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VoIP (VOICE OVER INTERNET PROTOCOL) FACTSHEET

Switching to VoIP can make your business more productive, accessible to customers, flexible and also greatly reduce your phone bill.

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 individual local office networks or between sites, enabling you to integrate call handling and reporting with other business processes and with your website. Using broadband, it can also deliver telephone services to remote users and home workers.

THE BENEFITS

VoIP has one advantage – cheaper calls. In a study by Benchmark Research, businesses rated telecommunications and IT has the biggest priority for making cost savings. 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.

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. Currently 6% of international traffic is internet-based. According to a recent research report this will be up to 75% by 2007 (Frost & Sullivan). In fact if you use a cheap, long distance telephone service, you're probably already using IP telephony without knowing it.

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.

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- **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 for free. 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.

- **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.

- **Wireless-compatible.** With a wireless LAN in place, mobile devices like PDAs and smartphones can use your VoIP system.

- **Connect to customers**. By adding a 'click to talk' button to its website, a VoIP-enabled enterprise can put web users in touch with its customer service personnel.

- **Dependable call management.** Voice-related services, like follow-me roaming, caller-ID, call forwarding and broadcast messaging, become simpler to maintain and can be updated as needed by your employees.

- **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.

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-PC, PC-to-phone and phone-to-phone calling.

PC-to-PC connections

You and a colleague may be able to make and receive VoIP calls from your desktops straightaway. You will each need a multimedia equipped PC (486 or better) or an Apple G3. 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 for free. However, though the public internet is fine for occasional use, quality and reliability issues still make it unsuitable for mission-critical VoIP. This is likely to change, though, with the advances in voice compression and bandwidth upgrades that are currently taking place.

  Additionally, if your PC is operating behind a firewall, you may need to install gatekeeper software on the computer that has the internet connection. Dialupaudio **(www.dialupaudio.com)** has a free demonstration version.

- **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.

Software

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

- Microsoft Windows 2000 users can use Netmeeting.
- In Windows XP, Messenger has this capability.
- Apple users can download freeware products like Mac2phone.
- For OS X users, SquidCam is available as shareware via the Apple site.

Hardware

You could use your computer's microphone and sound card to make and receive calls, but headsets and handsets are both inexpensive and more practical.

- Analogue Handsets are available for around £25. These plug into your existing soundcard. They are simple to operate but sound quality can be variable.
- USB handsets start at around £75. These usually have built-in sound cards and deliver superior audio. Look for models with Session Initiation Protocol (SIP) functionality. This enables you to plug into any PC and lets you sign in so you can access your voice mail and make/receive calls from anywhere. See page 8 for more information on SIP.
- Units that convert your existing phone into an SIP-capable phone are available, from Cisco and others, for around £100.

PC-to-phone connections

If you want to use VoIP to make calls to people without VoIP-enabled PCs you will need to connect via a gateway, which switches your call to the traditional telephone network. The latest generation IP-enabled PBXs for SMEs incorporate gateway functionality as standard and allow VoIP calls to connect onto the PSTN. Alternatively, a number of third parties provide PC-to-phone services, which link 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. Check **connecthere.net** for a list of providers.

BT's PC2UK takes a slightly different approach. A fixed fee of £10 per month buys you ten hours per month of calls to UK landlines with simultaneous web surfing on the same line. 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.

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. Your training and equipment costs stay low. Assuming your ITSP offers good deals for the places you call most often, you can make considerable savings.

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 (ITSP) 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 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.

VoIP SOLUTIONS – GOING FURTHER

If you are interested in VoIP primarily as a cost saving measure or wish to test out the technology, without making any major investment, it makes sense to open an account with an Internet Telephony Service Provider (ITSP) or use standard software and inexpensive hardware on your desktop. However, if you want to add value to your business's communication applications or are planning to migrate your telephone system you may need to look at a strategy that attaches VoIP to your company network.

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.

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, simultaneously, to use the office extension and 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 box for around £3,000, which connects seamlessly to your existing PBX and provides full VoIP functionality.

- A gateway (such as a 2-channel ISDN card) which provides the bridge between VoIP traffic and the standard telephone network. Expect to pay around £500.

- 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. The actual phones can be expensive, although there are basic models for around £100 each.

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 £500 per location and bypass the public telephone system. There is no need for equipment changes for the users, as individuals' phone systems are unaffected.

NOTE:

Check that your PBX telephone systems are:

- **QSIG compliant** – QSIG is the open, international standard for PBX systems and it has been specifically designed to support VoIP; or
- **DPNSS compliant** – DPNSS is BT's proprietary standard. Currently more than two-thirds of existing UK private telephony networks use it.

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. 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.

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:

- voice activated dialling
- video or audio-conferencing where several participants can work on the same document simultaneously
- hearing e-mails over the phone
- voice-based SMS

- offering customers a ‘click to call’ button on your website
- plug-and-play connectivity from any network point for both phone and data.

As people get used to the convenience of integrated data and voice communication, different ways of working will emerge. Voice will increasingly be used for recording data, triggering commands – for instance, ‘please look up the latest sales figures and send them to me’ or ‘please read me my e-mail’. The one-to-one phone call will be seen as just one kind of voice-based transaction.

Mobile communications

VoIP is well suited for wireless communications, such as cell-phones, smartphones and PDAs. To tap into the potential you need to know about SIP (Session Initiation Protocol).

SIP is an emerging IP telephony standard, which is being enthusiastically 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, IM and voice messaging
- 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 – with prices of £300 or more not uncommon. There are some good deals available, though, and it pays to shop around.

DECIDING TO USE VOIP

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 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 three main issues:

- **Quality of service**
- **Reliability**
- **Security.**

Quality of service

Quality of service is a prime concern. Unlike data, where lost signals can be re-sent, voice transmission has to happen in real-time.

Congestion anywhere in the network is the most likely reason for an unacceptable 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, ie routine automatic system management.

VoIP uses bandwidth very 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 and how will this affect network performance?

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 5 minutes of downtime a year. How does this compare to the network your VoIP will be working on?
- You need to ensure that the emergency services can always be contacted. Does your system patch into the public telephone network in the event of a system failure or software problems?

Security

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
- 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.

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.
- Limit administration access as much as possible.
- Encrypt voice data while it is being digitised, ie in the phone or at the gateway.
- Set up access lists to limit usage to authorised users.
- 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.

IMPLEMENTATION CHECKLIST

Research & analyse

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 486 PCs or Apple G3s 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

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

☐ advise on implementation

☐ provide training and software support

☐ get ongoing traffic analysis and network advice.

Plan & test

Plan your VoIP architecture

☐ Which VoIP applications do you want to offer staff?

☐ Which services (eg conferencing, queuing, voice transfer) will the network need to support these applications?

☐ What is the physical infrastructure (eg 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

- ☐ 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

Implement VoIP

- ☐ Rollout 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 6 months and 1 year. Have you achieved your objectives? Establish how you could improve things further.

FURTHER HELP AND ADVICE

- www.telecomsadvice.org.uk
- www.sipcenter.com
- www.cnpgb.com/voice-over-ip.htm
- www.openh323.org
- www.VoIP-calculator.com

Commercial sources

- www.microsoft.com/windows/netmeeting/default.asp – Microsoft Netmeeting
- messenger.msn.com/– Microsoft Windows XP Messenger
- www.net2phone.com – Net2Phone
- www.dialpad.com – DialPad
- www.avaya.com/eclips – Avaya VoIP solutions and consulting services

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