



Statement of direction

MD110
Convergence Communication System

The best of both worlds



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MD110 Convergence Communication System

Issued September, 2003

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The converged mobile enterprise

A mobile way of working

Today's competitive business environment has meant that many organizations put increased emphasis on controlling and reducing costs of operation. At the same time enterprises realize that a competitive edge is gained not only by cutting back on and controlling costs but are also looking for new ways of improving business. Top business priorities are to improve service to existing customers, to secure customer satisfaction and revenues but also to generate new business. Other highly rated topics on today's CIOs and communications managers' agendas are to improve and make business processes and internal communication more efficient.

More and more companies and organizations realize that by allowing a mobile way of working they help employees not only become more efficient but also allow them to perform more of their tasks closer to the customer. Being truly mobile is not just about being reachable by phone: it's also about being able to get all messages and access corporate data when needed; deciding how people can contact you in certain circumstances; and not being tied to one particular device with which you can access what you need. True mobility means having the freedom to communicate and access information using your device of choice: whether it's a digital desk phone, IP phone, laptops, desktops, mobile phone or PDA.

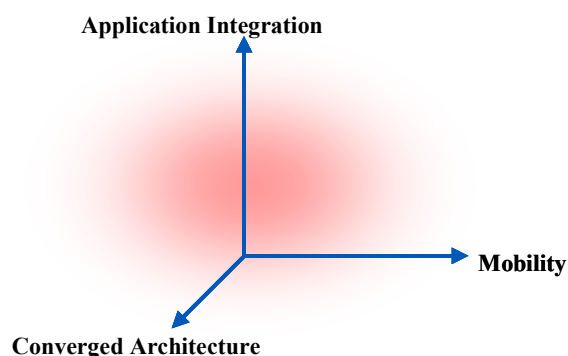
Enterprises deploying a mobile way of working soon realize the benefits in terms of increased customer service, improved internal efficiency and controlled costs. Having and supporting a mobile workforce is becoming a prerequisite for success in a highly competitive marketplace.

Ericsson Enterprise has a vision to make the Mobile Enterprise a reality for the business user, securing that each of the enterprise's employees, whether working in the office, on the road or from home will have access to applications and information anytime, adapted to their individual needs and still be an integrated part of the company.

This paper explains how you can develop your existing Ericsson MD110 infrastructure and applications into a Mobile Enterprise solution, and describes the benefits for your business.

The Mobile Enterprise

Ericsson sees three ingredients or dimensions to create a truly mobile enterprise: Mobility, Application Integration and Converged Architecture.



- **Mobility** is about flexibility and providing the employees with the tools and applications they need to be able to work anywhere, anytime, with same access, services and availability as if they were at their desks, in the office. This means that employees can be reached on their office numbers independent of where they are. It also means that they can access all sorts of messages, corporate data and directory and attendant services, when needed. It also means having the freedom to communicate over the preferred device of choice: whether it's a digital desk phone, IP phone, laptops, desktops, mobile phone or PDA. By supporting a mobile working the enterprise strive to reach benefits such as increased customer service and improved internal efficiency.
- **Application Integration:** To be really flexible and efficient the mobile worker needs mobile access not only the communication tools but also have secure and simple access to office applications: These applications can be for personal use such as e-mail and PIM applications or business applications for customer relationship management or field force automation. Application Integration over well-defined and open interfaces secures that the communication solution can be linked to the required personal and business applications.
- **Converged Architecture** is generally viewed as the enabler of business-class IP-telephony and access to applications where and when they are needed, over a scalable and distributed architecture based on a standard operating system and infrastructure. A converged infrastructure enables integration of core business applications with communication systems, yielding substantial cost savings in communication charges and maintenance. However, convergence in the true Mobile Enterprise is more than this; it is also about convergence of fixed and mobile telephony and services and the ability for the end-users to always access the head-quarters work anywhere over the available infrastructure as long as some sort that a user has access to. A truly converged architecture supports the Mobile Enterprise end users wherever they are, on whichever terminal, over whatever infrastructure, under the assumption that a telephone of some description is available, that the user has some means of getting IP connectivity to corporate Head Quarters and that this terminal with IP connectivity is equipped with an Internet Browser.

In the following we will explore how each of these aspects are being addressed in reaching our vision for the Mobile Enterprise.

The evolution of MD110 and enterprise telephony

1983



2003



All the way back in 1976 – at a time when there were only analogue, semi-automatic electronic exchanges – Ericsson and the Swedish PTT Televerket entered a joint venture to develop a new, entirely electronic and digital exchange. The result was MD110 – one of the world's most advanced and successful business communication systems.

MD110 was way ahead of its time. The technology was all-new. System software had to be developed in parallel with switching hardware and required extensive programming. (There was no readily available off-the-shelf operating system.)

From the start, MD110 employed a revolutionary digital architecture, based on modules called LIMs (Line Interface Modules) with a Distributed Call Control System.

Today, MD110 has a market-leading position in many countries. Since its introduction, over 20 million lines have been delivered to some 130 countries.

The MD110 has continued to benefit from technical innovation and development. For example, technologies like ISDN and DECT cordless telephony were integrated into the MD110 in early stages. In 2001 the MD110 became the first enterprise switch with full GSM integration. That means cellular phone users have access to the same comprehensive telephony services as they have from wired or cordless extensions.

In the same year, MD110 embraced IP technology – resulting in one of the world's first converged PBX with distributed IP telephony, and offering full reliability through features such as automatic gatekeeper discovery on service failure.

Now MD110 is bringing true mobility to the enterprise, embracing technologies such as VoIP, GSM, GPRS and UMTS (3G), and features like device independent free-seating along with new levels of integration with advanced business applications.

Today, MD110 is infinitely upgradeable thanks to its evolution into an open and standards-based converged platform that protects existing investments.

The MD110 Convergence Communication System

Today (2003) the MD110 Convergence Communication System is a converged hybrid communication system, supporting the best of both worlds: Voice (TDM switching) and Data (IP) in one system. This will help enterprises reduce the total cost of ownership (TCO) by adopting a minimal-risk convergence strategy. With multidimensional convergence enabled by the MD110 Convergence Communication System, it is now possible for users to move (port) their telephone extension number to any terminal type of phone (IP phone or client, digital, analogue, cordless phones or even a cellular or a home phone) via log-on procedures and still enjoy the feature richness of business class telephony. This will give today's dynamic workforce the freedom of choice when being mobile. It also allows a cost-efficient phone sharing model for flexible offices and reduced administration when moving/relocating employees.

Upgrades to MD110 Convergence Communication System

Older MD110 systems (release BCx – BC11) can be upgraded to the MD110 Convergence Communication System (BC12) by software and/or hardware upgrades. As the development is based on an evolutionary concept, it is possible to reuse as much as possible from existing hardware, terminals and applications. Not necessarily having to forklift replace the whole system or network means capitalizing on past investment and thus maximizing the return on existing investments.

IP Telephony

The MD110 Convergence Communication System comes with a native (integrated) support for IP Telephony (Gatekeeper and Gateway functions). It is one of the few IP telephony systems based on a distributed architecture with no single points-of-failures. This means that if the network (LAN) connection to one part of the distributed system is unavailable, or one IP system interface fails, then the IP-phones will automatically discover another IP system interface and register to it. This automatic recovery procedure is carried out automatically with no user or administrator interaction.

The distribution of the system modules (LIMs) is done either via E1 lines or over IP using the Ericsson MSED HL950 (TDMoIP), an interesting option to distribute the system on a campus LAN/WAN to accommodate the geographical distribution of the telephony users for minimal cabling and optimal load distribution.

The IP Telephony implementation is based on the open H.323 standard for VoIP, with value added proprietary add-ons, which enable supplementary services not supported by the standard, but necessary for business class telephony like automatic call backs on busy or no answer, etc., bringing the power of rich telephony heritage into the IP world.

Voice can be compressed to save bandwidth and the following codecs are supported: G.711 (uncompressed), G.729 with or without silence suppression and G.723.1. To ensure a high speech quality, the MD110 Convergence Communication System supports packet prioritization according to the *Diffserv* standard with separate settings possible for the voice media stream and the signalling. Call admission control (CAC) allows to limit the maximum number of simultaneous calls, which will prevent a degradation of the

quality of the calls in peak hours if the total VoIP bandwidth exceeds the link capacity in wide area scenarios (WAN).

Peer-to-peer direct multimedia streaming between IP endpoints on the LAN and over the WAN between different systems (nodes), ensures: highest speech quality (by elimination of multiple transcoding delays), no bandwidth restrictions, and the ability to use video and collaboration applications like file sharing and whiteboards between the IP endpoints. As the media stream is established directly between IP devices, bandwidth is only consumed in the local vicinity of the devices and is not aggregated centrally at the IP telephony system (Gatekeeper).

Unlimited user mobility is supported by a powerful free-seating capability, which enables any user to log-on any IP phone by logging-on procedures. The multidimensional convergence enabled by the MD110 Convergence Communication System, extends this mobility to embrace *all* kind of terminals: IP or traditional, fixed or mobile, private or public, keeping the same functionality. This means that you can log-on any analogue, digital, cordless (DECT), cellular (GSM) or public ISDN or analogue phone with your IP-extension number and a password or a PIN code. This will reduce administration when moving/relocating employees.

Enterprises with flexible offices, shift workers, mobile workers, home workers and telecommuters are able to save costs (CAPEX and OPEX) by consolidating their phones, and using *phone sharing* models.

IP phones



Figure: Dialog 4425 IP phone

The Dialog 4425 IP Vision phone features: integrated LAN switch enabling one cable to the desk, integrated Power over Ethernet (IEEE802.3af) enabling centralized power feeding with power backup over the same cable, large graphical display with integrated WML browser to access simple enterprise applications (like corporate directory browsing) over the phone, integrated headset connection and multi-codec support including the bandwidth efficient G.729ab. A built-in web server allows a comfortable way for the user to manage the IP phone from any PC via a web browser: programming keys, managing the phonebook and the call list. Features like DHCP, automatic gatekeeper discovery & registration and remote firmware download simplify the task of IT administrators in provisioning and maintaining IP phones.

An entry-level IP phone, the Dialog 4422 IP Office, will also be made available.



Figure: ECC 1.1 Softphone

The Ericsson Communication Client 1.1 is an IP softphone offering a phone on your PC by using the multimedia soundcard and headsets. In addition to the standard business telephony functions like automatic callback, transferring calls, conference calls, diversions, enhanced call list, etc..., it offers a comfortable way to search-by-name the corporate directory and click-to-dial on the screen. It also offers users to manage their diversions, message diversions and personal number profiles. A new monitoring feature, allows assistants to monitor up to 30 extensions, pick up their calls and change their settings (diversions, and profiles). It is possible to use this monitoring feature and answer calls directly on the PC (stand-alone) or via any type of phone (IP, digital, analogue, cellular). It is possible for end-users to install a client by downloading the software from the intranet via their internet browser or from a network drive. In addition features like DHCP, automatic gatekeeper discovery and automatic software update features simplify the task of IT administrators in provisioning and maintaining IP softphones

IP Networking or WAN IP Telephony

The IP networking capability of the MD110 Convergence Communication System enables companies to connect dispersed workforces cost-effectively over a corporate intranet or other IP wide area networks (WAN). IP extensions on different MD110 nodes can be connected using peer-to-peer multimedia streaming, ensuring voice quality is maintained through the elimination of transcoding delays. The traditional MD110 networking services (enhanced QSIG) are supported for any IP extension over the network.

Highest availability is guaranteed by an automatic re-routing procedure, which activates a fallback to the public telephony network (PSTN) when the wide area data network (WAN) is unavailable.

Network design and management is made easy even for large hierarchical network topologies. For example network expansions - like adding a new telephony node - does not need an update (routing tables) of all other nodes in the network. Management of the whole network can easily be done from a centralized management console. In fact, all the information held in a networked MD110 regarding number analysis, alternate routing and Least Cost Routing does not have to change in any respect due to a change over from circuit switched networking to IP networking.

With the emergence of MPLS-based cost-efficient IP-VPN (Virtual Private Networks) services, enterprises are able to consolidate their wide area networks and get rid of costly dedicated voice leased lines. This will reduce the total cost of ownership, especially by reducing the inter-site communication costs.

IP Telephony Solution for small Branch Offices

One of the main advantages of IP Telephony is the ubiquity nature of IP. If IP connectivity is available in the branch office (via corporate WAN or IP-VPN), then IP phones and Softphones can be easily deployed in the branches by simply connecting them to the local LAN. These remote IP phones will be fully integrated into the central MD110 Convergence Communication System thus capitalizing on the communication resources and capabilities of the headquarters. Provisioning, administration and maintenance can be carried out centrally without the need to visit the branches, as the phones support automatic registration and remote firmware download.



Figure: Enterprise Branch Gateway (EEBG)

The Ericsson Enterprise Branch Gateway (EEBG) is a small gateway and gatekeeper supporting direct multimedia streaming optimized for branch offices up to 100 users. The EEBG ensures access to the local PSTN/ISDN (via analogue, or ISDN BRI/PRI trunk interfaces) to take advantage of the local tariff, and provides a working alternative in the event the wide area data network (WAN) and thus the connection to the central site is not available. When in isolated mode (local survivability), internal calls towards and from the central site are alternatively carried out over the PSTN/ISDN public network, ensuring uninterrupted telephony services and connectivity. The Ericsson IP phones and softphone clients automatically detect connectivity failures and register

towards the EEBG. Upon recovery of the data network (WAN), the IP terminals will automatically reregister towards the main site MD110 Convergence Communication System.

It is possible to route external calls to remote areas (ex. international calls) over the corporate wide area data network (WAN) and break-out or 'hop off' via the EEBG into the local area PSTN at local tariffs – delivering potentially large cost savings.

It is possible to connect Faxes or analogue phones to the EEBG, or by using a dual port analogue/IP converter, the DRG22.

Mobile Telephony



*Figure: Mobile Extension
(symbolic)*

Ericsson was the first to introduce full cellular/mobile phone integration into a PBX. The MD110 Convergence Communication System features Mobile Extension, which fully integrates cellular phones into the corporate telephony communication. Business class telephony services like conferencing, call transfer, hunt groups, automatic callback, call accounting, etc... are made available for any cellular phone. Mobile users can use corporate resources like switchboard operators, assistants, contact centres to become more efficient and increase their customer service level.

Small Office/Home Office (SOHO) workers can use cellular phones and still be part of the central communication. They can use computer assisted applications (CTI) to lookup contacts in the corporate directory and click-to-dial from the PC screen, taking the call on their cellular phones. Mobile workers can even use the WAP browser of their cellular phone to access the corporate directory and manage their corporate (mobile) extension.

Mobile Extension enables enterprises to control the costs of their mobile workers and eventually allocate private and project calls accordingly. It also allows cost saving in the cellular communication bill, because less calls have to be returned due to better usage of switchboard operator/attendants instead of voicemail. Time savings of around 5 minutes/day per employee will also reduce the real cost of ownership (RCO) due to the fact that efficiency features like automatic callback, message diversions and corporate directory search can now be used on cellular phones. Finally mobile employees working mainly off company premises, can do without a fixed desktop phone when in the office, which saves capital and operating expenses.

For more details please refer to the Mobile Extension data sheet.

Traditional Telephony



*Figure: Dialog 4200
digital phones*

As the MD110 Convergence Communication System is a hybrid converged system, all traditional telephones can be connected to it: Analogue, digital and cordless (DECT) phones.

Ericsson offers a full range of digital business telephones (Dialog 4200 series) for the different type of users including operators, with user-friendly menu-driven graphical display which make it easy to access the multitude of telephony features. Remote firmware download is also supported for digital phones.

Roving workers in hospitals and in manufacturing, need reliable wireless voice and messaging communication. DECT is a digital standard for cordless telephony, which is certified for use in hospital environments. In contrast to Bluetooth and WLAN, the DECT radio spectrum is exclusively reserved for cordless telephony use, meaning no interference from other radio technologies and excellent reliability and voice quality.

DECT is optimized for seamless handover mechanisms of DECT guarantee a continuous connection when roving and moving between cells (base stations).

Ericsson, an innovator in that area and a the main contributor to the DECT standard, offers a new range of DECT portables for the MD110 Convergence Communication System:



Figure: DT590

DT290, an entry-level cordless phone with vibration alarm and hand-free speaking functions.

DT590, a high end cordless phone with comprehensive large graphical display, 2-way SMS, centralized corporate directory access, one key access to centralized voice dialling and voicemail, internal antenna diversity, integrated calculator & alarm clock and high battery life.



Figure: DT422

For industrial use, Ericsson offers robust scratch-proof, spill water and dust proof (IP64) cordless portables, the DT412 and DT422 with alarm messaging functions (machine-to-man and man-to-machine) with integrated man-down alarm. It is possible to locate the position of a person who initiated an alarm in hospitals wards or hazardous production areas (chemical industry). The DT430 is intrinsically safe and can be used in hazardous environments.

A future-proof continuous evolution

Ericsson will continue to develop the MD110 Convergence Communication System and offer new software releases to take the ultimate step in realizing the Mobile Enterprise.

2004



1) *An new medium sized IPBX*

For the medium sized offices, Ericsson will launch a new hardware platform for customers who wants to implement an IP only, fully converged node in their MD110 based network, e.g. a green field situation. This soft-switch is called the Ericsson Enterprise Telephony Server (EETS), which will complement and co-operate (full compatible) with the MD110 Convergence Communication System available at the main office.

Ericsson Enterprise Telephony Server will be the first product based on converted MD110 software. The MD110 Convergence Communication System software will be able to operate on a PC (server) and make use of unlicensed open-source operating system, *Linux*. The software will enable the creation of a full-featured softswitch, the Ericsson Enterprise Telephony Server 2.0.



Figure: Enterprise Media Gateway (EEMG)

Complementing the telephony server software (EETS), a new media gateway, the Ericsson Enterprise Media Gateway (EEMG) will include the necessary DSP resources and offer optimized hardware for IP (extensions, operator and trunks), mobile

extensions and E1/T1 digital trunks for connectivity to ISDN, PLMN and PBXs. It comes in a standard 19-inch rack, so that it can easily be integrated into the existing data infrastructure.

In MD110 terminology, the Ericsson Enterprise Telephony Server is viewed as a single LIM – that is, a single server – with a maximum size of 700 IP-enabled and mobile users.

As your business grows and you need to expand your existing network, you can combine the existing MD110 Convergence Communication System voice network with an Ericsson Enterprise Telephony Server 2.0 in new medium sized offices (figure 3). MD110 QSIG networking feature transparency is guaranteed between the traditional MD110 nodes and Ericsson Enterprise Telephony Server

The Ericsson Enterprise Telephony Server offers full MD110 networking capabilities over IP, providing seamless user experience and avoiding expensive investments in support systems, operators and management systems as the fully featured networking protocol allows users at the branch to be served by e.g. the head quarters Unified Messaging system and the operators already existing in the network. This will drastically reduce the TCO for a new, converged Branch office implementation.

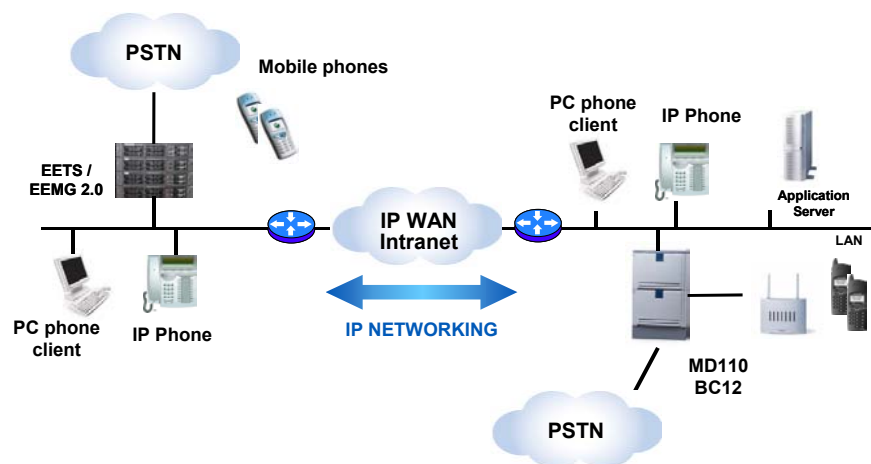


Figure: Side-by-side interworking of both platforms

2) Full integration of both platforms

As the MD110 Convergence Communication System is more than a traditional PBX, we continue its evolution to a server-client based architecture where the unique distributed architecture of the MD110 is fully utilized for an all converged IP infrastructure:

The next release of the MD110 Convergence Communication System (BC14/3.0) will offer true integration of new generation hardware and software platforms. New software development of the MD110 will be generic and made to run on the open server platform, Linux. The common software will guarantee 100% compatibility between both platforms, whether for new Ericsson Enterprise Telephony Server or converged MD110.

Integrating the Telephony Server software into an MD110 Convergence Communication System

This step enables MD110 CPUs to be replaced with open server boards, which simply slot into each LIM – effectively converting the MD110 into a full softswitch. Previous investment in legacy equipment such as digital phones, analogue phones and DECT cordless phones is safeguarded and can still be used. Legacy extension and trunk interfaces in the LIMs act as media gateways for the new server.

Integrating the Telephony Server as a LIM into a multi-LIM MD110 Convergence Communication System

At this stage it is possible to expand the upgraded MD110 Convergence Communication System at the main office with several hundreds of IP and mobile extensions simply by connecting the new version of Ericsson Enterprise Telephony Server with its own media gateway to the Group Switch. The MD110 Group Switch will treat the new Ericsson Enterprise Telephony Server as another LIM.

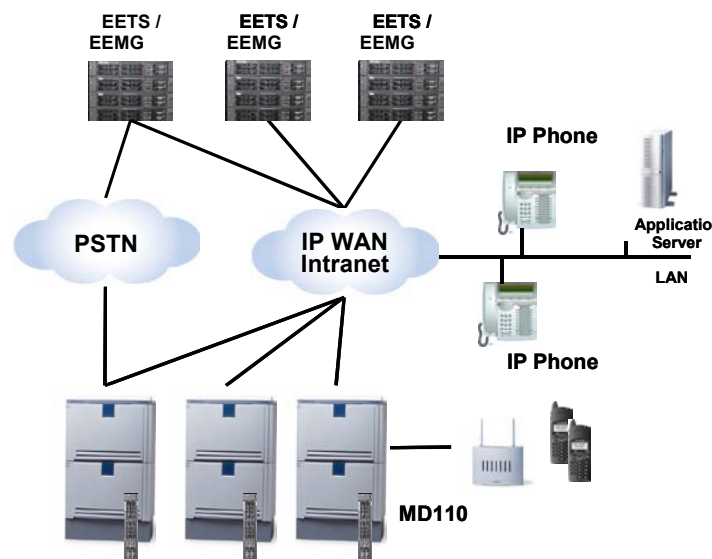


Figure: Full integration

Replacing the TDM based Group Switch with ubiquitous IP switching

If the ‘convergence rate’ of the system is high enough (that is, if IP-Telephony penetration is greater than 50 per cent), it is worth replacing the TDM based Group Switch with ubiquitous IP switching. This is simply a matter of connecting the LIMs to the E1 interfaces of an EEMG, which will take over the intra-system routing logic and signalling and enable the converged media switching to be done peer-to-peer directly on the IP infrastructure, enhancing the voice quality.

With the integration of the EETS 3.0 into the MD110 BC14/3.0, “LIMs-over-IP” become reality.

The Ericsson Enterprise Telephony Server 3.0 can scale up to 60,000 users by combining up to 124 servers (LIMs) into one single configuration. Ericsson Enterprise Telephony Server nodes in one system can be distributed over a WAN. The intra-system

signalling is approximately 64–128kbit/s. The main part of the WAN bandwidth required inside the system is the voice media stream, but this bandwidth is no more than the bandwidth needed if intersystem IP networking used between geographically dispersed nodes.

The advantage of this architecture is that the MD110 will act as one system on the WAN infrastructure, simplifying management, reducing service charges, enhancing flexibility and mobility by allowing any user to register at any location.

The infrastructure can now be configured with any combination of existing MD110 LIMs and new Ericsson Enterprise Telephony Servers, as all units are now running with identical software on Linux servers, whether they are stand-alone servers or the server inside the MD110 LIM.

Conclusion

Building on existing products and solutions has always been one of Ericsson's primary strategies. Protecting investments in existing systems is important both for you and for us.

Enabling your move into the Mobile Enterprise is not merely a change to your infrastructure: it offers you a route to a truly converged way of working – with all the attendant cost, productivity and service benefits – at a pace that suits your business.

The MD110 Convergence Communication System gives you the best of both worlds, voice (TDM) and data (IP), fixed and mobile services, embedded and open server platforms..., a future-proof investment for business class telephony.

List of abbreviations

3G	Third generation mobile phones
AXE	Telephone Exchange
CPU	Central Processing Unit
DECT	Digital Enhanced Cordless Telecommunications
DHCP	Dynamic Host Configuration Protocol (autom. IP address)
DRG	Digital Residential Gateway (Analogue/Fax <> IP)
DSP	Digital Signal Processor
EEBG	Ericsson Enterprise Branch Gateway
EEMG	Ericsson Enterprise Media Gateway
EETS	Ericsson Enterprise Telephony Server
GPRS	General Packet Radio Switching
GSM	Global System for Mobile Communication
IP	Internet Protocol
ISDN	Integrated Services Digital Network
LAN	Local Area Network
LIM	Line Interface Module
PBX	Private Branch Exchange
PDA	Personal Digital Assistant
PLMN	Public Land Mobile Network
PSTN	Public Switched Telephone Network
QSIG	Q-interface signaling protocol (for PBX interworking)
UMTS	Universal Mobile Telecommunication System (3G)
VoIP	Voice Over IP
VPN	Virtual Packet Network
WAN	Wide Area Network
WLAN	Wireless Local Area Network