



VoIP in the Enterprise

Date: March. 2005

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Version: 1.1





1 Background

Voice over IP

In the late 1990s Voice over IP (VoIP) was seen as a disruptive new technology that had the potential to radically change voice telecommunication.

VoIP is now a mature, proven technology which is becoming increasingly common as businesses seek to benefit from the lower infrastructure and communications costs and productivity-enhancing call services that VoIP can provide.

Circuit and packet switching

To understand VoIP it is necessary to examine how voice calls are carried over conventional telephone networks.

Fixed line voice traffic is carried over a physical network using a series of protocols collectively referred to as circuit switching. The circuit is an individual channel created by electronic switches creating temporary connections linking the two callers. This channel stays in place for the duration of the call.

Internet Protocol (IP) is a networking protocol which breaks down information into discrete blocks known as packets, which are sent across a network separately, often taking differing routes. A conversation carried over an IP network is therefore broken up into many packets which are routed separately to their ultimate destination and then re-assembled.

Many large organisations have already deployed VoIP solutions on their internal networks. IP phones are used to convert voice signals into digital data packets and route them to the destination telephone, and standards-based call servers (known as “soft” pbxs) and voice gateways are used to connect calls to the public switched telephone network (PSTN).





Benefits of VoIP

The attractions of VoIP to large organisations include:

- Cost savings achieved by converging separate voice and data networks onto a single IP network
- The capability of supporting many sites from a central IP PBX
- Simplification of Moves, Adds and Changes
- Provision of Unified Messaging services
- Provision of VXML (Voice XML) applications
- Ease with which IP Contact Centres can be built

As traditional PBXs reach the end of their useful lives, new investment is being directed towards VoIP technology. It is now the key technology for new voice service deployments.

Previous Barriers to Implementation Overcome

Earlier barriers to the adoption of VoIP technology have now been overcome. These included:

- Perceived lack of call quality
- Residual value of legacy equipment
- Unwillingness to move to a new technology
- Technology immaturity
- Protocol immaturity
- High cost of deployment in small sites

Businesses are now adopting VoIP because:

- VoIP is now a proven solution
- VoIP hardware prices have fallen significantly
- VoIP protocols are mature
- Codec quality and code stability is high
- VoIP offers feature parity with traditional PBX solutions
- Quality of Service (QoS) levels are now available end to end, providing guaranteed call quality
- QoS enabled ADSL based connections make VoIP solutions highly cost effective – even in small organisations or for home workers.

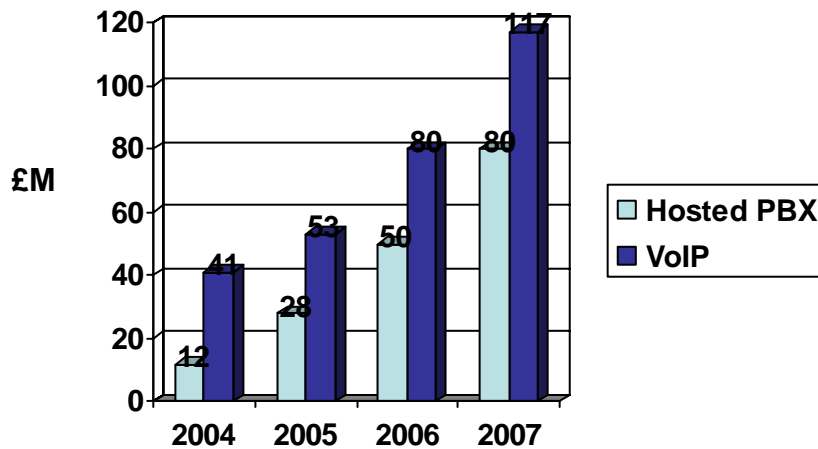




2 Introduction

VoIP Market Forecast UK

Forecasts of the value of the VoIP and hosted PBX (IP Centrex) business market are small when compared with the value of the market for traditional voice communications services. IDC, a US-based research house, forecasts the market for VoIP and IP Centrex will be worth just £200m by 2007.



However, it is clear from the level of activity in the market today that 2005 will start to see a move toward VoIP, with most large telcos and business ISPs announcing VoIP and IP Centrex services.

Drivers To Adoption

The drivers to corporate VoIP adoption include:

- Reduced fixed line call charges
- Reduced expenses through consolidation of telephony and IT departments
- Improved telephony billing and cost management
- Reduction in number of service providers
- Reduced capital maintenance and support costs
- Reduced network costs through optimisation of converged bandwidth
- Reduced business continuity costs
- Efficient voice application deployment
- Call centre virtualisation
- Improved remote worker productivity





Many of these benefits can only be achieved if VoIP is deployed throughout the organisation. The only way VoIP can be deployed in a cost effective way to smaller sites and home-based workers is by using QoS enabled ADSL (QoDSL) connections.

Businesses considering implementing VoIP need to plan for the organisational problems that can arise when telecoms and IT staff have to be brought together to provide voice and data services over a single IP network.

Existing voice networks deliver very high levels of availability and security, so it should also be anticipated that the migration from a traditional telephone network to a VoIP network will be phased over a long period.

Models for VoIP Deployments

The VoIP market may develop in the UK using one of two models:

Enterprise Communications Server Based Solutions

An enterprise communications server based solution uses a dedicated soft PBX or IP PBX to support part or all of a company's telephony requirements.

The soft PBX or IP PBX replaces the conventional PBX call processing functionality and operates with a number of other key components, including:

- A media convergence server platform for the IP telephony system
- Voice gateways to provide connectivity between IP and conventional telephone networks
- IP telephones
- Third-party telephony applications
- A QoS-enabled network, including QoDSL for smaller sites

IP Centrex Based Solutions

An IP Centrex solution replaces traditional PBXs with telephony functionality hosted remotely.





IP Centrex solutions are based on a layered architecture to allow the co-existence of various services on the same platform and a smooth transition from basic to more advanced service delivery.

The core infrastructure of an IP Centrex solution includes:

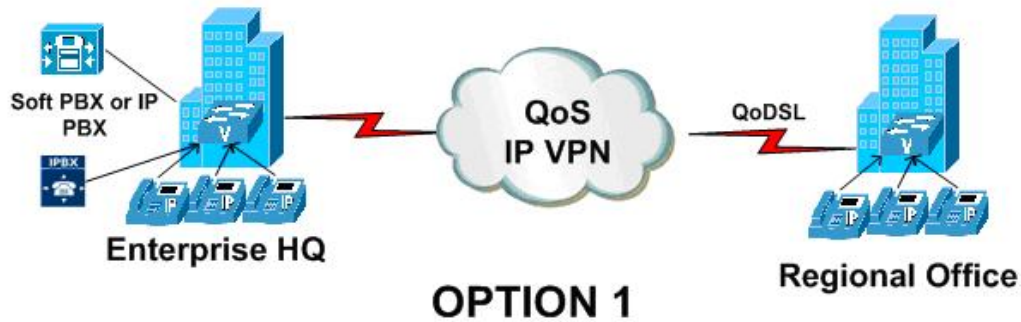
- A platform to provide call control and routing, numbering plan mediation, centralised accounting, protocol translation, centralized IVR functions, network announcements
- System monitoring
- OSS/BSS
- IP phones, soft clients and headsets, USB phones or analogue adapters
- Enhanced service applications, such as voicemail, unified messaging, presence, call centre
- A QoS enabled network, including QoDSL for smaller sites



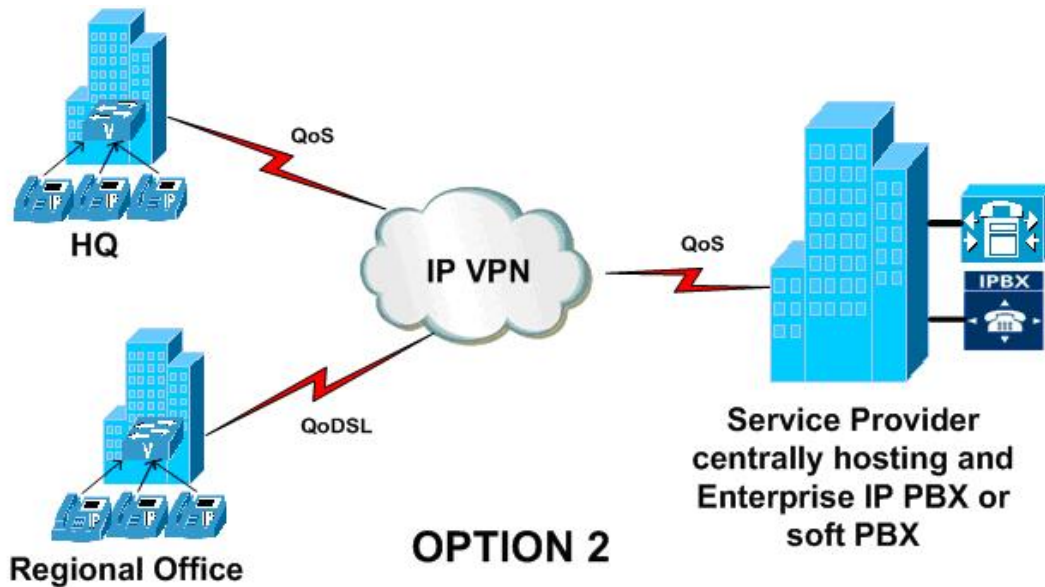


3 Enterprise Based Solutions

There are two options for the Enterprise approach. With Option 1, a fully managed solution is deployed on the enterprise network.



Option 2 is identical to Option 1 except that the IP PBX or soft PBX is hosted by Tiscali or a business partner while remaining dedicated to the enterprise.



With both options, IP handsets, call routing, dial plans and other functions are controlled centrally by the soft PBX or IP PBX. Larger sites are connected using traditional leased line connections to the MPLS IP VPN network, while smaller sites and teleworkers are connected by





QoDSL. QoS is essential to ensure both the establishment and quality of the voice calls.

Network Infrastructure

In order to work satisfactorily, it is essential that all underlying physical network infrastructure is capable of supporting a delay-sensitive application such as voice. Key features that the infrastructure and active network devices must have include:

- Resiliency
- Quality of Service classification for packets
- Packet Prioritisation
- Well designed IP address scheme
- Network monitoring



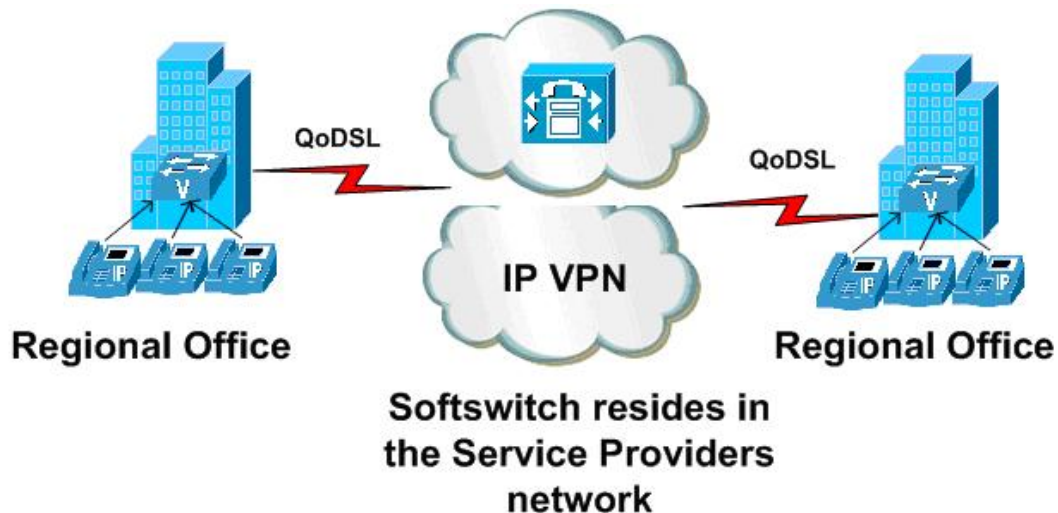


4 IP Centrex Solutions

Hosted solutions may be offered by existing telcos, ISPs and dedicated IP Centrex service providers.

In an IP Centrex deployment, all of the server and gateway equipment is located at the IP Centrex provider's facilities. The service it provides is designed to scale to thousands of users, and built to carrier-level reliability. The service is then deployed to customers over an IP network to the IP devices on the customer's own IP network.

A typical deployment is shown below:



The IP Centrex supplier invests in a softswitch which resides on its own network. End users receive their telephony services centrally from this softswitch using an IP VPN connection. As well as providing telephony services, the service provider also provides provisioning and billing platforms, system monitoring and administration portals.

Each desk that needs a telephone requires either an IP phone, an analogue phone connected to an IP adaptor or a soft phone running on a PC connected to an Ethernet





point. The phone system is usually administered locally using a PC via a web portal. Individual users of the system can configure their own preferences for features such as call forwarding and speed dialling. The provisioning and configuration of each aspect of the service is simple, flexible and secure so administrators can administer the phone system effectively to meet business needs.

With an IP Centrex solution, the only equipment deployed at an enterprise site are the phones themselves. Integration with existing PBX systems is possible with IP Centrex but this adds a considerable level of complexity to the fundamentally simple concept of IP Centrex. IP Centrex service providers claim scalability and flexibility on the basis of a carrier-class shared platform and the fact that performing adds, moves and changes often involves little more than activating or de-activating a “per seat” licence.

Integration Problems and High Costs

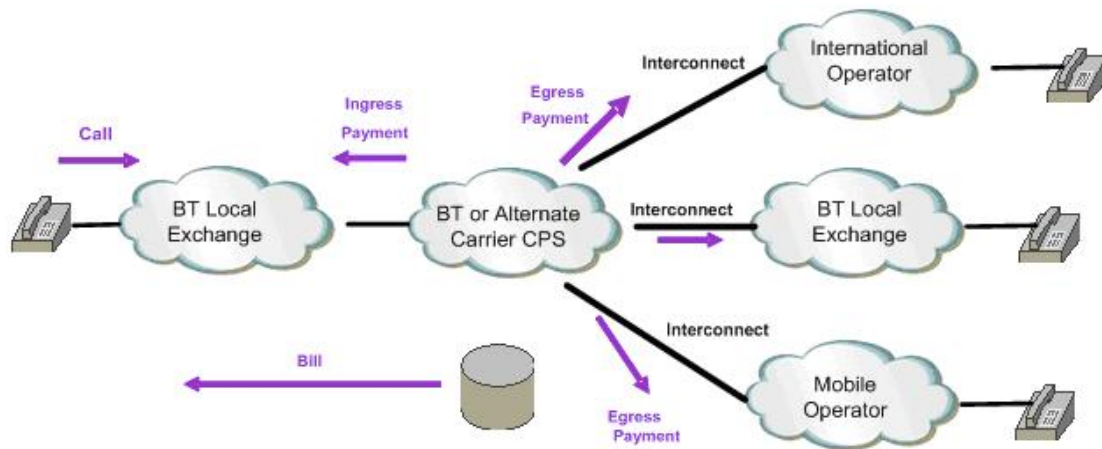
Although the technology has been available to provide these services for some time, the take up to date has been very slow. The main difficulties are integration with existing customer infrastructure and the cost of deployment - especially to smaller sites. In addition to this IP Centrex per seat licence costs are also often high.

5 VoIP and PSTN breakout

Connection with the PSTN (PSTN breakout) is an important consideration for any VoIP deployment.

Calls that originate and terminate within a corporate IP VPN only create internal network data traffic and do not incur call charges. But this is not the case with calls destined for external telephone numbers, which will typically be connected through the traditional PSTN network. The diagram below shows the call flow for a traditional voice call:



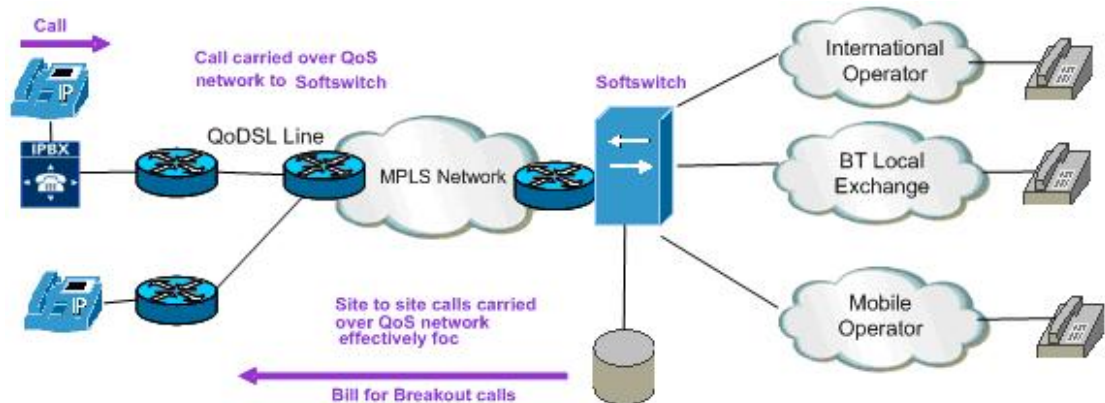


1. The call originates on a telephone connected to a local network supplier, typically BT.
2. The call is picked up by a carrier (typically BT or another carrier offering CPS).
3. The call is then carried to the destination network, which could be an overseas network, the local network provider for local calls or a mobile network carrier.

The call is always billed by the contracted service provider - BT or the CPS provider – and this service provider in turn is billed by the local provider for ingress and by the terminating provider for egress.

VoIP affords the opportunity to avoid the ingress payment to the local carrier by delivering the calls over the IP network to a switch directly connected to the terminating network, as shown below:





The contracted service provider still bills for the call, but only incurs the egress charges from the terminating providers.

In the enterprise communications server based model the customer has control of the termination of PSTN calls. Typically the PSTN breakout occurs directly from the IP VPN, via an interconnect to the network provider's softswitch, but these calls could be delivered to a third party softswitch provider.

In the IP Centrex model, the PSTN breakout will be a key component of the costing for the service and will be packaged together with connectivity and the delivery of calls. This limits the ability of the customer to negotiate and implement least cost routing for calls to the PSTN.

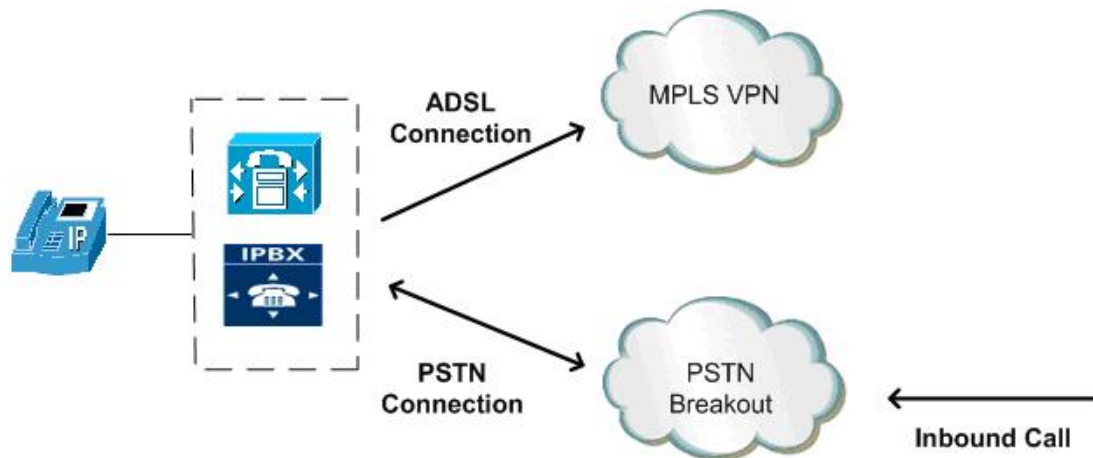
6 Inbound calling and VoIP

Inbound Calls

The economics of receiving calls to standard telephone numbers is not changed when a VoIP system is implemented.

Almost all companies have a PSTN trunk line and a set of telephone numbers. Using the Enterprise PBX model these lines and numbers can continue to be used. They also provide an alternative for outgoing traffic in the event that the main IP VPN connection goes down. This is obviously good practice as it provides the company with a backup telephone connection.





7 Analysis of IP Centrex service providers

Network

IP Centrex service providers offer centrally hosted telephony services and value added voice applications over IP networks. They are therefore dependent on network operators for the provision of the IP wide area capability to carry their voice traffic. Although this traffic could be carried by multiple Internet service providers, it is more commonly delivered over a single provider's network using an IP VPN, or - to increase voice quality - over private network capacity. IP VPN technology needs to be QoS enabled to be able to guarantee carrier-class voice services and while QoS enabled IP VPN connectivity is commonly available to larger enterprises, the costs have generally been prohibitive for smaller companies.

Capital Investment

Since most value-added voice applications offered by IP Centrex suppliers are also available on Enterprise PBX switches, IP Centrex services providers tend to market their solutions by highlighting the fact that they offer managed services, which require no capital investment on the part of the customer.

PSTN Breakout

The ability to breakout from the IP Centrex provider's switch directly onto the PSTN without incurring ingress charges provides the central cost justification for the model and





effectively finances the deployment of the necessary equipment at the end user sites.

Integration With Legacy Networks

The issue of integration with legacy phone networks may cause deployment and customer support problems, especially when legacy networks are provided and maintained by third party providers.

Chances Of Success

IP Centrex will appeal to some businesses, but the cost of deployment and the lack of flexibility – in particular with respect to PSTN breakout - will be significant inhibitors to widespread take up. IP Centrex service providers are likely to struggle to find effective channels to market.

8 Analysis of the impact of VoIP on ISPs

Potential Customers

ISPs have a large potential customer base for VoIP services in their existing network customers. ISPs' core competencies include network access, email and security rather than telephony, but their expertise in data access gives them credibility in the VoIP market place.

Converged networks

It is an attractive proposition both for ISPs and for businesses to use a single IP connection to deliver voice and data services. An ISP carrying combined voice and data traffic through a common IP infrastructure is able to offer a variety of cost-saving bundles including Internet access, IP VPNs and VoIP. ISPs are likely to offer IP Centrex based services to sell to their existing customer base or with which to target new business.

Competencies

While ISPs' strengths lie in re-selling wide area infrastructure and value added services to enterprises, the complexity of delivering voice, especially when it needs to be integrated into a legacy environment, will challenge the support capabilities of most ISPs.





IP Centrex

ISPs may offer IP Centrex to offer a combined voice and data solutions to customers, but the cost of IP Centrex deployment and the lack of flexibility - especially in respect of PSTN breakout - will present the same obstacles to ISPs as to specialist IP Centrex providers.

9 Analysis Of The Impact Of VoIP On Telcos

Declining Telephony Revenues

Traditional voice telephony is on the wane. The number of billable voice minutes is flat or declining, and there is continuing downward pressure on the revenue and margin values of these minutes because of surplus capacity. Revenues for fixed line voice services are set to drop further as more organisations adopt VoIP services and the uptake of mobile phones as a substitute for landlines continues. To fight this downward revenue trend telecommunication companies need to find new profitable revenue sources.

IP Centrex

Telcos are therefore likely to launch their own IP Centrex products. This fits well with their background in networked based services and their existing in-house voice expertise. It also offers the potential to provide revenue streams to compensate for the increasing shortfall in voice revenues, and add-on features such as voice mail and unified messaging open up further new potential revenue streams.

An IP Centrex strategy builds on the IP VPN capability that most telecommunications companies have invested in over the last few years, and enables them to become providers of data and voice connectivity, as well as breakout to the PSTN.

PSTN Breakout

Telcos see IP Centrex as a means to “lock in” the PSTN breakout revenues as they did with the traditional Centrex/Featurenet approach.





Chances Of Success

Telcos have the best channel to market for VoIP services as they are the current suppliers of traditional voice services. But they are likely to be slow to create VoIP services and offer them at competitive rates as these will damage their existing telephony revenues if taken up by existing telephony customers.

10 Conclusion

Many organisations are likely to review their telephony requirements over the coming year and conclude that VoIP can offer both significant cost savings and productivity improvements.

Many of these benefits are already being delivered to larger organisations which have been able to implement VoIP solutions. The advent of QoDSL based IP VPNs now allows smaller organisations and organisations with smaller sites the opportunity to take advantage of those benefits as well.

While some companies may be willing to hand over the provision and management of their voice infrastructures to IP Centrex service providers, the majority will want to retain control of their telephony and will deploy an enterprise based system or a hosted enterprise model.

