

# VOIP: Making phone calls across computer networks

Voice Over Internet Protocol

*Expert knowledge means success*

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Note: This publication has not been updated since it was last published. Some of the hyperlinks may have changed and may need updating. In addition, some of the information in this publication may be out of date.

## Introduction

Voice over Internet Protocol (VoIP) enables users to make phone calls across computer networks, by converting phone conversations into packets of data to be transmitted down the same wires used to browse the net thereby providing a low cost and efficient communication tool. Internet Telephony Service Providers can provide regular and enhanced phone line services, at reduced cost, with calls to other Internet phones often free of charge.

Services that route voice calls via the net, using VoIP are becoming increasingly popular with the increasing uptake of the broadband net services that underlie the service. Broadband services enable suppliers to offer sophisticated message handling options that would be more complex and costly to do with a traditional phone network. This coupled with the emergence of new telephony-enabling protocols such as SIP (Session Initiation Protocol), have revolutionised the sector. Microsoft, Cisco and many leading technology companies have now built SIP into their latest products.

There are already more than 6 million people worldwide benefiting from making voice calls over their Internet connection, primarily in Japan and the USA. The UK market is now poised to similarly take off.

Ofcom is supporting this emerging market and has allocated the telephone area code 056 for cyberspace. Subscribers with an 056 phone number will be able to use it wherever they are as long as they are connected to the internet.

In addition to the cost savings, one of the beauties of VOIP is that once you have an Internet Protocol telephone number you are contactable on that number worldwide wherever you can connect to a broadband connection. As soon as you connect your phone or laptop to that broadband service you can receive calls. In a Wi-Fi area, simply turning the device on will make it call ready (in public areas you may need to pay for the Wi-Fi access). Where broadband connectivity is not available, the IP number can be configured to reroute to another

number, such as a mobile phone to avoid missed calls.

## Internet Protocol

Internet Protocol (IP) is the communications standard that underlies the Internet. It allows large, geographically-diverse networks of computers to communicate with each other quickly and economically over a variety of physical links. Computers on the Internet use numerical IP addresses to route traffic and establish connections among themselves. Users generally access these addresses by names rather than by the numerical address.

IP networks split data into “packets” which are then sent to their destination via different routes and align themselves at the destination. Obviously, voice data must be realigned in the right order, and therefore the networks have to be sophisticated enough to carry the voice data without any deterioration in quality. VoIP is now used by public telephony operators for efficient IP telephony.

Building on the support of quality voice communication, IP is now often used for multimedia communication including music and streamed videos.

## Voice over Internet Protocol

Many small businesses are faced with spiralling phone bills. One way of reducing your bills is to use your IT network for phone calls between your branches, and to use the internet for external calls. This is known as Voice over Internet Protocol (VoIP).

VoIP can also dramatically improve the way you work. If you switch your phone calls to your IT network, you can merge voice and data, boosting staff productivity and enhancing customer service.

As the price of high speed internet connections comes down, it's well worth taking a fresh look at your long term plans for your phone and IT network.

This publication is for: small businesses who want to cut the cost of their phone bill. It's also for those who want to integrate their phone system with their business applications, to make staff more productive



and offer better customer service. It covers: the benefits of implementing VoIP, with advice on how to go about it.

## What is VoIP?

VoIP, short for Voice over Internet Protocol, enables businesses to make phone calls across computer networks, providing a low cost and efficient way to complement traditional phone systems. VoIP can be used in local office networks or between sites, enabling you to integrate call handling with other parts of your business such as your website. Using broadband, it can also deliver

### What is VOIP?

"It is probably the most significant paradigm shift in the entire history of modern communication, since the invention of the telephone".

*Michael Powell,  
US Federal Communications Commission  
Chairman*

telephone services to remote users and home workers. Besides the term 'Voice over IP', you may come across 'internet telephony', 'IP telephony' and 'voice over broadband'.

## The Benefits

The main advantage of VoIP is cheaper phone calls. Another key advantage is being able to combine phone calls with business data. It means you can adopt call centre style technology, with each incoming call triggering onscreen pop ups with customer details. Or you can add a 'Click to call' button on your website.

With VOIP a telephone number becomes an IP address that follows an employee. Instead of trying to contact that employee at various office locations, home or mobile numbers, the employee can always be contacted through one number.

With VOIP your "telephone" number need not be specific to where your company is based. This has the advantage that a company can appear to be locally based to all its customers simply by setting up IP numbers that start with the local STD code. For example a company based in Bath could set up IP numbers that look like Manchester, London and Birmingham numbers if they want to attract customers in those areas. Some operators now offer local area code IP numbers for the United States and some

European countries.

When you consider that the average employee spends hundreds of hours a year on the telephone, it's easy to see why VoIP is attracting a lot of attention. Many large corporates from banks to retail are using it for voice calls. UK bank Abbey is rolling out Voice over IP to its branch network, and sandwich retailer Pret A Manger has installed VoIP to communicate between shops, estimating it will save £10,000 a month.

As the cost of high speed internet access (such as broadband) comes down, VoIP is now within reach of small businesses. Some telecoms companies and ISPs are now offering Voice over IP deals targeted at the small business sector.

Traditional phone calls work by allocating an entire phone line to each call. With VoIP, voice data is compressed and transmitted over a computer network. This means VoIP uses up to 90% less bandwidth than a traditional phone call and is consequently more cost-effective and more efficient.

Phone companies are already using the technology to carry international calls. According to industry estimates, up to 75% of international calls will be carried over the internet by 2007. In fact, if you use a cheap, long distance telephone service, you're probably using IP telephony already without knowing it.

### Five reasons to adopt IP telephony

In order of importance, IP telephony can help firms to:

- reduce the cost of calls;
- increase features available from IP telephony, such as unified communication, real-time billing, click-to-call dialling, speech recognition and self-initiated videoconferencing;
- add and remove users and rearrange services, easily and inexpensively;
- self manage communication networks from a single control point;
- reduce business continuity risks in the event of disruption at any business site in the company.

*Source: Economist Intelligence Unit, AT&T*

*"We've done it ourselves and our 'road warriors' mobile telephone bills have reduced by 85% and our general staff have nearly cut bills in half. Instead of people always calling a colleague's mobile to reach someone out of the office they now know they can call on their normal IP number. Those people out of the office also get in the habit of hooking up their laptop and then using their normal IP number themselves. The cost savings to a business can be dramatic".*

*David Ellis – Head of Voice Portfolio  
Cable & Wireless*

VoIP is helping the phone companies save money, and by introducing a VoIP phone system on your own computer networks, you could do so too. For any business, the immediate benefits can be:

- Cheaper external calls – long-distance and international calls for the price of a local call;
- Free internal calls to all parts of your company that share a computer network. With a Virtual Private Network (VPN) in place you can speak to connected colleagues at different branches or on the road free of charge. This is particularly useful for the growing number of SMEs who have multiple sites – currently 33% according to the Yankee Group.

**But cheaper calls are not the only advantage. If you merge your phone and data networks, VoIP can help you work more efficiently and make your company's phone network easier to look after.**

- Simpler infrastructure. With VoIP on your computer network you can add telephones and increase call capacity without running additional cabling;
- Scalability. Traditional PBX (Private Branch Exchange) phone systems have a set number of ports for telephones to plug in to. VoIP systems provide greater flexibility as you can run a number of 'virtual users' through each network socket;
- Reduce operating costs. Because a VoIP-enabled system is based on software rather than hardware, it is easier to manage and maintain;
- Improve productivity. VoIP treats voice as if it were any other kind of data, so users can attach documents to voice messages or participate in virtual meetings using shared data and videoconferencing. They can also access data through voice commands. E-mails, voicemails and faxes can be integrated into one inbox and message formats can be converted (e.g. voice into e-mail) to allow a user to receive a message in the most appropriate format.

With voice and data on the same network, a calendar can be synchronised with voicemail. Then if an employee is in a meeting the calendar can take a message. If the calendar knows that the employee is away from a broadband connection, they can forward the call to a mobile. Messages can be accessed remotely, forwarded or e-mailed;

- Wireless-compatible. With a wireless LAN in place, mobile devices like PDAs and smartphones can use your VoIP system. (If you install a wireless LAN, you need to make sure you have appropriate security measures in place, such as a firewall or encryption);
- Enhanced customer service. By adding a 'Click to talk' button to a website, a VoIP-enabled enterprise can put web users in touch with customer service staff. You could also look at implementing customer relationship management software (CRM). Incoming calls could automatically trigger screen pops with customer account information and contact history;
- Dependable call management. Voice-related services, such as followme roaming, caller-ID, call forwarding and broadcast messaging, become simpler to maintain and can be updated as needed by your employees. When users login, the correct extension can be allocated to them, even remotely. When they want to use their "phone", they can then click the number they want to connect to, or forward a call to, from their screen. Calls can be initiated by selecting from a contact list rather than by remembering numbers;
- Flexibility. A Virtual Private Network (VPN) is an allocated amount of bandwidth on the public internet where public access is prevented through encryption. If your company has its own VPN and combines it with VoIP, you can set up a fully functioning office where there is a broadband connection. Green-field sites can be up and running in minutes not weeks;
- Remote working. Any broadband connection in the world can be used to interact with the office to receive all voice calls, voice mails, e-mails and faxes. Employees are contactable through the same IP address wherever they connect to broadband throughout the world;
- Billing. Internal management and accurate allocation of bills among units can be done centrally;
- Resilience. If a location is unavailable, communication traffic can be rerouted to other locations;
- Local presence. With IP numbers that resemble local area numbers your business can appear to offer a local service to customers even though they don't have a local physical presence.



## Ofcom supports Internet based phone calls

Ofcom has published a plain-English guide to VoIP services to help consumers find out what services are available and what they need to do to sign up. They intend to keep regulatory interference to a minimum in order to support the growth of the new VOIP market.

"Broadband voice services are a new and emerging market," said Stephen Carter, Ofcom Chief Executive. "Our first task as regulator is to keep out of the way."

Ofcom believes that the move to VoIP could lead to considerable cost reductions when compared with an old-fashioned phone system.

Right Time Communication Benefits		
Applications	Description	Benefit
Presence awareness	Right-time ability to see individuals across multiple media or determine availability from calendar.	Ability to contact hard to reach executives instantly on their preferred device based on their current status.
Team Collaboration	Sets up meetings across multiple sites by determining availability from a "buddy list".	Moves business projects forward by having team members liaise in right time.
Linking to back-office systems	Integrates application with back-office systems such as CRM and ERP applications.	Contacts co-workers immediately while working in an application for account status.
Integrating voice/data communication	Integrates telephone and PC channel based on availability.	Instant message notifications alert person on phone of urgent situations.
Keeping in contact with remote or travelling employee	Determines best way to reach remote or travelling employee based on user preference.	<b>Person's status</b> updated automatically as location change to simplify reaching mobile worker.
Facilitating use of collaboration tools	Integrates with instant messaging, calendaring, whiteboarding and discussion threads.	Simplifies use of collaboration tools to increase employee productivity.
Unified conferencing	Ability to set up audio, web and videoconferencing quickly and combine sessions as needed.	Decreases need for off-site travel to business meetings and promotes ad-hoc conferencing.

Source: Forrester Research Inc.

## The VoIP market

The good news is that Ofcom, the UK communications industries regulator, is pushing suppliers to introduce low-cost voice over broadband services in the UK. These services could be of interest to small and medium-sized companies.

As it's a competitive market, expect to see a raft of new products and services over the next few years, from both traditional telephone service suppliers and from Internet Service Providers (ISPs) who are evolving into Internet Telephony Service Providers (ITSPs).

Network suppliers such as Avaya, Cisco and Nortel also offer VoIP products and services. Managed services – where you outsource your phone and data network – are likely to be popular options for those who don't have in-house expertise.

Babble.net claims to be Britain's largest VoIP provider with around 110,000 registered users at the end of 2005. Currently it provides a pay as you go service, but the service is being extended to include a monthly subscription service that offers 1,000 minutes of free calls to UK landlines for £5 per month and to 'Zone 1' international destinations for £10 per month.

Skype claims to have nearly 2 million Britain based users, and this figure could increase dramatically if Britain's 10 million eBay customers decide to use the Skype service as part of their eBay transactions.

The more popular ISPs are also positioning their services. Santa Cruz Networks now provides its Festoon video plug-in software so that users of Google's instant messaging service – Google Talk - can see who they're talking to. The plug-in software will allow users to hold video voice calls on a one-to-one basis or with groups as large as 200 people, as well as to share photos and applications.

For news on industry developments, visit Ofcom's website: [www.ofcom.org](http://www.ofcom.org). For news on products and services, visit the Internet Telephony Service Providers Association website: [www.itspa.org.uk](http://www.itspa.org.uk) and [www.voip.org.uk](http://www.voip.org.uk), a website dedicated to UK IP telephony.



### Broadband suppliers well placed to provide VOIP

Broadband suppliers can offer VoIP at a low cost to both themselves and their users due to their inherent infrastructure.

Yahoo Broadband bundled VoIP in with its net service and as a result, 90% of its 4m subscribers are talking via the net for a much lower cost than via the old-fashioned phone system.

Yahoo can offer long-distance calls cheaply because it owns the network that the VoIP calls travel over. Yahoo has promised that its new version of Yahoo Messenger will offer the same service as Skype but at half the cost.

Google Talk, the Google VoIP offering is currently available as a beta service.

America Online and Microsoft both recently included voice capabilities into their messaging services.

Users subscribing to a VoIP service from a non-Broadband supplier e.g. Vonage (one of the leading North American VoIP suppliers) must also subscribe at an additional cost to a Broadband service.

## VoIP solutions – getting started

VoIP allows phone calls to be made between PCs that are connected together on a computer network. This can be an internal LAN (either Ethernet or wireless-based) or any computer connected to the internet, as this is in effect part of a single worldwide network.

At its most basic, a VoIP system simply links PCs. But most VoIP systems include connections (called gateways) to the regular telephone network, allowing PC-to-phone and phone-to-phone calling.

VoIP systems must be setup so that voice is prioritised over data on the IP network. A second's delay would not be noticeable for an e-mail delivery but would be noticed in a voice call.

### PC-to-PC connections

To make and receive VoIP calls internally in your business you will each need a multimedia equipped PC (Pentium) or an Apple G4. You also need to be connected to some kind of network:

- Internet. If you have an always-on internet connection you can, in theory, phone any suitably equipped PC in the world free of charge. Home users who want to try the technology to call friends and relatives overseas can make do with a dial-up connection. But for serious business use, you need a high speed internet connection such as broadband.

**If you have installed a firewall on your PC, you will need to make sure the VoIP software or hardware you use is compatible with it.**

- Private networks. VoIP can work across almost any data network, including wireless or Ethernet-based LANs and Virtual Private Networks (VPN), as well as the internet itself. The quality of service depends on congestion and transmission speeds of the network in question.

On private networks, especially across a LAN, voice quality can be at least as good, often better, than traditional telephone calls. For geographically dispersed networks the key factor is to provide adequate bandwidth, segregate data and VoIP traffic, and minimise network latency – that is, the time it takes for a network packet to travel from source to destination.

### Software

You need appropriate software to make VoIP calls on your PC or Apple Mac. Many of the latest operating systems include applications that let you make PC-to-PC calls.

- Applications such as Skype let PC, Mac and Linux users chat free of charge over the internet. The software is suitable for personal use rather than business use.

### Hardware

You could use your computer's built-in microphone and sound card to make and receive calls, but most users find headsets and handsets more practical.

- Analogue handsets plug into your existing soundcard. They are simple to operate but sound quality can be variable. Prices start at around £25;
- USB handsets plug into any PC and deliver superior audio as they usually have built-in sound cards. Look for models with Session Initiation Protocol (SIP) functionality. SIP models can plug into any PC so you can access your voice mail and make/receive calls from anywhere in the world. Prices start at around £40;
- Analogue telephone adaptors - units that convert your existing analogue phone into an internet capable (SIP-capable) phone are available from suppliers such as Cisco. Prices start at around £150;
- IP phones are available from Cisco, Avaya, Mitel and other suppliers. They plug into the data network. As well as making phone calls over the internet, you can check e-mail, browse the internet and access your company's business applications. But their screen is much smaller than a PC screen. Small businesses may also find their existing network is not sophisticated enough to accommodate them. Prices start at around £200.



### UK VoIP growth

Awareness of VoIP continues to increase, particularly among broadband customers, and industry estimates suggest that there are now more than 500,000 active VoIP users in the UK.

Take-up growth is forecast to continue over the next few years. By the end of 2007, some analysts forecast that there will be about three million PC-to-PC VoIP users and about one million who use VoIP services to call to and from traditional telephone connections in the UK.

*Source: Ofcom July 2007*

## PC-to-Phone connections

Not everyone has VoIP-enabled PCs. If you're using your PC to call someone who has a phone, you have to pay the price of a local call at the other end. However, you will still be getting an international call for the cost of a local call. To call people who have phones rather than VoIP-enabled PCs, your company needs a modern, IP-enabled PBX. They come with a standard gateway which connects VoIP calls to the public phone network.

Alternatively, you could use a third party service provider. Their service links your PC to the traditional telephone network. These Internet Telephony Service Providers (ITSPs), often based in the USA, offer subscription services, which provide gateways to the traditional telephone network. Most offer low tariff international calls on a pay as you go basis.

When you register with one of these services you are sent a password and log-in details. Typically, you buy time credits and can then place internet calls direct from any multimedia-equipped PC. Calls are routed via the provider's website to the regular telephone network using a local gateway, depending on your required destination.

You may need to download the service provider's software to convert your PC into a telephone and use a PIN number to access the service. Using an Internet Telephony Service Provider is a low cost option, as you do not need to invest in additional hardware. PC-to-phone services for businesses can be set up with single or multiple user accounts (with itemised billing) and can be a cost effective solution if you need to make international or long distance calls on a regular basis. Assuming your Internet Telephony Service Provider offers good deals for the places you call most often, you can make considerable savings. However, it's key to shop around on the internet. You need to look at the countries you dial most often and compare each Internet Telephony Service Provider's rate. It's worth double-checking them against traditional telecommunications providers such as BT.

## Phone-to-Phone connections

If reducing your international phone bill is the sole concern you can even opt for an account with an Internet Telephony Service Provider that gives you access to its low tariffs via a calling card solution. Here, you subscribe to a VoIP service and pre-dial its code when you are calling abroad. You don't have to upgrade your network to take advantage of these services, so it's a low-cost option.

You can use a standard phone and save money, but this approach delivers none of the service benefits available to the VoIP-enabled business – you are simply getting cheaper calls, not improving the way you work.

## VoIP solutions – going further

VoIP is not just about cheaper phone calls. If you merge your phone and data network, it can dramatically change the way you work, improving customer service along the way. Technologies and services that once required expensive equipment which was financially prohibitive to small companies can now play a part in business operations.

For example, you can use call centre technology to improve the way you deal with customers. Interactive voice response systems can request account numbers so that the incoming call can trigger your database to show a customer's address details, transaction history and any other relevant data on screen.

If you're considering using the internet for voice calls, you need to make sure your phone equipment conforms to industry standards. Check that your PBX is:

- QSIG compliant - QSIG is the open, international standard for PBX systems and it has been specifically designed to support VoIP; or
- DPNSS compliant - DPNSS (Digital Private Network Signalling System) is BT's proprietary standard.

Currently more than two thirds of existing UK private telephony networks use it.

If you don't fancy buying the kit and weaving it together, it may be easier to buy in third-party expertise to provide a solution for you.



### Cheaper calls for business travellers

VOIP is at its most competitive when used for international calls; particularly those made to mobiles or from hotel rooms. A laptop with "softphone" software can be used to route calls across the internet.

Virtual Contact centres can be created that integrate voice, e-mail and messaging. These can link remote sites with a main site for peak call periods or for receiving calls in different time zones. Remote workers appear to a caller as though they are part of an integrated team.

A 'Click to call' button on your website can be used to offer customers callbacks at the click of a mouse. For more details, see the section on voice-data integration below.

Real-time meetings with two-way voice and video or dedicated virtual "meeting room" space that supports messaging and voice can improve the effectiveness of collaborative working.

So, if you're planning to upgrade your telephone system or if you're implementing broadband on your IT network, it would be wise to make sure any new systems you install can cope with VoIP.

## VoIP enabling your switchboard

Most businesses use Private Branch Exchanges (PBXs) to manage shared external lines and switch calls between users on internal lines. You can add VoIP capability to this with little or no disruption to your existing phone set-up by installing a sub-network that works within your main PBX. By taking this route, businesses can preserve their existing investment, and take advantage of VoIP. You may find that the new equipment pays for itself within a year, through the costs you save on your phone bill.

Once installed, you can extend this network, for instance by using your VPN, to offer voice services to remotely based workers and sales teams. This will allow them to use the office extension and, at the same time, access the corporate database wherever they are online.

To do this you will need:

- An IP-Private Branch Exchange server (IP-PBX server). It deals with call routing and connection requests, monitors data traffic and manages bandwidth allocation. You can buy an IP-PBX server for around £350, which connects to your existing PBX and provides VoIP functionality;

- A gateway which provides the bridge between VoIP traffic and the standard telephone network. Expect to pay around £800;
- Software that allows multimedia-capable PCs to operate as high performance telephones using the company network. A 10-user licence software package starts at around £1,250;
- Or you could invest in IP telephones instead of the software – this is an option if you don't want to use a mouse to access your dial pad or if your working environment makes it difficult to set up computers for everyone that needs phone access. An IP telephone means you don't need PCs but can connect directly to your network, often they can also be used as standard phones if your own network fails – providing you have a landline as backup.

## VoIP between switchboards

If you are mainly interested in cutting the cost of internal calls between different branch locations, you can install VoIP gateways at each branch's PBX telephone system for around £800 per location and bypass the public telephone system. There is no need for equipment changes for the users, as individual phones are unaffected.

This will create a single, multi-location 'office'. You will cut the cost of inter-office phone costs and staff will benefit from remotely accessible voicemail and Direct Dial-In (DDI) numbers. See the case study on Parthenon Publishing.

Staff based abroad will be able to contact their UK colleagues by dialling the relevant extension. The return on investment (ROI) here is straightforward: it's the reduction in your phone bill less the cost of the hardware. With the ratio of internal to external calls at around 4:1 for the average business, the telephone savings could be substantial.

## Voice-data integration

If your company has different branches, a VoIP-based system that integrates all your communication services across a single, shared network will let you share data between branches as well as send and receive calls. The cost will depend on the number of locations you are integrating and the PC and phone handsets you have.

## Data Retention Regulations

The Data Retention (EC Directive) Regulations came into force on 1 October 2007.

The regulations require telecommunications providers to retain certain data relating to landline and mobile telephone calls (such as details of the caller and the number dialled), for a period of up to 12 months. The purpose is to enable national law-enforcement authorities to access data as part of terrorist or criminal investigations.

The new regulations do not apply to providers of internet telephony (or "VOIP") Services. The EU Directive on which the regulations are based allow a further 18 months before internet telephony providers are brought within the scope of the data retention regime.

The benefits are that a VoIP system can provide you with services that existing PBX telephone systems can't and that tighter voice-data integration will be more efficient. Possible services include:

- using call-centre technology, where an incoming phone call automatically brings up customer details on screen;
- offering customers a 'Click to call' button on your website;
- unified messaging for phone, e-mail and fax messages. Unified messaging offers a way of putting all these messages into a single 'in-box';
- video or audio-conferencing where several people in different locations can work on the same document, while discussing it over the phone or via a video link;
- voice activated dialling;
- voice-based SMS and
- plug-and-play connectivity from any network point for both phone and data.

## Mobile Communications

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If your company is dipping its toe into wireless networks, enabling staff to log on with Smartphones and Personal Digital Assistants (PDAs), consider how VoIP could fit into your strategy. To tap into this developing area, you need to know about SIP (Session Initiation Protocol).

SIP is an emerging IP telephony standard, which is being positively endorsed by the VoIP industry. With SIP-compliant systems users can:

- make and receive calls from anywhere;
- maintain a point of contact that is consistent, whatever device you are using and wherever you may be;
- automatically notify colleagues of their online status;
- provide the same address for e-mail and voice messaging; and
- update call management systems using standard contact management and calendar tools like Microsoft Outlook.

Mobile workers with SIP-based applications can use multimedia laptops, even PDAs, to stay in touch. Full function SIP phones remain expensive – they cost around £300.

While wireless networks bring great flexibility, they are relatively new and can bring increased security risks. Anyone with a wireless-enabled gadget can potentially tap into a wireless network, so you need to make sure you put in a firewall or encryption, as well as password protecting data and applications.

## Glossary

**ITSP** – Internet telephony service provider. A company that offers cheap phone calls that run over the internet.

**PBX** – Private Branch Exchange. A phone system that connects a company to the public telephone network.

**SIP** – Session Initiation Protocol. SIP is an emerging IP telephony standard that is being enthusiastically endorsed by the VoIP industry.

**USB** – Universal Serial Bus. An interface standard for connecting devices such as digital cameras to computers.

**VoIP** – Voice over Internet Protocol, enables businesses to make phone calls across computer networks. Also known as Internet Protocol telephony and IP telephony.

## Everything you need to know about Skype

If you're looking for free or cheap calls using the Internet, then pretty soon you will come across Skype. Allowing free calls across the net using Voice over IP (VoIP) technology, Skype is the market leader. It takes communications to a new and global era with its free, multi-faceted and rich communication tools, enabling users to make free, or very cheap, voice calls and rich messaging connections via the Internet. Skype currently has around 60 million registered users and is the most-used free net telephony application.

Subscribers can call land lines in 25 countries for a penny per minute (UK mobiles cost around 16p per minute). Skype also offers local area codes in several countries, so relatives abroad can call subscribers at local rates.

Developed by the people behind the file-sharing service Kazaa, Skype offers free Internet telephony with another PC user as long as both of you have downloaded the Skype software. Thankfully, there are many similarities between Skype and instant messaging (IM) applications, with which many people are already familiar. For instance, you can add your friends, you can hide your online status, block callers, track calls, have an IM-style chat or take part in a conference call with up to four others. (Source: Personal Computer World)

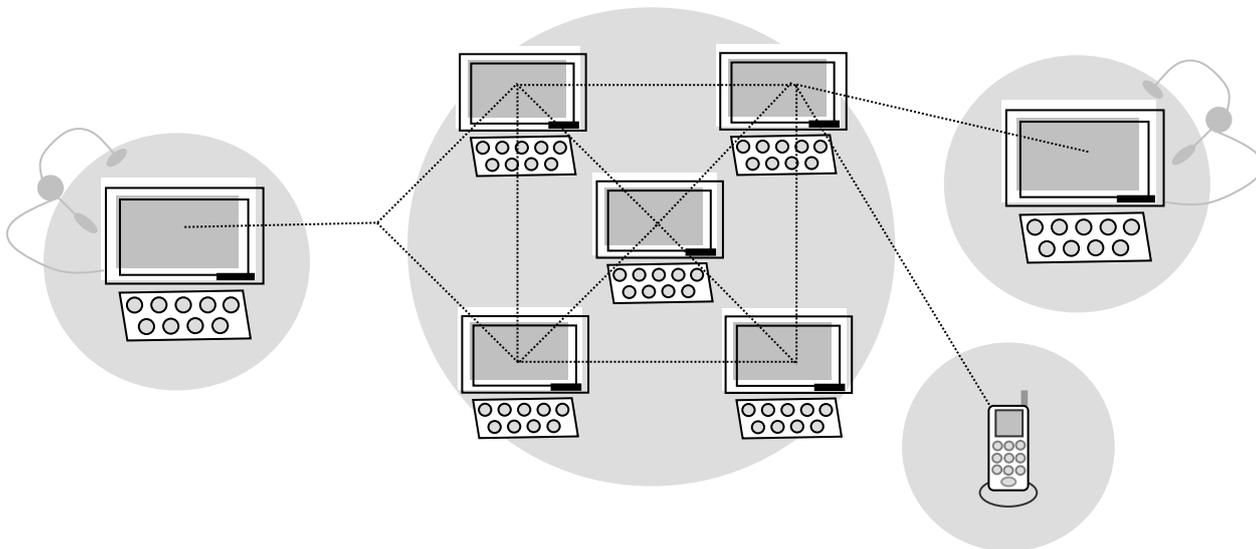
### Skype and SMS

Users of the VoIP service can now send and receive SMS messages, for free, using the Skype software. Net phone operators are using text messaging to create a bridge between mobile phones and PC desktops.

*"We've got more than 210m downloads now and that's growing at 180,000 a day, which is incredible when you consider that's a lot bigger than some other companies' total subscription base. Of our download base, we've got £68m registered users, so it's proving hugely disruptive for the tele-communications industry."*

*Saul Klein – Vice President of Marketing, Skype*

## How Skype Works



**1** Just download a free piece of software and plug a microphone into a PC, and you can make phone calls over the Net. You can also send instant messages to other Skype users or connect as many as five people in an ad hoc conference call.

**2** Unlike other voice-over-the-Internet services, **Skype uses a unique 'peer-to-peer' approach** to relay calls securely. That means no expensive centralised servers or switches – **making Skype's cost of adding new customers essential zero.**

**3** Calls from one Skype user to another are free and unlimited, just like instant messaging or e-mail. And a new service lets users make calls to conventional phones for about 2¢ a minute. Skype is now adding services aimed at businesses.

## *Answer phone*

When you are away from your PC and there is no one to answer your incoming Skype calls, there's a Skype application that deals with this: Go to [www.skype.com/intl/en-us/features/allfeatures/voicemail/](http://www.skype.com/intl/en-us/features/allfeatures/voicemail/) for more details.

## *Skype and Voice*

On the voice front, Skype works like most VoIP solutions by converting the sound of your voice into a digital data packet, which is then fired across the net and reconverted into sound at the other end. Some criticisms of Skype in the past were that it was limited to Windows and that there was no facility for calling offline friends on their normal phones. Now there are versions for the Mac, Linux and Smart Phones.

## *Skype and Video*

At the end of 2005, Skype 2.0 was launched which offers video conferencing. As 3G launches around the world, Skype aims to enable people to video conference with one another via mobiles at low call rates.

## *Getting Started*

So what do you need to get started? There's no need for expensive VoIP phones or a broadband connection, as Skype works fine across a modem (33Kbits/sec or higher) – useful if you have unmetered dial-up access. All you need is a microphone and some PC speakers or headphones. You probably had a stick-like microphone as part of your PC bundle but never had a use for it – now it's time to dig it out. But you'll be better off investing in a proper phone or headset which will improve the sound quality and reduce distortion. Analogue headsets that plug directly into your soundcard cost less than £10. Most laptops today have a camera and microphone build into the top of the screen.

## *Getting Skype*

To download Skype to your computer, simply go to: [www.skype.com](http://www.skype.com) and save the installation file to your computer. Be sure to remember where you saved the file (the desktop might be a good place). Once the file has downloaded completely, please open the folder containing the file you downloaded. Double-click the installation file you just downloaded to start installing Skype on your computer.

## *Skype on your Mobile*

You can now get Skype on your mobile.

Details are at:

[www.skype.com/intl/en-us/get-skype/on-your-mobile/download](http://www.skype.com/intl/en-us/get-skype/on-your-mobile/download)

## *Skype is also available on Mac and Linux Computers*

Skype has made its feature-rich system available for the Mac and Linux systems

Details are at:

[www.skype.com/intl/en-us/get-skype/on-your-computer/macosex/](http://www.skype.com/intl/en-us/get-skype/on-your-computer/macosex/)

[www.skype.com/intl/en/get-skype/on-your-computer/linux/](http://www.skype.com/intl/en/get-skype/on-your-computer/linux/)

## *Minimum System Requirements*

The minimum system requirements for using Skype on a PC, Mac or Linux machine are covered at:

<https://support.skype.com/en-us/faq/FA10328/What-are-the-system-requirements-for-running-Skype>

## Implementation guide

VoIP offers substantial benefits and the technology has now advanced to the point where it can be an attractive alternative for business use. But, unless there is a clear rationale for it, scrapping all your analogue PBX kit and handsets and replacing them with a total VoIP solution is likely to be costly and is probably unwise.

Usually it makes sense to introduce VoIP as an addition to your existing PBX-based system and gradually increase your level of sophistication as and when you need more functionality. Opting for a hybrid system will enable you to retain your installed investment in many popular handsets whilst providing a scalable platform to support future applications and user growth.

An important strength of VoIP architecture is that it can operate side-by-side with your existing systems. By initially restricting the roll-out of VoIP to a single department such as sales, and then extending it to the rest of the business as your needs dictate, you can minimise disruption and stagger your costs.

If you decide to use VoIP it is vital to check out the robustness of the networks you will be relying upon to ensure smooth implementation. Voice communication is too important to not work reliably in all conditions.

You need to look at four main issues:

- Quality of service;
- Reliability;
- Security; and
- Support.

### Quality of service

Quality of service is a prime concern. With the traditional phone system, users are accustomed to good quality calls – they may occasionally get ‘echo on the line’ but this is the exception. If you’re using a data network for voice calls, it means you are chopping up the phone conversation into packets that are reassembled at the other end of the line.

With voice calls, voice transmission has to happen in real-time, and it can be difficult to guarantee this if there is too much traffic on the network. If voice data takes too long to arrive, it can result in a stuttering effect, where words get cut in half and syllables get

lost – and this will not be acceptable to users.

Congestion in the network is the most likely reason for loss of quality. You need to test your network performance at peak times and at its weakest point.

As a rough rule of thumb, at least 25% of bandwidth should be kept available for administrative tasks, i.e. routine automatic system management.

VoIP uses bandwidth efficiently. But you need to look at worst case scenarios when deciding whether you will need to upgrade your network. Are there bottlenecks at times of high activity?

How does the network perform while very large files are being transferred? It is normally advisable to separate voice and data traffic on the same network to control the potential impact of one on the other. Additionally, you need to plan for the future. Will there be more use of video once VoIP is up and running, as staff start videoconferencing, and how will this affect network performance?

And while it’s possible to control your internal network traffic to some extent, it’s impossible to manage traffic on the internet, where you have no control over the hubs, routers and pipelines that make up the public network.

### Reliability

Next, you need to look at the robustness of the networks you are using. Losing telephony services as well as access to data could be catastrophic. Ask yourself:

- If one or more of your servers fail, is the network able to recover in sub-second time? If not, do you need to build in redundancy and/or mirrored servers?
- The standard (‘five 9s’) benchmark for telecom network availability is 99.999%, which is equivalent to less than five minutes of downtime a year. How does this compare to the network underlying your VoIP?
- If you intend to switch all phone calls over to VoIP, you could end up in a situation where you can’t use the phones because there’s a power cut. Make sure you have a backup solution;
- You need to ensure that you always have phone access to the emergency services, if your hardware or software fails.



### What should consumers ask about before signing up for a VoIP service?

Consumers should check the prices of different services carefully. In addition, some VoIP services might ‘look and feel’ like traditional telephone services but may not offer (in the same way or to the same standard) all the features consumers have come to expect from their traditional telephone service.

If you are considering VoIP, ask the provider to explain what their service can and cannot do, before you subscribe.

Some relevant questions you may want to ask the VoIP provider might include:

- does the VoIP provider offer access to the emergency services, i.e. 999/112 calls?
- does the VoIP service depend on your power supply? In particular, does the provider offer back-up power in case of power cuts?
- if there is a problem with your broadband connection, will the VoIP provider offer a back up to make calls via a traditional (PSTN) telephone connection?
- if you call the emergency services, will they automatically know where you are calling from?
- what other features such as directory assistance, directory listings and access to the operator, do the VoIP provider offer?
- will you be able to keep your telephone number if you later decide to transfer your services to another provider in the future?

Source: Ofcom

Landline and mobile phone service providers guarantee access to 999 services, but internet telephony providers are not currently bound by the same regulations.

## Security

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Because voice is transmitted as data it is potentially more vulnerable to attack than a traditional telephone system. There are a number of ways you are at risk, including:

- exposure to malicious attacks or computer viruses;
- eavesdropping by competitors leading to loss of confidentiality; and
- use by hackers of your network to make free calls.

An attack on the voice network may be unlikely, but if it were to succeed it would be crippling. The core techniques for securing voice networks are straightforward, things like firewalls, encryption and password protection, but they need to be embedded from the start in your strategy and planning.

In short, you need to make your VoIP system at least as secure as the rest of your network. Suppliers such as Avaya and Juniper Networks offer security features such as voice encryption for VoIP.

Here are some steps that can help protect your VoIP network.

- Place your IP-PBX servers behind firewalls so they cannot be accessed from the internet;
- Use intrusion-detection systems and install software patches promptly;
- Only give administration rights to certain, trusted members of staff. And set up access lists to limit usage to authorised users;
- Encrypt voice data while it is being digitised, i.e. in the phone or at the gateway;
- Require all phone points, especially LAN telephones, to have password-protected log-in procedures;
- Set up a virtual LAN so that data and voice transmissions use different parts of the network.

## Support

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If you switch voice calls to your IT network, it makes your IT staff responsible for your phone network. Key points to consider are:

- Is everyone aware of their new responsibilities?
- Do you have enough IT staff?

- Will staff need training so they can provide support for the phone system?
- What security changes do you need to make when adding voice to your IT network?

## Implementation checklist

### Research & Analyse

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#### Set Objectives

Do you want to:

- reduce the cost of communicating externally?
- enhance internal communications?
- improve communications support for remote and mobile workers?
- introduce integrated voice/data services?
- agree specific, measurable objectives for what you want to achieve?

#### Analyse Your Needs

- What proportions of voice calls are internal, external, between corporate locations?
- Identify the level of data and voice traffic at peak times. Is this likely to change in future?
- Do you need to upgrade PCs? You will need Pentium PCs or Apple G4s as a minimum;
- Is there sufficient bandwidth during periods of peak activity?
- What management and monitoring tools do you need?
- If you intend to introduce high bandwidth applications like videoconferencing does your cabling/wireless infrastructure deliver sufficient bandwidth to each desktop?

#### Cost Benefit Analysis

- Will you need to upgrade your existing network? Allow for the cost of this;
- What is the cost of additional equipment, installation, training and maintenance?
- What are the anticipated call savings?
- What are the expected savings in operating costs?
- Can you assess any productivity benefits?
- How long will it take to plan, install, configure and trial a new system?

## Explore the options

- Look at VoIP-enabling your switchboard;
- Do you want to use VoIP to bypass the public telephone system?
- Should you use an ITSP (Internet Telephony Service Provider)?
- Look at interoperability with your existing systems;
- Look at your needs for mobile communications and check for SIP compatibility.

## Consult

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### Internally

- Identify early adopters and discuss their needs;
- Decide which departments/individuals will be VoIP-enabled;
- Do proposed product offerings meet existing as well as anticipated needs?

### Professional advice

- If you lack the skills in-house, contact a Business Link adviser (or equivalent if you are in Scotland, Wales or Northern Ireland), in the first instance, for help on how best to:
- outline your requirements;
- establish how much you can afford to pay;
- scope the project;
- implement;
- provide training and software support; and
- get ongoing traffic analysis and network advice.

## Plan and test

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### Plan your VoIP architecture

- Which VoIP applications do you want to offer staff?
- Which services (e.g. conferencing, queuing, voice transfer) will the network need to support these applications?

- What is the physical infrastructure (e.g. protocols, switches, routing mechanisms) required to deliver this?
- Do you want to add voice services to one or several LANs?
- Do you want to add voice services to VPNs?
- Build in strong security measures.

## Plan the rollout phase

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- Look at training implications – what will the cost be?
- Decide which staff will require training and allow time for them to adjust to the new system;
- Break down the project into manageable chunks;
- Make it clear who is responsible for updating, maintaining and securing IP phones and other gateways;
- Make sure that your plans are scalable.

## Act

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### Implement VoIP

- Roll out any necessary training;
- Begin by replacing VoIP in a self-contained part of the business then gradually extend its use;
- Encourage staff involvement and feedback, this will help smooth implementation, as staff buy-in can make or break a technology project;
- Consider setting up a cross-departmental taskforce to manage the implementation process – it will help with staff buy-in and ensure that implementation works company-wide.

### Evaluate

- Monitor and review the impact on your business and against your objectives;
- Monitor quality of service and network availability;
- Get feedback from staff, customers and suppliers on the changes;
- Evaluate the impact after six months and one year. Have you achieved your objectives? Establish how you could improve things further.

## Further help and advice

Achieving best practice in your business is a key theme within the BIS<sup>2</sup> approach to business support solutions, providing ideas and insights into how you can improve performance across your business. By showing what works in other businesses, we can help you see what can help you, and then support you in implementation.

### General information on VoIP

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- Ofcom, regulator for the UK communications industries  
[www.ofcom.org](http://www.ofcom.org)
- Independent advice for small businesses  
[www.telecomsAdvice.org.uk](http://www.telecomsAdvice.org.uk)
- Technical sites with updates on industry standards  
[www.sipcenter.com](http://www.sipcenter.com)  
[www.openh323.org](http://www.openh323.org)
- Reviews of UK Voice over IP service providers  
[www.voip.org.uk](http://www.voip.org.uk)
- Site for network managers to calculate viability of VoIP  
[www.VoIP-calculator.com](http://www.VoIP-calculator.com)
- Internet Telephony Service Providers Association  
[www.itspa.org.uk](http://www.itspa.org.uk)
- IP Telephony magazine  
[www.tmcnet.com/voip](http://www.tmcnet.com/voip)
- Mobile Computer Users Group  
[www.mcug.org.uk](http://www.mcug.org.uk)
- Forrester Research  
[www.forrester.com](http://www.forrester.com)
- IPxStream – IP telephony news and resources  
[www.iptelephony.org](http://www.iptelephony.org)

### A selection of Software, Hardware and Service Providers

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#### *Comparison of VoIP Software*

- Wikipedia  
[http://en.wikipedia.org/wiki/Comparison\\_of\\_VoIP\\_software](http://en.wikipedia.org/wiki/Comparison_of_VoIP_software)

#### *PC to phone services*

- <http://voice.yahoo.jajah.com/home/index.castle?>
- [www.net2phone.com](http://www.net2phone.com)
- [www.webphone.com](http://www.webphone.com)
- [www.neteasyphone.net](http://www.neteasyphone.net)
- [www.callserve.com/Homepage.asp](http://www.callserve.com/Homepage.asp)

#### *VoIP hardware and solutions providers*

- Avaya  
<http://www.avaya.com/usa/>
- Cisco Systems  
[www.cisco.com](http://www.cisco.com)
- ConnectHere  
[www.connecthere.net](http://www.connecthere.net)
- **BT's Broadband Voice for Business**  
<http://business.bt.com/broadband-and-internet/internet-communication/broadband-voice/>

## Recommended Reading

- VoIP for Dummies, by Timothy V. Kelly published May 2005, ISBN: 0764588435
- Internet Communications Using SIP: Delivering VoIP and Multimedia Services with Session Initiation Protocol (Networking Council S.), by H. Sinnreich published November 2001, ISBN: 0471413992
- Introduction to IP Telephony, Why and How Companies Are Upgrading Private Telephone Systems to Use VoIP Services, by Lawrence J. Harte published May 2003, ISBN: 0974278777
- Voice Over IP Fundamentals, by Jonathan Davidson and James Peters published November 1999, ISBN: 1578701686
- Making the VoIP switch: a Decision Guide for CXOs and the Board of Directors. [www.deloitte.com](http://www.deloitte.com).
- **How "VoIP" offers cost-effective business communication: a guide to VoIP** prepared by the Institute of Directors and Avaya. [www.iod.com](http://www.iod.com)



## Further Information

This guide is for general interest - it is always essential to take advice on specific issues. We believe that the facts are correct as at the date of publication, but there may be certain errors and omissions for which we cannot be responsible.

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<sup>1</sup> The body of this document (from *Voice over Internet Protocol to Further Help and Advice*) has been based on the DTI (now BIS, see below) Best Practice Guide: Voice over Internet Protocol and Crown Copyright © therein is acknowledged. Additions have been made to the text where appropriate. More information can be found at: [www.dti.gov.uk](http://www.dti.gov.uk). Examples of products and companies included in this leaflet do not in any way imply endorsement or recommendation by BIS. Prices quoted are indicative at the time it was published.

<sup>2</sup> The Department for Business, Innovation & Skills (BIS) was formerly known as the Department for Business, Enterprise and Regulatory Reform (BERR) and before that was called the Department for Trade & Industry (DTI).