enabling e-Business through workable convergence solutions

technical overview

IP convergence

solutions in practice

This Technical Overview looks at the practical issues involved in the migration towards integrated IP networks carrying multimedia traffic.

Part 1 examines the context in which enterprise networks are evolving towards widespread deployment of IP, and the factors driving convergence.

Part 2 discusses the future of IP networking, and the benefits that convergence will bring, in the form of new integrated applications and extended access to corporate resources.

Part 3 addresses some practical issues which the Network Manager needs to address in moving towards full IP convergence while minimizing risk and disruption. It considers two possible scenarios to illustrate how solutions from Cable & Wireless are specifically designed to simplify and facilitate the migration.

Key topics

- ***IP telephony***
- ***real-time IP***
- ***budgetary convergence***
- ***intranets***
- ***virtual private networking***
- ***'click to call'***
- ***unified messaging***

CABLE & WIRELESS

technical overview

Contents

1 Background — drivers for change

Section 1 outlines the context in which enterprise networks are evolving towards widespread deployment of IP and eventual convergence.

What's typically in place now

In the local area

Figure 1 illustrates a typical configuration at a single location, with voice and data carried over separate infrastructures and covered by separate budgets for equipment, cabling, management and maintenance. This generally consists of:

- An Ethernet data LAN, carrying IP and legacy traffic between PCs. Connections typically use Category 3 (Cat-3) or Cat-5 cabling.
- A PBX for switching voice traffic between extensions and outside lines, with telephones on the desktop and dedicated cabling.

In the wide area

Figure 2 shows what organizations typically have in place for inter-site communications. As in the LAN, voice and data communications are usually covered by separate budgets. The typical wide area enterprise network might include:

- A corporate data network based on frame relay, ATM, private circuits or a combination, with IP (intranet) and legacy traffic carried over links with requirements for a committed data throughput. Different classes of service (CoS) may be available to support particular applications — for example, an ATM constant bit rate (CBR) service for realtime applications such as video.

The irresistible rise of Internet technology

*In a recent survey of the Network Managers of 251 major corporations, 91% reported that IP is now the predominant protocol on their corporate network, or **intranet**. More than 35% of these communicate with other organizations via an **extranet** — a group of intercommunicating intranets, with access restrictions to isolate it from the wider Internet.*

*There is also a significant move towards **virtual private solutions**. Overall, 42% of businesses in the UK, and 47% in the Netherlands, now see IP-VPNs as the future. This figure rises to over 70% among Law firms — a sector which by definition insists on the highest levels of data security. This positive attitude reflects growing confidence in IP as a secure, proven technology.*

Figure 1. The pre-convergence LAN

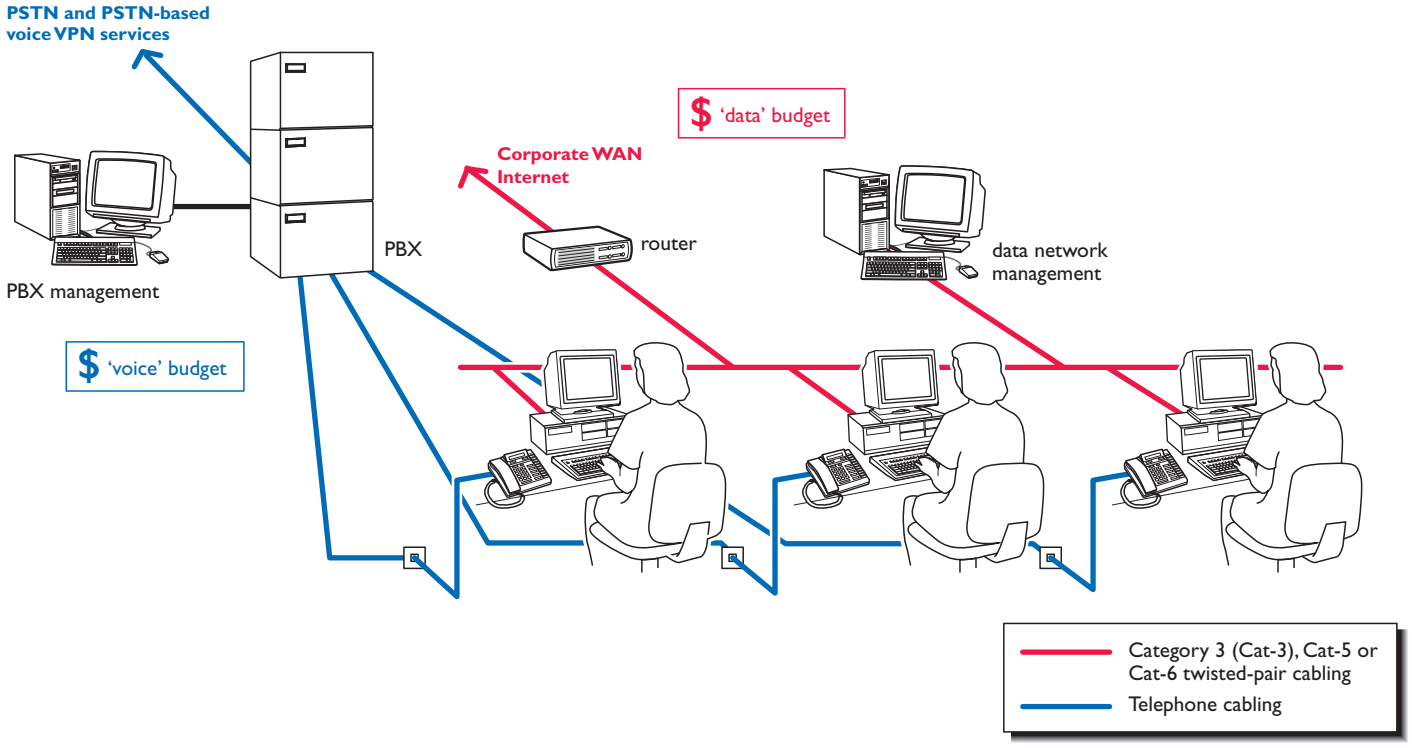
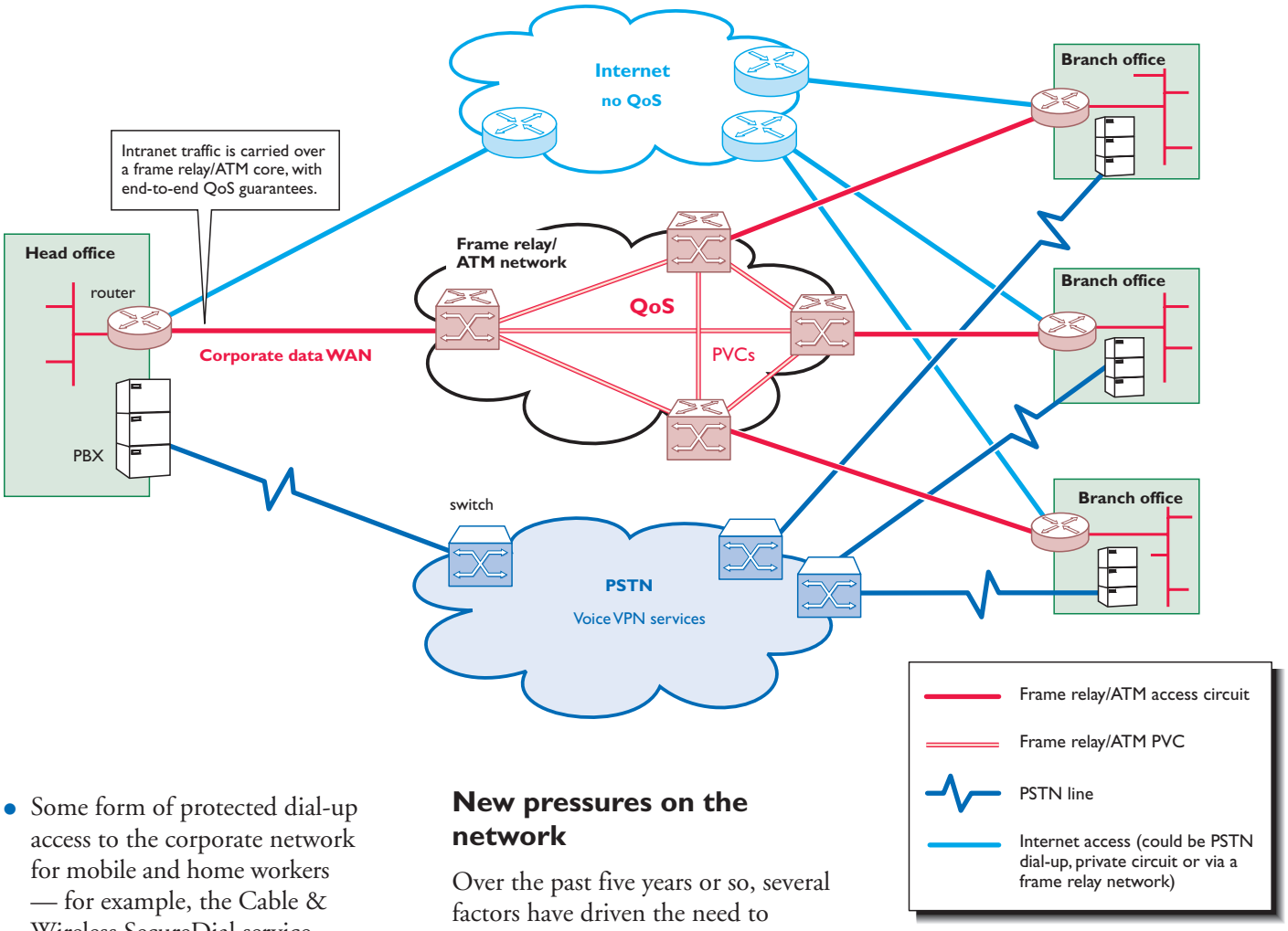


Figure 2. The pre-convergence enterprise network



- Some form of protected dial-up access to the corporate network for mobile and home workers — for example, the Cable & Wireless SecureDial service.
- Internet access, with a publicly available web site for e-trading, marketing, etc. With an **extranet**, authorized users outside the enterprise may be granted access to parts of the intranet via Internet connections.
- PSTN lines for voice calls. For intra-company voice traffic, many organizations use a managed, public network-based service like Cable & Wireless Global Intelligent Virtual Network, which provides a short-code Dial Plan between sites, and incurs lower call charges than standard PSTN services.

New pressures on the network

Over the past five years or so, several factors have driven the need to upgrade communications and computing infrastructures.

- With more processing power on the desktop, users are running more (and more complex) applications, placing heavier demands on the network.
- Available bandwidth within the LAN has increased in response to changes in the type and volume of traffic and the need for resilience. Increasingly, users have 100 Mbit/s connections to the desktop, and some now have Gigabit Ethernet.
- The 'desktop' is no longer geographically fixed — staff need the flexibility to access the corporate network while traveling or working from home, and to share desks in the office when necessary.

Challenges faced by IT staff

The technical difficulties faced by IT staff are compounded by radical and rapid changes in the business environment.

- Globalization means they must deal with more widely dispersed locations, working across national boundaries.
- With mergers, acquisitions and reorganizations, sites often need to be added to or removed from the network at short notice, and provided with the ability to communicate directly with one another in a meshed network.
- Applications also need to be added, modified and removed as business requirements change.
- Web pages are becoming more complex, expanding from simple text and graphics to interactive multimedia applications which support e-Business.

Evolution in service delivery

The 'traditional' corporate data network was based on private circuits, with fixed bandwidth between fixed locations. Now that neither bandwidth requirements nor locations are fixed, this arrangement lacks the necessary flexibility and scalability.

Circuit-switched networks have largely been replaced by packet- and cell-switched technologies such as frame relay and ATM, with virtual connections sharing bandwidth by statistical multiplexing. This allows for a more efficient and cost-effective use of bandwidth, especially for the bursty traffic carried over data networks.

Most of these technologies remain connection-oriented, however, with specified locations linked by permanent virtual circuits (PVCs). Adding new sites to an enterprise network still involves the provisioning of new PVCs and reconfiguring equipment, and access bandwidth is a limiting factor.

The next step is to dispense with circuits altogether, and use connectionless technology such as IP. Users, sites and devices can be added to or removed from an IP-based enterprise network at any time, by simply validating user IDs and passwords. An IP network is, by definition, meshed — a single, straightforward connection to a public network Point of Presence (PoP) gives any-to-any connectivity, with no need to worry about configuring virtual circuits to share access bandwidth.

The trend towards virtual private networking

As the enterprise network becomes more inclusive and wide-reaching, the challenge of day-to-day management can be a distraction from the strategic planning and innovation necessary for continuous competitiveness.

Businesses are increasingly turning away from fully 'private' networking solutions, and relying on operators like Cable & Wireless to supply and manage their infrastructure, allowing them to:

- reduce capital investment and management overheads
- concentrate their own resources on developing and supporting applications
- benefit from the performance, reliability and capacity of a public network, and the expertise and around-the-clock availability of specialist staff
- be confident that future upgrade paths are built into the solution, thus mitigating technical risks

This is the **virtual private network (VPN)** — a solution providing secure transport of private traffic across public network infrastructure, with **Service Level Agreements (SLAs)** defining availability and performance. IP-compatible VPNs are known as IP-VPNs.

A new generation of VPNs

IP was not originally considered to be appropriate for running business-critical applications over an enterprise network, because it could not deliver guaranteed QoS, and security was a major concern.

With the development of Multi-protocol Label Switching (MPLS), VPNs can now be configured across public IP networks with the necessary QoS guarantees for different traffic types, including realtime voice and video. For more information about MPLS, see the box on page 7.

As for security, with MPLS plus firewalls and encryption techniques, IP-VPNs can be made as secure as the fully 'private' alternative, with the added advantage of providing easier and more flexible control over users' access to specific information.

2 The new enterprise network

Section 2 looks into the future of IP networking, and at the benefits that convergence will bring.

Steps towards the converged network

Figures 3 and 4 show how a typical enterprise network might evolve towards convergence.

Establishing an IP-VPN

One possible starting point is to replace the existing WAN infrastructure with an IP-VPN, using MPLS to provide consistent, guaranteed QoS.

This new network will be flexible and scalable, so that new users, sites or applications can be added and integrated whenever necessary.

Bandwidth is plentiful at the core, and can be added to access circuits with no need for major reconfiguration.

Migration won't happen overnight — in most cases, the IP-VPN will need to be integrated with existing infrastructure (e.g. ATM) for some time. An advantage of MPLS in this respect is that it is a *multi-protocol* technology — the label-switched paths which are routed through an MPLS system can be switched by ATM switches as well as by IP routers, allowing IP traffic to be carried across an ATM core.

Categories of cabling

The unshielded twisted pair cabling (UTP) used in LANs is categorized under the EIA/TIA-586 standard, according to the data transmission speeds supported, as follows:*

- *Category 3 (Cat-3) — up to 10 Mbit/s*
- *Cat-4 — up to 16 Mbit/s*
- *Cat-5 — up to 100 Mbit/s*
- *Cat-5E — up to 1 Gbit/s*
- *Cat-6 (yet to be ratified) — Gigabit and beyond*

** Electronics Industry Association (USA); Telecommunications Industry Association (UK)*

Figure 3. Data on the corporate IP-VPN

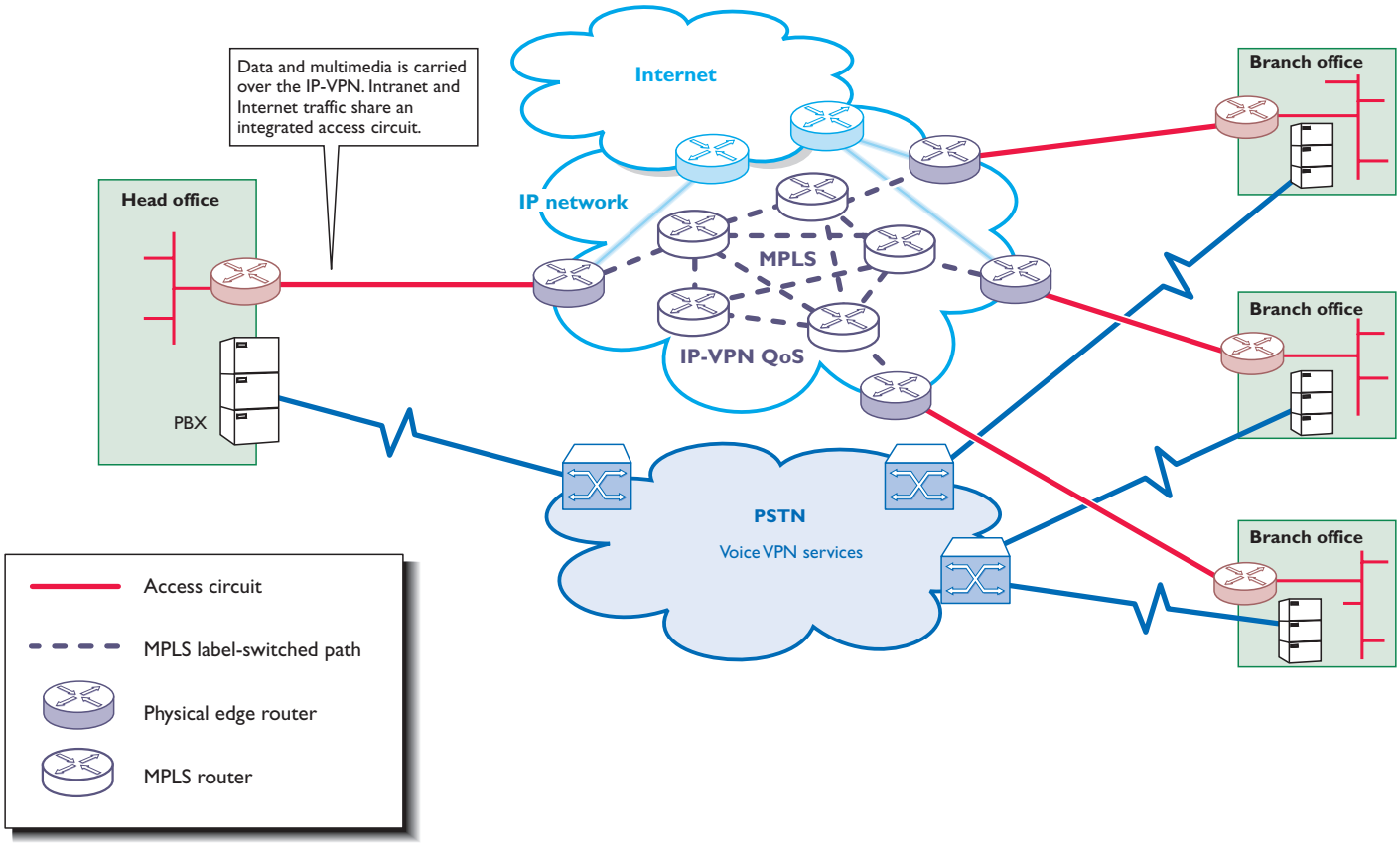


Figure 4. The converged enterprise network

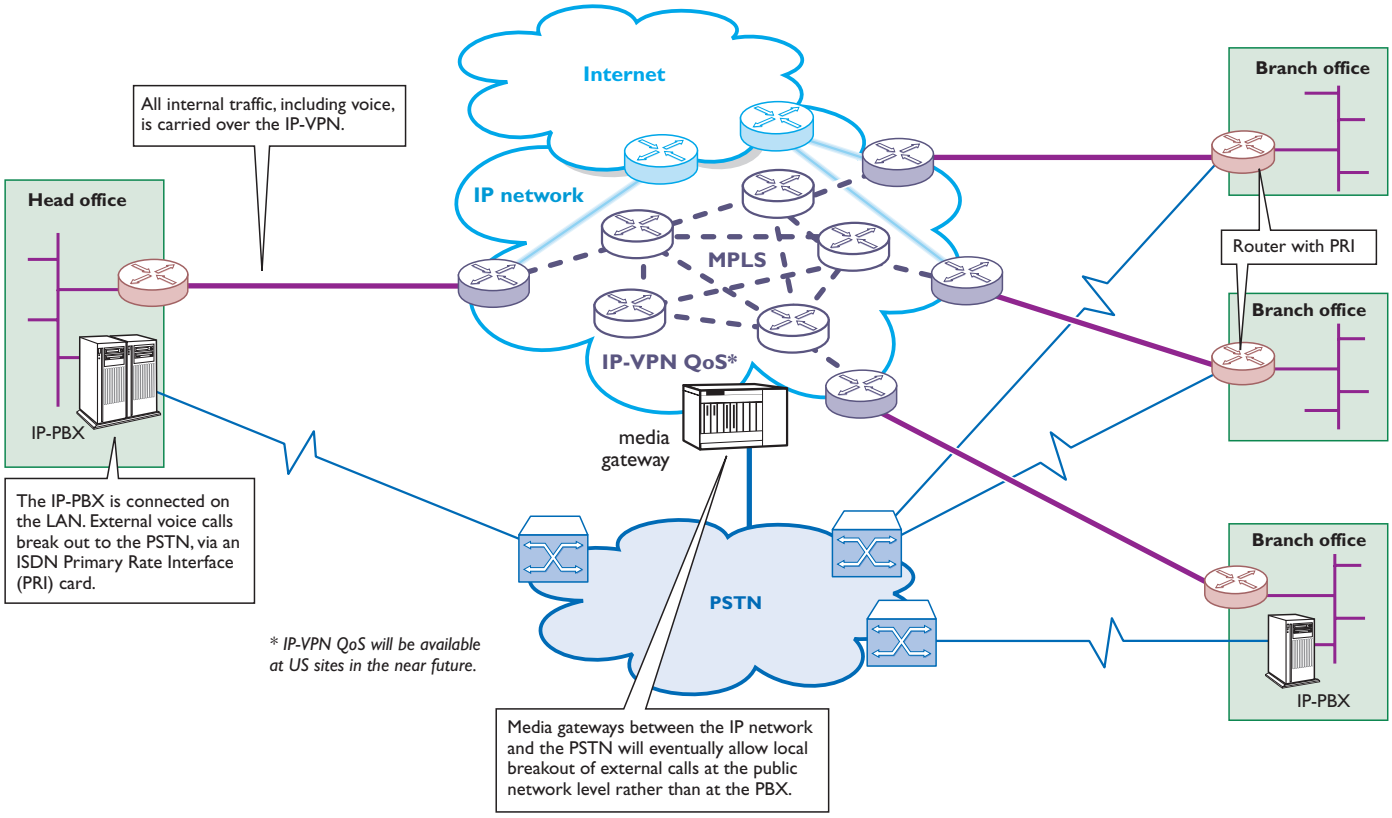
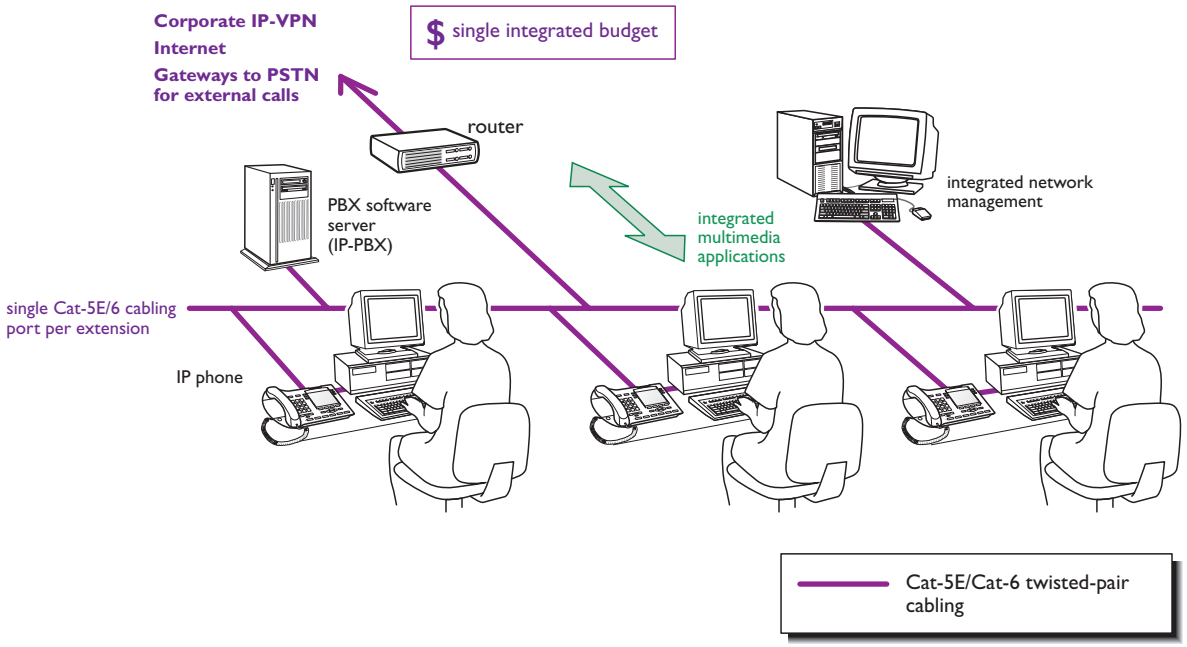


Figure 5. The converged LAN — integrated services to the desktop



Bringing voice onto the IP network

With the IP-VPN in place, and plenty of spare capacity, internal voice traffic can be routed over it. Voice calls consume relatively little bandwidth, especially with compression techniques, and thus place very little demand on the network.

Within the converged LAN, there will be just one cabling and switching port per user, with integrated cabling (Cat-5 or Cat-6) connected to the desktop (Figure 5). Telephones have been replaced with IP phones, connected directly to the PC.

Initially, sites will retain PSTN connections for external (outside of enterprise) voice calls, which will be switched either by an IP-PBX connected on the LAN (see the box on page 8).

In the future, separate connections won't be necessary — external calls will be carried over the IP network and broken out locally onto the PSTN via media gateways.

Some existing PSTN connections can be kept as a backup resource in case of emergency.

Media gateways

Media gateways allow voice traffic to be passed between IP infrastructure and the PSTN, by providing conversion between the information carried on telephone circuits and the data packets carried over IP networks.

The call-control intelligence for several media gateways is handled by a ***media gateway controller (MGC)****.*

Communication between gateways and MGCs uses the ***Media Gateway Control Protocol (MGCP)****, defined by the Internet Engineering Task Force (IETF).*

Benefits of convergence

Full convergence will bring together businesses' information strategies and communications strategies for the first time, resulting in cost savings and improved efficiency and flexibility.

Economies of scale

With voice, data and video sharing both infrastructure and equipment, the cost of ownership is greatly reduced. A single budget now covers all access lines, equipment, cabling, installation, management and maintenance.

With managed service options from Cable & Wireless, businesses can further reduce capital investment and management overheads, focusing resources on strategic planning and application development and support.

Reduced call charges

Intra-company voice calls may account for a significant proportion of monthly phone bills, even with the lower charges incurred using a PSTN-based voice VPN service. This particularly applies to international organizations. By routing internal calls over the IP-VPN, usage-based charges are eliminated.

For international calls outside the company, it may be possible to reduce charges by routing the call over the corporate network to the office nearest to the destination and then breaking out locally to the PSTN.

MPLS — the key to IP-VPNs

Multi-protocol Label Switching enables the provision of secure VPNs, with guaranteed QoS, over an IP network.

With MPLS, there are no permanent virtual connections between sites. Instead, secure, logical paths are set up through the network as and when there is traffic to deliver, using the best route available at the time. This means that users, sites or devices can be added to the network at any time, without reconfiguration and without affecting security or reliability.

In technical terms, MPLS makes routers behave similarly to switches, integrating layer 2 (data link) information about network links (bandwidth, latency, utilization, etc.) with the layer 3 information in IP headers (source and destination addresses, type of service and QoS requirements).

The key feature of MPLS is the addition of a short, fixed-length label to each data packet that enters the network. The labels act as a shorthand representation of the IP headers, and are used to assign packets to label-switched paths (LSPs). High-speed routers in the core network use signaling information to determine the routing of LSPs, taking into account network conditions. In essence, these routers make switching decisions based on the headers.

Integrated applications

With applications sharing both infrastructure and end-points, voice, data and video can be integrated to keep up with new working arrangements and business practices. Examples include:

- With **unified messaging**, users have a single inbox for voice messages, faxes, email and Short Message Service (SMS) messages from cellular phones. They can access their in-boxes from anywhere in the world, either from a telephone or via the Internet, to send and retrieve any type of message.
- '**Meeting**'**-type and collaborative applications**, which combine audio- and videoconferencing, whiteboarding, etc. allow people to share resources and expertise whenever they need to and wherever they are.
- Currently, many organizations have both call centers and websites, but these are usually separate. Full **computer–telephony integration** (**CTI**) to the desktop will enable the development of **integrated call centers** — for example, the customer and call center agent will be able to view the same product description or demonstration on screen while talking to each other.
- '**Click to call**' facilities will allow users to set up voice calls by clicking on links on websites.
- Applications like **distance learning** will be enhanced by the ability to embed voice links into electronic documents.
- With **multicasting**, organizations can make interactive training and information videos available to staff, who view them on their desktops rather than having to go to dedicated meeting rooms. Multicasting is also a cost-effective way of disseminating corporate messages.

Widening access

The IP network gives users 24-hour access to information and network resources, from any location. All they need is a valid IP address and password, and a connection to the fixed or mobile public network.

Voice calls will be able to locate the recipient anywhere on the network, using the IP address.

The IP-PBX

Unlike traditional PBXs, which require dedicated (and costly) call-processing hardware, IP-PBXs run as software applications on a network server.

IP-PBX software extends enterprise telephony functions to packet telephony devices such as IP phones, multimedia processing devices and VoIP gateways.

IP-PBXs provide all the familiar PBX features such as hold, transfer, divert, speed dialing, conference calls, etc. Reconfigurations and upgrades are carried out through the software.

With some IP-PBXs, multiple servers can be 'clustered' and managed as a single, distributed, multi-site system, allowing capacity to be scaled up to include tens of thousands of users. Clustering also builds redundancy into the system, improving availability and reliability.

IP-PBXs may be configured automatically to divert calls to the PSTN (via an interface such as ISDN PRI) if bandwidth is not available in the WAN.

3 Solutions in practice

Section 3 considers how organizations might move towards full IP convergence while minimizing risk and disruption. Solutions from Cable & Wireless are specifically designed to simplify and facilitate this migration. Two hypothetical but typical scenarios are discussed.

Budgetary convergence

While the benefits of IP convergence are not questioned, in reality organizations do not, without good reason, change what already works. Network developments will be driven by need, as the existing infrastructure becomes inadequate for supporting new applications, additional users or corporate expansion.

Any new investments in telecommunications or data networks should have IP convergence factored into them. As the network evolves, the traditional voice and data budgets will converge, freeing up resources for further innovation and the development of e-enabled business.

The way this happens will depend on individual circumstances. In practice, the process will usually be a phased transition rather than an overnight transformation.

Mitigating risk

One reservation shared by network managers about convergence is that standards for VoIP are still in a state of flux, with no clear consensus as to which one will eventually predominate.

The H.323 standards defined by the International Telecommunications Union (ITU) represent the 'voice-oriented' approach, while Session Information Protocol (SIP), defined by the Internet Engineering Task Force (IETF) is seen as 'data-oriented'. It is probable that more than one standard will exist for the foreseeable future.

In the face of this uncertainty, any commitment to capital investment is seen as risky, and managers may wish to delay major decisions.

Managed solutions from Cable & Wireless provide low-risk migration paths, with predictable pricing models, and rental options which reduce capital investment. Built-in upgrades allow you to keep up with new developments. And because Cable & Wireless services are fully standards-based, there's no danger of becoming locked in to a proprietary solution.

Auditing your current network

Before recommending a course of action, Cable & Wireless will work with you to evaluate your current network, your priorities and your requirements for the future, asking questions like:

- What are your voice and data traffic volumes and profiles?
- How closely will you want to integrate voice and data?
- What is your user profile? What proportion of your staff uses their PC most of the time?
- How much is your PBX costing you? You need to consider the ongoing costs in terms of upgrades to memory, software, hardware, firmware, etc. required to accommodate new users or additional traffic.
- How do you handle incoming calls? Are most of your calls answered by an operator, or do callers dial direct to users' desktops? Or are you running a call center-type application?
- How many sites do you have? If you run a multi-site operation, how about using a centralized operator? How important is PBX-type feature transparency between sites?

Scenario 1: change driven by data requirements

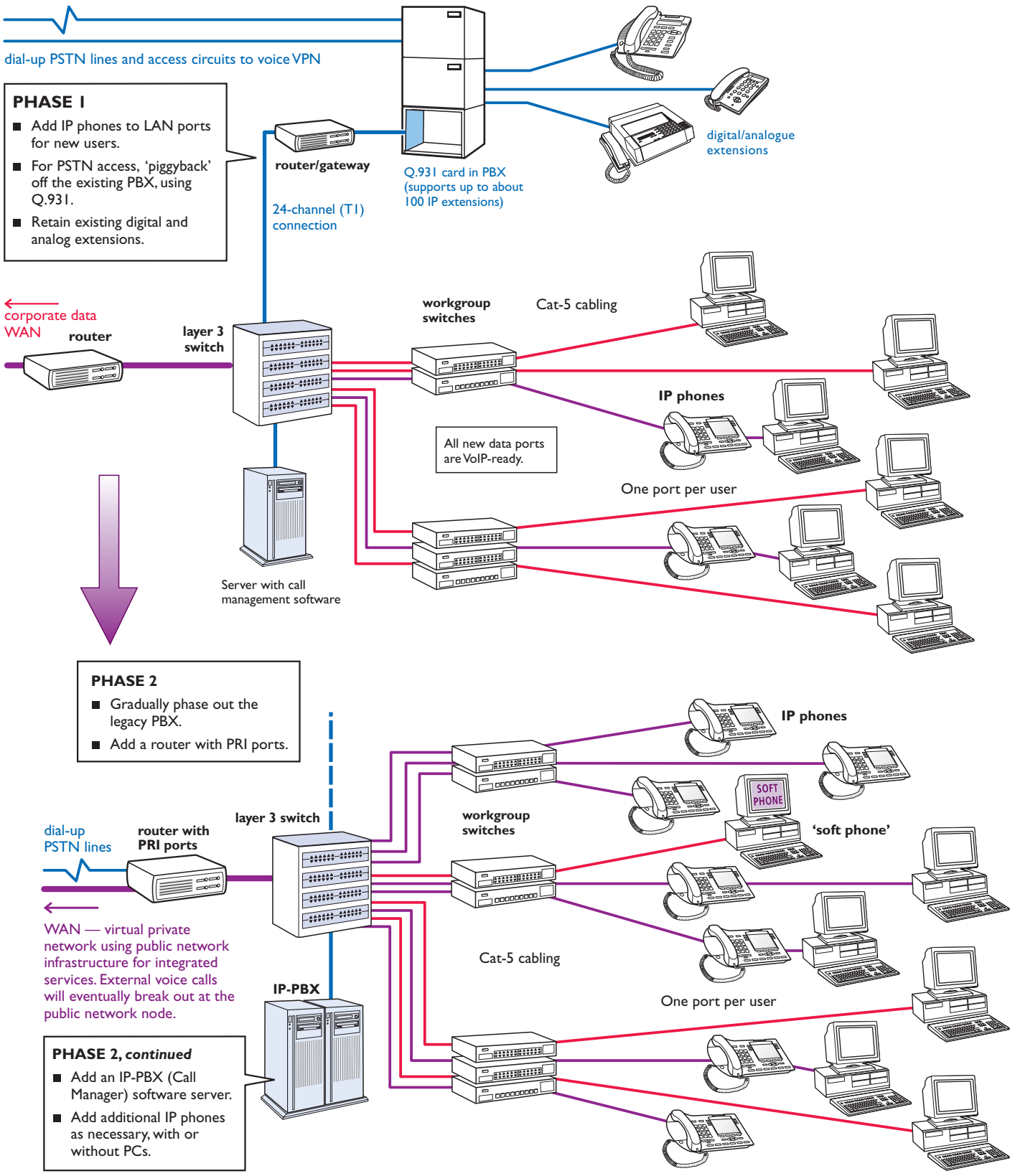
In this scenario, an organization needs to upgrade its corporate data infrastructure — for example, to roll out new applications, to accommodate new users or to migrate from SNA to IP.

As for voice traffic, the existing PBX currently meets the needs of most users. But its capacity is stretched and upgrading or replacing it would be costly. Therefore, any solution to the data requirements must include new voice capacity, with a view to eventual convergence.

Figure 6 (page 10) shows a possible phased approach, based on the **Cable & Wireless IP-LAN** service (see the box on page 11). Cabling is upgraded as necessary, by providing Cat-5 or Cat-6 to each desktop. All new user ports are VoIP ready, with equipment either purchased as capital, or leased on a per-port basis. A single network port for each user will cater to both voice and data needs, with significant cost savings.

A layer 3 switch (see the box on page 11), which supports voice as well as data traffic, links the various network elements.

Figure 6. A transitional approach towards convergence, using Cable & Wireless IP-LAN



Phase 1 — subsidiary working

Initially, for access to the PSTN, the life of the existing PBX is extended using a form of 'piggybacking', or subsidiary working, as shown in the first part of Figure 6.

Using the ISDN Q.931 signaling standard, the PBX is linked via a specialized router or gateway to a LAN segment. IP phones are installed on the LAN for the additional users, and integrated with their PCs if required.

A single Q.931 card (which occupies a PBX extension slot) can support up to about 100 IP phones, with or without PCs.

To manage the Dial Plans for the new IP extensions, call management software is installed onto a server.

Phase 2 — adding an IP-PBX server

Later, an IP-PBX software server is added, with IP phones on the desktop and as stand-alone units without PCs where necessary. This equipment can be a further capital purchase or an add-on to the initial managed service contract.

Flexibility in the LAN

An IP-LAN solution is especially appropriate for organizations looking to develop more flexible working practices. Examples of IP-LAN's flexibility include:

- The ability to configure **virtual LANs (VLANS)**, minimizing network congestion by grouping ports that exchange a lot of traffic. VLANs operate regardless of which physical port each user is connected to, so they simplify additions and changes of equipment and ports, and facilitate 'hot-desking'.
- **Wireless LANs**, which are ideal for touchdown areas, where users can have wireless access to the LAN without plugging their equipment into a physical port. Cable & Wireless uses Cisco Aironet 340 equipment, supplying data rates of up to 11 Mbit/s depending on conditions.

Cable & Wireless service info

IP-LAN

IP-LAN is a complete, scalable LAN connectivity solution for sites with 100 or more users. It includes:

- *equipment (Cisco Ethernet switches), which can be leased on a per-port basis or purchased*
- *design and installation services*
- *cabling upgrades if necessary*

The three management options, all backed by SLAs, are:

- ***Maintained** — equipment maintenance and upgrades*
- ***Monitored** — proactive fault detection*
- ***Managed** — the most comprehensive monitoring and management option*

*The **Technology Refresh** option offers regular upgrades to equipment or software, also on a price-per-port basis.*

Layer 3 switching

*Switches traditionally operate at layer 2, the **data link** layer of the OSI model. They give of high throughput and low latency; but are limited in their scalability and flexibility, and in their support of multimedia and multicasting.*

*Routers operate at layer 3, the **network** layer, and can provide for security features and differential QoS requirements. But with their higher processing overhead they run the risk of congestion in very busy networks.*

Layer 3 switches combine the speed of layer 2 switching with the intelligence of layer 3 routing. While routers carry out the processing in microprocessor-based engines, layer 3 switches use application-specific integrated circuit (ASIC) hardware to achieve much higher forwarding rates than conventional routers.

Scenario 2: change driven by voice requirements

In this scenario, the organization's PBX is no longer adequate, and extra voice-traffic capacity is needed. Managers are hesitant to start investing in infrastructure which may become obsolete within a couple of years.

The **Cable & Wireless Convergence PBX Plus** service (see the box on page 13) provides an answer, in the form of low-risk phased migration from a traditional PBX to a full IP telephony solution. The existing PBX is replaced by a managed Nortel Meridian PBX, on an initial fixed-term contract, with a mixture of standard and IP extensions. The transition to IP telephony takes place over the contract term.

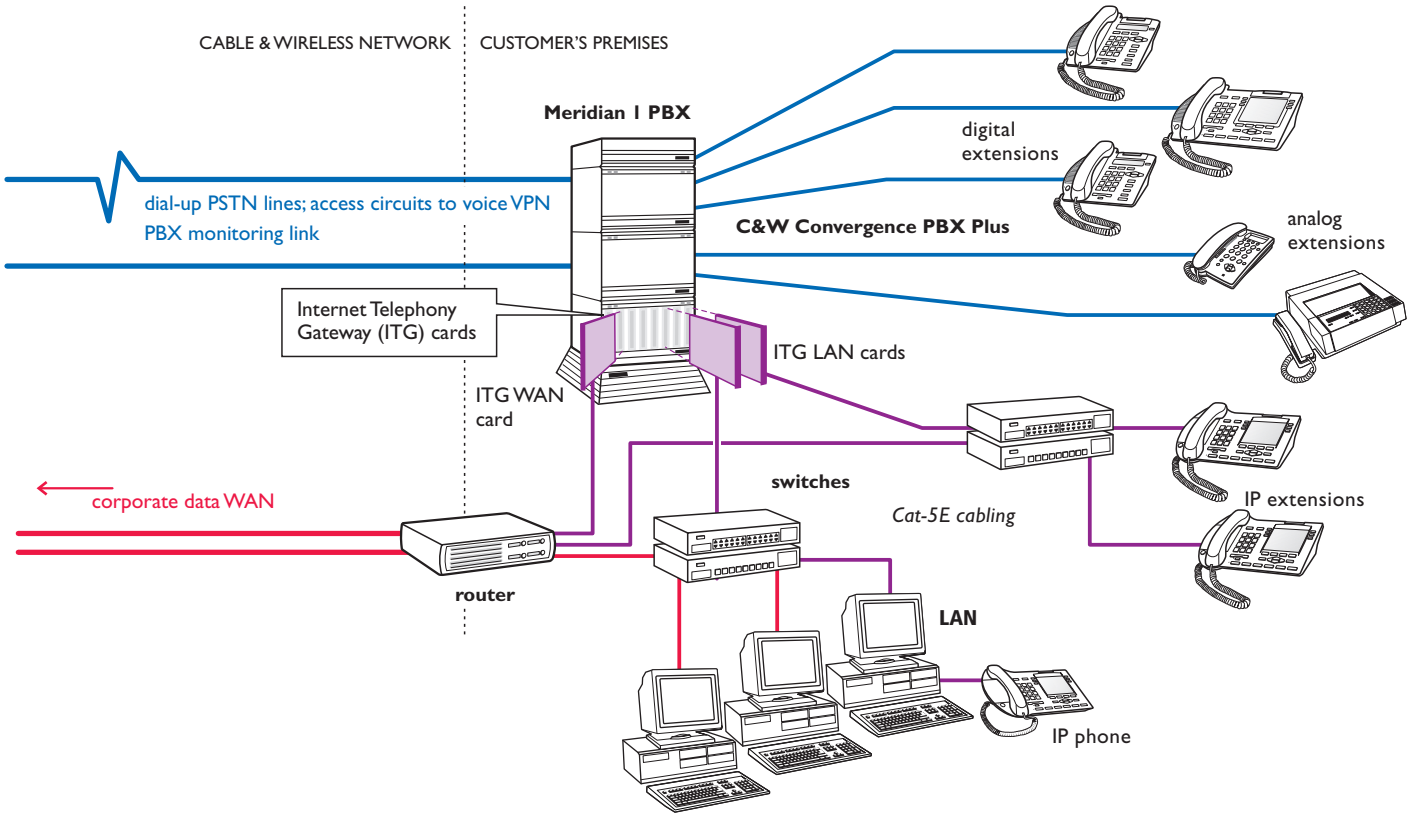
Convergence PBX Plus is particularly suitable for applications which demand sophisticated PBX features such as centralized operators, audio conferencing or networked voice messaging. It also includes several options for call centers — from basic software for simple agent working, up to enhanced server-based services that support very high traffic volumes.

The service has advanced networking capability. Figure 7 shows how the Internet Telephony Gateway (ITG) card can be used both for connecting IP extensions within the LAN, and for interconnecting sites over the WAN, providing cost savings on intra-company calls. The Nortel signaling standard, Meridian Customer-defined Networking (MCDN), provides feature transparency between Convergence PBX Plus sites. Sites with other PBXs can be included in the network, using Q.931 for some feature transparency.

Policy management capabilities inherent to the gateway measure the network QoS, and automatically reroute voice calls over the PSTN when necessary.

Pricing of Convergence PBX Plus is based on a simple and predictable formula — equipment, features and options are costed out on a per-extension basis. This makes it easy to budget for additional extensions as the system grows with your business.

Figure 7. The Cable & Wireless Convergence PBX Plus approach to convergence



C&W service info

Convergence PBX Plus

This fully managed service is designed as part of a convergence strategy from a traditional PBX to a fully integrated IP-PBX platform. It is available on a rental basis only, with no capital outlay for customers.

The service is based on the industry-leading Nortel Meridian PBX range. It supports between 16 and 16,000 extensions on a single system, and includes:

- *the PBX*
- *extension equipment*
- *connection (direct or indirect) to the Cable & Wireless network*
- *installation and configuration*
- *cabling where necessary*
- *scheduled software and hardware upgrades*
- *a range of options for applications such as call centers*

Three options are available for each extension:

- *a standard digital voice extension, with a choice of handsets*
- *IP migration, starting with a digital extension and allowing swap-out to a VoIP port, equipped with an IP phone, during the term of the contract*
- *an IP phone from day one*

Figure 7 shows Convergence PBX Plus configured as a hybrid system, with a mixture of extension types.

Convergence in the wide area

At the same time as the LAN is upgraded, the need for extra capacity and flexibility in the wide area is met by migration to the Cable & Wireless **IP-VPN QoS** service (see the box below), with Class of Service options appropriate for the applications being run.

Managers can therefore concentrate on developing and delivering new applications, confident that the infrastructure exists to deliver them, backed by comprehensive SLAs. For example, the Premium service option delivers realtime IP — transport of IP packets at sub-150 ms latencies, supporting realtime traffic.

For the time being, organizations will retain public exchange lines (typically 2 Mbit/s ISDN circuits) for external voice calls, while intra-company calls will be routed over the WAN. Eventually, it should be possible for all traffic to be carried over shared access circuits, with external calls breaking out at a public network node.

Adding new applications

The point at which individual users' desktops are converted from standard PBX extensions to integrated IP ports will depend partly on their need for new applications.

These applications include:

- **Multicast services**, an economic way of delivering training material, corporate messages, etc. to users, who can sit at their desks and receive broadcast TV-style content.
- **Unified messaging** — Cable & Wireless can give users message boxes which receive voice, email and fax, with some ability to transfer messages between them. This allows on-the-road staff to access their email over the corporate WAN and to receive voice mail without paying international call charges.

See page 8 for more information about integrated applications.

Cable & Wireless service info

IP-VPN QoS

This fully managed private network service will be available at US sites in the near future. It uses the shared Cable & Wireless IP network infrastructure to provide customers with any-to-any connectivity within a defined VPN, with an optional firewalled connection to the Internet.

The service uses MPLS at the core, offering much higher QoS levels than the services delivered over the public Internet, together with a level of security equivalent to that in a fully private network.

Three prioritization levels, or Classes of Service (CoS) are available:

- ***Premium** — realtime IP, for time-critical traffic such as voice and video*
- ***Enhanced** — for business-critical traffic such as transactions*
- ***Standard** — for non-critical traffic such as email*

A single access link can be configured with a range of Classes of Service.

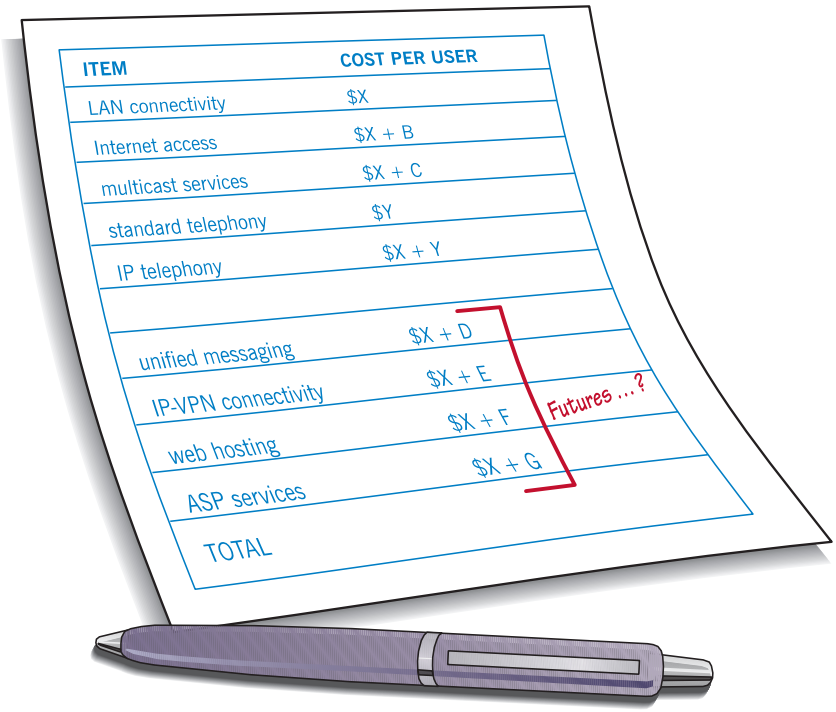
A predictable pricing model

With such fundamental changes taking place, managers need to feel that they have a handle on their budgets, and that costs will not spiral out of control.

Cable & Wireless uses a simple and consistent pricing structure for its managed convergence portfolio, charging for each option on a per-user basis, with management and maintenance built into the cost.

Managers can therefore plan accurately for the future, allocating resources according to the individual needs of users.

Figure 8. Simplified budgeting for current and future applications



Opening up new possibilities

A converged IP network offers enterprises more than just cost savings and new applications; in a fully IP-enabled environment, businesses can find more effective ways of communicating with customers and associates.

A key feature of Internet telephony is **Click to Call**. A user browsing a web site can click on a link to set up a simultaneous voice call using the same connection. The call can then be dynamically routed according to various criteria — the caller's location, the availability of staff to take the call, time of day, etc. As they talk, both parties can simultaneously view the same web screen shots.

Within the enterprise, Click to Call facilitates collaborative working and increases efficiency. And as more home users get access to high-speed Internet links, it will allow businesses to provide better service to online shoppers and people requiring customer service. The NetMeeting software that users need to set up VoIP calls is included with Microsoft Windows® 2000, and is therefore finding its way into many homes. Users' only additional requirement will be a microphone or other H.323 input device. Alternatively, some of the new generation of stand-alone web-browser phones will be H.323-compatible; and set-top boxes may soon be available, opening this capability up to the digital TV market.

Convergence as an enabler for e-Business

The services described in this Technical Overview are fundamental components for the delivery of an e-enabled infrastructure to support e-Business. They have been designed to provide solutions based on traditional communications budgets, thus focusing the next round of IT spending on driving the upgrade of the enterprise network toward a full e-Business environment.

The delivery of end-to-end QoS and voice/data integration are facilitated by Cable & Wireless's solutions for national, regional and global requirements. They provide the foundation for other applications and services, maximizing business benefits in the emerging electronic marketplace.

Cable & Wireless: Delivering the Internet promise

Cable & Wireless delivers the Internet promise to businesses in 70 countries worldwide. With one of the fastest global Internet networks on the planet, we can help you succeed in e-Business with a full range of IP connectivity, web hosting, e-Commerce, voice and data or ISP solutions. Visit our web site for more information.

Contact information

For more information on business solutions and services, speak to your Cable & Wireless sales associate, or visit the Cable & Wireless web site:

http://www.cw.com

For more information on Cable & Wireless's Convergence Solutions, email us at **convergence@cwusa.com**, or visit the Cable & Wireless web site:

http://www.cw.com/us/convergence

Full details of the individual Cable & Wireless services described in this Technical Overview can be found on the C&W Consultants' web site:

http://www.cw-reference.com/consult

This includes complete Service Descriptions, briefer Service Summaries and a technical Glossary covering many terms associated with IP networking and other communications technologies.

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