STRATEGY WHITE PAPER

IP Communication Server Strategy

There is no denying the underlining interest for Enterprise Voice IP networks as businesses continuously seek to competitively position their company. The list of glittering arguments facing Information Systems (IS) managers is long; single-common voice-data communications infra-structure, simplified moves and changes, common network management tools, and new carrier services and network connectivity.
How can we meet the promises of improved performance, more efficient organizations, lower Total Cost of Ownership (TCO) and better Return On Investment (ROI) ? How are the issues of quality, security, robustness, and inter-working really solved ? How does an Enterprise optimize and leverage it's existing investments and make an optimal transition to the promised benefits of IP networks, at the lowest cost and minimum risk?

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IP COMMUNICATION SERVER STRATEGY

Realistic IP solutions enable enterprises to leverage existing business communication investments while moving to converged voice/data networks.

Introduction

Today's enterprise communication market is going through an important transformation, moving from the "traditional" monolithic proprietary Private Branch eXchange (PBX) to open standard converged communication solutions. Several main driving forces can be identified:

- Businesses need to establish closer contacts with their customers, suppliers and employees. The customer is the central focus and the most precious asset of any company. Building trust in customer relations requires efficient, direct and personalized communication. Customer contacts need to be completely interactive (inbound and outbound), utilizing both traditional and new communication media, such as voice, video, messaging and the Internet.
- The Internet has become an important strategic tool for businesses, opening the door for new communication media, such as:
  - e-mail;
  - e-commerce: customers place orders (or make enquiries) over the Internet;
  - employees can use the Internet (or intranet) to access messaging, information and database services using browsers or interactive voice response servers.
- The introduction of new communication systems based on Internet Protocol (IP) architectures is being fuelled by enterprises seeking to rationalize their business processes. Technology is now sufficiently mature to meet this need. Clearly, the corporate data network has become a vehicle not only for all an enterprise's internal relations (e.g. with mobile employees), but also for its external relations with customers and suppliers. New technologies allow voice to be transported and switched over a data network, offering an opportunity to rationalize communication by evolving to converged voice and data networks.
- Increased importance of business applications that offer improved productivity and greater employee efficiency both within the office and when working outside the enterprise.
- Employees are increasingly mobile, for example, sales representatives, home workers and employees moving between sites. Mobile employees need simple, friendly access to the enterprise information systems, to be able to communicate with their peers, and to be able to access the corporate network at all times.
- Many employees are increasingly in direct contact with clients. Not only are there dedicated call centers for managing customer relations, but the notion of "informal" call centers is emerging. Each employee is becoming a potential point of contact. Seen from outside the enterprise, everyone is a call center agent to some extent. Consequently, applications are needed that guide employees step by step through the necessary customer relations procedures.

These new business communication skills and services can be deployed on the following architecture:

- Open communication suite consisting of a number of application servers hat host eBusiness applications, including Enterprise Resource Planning (ERP) and Customer Relations Management (CRM).
- Open network foundation for connecting with clients.
- Terminals.

Alcatel can provide all or some of the components for the open communication suite and open network foundation, as well as a range of terminals.

The OmniSolutions family is composed of a number of building blocks (see *Figure 1*) which are used to create the most suitable communication solution for an enterprise. These components are:

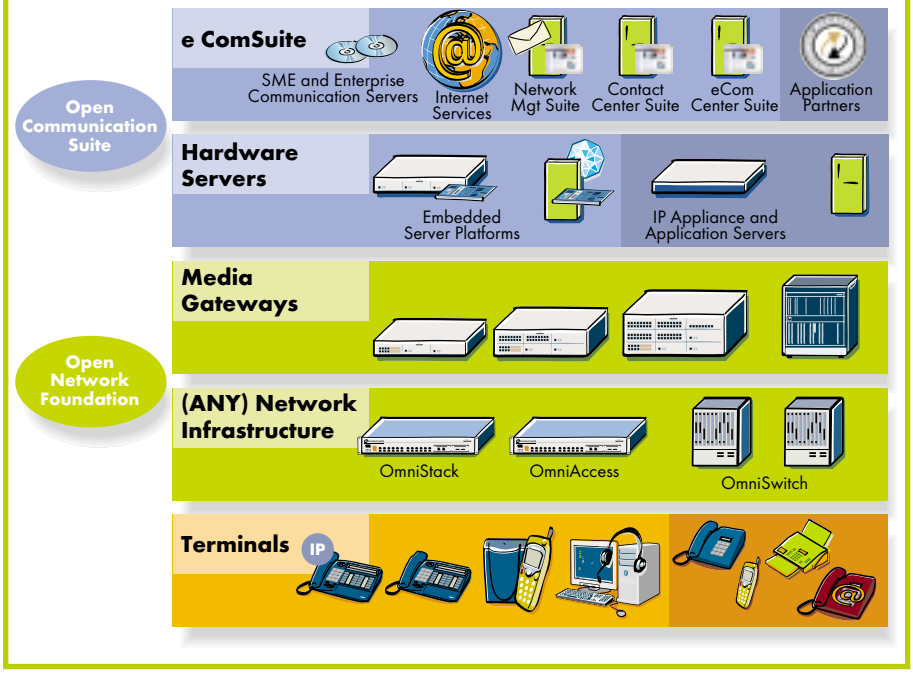
- eCommunication software suite, comprising telephony call servers (including the OmniPCX IP Communication Server) and value-added applications like the Alcatel OmniTouch contact center and eCommunications Center (unified messaging), as well as applications from Application Partners.
- Hardware servers that run the eCommunication software suites.

- Media gateways, which are the basic building blocks for connecting legacy terminals and networks.
- Fixed phones (IP phones, softphones, traditional analog phones, digital phones) and mobile phones (cellular, Digital Enhanced Cordless Telephony / Private Wireless Telephony; DECT/PWT).

The various buildings blocks of the enterprise solution are distributed over an Ethernet/IP network which provides standard interfaces, real-time voice switching, and voice grade availability and performance. Desktop applications, including unified messaging, are dealt with elsewhere in this issue [1].

Alcatel's OmniPCX IP Communication Server is based on the next generation of "intranet communication systems" for enterprises. It uses native IP packet technologies, providing multiple solutions according to the level of voice/data convergence available in the enterprise network. This architecture can either be deployed as a "full" IP solution, in mixed or in classical solutions, depending on the customer's requirements. OmniPCX's unique architecture and feature set meet all an enterprise's current needs, and can meet new requirements as they emerge. In addition, it facilitates the seamless migration to IP communications while building on existing investment.

Fig. 1 Building blocks for the OmniPCX family



What Should an IP Communication Server Deliver to Meet Customer Requirements?

Platform Independent

Customers increasingly view the call server as a communication application, similar to other applications that they manage (SAP's e-business platform, IBM's Lotus, etc). The call server should thus be supported on the same platforms and operating systems as the enterprise is using for these other applications.

The Alcatel IP Communication Server is designed to be hardware and operating system independent. In addition to Unix, the server software runs under the Linux operating system on standard "off the shelf" appliance servers. Linux is proving to be a robust, reliable operating system, which is benefiting from the dynamism of the Internet technology community. The server requires only an Ethernet network connection to provide the necessary signaling and control between the physical elements of the network (media gateways, terminals, etc).

The technical considerations and benefits of using Linux for enterprise communication systems were discussed in a previous issue of the *Alcatel Telecommunications Review* [2,3].

For more traditional customers, the Linux software version can also run on a specific system central processing unit (Alcatel 4400 in which the CPU is hosted in the cabinet), providing Time Division Multiplexing (TDM) switching based on Alcatel's proven Crystal technology.

"Any Network" Strategy

One of the achievements of IP telephony is to divide the various functional blocks of the monolithic PBX architecture into smaller parts with clear standard interfaces. For example, voice switching is no longer performed in the PBX but in the Local Area Network (LAN). The idea is that the LAN is used not only for voice switching but also for switching all the company's traffic. This enables an enterprise to select the most suitable vendor for each function in order to build the best possible solution that matches its needs.

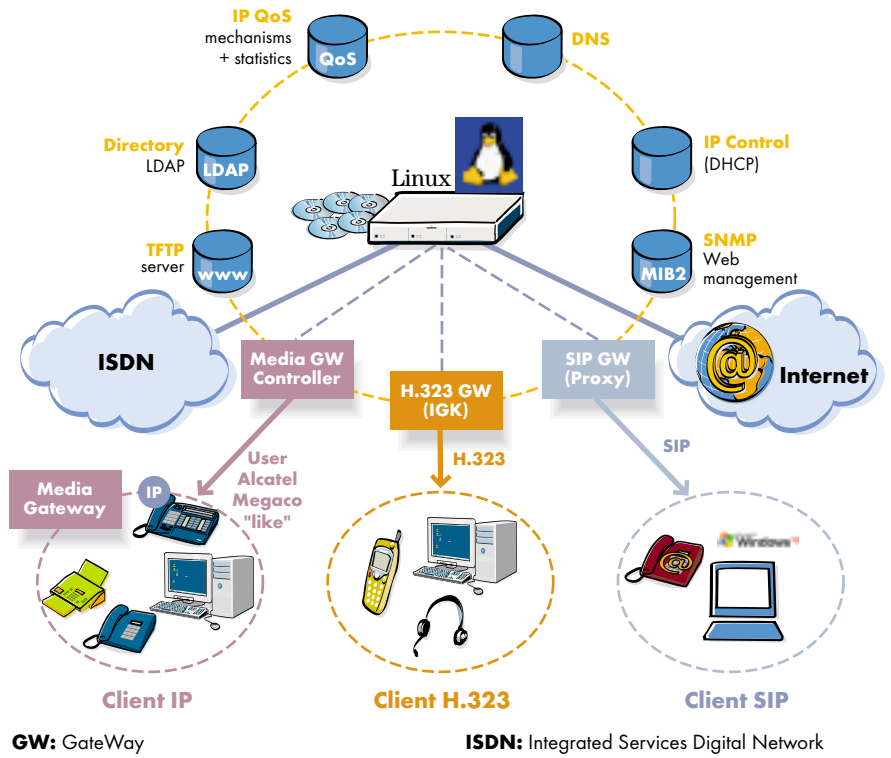
At the heart of Alcatel's enterprise strategy is the objective of deploying enterprise IP telephony solutions over any data network (LAN switches, routers, etc), whether provided by Alcatel or a third party. This approach ensures that customers are not locked into

single vendor data and voice networks, which might be against their long-term interests.

To meet this objective, a clear distinction is made between the voice "superstructure" (IP media gateways and IP phones) and the data "infrastructure", with standard protocols linking the two layers, mainly Ethernet 802.3 and 802.1 p/q, DiffServ, and 802.3 af for in-line power feeding of IP phones. The following standard protocols are also supported to enable a voice solution to be deployed efficiently over a data network:

- Dynamic Host Configuration Protocol (DHCP) for automatic allocation of IP addresses to IP phones and gateways.
- Lightweight Directory Access Protocol (LDAP) to enable OmniPCX users to access standard directory servers.
- Simple Network Management Protocol (SNMP) for management through "hypervisors" (e.g. HP OpenView, Computer Associates TNG).
- IEEE 802.1 q/p and Type of Service DiffServ for Quality of Service (QoS) enforcement and voice/data virtual LANs (VLAN).
- Domain Name System (DNS) for Session Initiation Protocol (SIP) interworking.

Fig. 2 **OmniPCX IP Communication Server support for SIP, H.323 and Megaco**



GW: GateWay
IGK: Integrated GateKeeper
ISDN: Integrated Services Digital Network

Smooth Migration to IP

When opting for full IP, TDM or mixed solutions, enterprises should insist on receiving all the services they need and the performance they require irrespective of the type of network!

Enterprise are quick to apply the benefits of convergence to their business objectives and organization, but only when the adoption of these technologies does not put their day-to-day business at risk. It must be possible to deploy new technologies gradually at the company's pace without compromising services and past investment. Not every company will deploy a converged network overnight. The compelling reason for implementing convergence is the benefits that it offers enterprises.

With this firmly in mind, the Alcatel OmniPCX "any-network" architecture allows enterprises to deploy "full" IP solutions as well as mixed TDM/IP solutions according to their needs.

To allow optimum migration from TDM to IP solutions and prepare for the next generation of communication services, an IP communication server must be based on and capable of supporting three standard protocols/architectures: Megaco, H.323 and SIP.

Although several standard Voice over IP (VoIP) protocols are available, there is a general consensus that SIP is the best candidate in the long term for developing new converged multimedia services and applications in IP networks embracing both the Internet and intranets. It will also facilitate a gradual evolution from IP telephony to Internet telephony. SIP will not replace protocols like H.323 or Megaco overnight, but will allow these complementary protocols to be deployed as part of a long-term IP solutions strategy.

The OmniPCX IP Communication Server can support all three protocols, each with its own domain of application and advantages in meeting customer requirements (see *Figure 2*).

Megaco architecture

The Megaco architecture uses different principles from those of H.323 and SIP. Intelligence is centralized

in the media gateway controller (server); the user device (IP phone and/or media gateway) only supports the basic functions (e.g. voice coding and packetization). It is the "thin client" equivalent of the PC application model.

Megaco is best suited to interfacing IP networks to legacy terminals, such as analog phones, fax machines or modems, as well as analog or digital T1/ T2 trunks connected behind media gateways or native IP phones. The Megaco architecture provides a reasonable level of telephony services to the terminals (almost the same as an equivalent terminal connected to a TDM switch), and requires almost no management on the terminal/media gateway side.

These advantages are appealing to IT managers in the case of IP telephones in a campus network where terminals are likely to be regularly added, moved and changed, and particularly in the case of branch offices where high levels of service, zero management and toll bypass easily justify the investment in an IP telephony solution. Moreover, Alcatel OmniPCX media gateways also allow the connection of legacy equipment and base stations for DECT/PWT mobility, and host a digital signal processor farm for media processing (media server). This media server provides three- or multi-party conferencing, voice guidance and music on hold to legacy and IP phones.

Although the Megaco architecture has obvious benefits, the protocol is inadequate when required to support the enormous variety of PBX (TDM) services to which users have become accustomed, while managing a high level of standard and proprietary legacy services (ISDN, digital phones, etc). Consequently, an additional protocol (User Alcatel Protocol) is used between the IP phone or media gateways and the OmniPCX IP Communication Server.

H.323

H.323 is a peer-to-peer protocol for communication between VoIP devices. It is fundamentally different from Megaco in that it requires intelligent end points. As H.323 is now widely deployed by many vendors and customers, there is extensive interoperability.

H.323 gateway and gatekeeper functions supported by the IP Communication Server allow the registration and interoperability of standard H.323 devices, such as wireless LAN voice terminals using the IEEE 802.11 standard, IP audio conference stations, and IP fax adapters (T38 Annex D standard), with the terminals in the enterprise. Interworking with carrier solutions, like the Alcatel 5020 gatekeeper, is also supported.

SIP

SIP deployment strategies are discussed elsewhere in this issue of the *Alcatel Telecommunications Review* [4].

Scalability / Availability

One area in which IP telephony can fulfill its promise of a lower total cost of ownership is in campus and multi-site environments. Unfortunately, few VoIP solutions vendors are able to support distributed systems with thousands of subscribers, located on hundreds of sites, while providing a wide variety of user features and high system availability. This is of major importance for organizations that require greater and greater flexibility.

Different distributed architectures are possible, depending on the customer's requirements for capacity, security, availability, topology, infrastructure (IP, ISDN), distribution of application servers (e.g. voice messaging systems), etc. These architectures can be based on centralizing the call control (the intelligence) or distributing it over the network. Physically distributing the various components greatly enhances availability as the failure of one component will not adversely affect the rest of the network.

The following are two complementary approaches for maximizing availability by distributing VoIP components in an Alcatel IP Communication Server solution.

IP communication server mirroring

Duplication of the communication server software, operating on two dedicated servers, provides a continuous service in the unlikely event of one of the servers failing. A duplicated or mirrored server is essential for contact centers that offer emergency or 24 hour/7 days-a-week service as it ensures uninterrupted service in the event of a failure and during maintenance.

Using two servers distributed over an IP network provides both functional and spatial mirroring, ensuring greater security against fire damage or physical intrusion than traditional PBXs using redundant collocated central processing units.

Maximum availability by aggregating multiple IP communication servers

Multiple servers are interconnected through the IP network, providing total service transparency and centralized management. The protocols involved are Alcatel Business Communication (ABC) / Q Interface Signaling (QSIG) and H.323. This solution can be deployed in a campus environment or Wide Area Network (WAN).

The media path between two devices (IP phone or media gateway) is "direct", avoiding undesired transit through gateways. This improves voice quality by avoiding the unnecessary use of gateway resources and by limiting delay in the IP network.

As far as system availability is concerned, because each server is completely autonomous, a WAN failure will have only a limited effect on network behavior and

service provisioning, with voice communications being seamlessly rerouted to the public switched network.

Example of a Multi-site Corporate Network with Branch Offices

Until now, it has not always been easy to integrate branch offices, especially smaller remote sites and home workers, into the corporate voice network. Also, it was often difficult to justify the investment because of the high cost of the TDM leased lines that were needed to link branch offices to the headquarters.

Alcatel's OmniPCX IP solutions, which have been designed to resolve the issues of managing and controlling isolated branch offices, offer the following advantages:

- Lower total cost of ownership by converging the voice and data infrastructures.
- Sharing valuable human resources throughout the corporate network (management, attendants, call center agents), thereby providing a better service to customers at a lower cost.
- Enhanced user productivity as a result of full communication services and applications continuity to smaller sites.

In the following example (see *Figure 3*), a single call server handles all calls for all sites (eventually duplicated to enhance availability and security). The server is typically located at the main company site. This architecture requires a voice-enabled IP network interconnecting each of the business sites. The physical connections are often based on routers over frame relay or leased lines, or an outsourced IP Virtual Private Network (IP VPN).

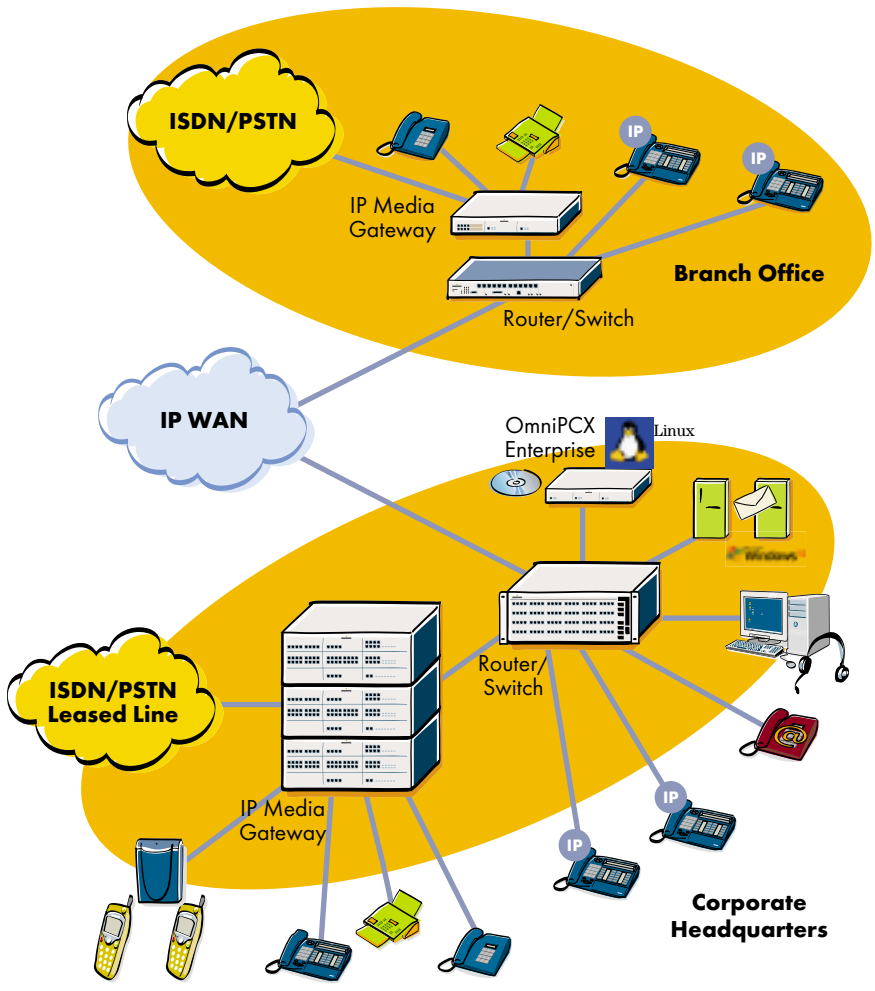
Remote branch offices can be equipped with:

- IP telephones as well as media gateways for traditional legacy interfaces (analog networks, analog phone interfaces, digital T0, T1 or T2).
- Media gateways for the sole purpose of connecting digital phones, fax and analog phones, DECT and PWT base stations, to the network.
- PC supporting an IP softphone application for home workers.

This solution has a number of benefits for an organization and its employees:

- Telecom cost optimization: Transporting voice communications on the IP network eliminates the need to use the public network for inter-site traffic.
- Larger enhanced voice systems can now offer the same level of service "transparently" to organizations with a number of small sites without the extra cost. For example, multi-carrier network routing, automatic call distribution, voice messaging, PC telephony, directory and contact centers.

Fig. 3 Single server serving all calls for all sites



- Simpler remote site installation and maintenance: Deploying a centralized administration and management system makes it a trivial task to install IP phones and media gateways. Maintenance is equally simple (e.g. moves, changes, user service parameter modifications) as it is carried out by the central organization.
- Backup continuity: In the event of the IP WAN network failing, backup continuity allows telephony features to function in the branch offices while data communications is out of service.

Deploying VoIP in the Field

As already explained, running voice and data on a single network provides a considerable number of benefits. However, providing a high voice service quality for users does not only depend on the intrinsic performance of the "voice " components (IP phones and VoIP media gateways), but also on the underlying IP network. Packet networks can generate excessive delay, jitter and packet loss during traffic peaks; real-time packetized voice (VoIP) is particularly "sensitive" to these impairments. Before deploying a VoIP solution, it is essential for customers and Business Partners (distributors and integrators of Alcatel enterprise solution) to have a comprehensive understanding of the IP network and how it is being used. This will avoid running voice on a non-compliant data network, leading to a poor quality of service and dissatisfied users. Alcatel has developed a suitable methodology for performing a VoIP compliant network assessment. It includes:

- a data network traffic and topology analysis;
- an evaluation of the potential voice traffic load;
- a measurement campaign on the network using emulated voice traffic;
- an analysis methodology which provides a recommendation as to how the network should evolve, when appropriate.

Alcatel has completed another methodology which implements engineering rules to help network architects to prepare for VoIP deployment on an existing data network. By following this process, it is possible to fully meet customers' expectations as to the quality, availability and security of their VoIP solutions.

Conclusion

The many issues facing businesses when they are considering the promises of a converged IP network can be resolved by using Alcatel's "tailored" IP solutions. Convergence can now be achieved pragmatically by deploying viable solutions that propel businesses into a new era of eBusiness communications.

Although IP solutions are now a reality, businesses need to be cautious in choosing such a solution as there is still a lot of hype in the industry. Some vendors are still offering new IP solutions based on proprietary technology, which is contrary to the basic principles of open IP communication services.

Areas of standardization that need to be closely monitored include:

- IP phone powering (eliminating the need for a local power socket): The IEEE 802.3 af standard is now complete and standard power-in-line products are now available.
- Physical/geographical location of IP phones in the event of an emergency phone call (911 in the US and 112 in Europe): This topic is currently being addressed by standardization bodies, like the Telecom Industry Association (TIA).
- IP phone moves and changes in the campus is one of the main benefits. IP phones can be moved from one Ethernet plug to another without the intervention of technical staff. This is one of the visible advantages of IP telephony. However, it can become complicated if data and VoIP devices are on different virtual LANs, especially if the VLANs are managed by port as the majority of LAN switches. Proprietary solutions exist, but there is a need for standardization. Alcatel considers that an open and flexible solution is a priority.

These relatively minor obstacles will be overcome. Already IP telephony solutions offer great opportunities for enterprises to build distributed multi-site or campus solutions providing better serviceability, better availability and improved security with lower recurring costs.

The deployment of intranet VoIP still remains confined to the enterprise network, and does not naturally cross the border to service provider VoIP networks without going through VoIP gateways and security mechanisms (firewalls). This is called VoIP peering. As issues relating to Internet network address translation and firewalls have still to be resolved, service providers are offering solutions based on enterprise VPN links between different sites (e.g. branch offices, home workers).

Some service providers have gone a step further with VoIP VPNs, which will allow voice traffic to flow over the Internet.

Alcatel has a global knowledge of enterprise and carrier networks, and already offers solutions for the next generation networks supporting the H.323 and SIP protocols across these gradually tumbling borders.

Today and tomorrow, look for partners that offer *true, realistic enterprise IP solutions*.

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Abbreviations

ABC Alcatel Business Communication
CRM Customer Relations Management
DECT Digital Enhanced Cordless Telephony
DHCP Dynamic Host Configuration Protocol
DNS Domain Name System
ERP Enterprise Resource Planning
GW GateWay
IGK Integrated GateKeeper
IP VPN IP Virtual Private Network
IP Internet Protocol
ISDN Integrated Services Digital Network
LAN Local Area Network
LDAP Lightweight Directory Access Protocol
PBX Private Branch eXchange
PWT Private Wireless Telephony
QSIG Q Interface Signaling
SIP Session Initiation Protocol
SNMP Simple Network Management Protocol
TDM Time Division Multiplexing
TIA Telecom Industry Association
VLAN Virtual LAN
VoIP Voice over IP
WAN Wide Area Network

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