [ ] Through Receptionist
- [ ] Through an IVR

Voicemail

- [ ] Company
- [ ] Individual

___ **Fax Numbers**

Call Routing by Schedule

- [ ] Non-Business Hours
- [ ] Holidays

Other Inbound Requirements

- [ ] Ring / Hunt Groups
- [ ] Music On Hold
- [ ] Find Me / Follow Me

Outbound Call Flow

Call Types

- [ ] Long Distance
- [ ] International

___

Outbound Caller ID

Special Call Routing/Handling

EQUIPMENT CHECK LIST

(print and fill out)

This checklist should be used to help you map out what equipment you already have, and what you might need. Not everything listed is required - this is just to give you something to check.

- ____ **Desk Phones**
- ____ **Receptionist Phones**
- ____ **Conference Phones**
- ____ **Sidecar Add-Ons**

- ☐ **On Premise**
- ☐ **Hosted**

Depending on whether you want an On Premise or Hosted solution will determine how much equipment will be on site.

Connection Devices

- ☐ **Router**
- ☐ **Managed Switch**
  - ☐ **PoE**
  - ☐ **802.11q (VLAN)**
  - ☐ **802.11p (QoS)**
- ☐ **Firewall**

Connection

- ☐ **Public Internet**
- ☐ **Private Network**

On Premise Specific

- ☐ **IP-PBX**
- ☐ **Session Border Control**

Extra Items

- ☐ **Headsets**
- ☐ **Cables**
- ☐ **Power Supplies**

VENDOR CHECK LIST

(print and fill out)

Use this checklist to make sure that the vendor you're considering covers everything you need.

Equipment Compatability

List Of...

- ☐ Phone Types
- ☐ Routers

Minutes

- ☐ Pay Per Minute
- ☐ Minutes Packages
- ☐ Unlimited Minutes
  - ☐ Acceptable Use Policy

Encoding

- ☐ G.711
- ☐ G.729
- ☐ ____________________

Prices & Contracts

- ☐ Month to Month
- ☐ Annual Contract

Encryption

- ☐ TLS
- ☐ IPSec
- ☐ SRTP

Features

- ☐ Voicemail
- ☐ IVR
- ☐ Find Me / Follow Me
- ☐ Call Schedules
- ☐ Call Recording
- ☐ Softphone