



## Flexfone Requirements Checklist

### Introduction

Before you deploy voice-over-IP or a Hosted PBX service in your office there are a few considerations you must first address. Switching from traditional telephone service to voice-over-IP (VoIP) requires sufficient bandwidth, a proper switch and router, and a good battery backup solution to protect you from power failures.

The key voice-over-IP requirements discussed in this article are:

- **Bandwidth** - Determining how much bandwidth you will need for voice-over-IP in your office is your first step.
- **The Router** - Choosing a low quality or under performing router is a costly mistake which will degrade your call quality.
- **Quality of Service** - You must decide whether voice traffic will be separated from regular Internet users or if it will share the same network.
- **VoIP Equipment** - There are many digital office phones, soft phones, headsets and telephone adapters on the market to choose from.
- **Power Failures** - Voice over IP does not work when the power goes out so you should install a battery backup system and possibly a Power-over-Ethernet switch if your budget permits it.

### How much bandwidth do I need?

Voice over IP needs a certain amount of bandwidth in order to keep your conversations clear and free of disruptions. Bandwidth is the amount of information that your Internet connection can send and receive in a certain period of time. Your first step should be to use an online speed test to find out what your maximum upload stream and download stream is. We suggest you do this test using a fixed connection to the Internet rather than using your Wi-Fi (wireless) connection to get accurate results. Try to use numerous tests during different times of the day to get a good average of what you can expect from your Internet connection. Bandwidth is normally measured in kbps or kilobits per second.

You will need to have a high-speed (broadband) connection to use voice-over-IP. A typical DSL connection will be rated at 600 kbps for the upload stream and 5000 kbps on the download stream. You will notice that your upload stream is almost always smaller than your download stream that becomes your limiting factor for using VoIP service.

Your next step is to determine how many people in your office are likely going to be using the phone at the same time. For instance, having ten people on the phone will



require ten times as much bandwidth as having one person on the phone. Below is a chart that will help you calculate how many people can be on the phone at one time:

Ask your voice-over-IP service provider what audio codecs they offer as there is a trade off between audio quality and bandwidth usage...

**Full Quality Audio (G711 Codec)** - Uses 87 kbps for each concurrent phone call  
**Compressed Audio (G729 Codec)** - Uses 33 kbps for each concurrent phone call

So the calculation for a typical DSL connection would be:

**DSL connection:** 600 kbps upload / 5000 kbps download

**Gives us (Full Quality):**  $600 \text{ kbps} / 87 \text{ kbps} = 6$  concurrent calls

**Gives us (Compressed Quality):**  $600 \text{ kbps} / 33 \text{ kbps} = 18$  concurrent calls

Notice we used the upload bandwidth in our calculation, as this is the limiting factor for voice-over-IP. You also don't want to push your connection to the limit as most cable and DSL connections do not have guarantees in terms of how much bandwidth they will deliver. If your Internet connection drops in bandwidth at some point during the day you don't want your call quality to be affected. Other factors affecting voice-over-IP are the latency of your connection and how much packet loss there is on it.

### Choosing a router

A router is the device that connects all your computers and network equipment to your Internet connection. It is an often-overlooked piece of the puzzle that can have a major impact on the success or failure of your voice-over-IP implementation. There are many routers on the market, some are very cheap (less than \$40) and others can cost you thousands of dollars. There is nothing worse than putting a poor quality or underpowered router in your office which could cause an otherwise good VoIP installation to go bad.

Your router needs to be powerful enough to handle the number of phones you will have in your office and should also work flawlessly with voice-over-IP equipment. A good place to start when deciding on your router is to speak with your voice-over-IP service provider. We also recommend checking to make sure that your router is compatible with voice-over-IP services. Please review our Router Compatibility Guide. The following is a list of items which will help you to determine whether your router is right for voice-over-IP:

- How many voice-over-IP phones will you be connecting to the router? The more phones you will be connecting, the more powerful the router needs to be. Don't use a \$40 router to run an office with 10 IP Telephones.

- Will your voice-over-IP phones have their own dedicated Internet connection? If not, a router with a quality of service (QoS) setting to prioritize voice traffic over regular traffic is an absolute must. Without QoS you will encounter poor quality telephone calls regularly.
- What other functions will the router need to perform? You might need your router to handle VPN connections, allow Wi-Fi (wireless) connections or perform other tasks.
- Make sure you can bridge your router to your modem. Routers that are not bridged can cause problems with voice-over-IP installations.
- Never use more than one router or NAT gateway on the network at a time as this will cause problems for IP Telephones when they attempt to do NAT.
- Check our [Router Compatibility Guide](#) to make sure your router is compatible.
- It is always best to get a recommendation from your voice-over-IP Service Provider, as some routers are known to perform very poorly with VoIP phones.

## Quality of Service (QoS)

Call quality is a function of your network and the public Internet. Some delays and network congestion cannot be avoided due to information traveling over the public Internet while other types can be avoided. Good network design is critical to a stable and reliable voice-over-IP implementation.

Quality of service (QoS) refers to the ability for your router to prioritize voice traffic (VoIP) differently than regular Internet traffic on your network or the separation of voice traffic. Voice over IP is a real-time protocol that means that if information is lost or delayed it will result in a noticeable drop in call quality or a complete loss of it.

Symptoms of network congestion include garbled audio, dropped calls and echo. When setting up voice-over-IP in your office there are three possible ways handle voice traffic. Some customers report perfectly good results without any quality of service (especially in a small 1-2 person office) and others report worse results with quality of service enabled on their router as some routers do a poor job of implementing this. Generally speaking the best way to deliver reliable voice-over-IP service is through a [dedicated Internet connection](#) that is only used by the voice-over-IP equipment rather than sharing the Internet with computers. Below are the different methods of doing quality of service:

- No QoS - Voice traffic and regular Internet traffic in your office are sharing the same Internet connection. No prioritization of voice traffic over regular traffic is being performed and thus there is the high potential that voice quality could be degraded if there is insufficient bandwidth for both voice and regular traffic. Some customers

experience very few problems using this method while others report a high frequency of poor quality calls, dropped calls and garbled voices. It all depends on how much network congestion your office has. Most Internet connections are more likely to be upload bound which generally results in people not being able to hear you, because all of your upload bandwidth is being consumed by something on your network.

- Router enabled QoS - Voice traffic and regular Internet traffic in your office are sharing the same Internet connection, but your router is able to distinguish between voice traffic and regular Internet traffic and give the voice traffic a higher priority. The problem with this method is that routers can only prioritize upload bandwidth that means your voice will be clear but the router cannot ensure that download bandwidth will be prioritized. If employees on your network are downloading often this will cause a noticeable drop in call quality but this method is better than no quality of service. Some Internet providers can prioritize the download bandwidth using TOS or COS methods from their end which will create an end-to-end quality of service solution. Most customers find that even prioritizing upload bandwidth for voice-over-IP offers a dramatic improvement in call quality because most Internet connections are limited by their upload bandwidth and have lots of download bandwidth free.
- Separated Traffic - Voice traffic and regular Internet traffic are separated onto two different Internet connections and networks. This is especially critical for larger offices with 5 or more employees. Voice traffic is carried on one Internet connection and data from computers is carried on the other connection. In this case your router requires no prioritization, because voice traffic has its own [dedicated Internet connection](#). This is the best way to ensure clear voice communications and the method we generally recommend customers whenever possible.

The method you decide on largely depends on how much bandwidth you have, what you are using your Internet connection for besides voice-over-IP and the level of call quality desired. Many offices report perfectly good results without using any QoS, while others find that it makes a major difference in the quality of their calls.

### **Choosing VoIP telephones and equipment**

Before deploying voice-over-IP in your office you will need to decide how each employee will be connected to your voice-over-IP provider. There are many choices on the market today.

- Digital IP or SIP Telephones - These types of phones look just like regular multi-line business telephones except that they connect directly to your Internet connection using a network cable.



- Soft Phones - A soft phone is a software program running on your computer that looks and feels just like a real telephone. This requires you to purchase a USB headset that connects to your desktop or laptop so you can make and receive calls.

#### **Battery backup and Power over Ethernet (PoE)**

With voice-over-IP and most office telephone systems you must consider what happens when the power goes out. For some offices this can be a regular occurrence and for others it might happen with a very low frequency. One of the things you will need to decide is whether or not you will install a battery backup system.

Here are a few important terms you should know:

- Power over Ethernet (PoE) - Is a technology that allows VoIP over IP telephones to be powered using regular network cables rather than power adapters that plug into the wall. This has the advantage that you can power all the phones in your office from a single source and makes installing a battery backup unit much easier.
- Uninterruptible Power Supply (UPS) - Is a device that powers your equipment when you lose power at the office. The system has a built in battery that keeps your network devices operational when the power goes out.
- The easiest way to protect your phone system from a power outage is to power all the phones using a Power-over-Ethernet switch that would normally be connected in the back room where your router and cable/DSL modem is located. This has the advantage that all your phones are drawing power from a single source which you can backup using an uninterruptible power supply (UPS). All you need to do is plug in your PoE switch, router, and DSL/cable modem into a sufficiently powerful UPS device so that when the power goes out all your phones remain up and running.