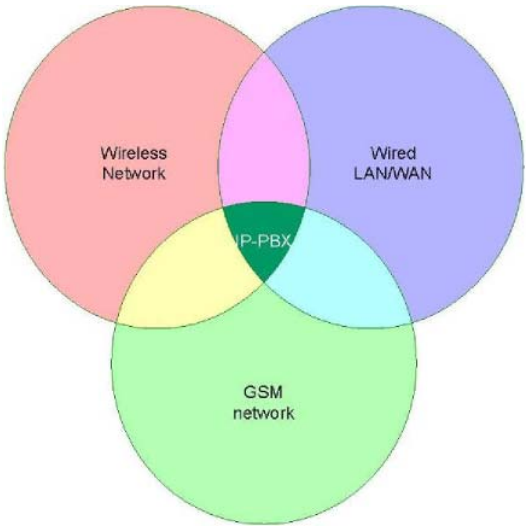
The Private Branch Exchanges (PBX) Reaches Out

White Paper

Abstract

The goal of being able to extend the features, capabilities and benefits of a PBX out of the confines of the corporate network is achievable. Intelligent telephony solutions can be created today using a combination of open standards SIP applications running on existing LAN/WAN infrastructure, the internet and wireless networks, in conjunction with mobile technologies like GSM and GPRS. This type of intelligent telephony will reduce mobile phone costs and increase contactability – two key requirements for most businesses today. This paper addresses the question of what is an intelligent telephony solution and why we believe businesses will increasingly take this approach to their telephony.

The Concept of Intelligent Telephony



As technology has developed over the past few years, the number of devices that people carry with them has increased. Most people will have a mobile phone and a laptop, as well as a desktop phone in the office and a phone at home. Many people also carry personal data assistants (PDAs), GPS (global positioning system) navigation equipment for vehicles, personal entertainment devices.

The list is extensive and this plethora of devices causes confusion for the user. Which phone should I use? What information is stored where? Are all devices synchronised? People wanting to contact the user have a dilemma also. Which number should I call? What time of day is it and so where is he likely to be?

In the end, because the mobile is normally now kept with the owner constantly, most people will use their mobile phone to make calls and the first number that they try for any given contact will be the mobile number. An expensive solution that does not take advantage of arrangements for corporate telephony minute call rates or of the cost saving of using virtual private networks (VPNs) and breaking out to the public switched telephony network (PSTN) on a lower cost, more local call.

In a truly converged world, it should not matter what device is used or where someone is contacted to because the device selected - whether mobile, fixed line, home line or IP Phone - will select the most cost effective transportation route. Also, any inbound calls will be routed to the device designated by the user as their point of choice. This is intelligent telephony.

'Intelligent telephony' is a concept for the user; the ability to derive business benefits through intelligent systems designed to reduce cost and increase contactability. Intelligent telephony should not be confused with the technical aspect of carriers and service providers building routing and switching functions into the network. These Next Generation Networks, sometimes referred to as Intelligent Networks by such carriers, have, as their goal, optimisation of the transport layer. Although convergence has been a buzzword for a decade, advances in portable processing power, industry standardisation and breaking up of longstanding monopolistic practices is starting to make intelligent telephony a real contender.

The Changing Face of Contactability

Today, this level of convergence is starting to happen, enabled by the spread of technologies like wireless ADSL routers, WiFi hotspots and PDAs with GSM capabilities. The take up of broadband in the UK continues to grow with the UK outpacing our European counterparts, according to a study from the European Competitive Telecommunications Association (ECTA) More than 69% of UK net users have broadband connections according to the latest figures from the UK's Office of National Statistics. This trend is adding to the pressure for IT managers to devise ways for their staff to work outside the office and be easily contactable in a way that is cost effective for the business.

The term contactable is also changing its meaning. At one time it simply meant that someone, often the personal assistant of the main contact being sort, would receive the call and then transfer the call if their knew the user was available and willing to take the call, on a fixed line extension to the central enterprise PBX. Over the last 10 years, first in the large enterprise and now, increasingly, in the small and medium enterprise, this has changed because of pressure on personnel costs and high work levels. Personal numbering, ensuring the call goes directly to the user, has become more prevalent. But a new issue has arisen – voice mail. As calls go directly to the user, more of them are diverted to voicemail when the user is busy or unavailable to take a call.

Contactability has become about empowering users to manage their availability. Today, with intelligent numbering we have device and line independence for telephony users, whether on- or off-net. However, the network used is dictated by the device on which they are logged in; PC, mobile or fixed line. The next step will be network independence and will mean that contactability will refer to accessing the person from a combination of fixed, mobile or LAN telephony, instant messaging and email applications. Contactability will be irrespective of the network used. The user will be able to respond using the methods of their choice, from any location, with a connection to the internet, the GSM network, the PSTN (public switched telephone network) or the corporate network.

Choice and Flexibility of Devices

The device that contacts are made on is also changing, with new mobile phone and PDA hardware and new features being introduced on a nearly monthly basis. One of the most flexible of these converged devices has to be the modern GSM-enabled PDAs, like the XDA Exec and HP iPAQ hw6940 Pocket PC. These devices use a combination of GSM and GPRS to deliver voice and email to the user on the move. When a user is in range of an accessible wireless network, the device uses this network for voice and data communication. This is a clear step towards the intelligent telephony network.

Another technology that is, increasingly, being used is voice over internet protocol (VoIP). This allows voice, video and fax calls to be made over switched IP packet networks which, particularly if internet based, have a consequent reduction in costs for the enterprise. VoIP capable end user devices, today, can be broadly divided into two types: hardware fixed-location phones and software-based mobile location independent devices such as laptops or PDAs which, with software IP telephones installed, enable the user to make and receive calls from any available IP network - LAN, WiFi or internet.

User Empowerment

When taken together, the choices of different network technologies and the different devices have the potential to leave the end user with a bewildering and disparate array of devices and the IT Manager with a contactability problem. The challenge to implementers is to provide the end user with a consistent look-and-feel and interface to communications with access to appropriate information from any network and on any device, irrespective of location or information type and with contactability points at the discretion the end users making and receiving the communications.

In the ideal intelligent telephony world, the end user will be able to connect to any device at any location, with access to any other device on any other network. They will be able to use the same device irrespective of the network type being used to carry traffic and, by leveraging capabilities such as broadband to the home, Enterprise VPNs and public WiFi hot spots, should be able to achieve universal connectivity at a lower cost per connection. This will result in end user empowerment. Any device, any network, any application, any location – lowest cost!
For the end user, the benefits are obvious – choice and cost - choice of device, choice of application, choice of location and a best cost connectivity solution irrespective of device or application selected.

Business Benefits

For the business, the benefits of intelligent telephony are also related to choice and cost.
It will be possible to reduce call costs by automatically having the device select to utilise the lowest cost network at any point in time. This will mean that less expensive (such as private enterprise VPNs) or free IP networks (such as the internet) can be used, when available, instead of the GSM or PSTN, with subsequent cost savings to the enterprise.

There will be savings from increased staff contactability and voicemail costs. The user is in control of when and to which device their calls and contact come. Single number contact, irrespective of device, becomes the norm. Instead of a customer calling, leaving a voice mail on the landline, calling again and leaving a second voice mail on the mobile. Then, the enterprise paying to collect both voice mails and then, returning the call at a further cost to the enterprise. A single incoming communication will be able to go straight to the end user at their selected device and in the medium of choice. The result for the business can be greater staff contactability, lower telephony costs and improved customer satisfaction.

The business will have less reliance on specific hardware manufacturers. As devices and networks become interoperable and a unified network becomes the norm, the user or company will be able to select the most cost effective products, based on usability, fitness for purpose, cost of device. They can then negotiate competitive supplier pricing and select best value service providers to meet the business needs.

Staff manageability will be a further benefit to the business. As all devices become part of a unified contactability solution, so remote workers will be seen as part of the PBX community, allowing full statistics to be gathered on calls made and received and allowing business applications such as call recording and call monitoring to be available irrespective of device or location.

Finally, a key advantage will be that all these devices will utilise a single application set. One set of advanced telephony application services available to all users, on all networks, irrespective of location or device with resulting lower maintenance, support and training costs. This will create an increase in end user comfort and familiarity with the usability and features of the applications available.

How Does it Work?

Everything described above can be deployed today. There are a number of key factors involved in building this type of intelligent telephony network.

Devolving intelligence to the endpoint

One of the major factors that have enabled this type of convergence is the increasing intelligence and processing abilities of endpoint devices. In legacy PBX environments, the telephony is a true dumb terminal with every key press or signal reported to the central processors where the PBX interprets these into actions or commands. The new generation of intelligent endpoint devices do large amounts of this processing themselves; they understand how to make and receive calls, they can play tones locally, removing the need to stream information from a central location. This removes an overhead on the network and a dependence on a powerful central PBX.

Selecting intelligent endpoint devices

There are really only three broad classes of device that we need to consider as having features that allow them to be used in an intelligent telephony network. The conventional PC or laptop with WiFi capabilities, WiFi enabled PDAs (with or without GSM/GPRS features) and SIP hardware telephones.

Lets think about the SIP hardware phone first. This can be used at the office on the corporate LAN and WAN to make and receive calls and be a fully functioning part of the IP-PBX environment. However, it could just as easily be taken home and plugged into an ADSL router and it would be able to make and receive calls in exactly the same manner. This would mean that all calls to and from this phone are then routed via the IP-PBX (figure 1).

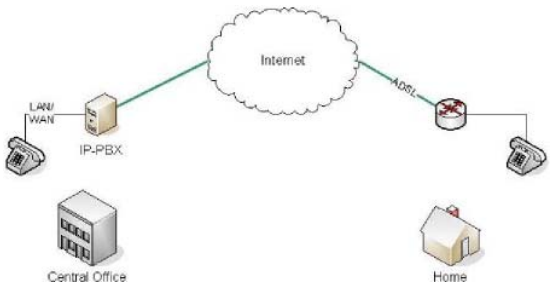


Figure 1: Using SIP hardware telephones in the office or at home

Software telephones (softphones) installed and running on a laptop or PDA would work in a very similar way from home, connecting to the central PBX using the ADSL router, as it would from within the corporate office network. With the additional ability to use WiFi, the PDA can also be

connected and the laptop has the additional option of using public wireless hotspots. The laptop or PDA could be used to connect to the company IP-PBX over the internet connection available at the hotspot. Laptops connecting to the core PBX over the internet would usually use some VPN software. Once the software telephone running on the connected laptop or PDA is connected over the WiFi network, calls can be made and received by the end user in exactly the same way as if they were in the office (figure 2).

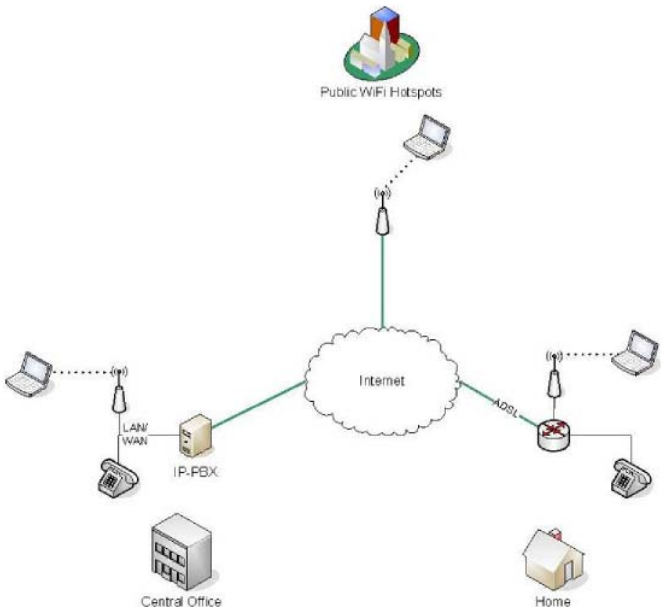


Figure 2: Using a softphone from locations on an IP network

If a connection is made from an ADSL router at home it is relatively straight forward to use a VPN to allow the phones to access the corporate network. However, if telephony is to work from a public WiFi network a device often called a session border controller (SBC) is needed. Private SBCs are used along with firewalls to enable IP telephony calls between a protected enterprise network and public networks using a process known as network address translation (NAT).
For those PDAs with GSM capabilities, they would continue to be able to make and receive calls at any location using the existing GSM network.

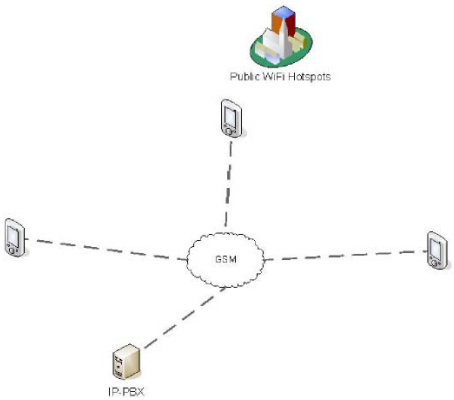


Figure 3: Using the GSM network from different locations

However, this means that the GSM device is not part of the PBX network and is not able to take full advantage of features like call recording, statistic gathering and corporate call plans. This represents the normal way that GSM enabled devices are being used today.

The intelligent telephony network configuration

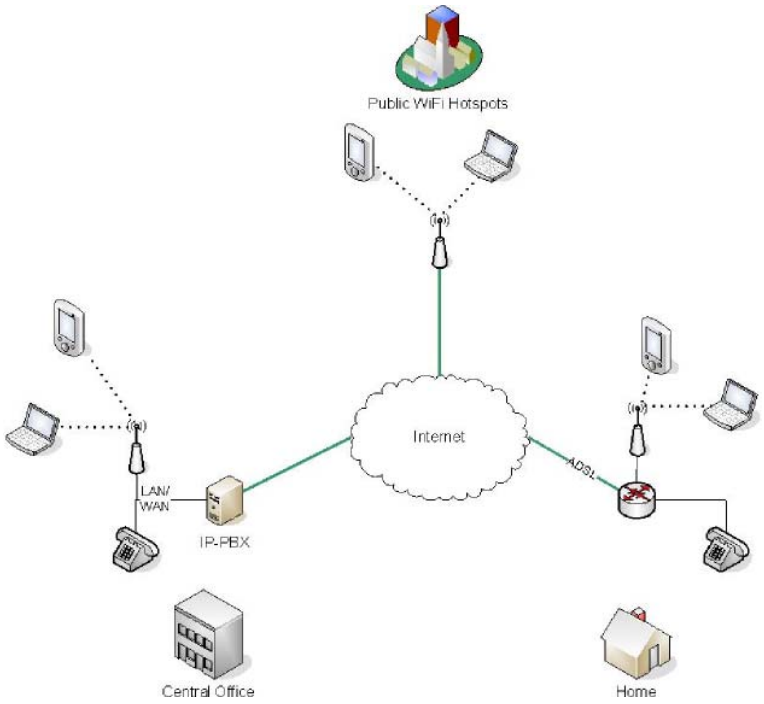


Figure 4: One possible schema for an intelligent telephony solution

The diagram above shows a true wide area intelligent IP based telephony network. The core intelligent telephony element could consist of GSM, PSTN, or IP network segments such as existing IP VPNs and the existing internet. The IP portion of this network allows WiFi enabled PDAs and laptops to connect from any location with internet access, such as the office, at home or a public hotspot. This enables the user to appear as a full participant of the IP-PBX, irrespective of the device or location.

All the different networks are available and accessible from a number of different locations, without the need to look for manufacturer specific device or network solutions. This allows the end user, or the end user devices, to select the most appropriate network to use to make and receive call.

When connections between the different segments are required, a gateway is used. A gateway is an edge-of-network device that converts between networks. Today, most gateways convert between IP telephony traffic and a different protocol, for example, between SIP and PSTN. This allows calls to be made between the different areas of the telephony network. The user does not need to know whether the call is destined for a mobile device in a coffee bar or a phone in a home worker's house, the intelligence built into the network decides on the routing.

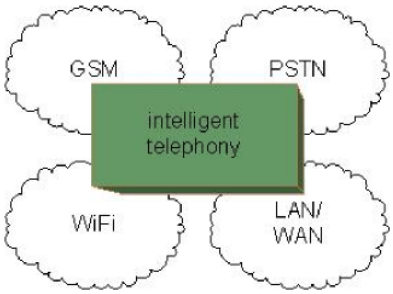


Figure 5: The intelligent telephony integrates the existing networks into one intelligent community

The end user devices described above illustrate the flexibility that is achievable, now, using an open standards approach to telephony networks. We are rapidly approaching a truly any device any location working environment.

If it is possible, why is it still uncommon?

The main limitation imposed on the adoption of intelligent telephony is not necessarily technical but more based on the vested interests and revenue streams the technology disrupts. For example, the ability to use a privately owned and maintained GSM cell to route calls over a 'free' internet IP transport layer would reduce revenue for mobile phone operators.

Having a single universal voice mailbox for mobile, landline and VoIP calls would be a major benefit for customers, however this type of truly converged solution has commercial challenges – for example which service provider would own, maintain and ultimately bill the customer for such a universal mailbox service?

Another hurdle is the issue of trust and security. Few service providers are willing to expose network infrastructure to rivals. A large fixed line telephony carrier is unlikely to expose its network to a progressive VoIP provider, ISP or mobile phone operator.

Consequently, intelligent telephony is, initially, finding its feet in either the very large organisations that can, effectively, force carrier suppliers to go the extra mile to deliver intelligence to maintain a profitable business relationship. Conversely, the other early adopter is the aggressive SME who is prepared to tweak and configure systems to build a utopian intelligent telephony solution. Both the David & Goliath early adopters are in the minority, while a viable mass market offering is still some way off, although a number of technologies are making it more likely.

The most noteworthy is IMS (IP Multimedia Subsystem) - a standardised Next Generation Networking architecture for telecom operators that want to provide mobile and fixed multimedia services. It uses a Voice-over-IP (VoIP) implementation based on a 3GPP-standardised implementation of SIP and runs over the standard Internet Protocol (IP). Existing phone systems (both packet-switched and circuit-switched) are supported.

The aim of IMS is not only to provide new services but all the services, current and future, that the Internet provides. In addition, users have to be able to execute all their services when roaming as well as from their home networks. To achieve these goals, IMS uses open standard IP protocols, defined by the IETF. So, a multimedia session between two IMS users, between an IMS user and a user on the Internet, and between two users on the Internet is established using

exactly the same protocol. Moreover, the interfaces for service developers are, typically, based on IP protocols. This is why IMS truly merges the Internet with the cellular world; it uses cellular technologies to provide ubiquitous access and Internet technologies to provide appealing services.

One initial likely benefit of adoption of IMS is that large service providers from mobile, fixed and Internet realms will form partnerships and enable IMS on their respective networks to offer partner customers the most basic of intelligence.

For example, a large national fixed line carrier would partner with a major mobile operator to allow a single voice mailbox to be shared between both services. In this theoretical example, the partnership created would enable a closed form of intelligence, while still sharing in the revenue from such a service.

The other hurdle is the isolation of applications, often called silos. For intelligent telephony to grow, applications need to be accessible irrespective of media or delivery mechanism. The popularity of web services and standards such as XML is helping to promote application availability outside of the closed confines of a particular vendor's network.

For potential converts to intelligent telephony, application deployment should be based on the theory that, at some point, intelligence will be a requirement and applications developed, either as web services or with the ability to communicate in a standard format such as XML, will make the progression much smoother.

For example, let us say a company deploys a CRM application for a call centre today. The application has been designed for users with a headset, a VDU screen and keyboard, and is closely integrated to the call centre infrastructure and respective diallers, databases and monitoring systems.

Move forward 3 years and the same call centre is now a distributed one with agents dispersed by geography and time zone. If the application is initially developed as a browser-based system with data exchange via XML, it will be much easier to integrate it into an intelligent telephony environment then a legacy client server application.

Putting the user in control

The aim of all the technologies described above should be the same – to put the user in control. The devices are getting smarter but the most intelligent component remains the user. They know where they are and they know if they are free to take calls, want to read emails, need to be contactable or can afford to put users through to voicemail. When the user has a simple and common interface to all their communications devices, no matter where their location, they have the ability to put themselves in control. They can manage their own contactability today and, once presence capabilities become more widespread, they will also be able to advise others easily of the contactability. Presence capabilities are limited to devices registered through a common point of intelligence and so able to be seen by other users devices also registered – today this is either directly on the SIP/IP network, where standards are emerging to define the registration on the network, or through specific intelligent applications such as TeleWare's intelligent Office.

TeleWare's Position

TeleWare is a company that believes in personal empowerment of end users. TeleWare is involved with neither manufacture nor design of hardware devices. However, we can, as an independent and industry standard based application vendor, empower intelligent devices such as industry standard SIP phones, laptops using the iX-Fone software, the PDA using the iX-Fone CE software and the telephony switch using the TeleWare intelligent eXchange IP-PBX based network, and can deliver on this intelligent network as described above - today.

For details of the products involved visit www.teleware.com

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