



## >THIS IS THE WAY

SIP ENABLES REMOTE WORKERS TO BE AS  
PRESENT IN THE WORKPLACE AS THEIR  
COLLEAGUES IN THE OFFICE

## >THIS IS NORTTEL

### White Paper

#### >SIP: Enabling real-time communications effectiveness for today's virtual enterprise

Consider the fact that almost three-quarters of the top IT executives surveyed in CIO Insight's July 2003 research say speed to market is critical in their industry. This has as much to do with business processes and the ability to access business information in a timely fashion as it has to do with providing increasingly distributed employees with the collaborative tools to work more effectively across the virtual enterprise. Jack Welch, the legendary CEO of GE, has been quoted as saying, "An organization's ability to learn, and translate that learning into action rapidly, is the ultimate competitive business advantage."

What is impeding enterprises as they attempt to increase their real-time communications effectiveness? Users, knowledge workers and others with the need to communicate and/or collaborate are faced with a number of pain points, including:

- Managing multiple contact numbers and inboxes (the lack of service ubiquity)
- Losing productivity when away from the office (the lack of geographic flexibility)
- Using disparate systems (e.g., telephones, room video conferencing, e-mail, file servers) to communicate across teams

In addition, many enterprises see regulatory and security liabilities arising from employees using public communications services, especially instant messaging (IM), e-mail, and other Internet-centric services lacking encryption and involving public servers or storage nodes. IT's role is to address these user and enterprise challenges.

The solution to these pain points rests in what Gartner Group calls 'always-on integrated communications'. 'Integrated communications' are made up of async communications (e-mail, voicemail, short message services) and sync communications (IM, voice, video, and application sharing) combined with presence and location intelligence. While each of these modalities can be deployed on a one-off basis, 'integrated' implies a seamless user experience across all these media. 'Always-on' implies a level of reliability not generally associated with platforms supporting general-purpose business applications such as e-mail, workflow and document handling.

Vendors are taking different approaches to meeting the intrinsic needs of the increasingly distributed and mobile users for secure and reliable real-time collaborative tools. For example, enterprise productivity tool vendors are enhancing their document handling and work flow applications with real-time capabilities such as chat and real-time file transfers. Video conferencing and data Web portal vendors are expanding into data and Web conferencing respectively. While IM and presence are often a common element of these systems, telephony, if offered at all, is very basic. In contrast, telecommunications vendors, such as Nortel, have had a long history of offering always-on inter-person communications solutions in the form of business telephony (both desktop and mobile) and customer contact solutions, and presence-based, rich media capabilities in the form of video, IM and application sharing. SIP is being embraced by many of these information technology vendors, including Microsoft and IBM, either as a gateway function or at the heart of their emerging architectures. Many telecommunications vendors are SIP-enabling their PBX and customer contact centers to enrich these environments and provide converged desktop functionality. The converged desktop tightly couples the telephone (whether digital, analog or IP) and the PC for a richer experience, drives service ubiquity and allows employees to have desktop functionality anywhere, anytime, using any device.

SIP offers the optimal means of creating real-time integrated communications. This high-level architectural paper provides an overview of the distributed SIP networking architecture, how this architecture works into desktop and business applications and how Nortel's Architecture for the Converged Enterprise (ACE) leverages SIP to provide leading-edge collaborative capabilities.

## **SIP—The foundation for always-on integrated communications**

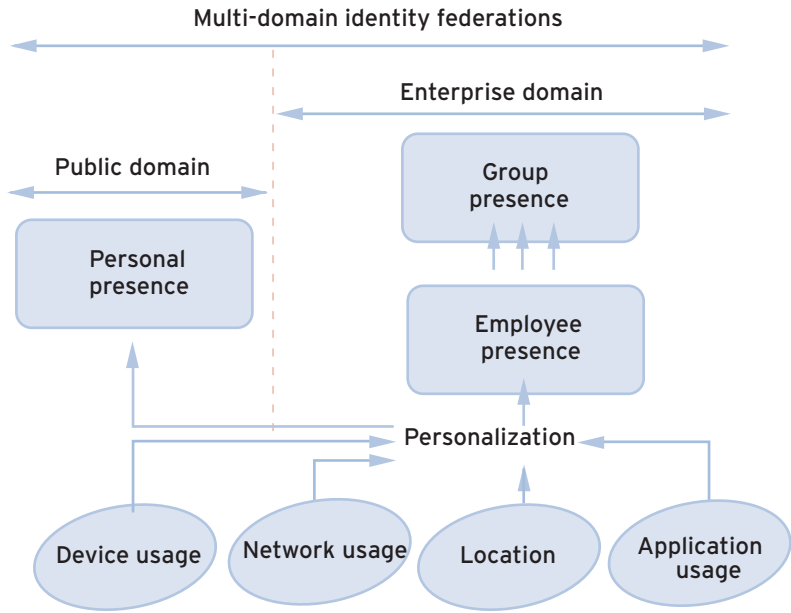
SIP, the Session Initiation Protocol, forms the basis of the industry-standard IP-centric converged communications architecture. It does for real-time inter-human communications what HTML did for browsing. SIP serves as a signaling mechanism to establish a wide variety of sessions. In this context, a session is any interactive communication that takes place between two or more entities over an IP network, from a simple two-way telephone call or an instant message exchange, to a collaborative multimedia conferencing session. SIP does not dictate the details within a session but instead negotiates interaction based on the capabilities of participants. By using SIP, users can locate and contact one another—regardless of location, device, type of network access, media content and number of participants. SIP is a whole new communications model. Features and applications are integrated at the session and service layers, independent of access constraints and the processes of message transport. In SIP networks, voice is just another media, albeit a very powerful one.

SIP is highly scalable, extensible and fits comfortably into different architectural and deployment scenarios. For example, it exhibits the following attributes:

- Ease of programming via text-based message formats, and re-use of HTTP for syntax in message headers and cause codes
- Flexible addressing via e-mail-like addresses (e.g., name@enterprise.com)
- Expendability by leveraging Internet building blocks (e.g., DNS, LDAP and RADIUS) and by allowing application servers (e.g., conferencing)
- Scalability via highly-distributed networking
- Security by leveraging IP security protocols (e.g., SSL, IPSec) and functionality (e.g., firewalls)

SIP's true power derives from the ease by which it can enable innovative communications capabilities. There are inherent advantages in the way the elements of a SIP architecture are distributed. It's more like an Internet service delivery model in which it's easy to introduce a new service, and it's easy to grow it. In addition to the flexibility of endpoint service nodes, network-based SIP elements enable services to be readily available at all times, from any location. Services can start out highly focused on a specific problem for a limited set of individuals and very easily expand to serve a much larger community with similar needs. We can envision a virtual account team being set up every time a new customer is created in a CRM system. This could include instant insertion in personal directories and creation of buddy lists.

Central to the SIP-based architecture is the notion of presence. Real-time presence information is captured across a broad range of activities including being active on a device (telephone, PC, PDA, BlackBerry), having a session in progress (whether synchronous or asynchronous) or being at a location (office, functional area like a conference room, or surgery). This information can be combined with location intelligence and selectively made available to clients and to any SIP-enabled application, such as CRM, document handling, work flow, and customer service. SIP, or more specifically SIMPLE, will be used to extend sessions and the notion of presence; for example into vertically targeted IM systems (e.g., Reuters messaging services for financial institutions).



**Figure 1. Presence—a key element of the SIP framework**

**Table 1. Illustrative SIP-based applications**

**SIP-based collaboration.** Multimedia, video and audio conferencing, secure instant messaging, IM chat, Web collaboration, application sharing, file exchange, Web push and co-browsing, white boarding and clipboard sharing.

**SIP-based mobility.** People-centric session set-up, presence-enabled personalization and customization, network-enabled find-me follow-me and location-based services, adaptive capabilities to user device and network connectivity.

**SIP-based productivity and information interactions.** Network-based directory, network-wide session screening, and management including click-to-call handling and session logs, automatic and user-set presence management, real-time information exchange tagging of all sessions with subject fields and context-sensitive session rejection—all made available to all devices.

**SIP-based customer services.** Multimedia collaboration, mobility, productivity and information interactions as the basis of new engaged customer services and for customer contact center operational effectiveness. Experts and supervisors can transparently enter and provide insight into customer interactions without transferring the customer from person to person.

## **Integration with the business environment**

Always-on integrated communications systems must leverage enterprise investments in telephony, desktop technologies, corporate directories and business applications if they are to deliver maximum business value.

### **Business telephony and customer contact integration**

A key element of any always-on integrated communications system is integration with business telephony, customer contact and unified messaging environments. SIP is the glue that ties PBXs, communication and application servers and gateways, and presence servers together. In this way, SIP-based collaboration, mobility, productivity and information interactions, and customer services and customer services applications can be seamlessly provided across the full range of user devices and communication methods.

### **Desktop application integration**

Desktop integration is fundamental to provide a consistent user experience for end users, both between multimedia desktop clients and PC applications, and between PCs and desktop phones. This integration can take many forms, using the pervasive Microsoft Office environment for illustration purposes. Click-to-call to e-mail sender, outlook contact and outlook meeting requestor via an Outlook 2000 plug-in eliminate the boundary between e-mail and telephony speed call environments. Directory integration allows Outlook Contacts to be imported to a user's SIP multimedia client directory. Sessions can be initiated in any Office document by embedding SIP addressing information in Microsoft Smart Tags—an Office 2003 extensibility option that generates content-sensitive dialog boxes. Microsoft has a Smart Tag Development Kit available for free download, including a set of code samples written in Visual Basic .Net, Visual C# and Visual C++.

In the future and expanding on the above click-to-call capability, the user will be able to click an e-mail address to determine presence of a friend; and to create ad hoc conference sessions directly from Outlook. There are also opportunities to integrate calendaring with scheduling of conferences and presence.

### **Corporate directory integration**

Corporate directory integration is provided via LDAP—the Light-weight Directory Access Protocol. LDAP is a specification for a client-server protocol to retrieve and manage directory information. The LDAP standard defines a network protocol for accessing information in the directory, and how data may be distributed and referenced. It also specifies an information model for the form and character of the information and a namespace for how information is referenced and organized. LDAP can be used for initial provisioning of the multimedia system, with updates automatically reflected in both systems. It was originally intended as a means for clients on PCs to access X.500 directories, but can also be used with any other directory system that follows the X.500 data models. This protocol is specifically targeted at management applications and browser applications that provide read/write interactive access to directories. LDAP is widely available on enterprise directories including those from Microsoft, IBM and Oracle.

### **Business application integration**

Real-time integrated communications can bring a lot of value to business applications. For example, a business application such as supply chain management could be made aware of user presence and be able to initiate IM, voice or multimedia sessions on behalf of users to initiate exception handling. This could be achieved in three general ways. First, some of these applications will be SIP-enabled, leveraging the programmability of SIP. Secondly, vendor-provided gateways will be provided from real-time integrated systems to some of these applications, as Nortel has done in its SIP-enabled customer contact solutions for Siebel's CRM application. These will be expanded through the definition of APIs and a more complete development environment. Thirdly, Web services will be used, leveraging XML, CCXML and VXML, to provide additional interworking flexibility. Again the most advanced example is in customer contact solutions where Nortel has delivered advanced speech self-serve application with its VXML-based toolkit.

## Table 2. SIP architectural primer

**User Agent (UA):** End device used by person or process acting on behalf of a user.

**Presence User Agents:** Collectors and broadcasters of state information for users (or groups of users) based on preferences, location, device, network and application usage. The protocol used is SIMPLE (SIP Instant Messaging and Presence Leveraging Extensions).

**Session management:** Establishing sessions and changing session attributes/media while the session is in progress, including session participants who can be added, dropped or transferred.

**Session Description Protocol (SDP):** Session attributes defining media to use and the codec technology details necessary to use them.

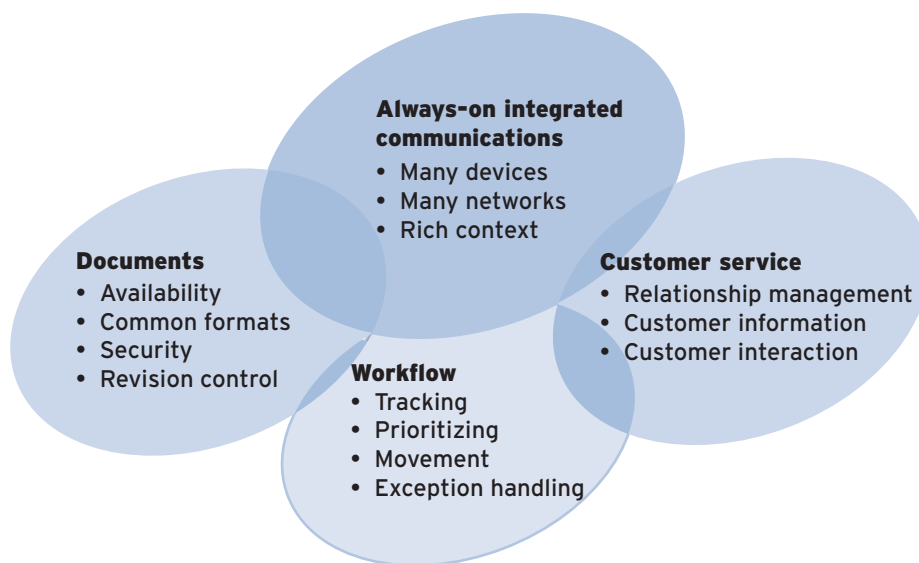
**Registrar servers:** Database containing a mapping of all UAs within a domain, their respective user identities, name and number translations and having access to presence information.

**Proxy servers:** Functional entity within a domain that accepts requests, queries registrar and forwards invites to recipient, or to a redirect server for inter-domain sessions.

**Redirect servers:** Functional entity that redirects SIP session invites to mobile or nomadic users and to proxy servers in external domains.

**Domain:** An administrative grouping of addresses within a community of interest (e.g., an enterprise); users can be associated with multiple domains (e.g., personal vs. business).

**Identity federations:** Multi-organizational infrastructures that enable enhanced communications, while respecting privacy and security of shared identity information.



**Figure 2. Always-on integrated communications and the broader collaboration space of document handling, work flow and customer service.**

## Nortel's SIP-based framework

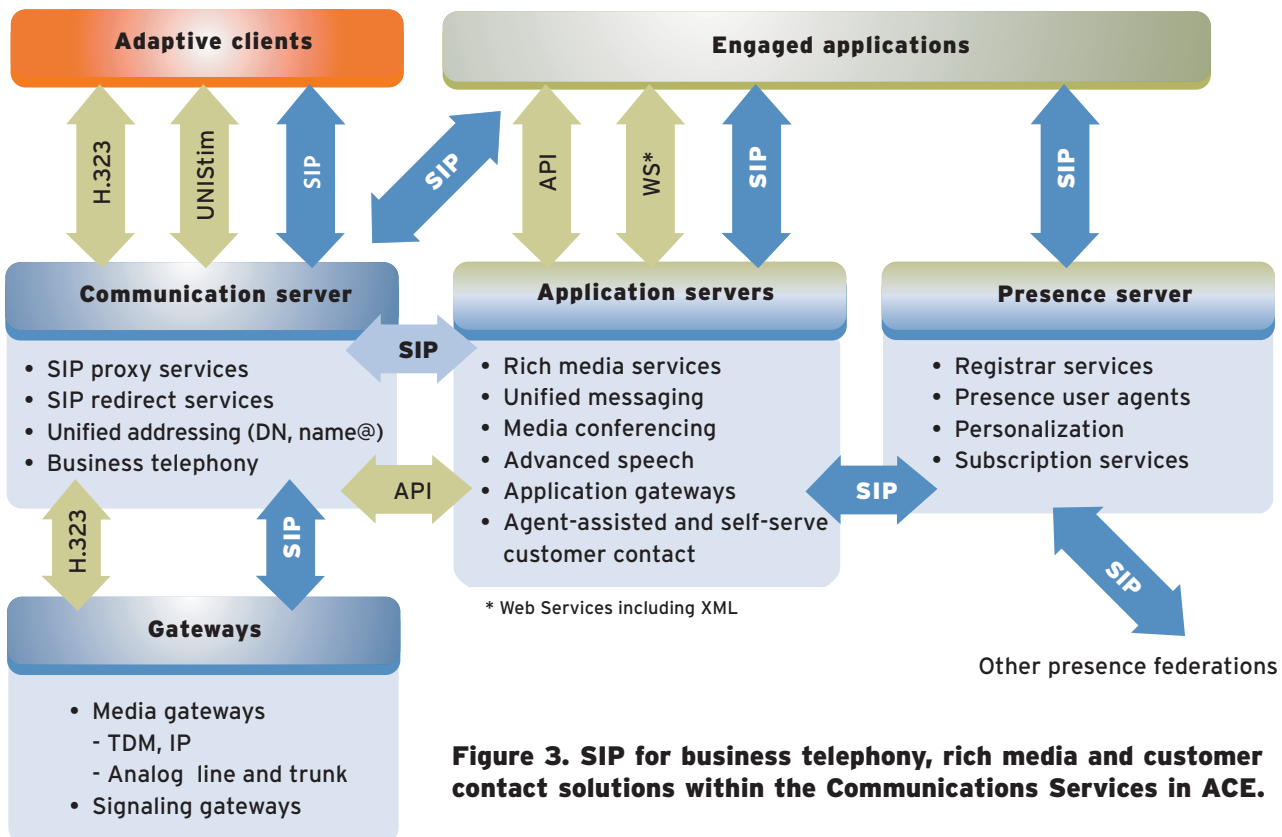
Nortel's Architecture for the Converged Enterprise (ACE) describes how client, application and communications functionalities are distributed across a data networking infrastructure in a secure and manageable enterprise environment. ACE is a standards-based blueprint for ongoing network planning, design and implementation, giving enterprises flexibility as they converge their networks, communications systems and business application environments. ACE, through its adherence to open standards, ensures that enterprises can inter-operate across multivendor environments and have the flexibility to fully leverage new technologies as they emerge.

ACE Communications Services provide network intelligence, required for always-on integrated communications including business telephony, rich media and customer contact.

A SIP-based framework opens the door for the delivery of innovative solutions such as the converged desktop, including telephony and multimedia mobility, collaboration, presence, messaging and video services. While SIP standards are defining a number of functional elements as discussed in the sidebar, a more generic approach (see Figure 3) describes these around three common building blocks (gateways, communications servers, and applications servers) augmented by a fourth: presence servers. SIP peer networking and support for related protocols such as SIMPLE provide integration across these elements.

Support for the full range of legacy and emerging Adaptive Clients in ACE includes support for a range of client protocols including SIP, H.323 and thin client protocols (e.g., Nortel's UniStim for wired and wireless phones). As discussed, interfaces into Engaged Applications including corporate databases are provided via SIP, XML, APIs, Web services and LDAP. Together, these SIP-centric capabilities drive a rich set of functionality and service ubiquity—anywhere, anytime.

The SIP control paradigm provides the key functions that will enable an entirely new network communications model, changing the way people communicate forever. SIP represents exciting possibilities for personal and enterprise communications. As more users adopt IP-compatible smart clients (phones, PCs, PDAs, mobile handsets), SIP-enabled sessions utilizing IP Telephony, rich-media conferencing, push-to-talk, and location-based services will become more and more prevalent. SIP-enabled converged desktops will bridge the traditional and IP telephones with multimedia clients on PCs. In this brave new world, users will be able to locate and contact one another with little regard to physical location, media content or the number of participants in a session. These users will enjoy a wealth of new services as well, while enterprise IT, system integrators, and service providers will be able to dramatically lower the cost of designing and deploying innovative new IP-centric services for their customers.



**Figure 3. SIP for business telephony, rich media and customer contact solutions within the Communications Services in ACE.**

## Nortel Architecture for the Converged Enterprise (ACE) executive summary

**Engaged Applications:** All enterprise applications that are or can be communications-enabled to be more anticipatory, media adaptive and real-time in meeting end-user and customer needs.



**Adaptive Clients:** Wired and wireless phones, PDAs, tablet PCs, laptops and PCs, and networked devices such as surveillance cameras and active and passive sensor devices.

**Communications Services:** Converged communications services such as business telephony, rich media and customer contact, as well as network-based connectivity intelligence (e.g., application switching, DHCP servers).

**Data Networking:** Business-grade Layer 1-3 networking infrastructure, optimized on IP, Ethernet and optics that consistently delivers the reliability, connectivity, bandwidth and latency required by applications.

**Management:** Network and service planning, deployment, and operations across all elements of ACE, including interworking with umbrella management systems.

**Security:** Protection of multimedia services and enterprise resources from internal and external threats, through policy-based authentication and authorization, encryption and a broad range of multi-layer security mechanisms.

## Summary

SIP is being embraced today by all major communications equipment manufacturers and many software companies. Because SIP is an Internet Engineering Task Force standard, it is inherently an open architecture, which serves to quicken its acceptance. The protocol readily enables voice and data convergence and is quickly becoming the protocol of choice for always-on integrated communications, adding rich media collaborative capabilities to business telephony and customer contact environments. Presence and the integration/interworking of SIP into desktop and business applications are central to the virtual enterprise, simplifying workflow, lowering transaction costs, enabling faster decision making, and improving customer and employee satisfaction. SIP is central to Nortel's ACE—the open, secure, reliable and scalable architecture for network, communications and applications convergence.

Returning to some of the major pain points of distributed enterprise users and IT organizations:

**Managing multiple contact numbers and inboxes:** Ultimately, a SIP name will become the primary address that needs to appear on a business card. This is all about service ubiquity. Unified messaging will go a long way to eliminating management headaches associated with multiple mailboxes.

**Losing productivity when away from the office:** SIP-based multimedia collaboration and virtual office capabilities will eliminate geographic boundaries. Work will increasingly be what you do, not where you go.

**Disparate systems for collaboration:** Always-on integrated communications provide a unified interface to a full range of multimedia communications capabilities.

**The liability of employees using public IM services:** While Instant Messaging may be the problem, it's not the solution! Secure IM (including archiving) is part of a rich always-on integrated communications system. Furthermore, IM can complement multimedia conferencing capabilities by providing real-time status signaling.

Nortel leads in *convergence* with fully functional, highly scalable communications solutions for enterprises that drive employee productivity, collaboration and responsiveness across the virtual enterprise. Nortel is a leader in application innovation and has deployed many production SIP-based systems, delivering business value to both enterprises and service providers. Its multimedia communications, customer contact and business telephony solutions drive employee productivity, collaboration and responsiveness with service ubiquity—anywhere, anytime, any device; and provides geographic flexibility, eliminating geographic organizational boundaries and barriers for information and workflow.

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