Avaya
Communication Architecture
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1 Introduction

The emergence of the virtual enterprise means opportunity—the opportunity to enable productivity gains as well as flexibility and responsiveness to customer and market dynamics that enterprises need to be competitive in today's environment. But to take advantage of this opportunity and to succeed in this new environment, enterprises will need to create communication strategies that establish tighter connections among their employees as well as with partners and suppliers.

Exceeding customer expectations is what Avaya solutions are all about. Avaya's enterprise-class solutions and services are specifically designed to help enterprises implement business strategies that are truly driven by a focus on the customer. Central to this focus is the communications architecture that powers the enterprise interactions with customers as well as the processes for delivering value to customers and shareholders.

To enable enterprises to implement business strategies that are truly driven by a customer focus, Avaya is committed to:

• Creating an instant and seamless connection across enterprises—linking people, processes, systems and networks so the customer is better served.

• Providing seamless access to critical communications and business information to facilitate better, faster decisions and enable a more competitive enterprise.

• Delivering the personalized service needed to build long-term customer relationships.

Today's business environment can be seen as a logical outgrowth of eBusiness and advanced integrated networks, including the Internet, that have transformed business processes. The new “Net” and its applications deployment models have revolutionized the way businesses interact, collaborate and transact business with customers, suppliers, partners, employees and shareholders. Avaya is focused on delivering solutions that enable enterprises to attach to their customers more tightly by communications enabling these processes at every step of the way. This communications enablement not only enables greater synergy and velocity among vendors, suppliers and partners within the value creation and delivery chain of the business but also creates responsive and seamless customer service.

2 The Evolution to Intelligent Communications

As business planners survey the critical business challenges that they face during the beginning of the 21st century, one very important phenomenon that stands out is the increasing speed of the marketplace. The pace of business appears to be accelerating at every turn, from the pressures of quarterly financial reporting to the onslaught of product innovation and the flow of information about almost every conceivable topic.

Efforts to analyze the causes for the increasing speed of business often point to changes in the type and level of market competition. Three key factors seem to be at work impacting the increasing level of competitive activity:

• The Internet. For many industries, the Internet has changed the rules of the game and created new, faster competitors who have learned to use new mode of information handling and processing to increase their internal and external velocity.
COMMUNICATIONS AT THE HEART OF BUSINESS

- Globalization. Not only have trade barriers been eliminated leading to new competitive market entrants, but also the unleashing of entrepreneurial cultures in the “emerging” powerhouses of Asia have created a vast array of new competitors that are using information and networking technology to eliminate the constraints of physical markets.

- Financial Reaction to opportunity. Global investment has grown enormously where the opportunities for growth under stable governments have replaced the old measurements of capital investment and risk assessment of the older years.

When these factors are combined, the potential for cost dislocations is enormous and the resulting impact on the pace of business has been dramatic.

On the demand side of the equation, there has been equally dramatic change in customer and buyer expectations. More open markets and better information flow at the customer level, which have been provided by the Internet's impact, are fueling higher levels of expectation and requirements. Customer requirements for quick turnaround, constant access, and customized solutions from their suppliers are increasing across the board. Also transforming buyer expectations is the increase in service support including speed of response, ease of operations and lower pricing.

The rapid onset of these market changes have brought considerable pressures on enterprises to adapt. Yet many businesses have encountered difficulty in moving fast enough. Enterprise processes and organizations that had developed over decades were not designed to be agile. As a result, organizations are experiencing increased difficulty in keeping pace with new technologies and product innovations. The increasingly rapid information flow of the market demands faster decision making than many large organizations are used to making. As CEO’s turn to their IT organizations for help in addressing flexible and adaptable business processes they are met with some push back challenges in making it happen. A recent statement by the CIO from Whirlpool illustrates the challenges ahead. “We have data to see variations …we can define rules, exception messages, alerts and signals. The technology is there. But what do you do with it? Who’s going to react to it?”

Avaya believes at least part of the answers to those questions lie in the ongoing development of communications capabilities that have been emerging over the last decade. One industry analyst has characterized the development of IP communications as traveling though three phases. In its earliest phase the rise of the IP telephony was linked to the Internet networking revolution. Its main characteristic was establishing itself as a less expensive but equally reliable and available means of voice communications over a converged IP Network. The 2\textsuperscript{nd} phase of IP Telephony has been characterized by its essential economic replacement dominance. By moving to standards based platforms and taking advantage of new less expensive network services, IP Telephony is becoming the obvious choice in the natural replacement cycle for telephony systems. With expected savings ranging from 15% to 50%, IP Telephony systems deployment has passed time division multiplexing (TDM) in terms of current deployment.

The third phase, which we are now entering, is starting to shift focus from tactical cost reductions to enhanced functionality that can begin to deliver strategic value to enterprises poised to take advantages of the underlying technology. At the heart of the strategic value proposition is the promise that communications capabilities when closely linked into business processes and applications can accelerate the velocity of enterprises to respond to changes in customers, and markets situations.

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The basis for creating this tight linkage of business applications and communications capabilities resides in two emerging technologies: Web Services in a Services Oriented Architecture (SOA) and Session Initiated Protocol (SIP). Web Services in an SOA construct provide the ability to create new business application integration that incorporates communications services. SOA is aimed at building high level interfaces between applications that allow them to share information and process flows. SOA promises to achieve higher levels of application interoperability which can result in better application integration with business process, faster deployment of new capabilities, and increased flexibility for application and business process modification. SIP is a new communications protocol that co-exists within an IP environment. It capitalizes on a peer to peer call signaling model and provides a rich presence context that is a key foundational element for creating intelligent communication capabilities.

The challenges of creating new velocity-enabling applications that can help enterprises to increase their speed of decision making and execution have already led a growing number of IT architects to adopt new business applications software creation techniques that include Web Services and SOA. The objective of this migration is to enable businesses to combine the advantages of off the shelf software packages with new methods of customization and integration that results in solutions tailored to the specific needs of the enterprise.

Avaya and a growing number of its partners believe that IT planners must move beyond their initial adoption of SOA for data exchange between their existing business applications and begin moving to an expanded view in order to create communication enabled applications that deliver on the vision of Intelligent Communications. By communication-enabling their integrated applications and processes, enterprises will be able to gain the strategic value at the heart of IP telephony's third phase of evolution.

For IT organizations, the convergence of communications over SIP and IP, the convergence of IP communication with IT applications using Web Services and SOA, and the ubiquitous access by fixed and mobile devices mean a fundamental transformation to the way they architect their enterprise applications and support their business operations.

To help lead the way by example Avaya is unveiling additional detail within the Avaya Communication Architecture to explain and illustrate what can be accomplished in creating intelligent communication services designed to integrate with and enhance business applications and business services.

3 The Avaya Communication Architecture - Overview

The Avaya Communication Architecture is a framework that enables evolution to intelligent communications. The framework supports functionality from multi-modal (voice, video, and data) access to an infrastructure providing a full range of communications. The Avaya Communication Architecture is built around the dual concepts of communications applications and communication services. Avaya communications applications can be integrated into enterprise operations and processes. Avaya communication services provide a finer granularity as an application building block that can be coupled with business applications and process flows. When combined together they deliver on the promise of Intelligent Communications.

By adopting this framework and deploying its communications resources in creative new ways, business planners can achieve an application and network infrastructure flexible enough to adapt to the dynamic needs of their businesses. At the same time, they can make the most of their existing communications and information assets.
The Avaya Communications Architecture shown in Figure 1 frames the communications building blocks that Avaya views as a basis for integrating communications into the business with unified multi-modal access, applications and services.

![Figure 1 Avaya Communications Architecture](image)

The framework in Figure 1 disaggregates enterprise communications resources into communications and business layers. These are shown horizontally and also as two vertical elements: application development and management. Backing up today's technology and applications is a services capability that maintains and helps ensure communications.

The framework has three main layers: unified access, applications, and converged infrastructure. Business applications and communications applications are positioned within the application layer. Communications services link communications into business processing, using the converged IT software infrastructure for integrating communications with business applications, and the underlying converged infrastructure providing communications capabilities. The framework is open, uses industry standards wherever possible, and as such, enables Avaya products and solutions to be readily integrated into a mixed vendor environment. The application development element provides an environment that allows systems integrators and developers to create new communications-enabled business applications and business process flows using the communications services software development kits provided. The system and network management element provides unified management across all layers.

**4 The Avaya Communication Architecture - Functional View**

The next level of refinement for the Avaya Communication Architecture, shown in Figure 2 below, further illustrates many of its benefits in providing an evolutionary path to *intelligent communications*. In the subsections below, the functional characteristics of each of the three layers are highlighted.
4.1 Unified Access Layer - Functional View

This layer represents a user-centric gateway to the enterprise that gives individuals secure access to applications, information and people. For example, Avaya software enables contact centers to handle customer inquiries via voice, fax, web and e-mail, as well as text chat. Avaya software also enables employees to access and manage all of their messages via a unified communication portal with a single mailbox for messages—voice, e-mail and fax—using the communications device of their choice. It also enables mobile users to reach business processing and communications functionality regardless of network connection.

Examples of components in the unified access layer include multimodal access, access control, personalization and enterprise portal. These components provide the means to establish a common access mechanism for Avaya applications, for integration of communication services into portals and for communication-enabling enterprise applications.

- **Multimodal Access** - This component provides integrated access via web, wireless data and speech to enterprise applications and communication applications. It supports a full range of devices and modes, including PDAs, wireless devices and phones, IP appliances and phones, traditional telephones and speech access. It support a full range of markup languages—including XML, HTML and VoiceXML—and the company intends to support emerging markup languages as well. Wireless data devices (PDAs) supported within the architecture include Microsoft Windows CE (e.g. iPAQ), Palm and RIM Blackberry. Embedding of communications capabilities can also be achieved within common PC desktop applications such as Lotus Notes and Microsoft Outlook.

- **Access Control** - The access control component provides the framework for integrating access with existing enterprise security mechanisms and business applications. It integrates seamlessly with leading vendor portal solutions, allowing single sign-on (authentication and authorization) and integration with enterprise directories via the LDAP standard. The user profile information can
contain typical personnel information (e.g. name, email address, telephone number, role in the organization, etc.), as well as personal preference information such as preferred methods of alerting (e.g. instant messaging, SMS, etc.). This user information can be synchronized with enterprise directories.

- **Personalization** - The personalization component provides a personalized context for collaboration, allowing the dynamic specification of what the preferred access mechanism is for incoming communication and what will be presented to the user based on the access mechanism, access device, specific application and user profile.

- **Enterprise Portal** - The enterprise portal component provides the ability to link communication capabilities seamlessly into new and existing enterprise portals. This includes the ability to access a multitude of communication-related functions (such as conferencing), either embedded into the business enterprise portal, or as a function of vendor portals (e.g. Lotus) that Avaya has partnered with. This includes capabilities such as single authentication, authorization and sign-on to systems and applications, whether from Avaya or third-party portal vendors.

The ability to create communications-enabled portals provides the access points, based on the Avaya underlying framework, for the anytime, anywhere, any mode personal communication that businesses require in order to succeed.

4.2 Business Applications and Communication Services Layer - Functional View

The business applications and communication services layer provides the framework to integrate communication and business processes. The real value of this layer is its ability to communication-enable business applications (i.e., integrate communication services with business applications) and to business-enable communication applications (i.e., integrate business rules and contexts with communication applications). Included in this capability is the ability to select a communication capability of choice, and embed it into a business process flow. For example, a business process flow that might include “Claims Process” can now also include:

- Alert appraiser and underwriter to resolve a claim issue
- Launch On Demand Conference with Claims decision makers
- Notify the customer of the status

The business applications and communication services layer is composed of three sub-layers: business applications, communications applications and communication services. A brief overview is provided below.

4.2.1 Business Applications Sub-Layer

The business applications sub-layer consists of the applications typically deployed by the enterprise to manage its operations more efficiently (back-office) or applications that face the user (portal). Examples include sales force automation, partner relationship management, supply chain management and employee relationship management. An enterprise value chain usually requires that business context and data be shared across these applications.
Intelligent communications solutions facilitate the integration of these applications with communications capabilities. For example, having a standard speech connector within the layer makes it easy to add speech access to either a sales force automation application or a human resource self-service application. In addition, intelligent communications applications solutions make it possible to leverage the business applications infrastructure to build communications applications.

4.2.2 Communication Applications Sub-Layer

The communication applications sub-layer defines the communication capabilities necessary to provide more efficient, timely, competitive and productive responses. This sub-layer is composed of several unified communication and telephony applications.

- **Multimedia Contact Center** - Businesses today are interacting with customers across more channels than ever before – including phone, web, email, and fax – with new channels such as VoIP, instant messaging and wireless emerging rapidly. Multimedia contact center applications provide consistent customer experiences across all these channels by integrating the channel technologies around a single customer view with common business decision-making, routing, management and interaction delivery. Simultaneous access to customer information is also supported, enabling effective cross-selling and up-selling tailored specifically to each contact. This consistent and personalized service can help increase customer satisfaction and retention.

- **Personal Collaboration** - Personal collaboration applications empower customers to communicate within and beyond their enterprise for better, faster decision making and superior responsiveness to customers, associates and suppliers. The building blocks for personal collaboration are: multimedia collaboration—for quick and easy voice, video and data interaction; message management—for simplified and integrated management of voice, fax, email and video images; contact direction—for seamless access to integrated directories from anywhere and from any device; personal assistant and mobility management—for setting personal rules that control how and whether a user is reached and how important messages are handled.

- **Enterprise Telephony** - These applications build on Avaya’s decades-long heritage in enterprise telephony leadership and bring industry-leading, intelligent call processing to the enterprise. It enables call control on a dynamic, call-by-call basis—along with full telephony functionality—then takes this capability to the next level by adding support for new applications, infrastructure and communications devices. Avaya’s MultiVantage™ Software represents the latest generation of this solution, delivering more than 500 highly reliable voice features that many of Avaya’s enterprise customers, which include more than 90% of the FORTUNE 500®, rely on every day. Avaya products support a broad range of industry standards for telephony, including JTAPI, ASAI, TAPI, H.323 and Session Initiation Protocol (SIP). With the new communication services (discussed below), enterprise telephony is also supported through a range of telephony web services for ease of integration into the business processing and portal frameworks of the enterprise.

The communication applications in this layer provide the repository of many of the communication services (described below) necessary to enable business processes to become “communication-enabled” solutions. In the evolution towards intelligent communications, these communication applications become more open and modular, supporting a range of applications interactions through a requested service call mechanism. Support for data exchange standards such as XML are also included to facilitate data exchange and integration with business applications.
4.2.3 Communication Services Sub-Layer

The Communication Services sub-layer is the foundation for Avaya Intelligent Communications. This layer contains the middleware “glue” that mediates between Avaya MultiVantage communication capabilities and enterprise business applications and services. It is here where Avaya developments in SIP and presence, SOA, market and communication events, business process integration, and user-context intelligence come together in a “perfect” storm” that will change the way in which enterprises view the use of communications.

Core capabilities in this layer include:

- **Presence**—Presence is a communication service that extracts information from communication devices and other applications to establish whether a person is present on the network and available on a particular communication device. This information can then be used by other applications to intelligently route communication requests to users.

- **Context**—Context refers to selecting the most appropriate person or resource for a transaction or service, and presenting the right information for personalization (right time, right format) based on information about the user that is maintained in a service directory. This information about the user includes, but is not limited to: user information and permissions (role in/outside of organization), presence, user preferences for initiating and receiving communication, end-point media capabilities and transaction histories.

- **Translation**—The translation component provides a full range of translation services to business and communication applications, including text to speech, speech to text, automatic speech recognition, interactive voice response (IVR) and various protocol translations from the device of the caller's choice to the most appropriate agent.

- **Rules**—Rules support the interaction of business process and communication capabilities based on a conditional event. For example, actions can be triggered based on the severity of a detected event, the time of day or the source.

- **Routing**—Intelligent routing combines information and resources from all the above functions to make a decision of how to best invoke a communication service that will keep business processes moving forward.

- **Events**—Avaya solutions are designed to sense, correlate and respond to events in real time as defined by the business. By continuously monitoring these transactions, the solution can generate new events, right-time alerts or initiate an intelligent communications flow to support business activity. When a significant event is detected – using complex event processing algorithms – the Avaya event processor responds with an event or real-time alert that enables organizations to take swift and intelligent action on critical business events as they occur.

Through the Communication Services sub-layer, communications transform from disparate capabilities within application silos, to discrete services that span across any business process, service, or application, all orchestrated through an “Intelligence Engine” that imbues the communication service with intelligence about the business context in which the service is being invoked, knowledge about the user context in which the service is trying to reach them, and knowledge about the communication resources that can service the request. This intelligent weaving of business applications, communications capabilities, and user context is what Avaya calls “Intelligent Communications”.
Why are Intelligent Communications important? Few enterprises today fully understand the business context in which their communications occur, yet real-time communications are the key to the normal operation of many business processes, and become critical when exception or crisis events require rapid response and quick decision-making. It is often during these situations that human interactions and communication are subject to the greatest level of latency and delay. Avaya Intelligent Communications, through the integration of business-context knowledge and user communication knowledge, help to increase business agility through rapid, intelligent responses to business events with a comprehensive multi-channel communication access architecture that finds and connects the right people, at the right time, with the right device. This communications integration enables businesses to keep their decision processes moving towards resolution, whether for application-to-application tasks, human-to-application, or application-to-human communications related tasks.

At the core of Intelligent Communications is the **Avaya Intelligence Engine**. The Avaya Intelligence Engine provides the event processing, service orchestration, and communication resources management for bringing integrated business and communication services to realization. It also incorporates user and business requirements into an intelligent decision-process through the incorporation of customer defined Business Rules, User Rules, and Rich Presence.

The Intelligence Engine provides multi-channel event driven rapid response, incorporating business-driven communication needs. It operates with real-time events that can be externally triggered from business applications, or internally triggered by system or user communication actions, and initiates the appropriate action given the business context. The Intelligence Engine can combine communication services for access across multiple MultiVantage communication resources, and is designed to weave business services and communication services together to create composite business services (see detailed description below). An important capability of the Intelligence Engine is resolving the appropriate communication resource to achieve the requested communication capability. It is designed to intelligently use the most optimal communication resource, or combination of resources, available anywhere in the network. This ability to rapidly scale communications through the optimal use of distributed communication resources provides a comprehensive, communications access architecture that can be used to support large scale requests, such as a multi-channel emergency notification in support of a real-time disaster recovery system. The Intelligence Engine also incorporates knowledge about user resource usage and is therefore able to select communications channels that are both available and optimal. For example, in an emergency situation if the user is busy on a call through a communications resource that does not support call interruption, the system may instead route out an emergency notification through another device or IM page to the user’s PDA.

The Intelligence Engine is designed to address the unique qualities of human communications. Voice communications within a business process context are often characterized by long-transaction and variable response times. Over a span of time, a user may also be involved in multiple communication sessions across a number of business processes. Avaya recognizes that support for synchronous as well as asynchronous responses to communication requests are required for the multiple real-world communication sessions that users are involved in today. Because of the potentially long duration of a communication session, the request of a communications service does not block the client or business process from continuing. Instead, processing continues and the Intelligence Engine provides an asynchronous response, sent within the appropriate business process context that provides information about the communication transaction.
The Avaya Intelligence Engine takes into consideration business context and policies as well as user preferences in its decisions to invoke communication services. For example, when a supply chain situation triggers an emergency event, it may require the interaction of the supply chain group, along with the manager of the group, to assess the situation and make a quick decision. Avaya Intelligent Communications confirms the availability of the individuals of the group, but determines from the manager’s presence information that he is not available. Probing deeper into the communications context of the manager’s current state, the Avaya Intelligence Engine establishes that the manager is on a conference call. Based on this context and priority of the event, it can intervene in the conference with a “whisper page” (interrupts into the existing call but only the manager hears it) to the manager with a message of the situation and then links the manager to a new conference call with the rest of the supply chain group.

The basis for creating this tight linkage of business applications and communications capabilities resides in two emerging technologies: Session Initiation Protocol (SIP), and Web Services in a Services Oriented Architecture (SOA). SIP is a new communications protocol that co-exists within an IP environment. The internet-centric design of SIP allows it to integrate easily with the web service environments being developed for many business critical applications. For enterprises, this means the introduction of powerful multi-modal communications, embedded as a service within their business applications. It also means that information on user presence can be incorporated into application business logic. Rich Presence gathers presence information about the state of users and aggregates that information into a single coherent picture that reflects the status of the user engaged in any communication activity. Since much of the value to be derived from intelligent communications is based upon finding the right individuals based upon a business event to collaborate and make timely decisions, the availability of those individuals involved becomes very important.

Web Services in an SOA construct provides the ability to create new business application integration that incorporates communication services. SOA is aimed at building high level interfaces between applications that allow them to share information and process flows. SOA promises to achieve higher levels of application interoperability which can result in better application integration with business processes, faster deployment of new capabilities, and increased flexibility for application and business process modification. Avaya’s adoption of the SOA methodology for defining and accessing base communications services enables its communications capabilities to be utilized by other enterprise applications. Communication services which have historically been isolated within Avaya’s traditional communications applications, are now being uncovered to extend their usefulness. Within SOA methodology, these services are now discoverable, provide coarse-grained business-level interfaces, have a network address, can be composed with business services and with each other, as they are now part of an integrated IP-IT convergence solution, and can be remotely invoked from anywhere in the network.

These advanced communication capabilities that originate from the underlying Avaya MultiVantage applications and exposed as self-contained, self-describing services with a web services interface are called Avaya Communication Services. As illustrated in the expanded layer shown in Figure 3, these services are discrete reusable components that leverage the rich communication functionality within Avaya. The web service abstraction facilitates access to the services in building new workflows and integrated applications, and enables the enterprise to map the use of their communications solutions to their business processes. Further, this loose coupling with the underlying MultiVantage communication resources provides new capabilities for communications-enabled business processing that can be event and exception driven.
Avaya Communication Services will encompass the entire scope of Avaya capabilities ranging from straightforward communications resource and media capabilities (e.g., make a call), to communications related data activities (e.g., change the user’s profile information), including areas related to telephony, voice, conferencing, speech, media, messaging, video, device (appliances), contact center, and unified messaging. These services do not rely on other services or specific communication resources. They are self-contained and self-describing through a well-defined interface called a service contract that defines the service’s capabilities, how to invoke it, what it takes as input, and what it returns as a response. Because these services are self-contained, they can be easily combined to create unique composite services with capabilities that span across multiple Avaya MultiVantage resources.

Avaya Communication Services work with the Avaya Intelligence Engine to create the key output that forms the heart of Avaya Intelligent Communications, called Business Composite Services. **Avaya Business Composite Services**, highlighted within the Avaya Communication Architecture in Figure 3, will be true business solutions that incorporate a business process workflow, including service and information requests from the enterprise business applications, transactions that combine both data and communication steps, parallel execution steps, and conditional branching based on business logic (see Figure 4).
An online healthcare appointment service provides an example of a simple business composite service. The business service workflow integrates the medical patient and appointment business applications, and provides multi-channel access through self-service voice or web portal communication services. Patients can view and set-up appointments either over the web or by calling the office and accessing the voice portal service. During appointment confirmation, patients are given the option to be added to a waiting list in case earlier dates become available. If another client cancels their appointment, the event processor triggers a new process workflow through the Intelligence Engine that initiates a call out to a client on the wait list and offers them the choice of taking the now open appointment. If the client accepts, the revised appointment data is updated in the system and available if the patient subsequently calls in or uses the web portal to check their status. This is exemplified in Figure 5.
As communication services are exposed, they can be formed along with business services and business process workflows into Business Composite Services. By utilizing Web Services in a SOA context, Avaya can make these services available in the same manner that enterprises are already starting to do with other business services extracted from business applications. Avaya’s Intelligence Engine along with plug-ins like Dialog Designer tool can work with existing enterprise SOA service creation environments such as the open source ECLIPSE Platform. This unlocks the true power of existing resource assets within the enterprise. Individuals can compose business-relevant applications, infusing the power of communication into those applications using standards-based design tools.

Almost any business process can substantially benefit from appropriate and timely use of the many services derived from intelligent communication today, especially when the right services “appear” at the ready based on situational context and respond according to business needs when a process encounters exceptions requiring human-process interaction or special purpose application processing. Avaya Intelligent Communications leverage the rich heritage of communication services from Avaya, which become an extensible set of building blocks organizations can utilize to achieve higher business performance while reducing time and resources needed for creation and deployment.

### 4.3 Converged Infrastructure Layer

The *converged infrastructure* layer includes system and network device solutions for routing, switching, voice communications and messaging, storage, and application service platforms. The importance of this underlying network infrastructure increases as enterprises link mission-critical business processes across dispersed stakeholders in the value chain. Through alliances with network infrastructure vendors such as Extreme Networks and Juniper Networks, Avaya Intelligent Communications can be deployed over a flexible, intelligent, always-available network to support the integration of real-time communications and business services within an SOA construct.

However, the Avaya Communications Architecture is based on the concept of seamless communications over an open, multi-vendor infrastructure. Avaya, Extreme Networks, and Juniper Networks offer open yet integrated solutions that contain best-in-class technology for routing, voice communications, and security. In addition, Avaya offers Avaya Application Assurance Networking which offers a new intelligent network overlay solution for many existing networks. Through a comprehensive approach to network monitoring, application-based assessment, and network optimization, intelligent overlay technologies introduce application layer intelligence across any network using open standards to help assure that the network delivers assured communication services wherever they are needed.

### 4.4 Application Development Environment

In the traditional model of applications integration, enterprises spend a great deal of time and money integrating large, monolithic applications via APIs and other semi-proprietary interfaces to databases and other 3rd party applications. Avaya, with its focus on SOA methodology, has set out to create a more efficient approach to applications integration. Since service oriented applications are designed to span business operations, it has designed its services to be handled in a unified way across a wide range of applications.

Avaya’s SOA strategy includes deployment of a number of tools in its Application Development Environment (ADE) framework that can be used to make the access to communications services within an enterprise’s SOA based application development environment such as the open source Eclipse platform simpler and customizable. These tools will enable professional application designers to
create customized vertical or horizontal applications that can be reused and easily managed. Using a common, open standards-based ADE, enterprises can easily define custom business applications that smoothly integrate multiple software capabilities regardless of vendor or original application intent. To reinforce the strategic focus of Avaya, the method of orchestration of business and communication services is reliant upon the open standards based approach, currently identified as Business Process Execution Language (BPEL). Avaya is active in the OASIS based BPEL committee to ensure real-time communication is intrinsic in the BPEL definition.

Avaya Dialog Designer is an example of Avaya’s first open source plug-in tool which ships free with Avaya Voice Portal and Avaya Interactive Response software. It allows speech application designers to use simple drop-down lists to choose context available objects with business meaningful names when designing various aspects of self service application components that reference other application components. Features such as these can make application design significantly easier.

4.5 Intelligent System and Network Management

Management and serviceability is vital to any solution. The complexity of managing a solution has a direct impact on its total cost of operation as well as its ability to support business agility. In addition to reducing complexity, management solutions must be able to fit within a large ecosystem that makes up the customer’s information technology infrastructure and be able to support accurate efficient problem determination and resolution.

An SOA infrastructure introduces some key challenges such as supporting flexibility and accommodating changes based on business direction and priorities. Because SOA facilitates a multi-vendor environment, management can become complex as services span across a diverse set of products. Avaya communication services, applications, and management services will utilize SOA practices. These solutions will strive to make communication services easy to deploy, easy to use, easy to maintain, and easy to integrate. Avaya supports existing management standards such as SNMP, LDAP, and JMX. In addition, to help reduce the cost of management in an SOA infrastructure, Avaya supports web service related standards such as WS Distributed Management (WSDM), WS-Management, and Web Services for Remote Portlet (WSRP).

Avaya communication services and elements use standard interfaces to expose management operations and information, and support industry style event formats to make it possible to report status and information consistently across services. This makes it easier to integrate Avaya services into an IT infrastructure, and easier to manage them through an Avaya or 3rd party enterprise management system. The management interface can be used for traditional provisioning, control, and monitoring support functions; in addition, management operations can be orchestrated through standard business process management languages such as BPEL (Business Process Execution Language). Avaya communication services also provide state and status information that can be leveraged to make proactive or adaptive decisions.

4.6 Services Support

Key to achieving faster customer response and improved operations is the ability to design, orchestrate, and support new solutions that link communications and business processes. Professionals from Avaya Global Services can provide the expertise, experience and consistent methodologies to take customers to Intelligent Communications, from planning through full implementation and Life-cycle support.
As companies move toward Web services for more flexible access to communications applications, professional services will play an increasingly important role in creating the applications functionality that will support new capabilities in an SOA environment. Professional Services from Avaya help IT and business managers to identify business processes that can be communication enabled by helping to develop technology and IT architecture roadmaps to support this transformation. As a result, Avaya can help business mitigate risks, leverage existing investments, and maximize potential benefits.

Professional services from Avaya also support enterprises on the design, development, and integration of custom software applications that enable the migration from traditional enterprise communications and contact center solutions into powerful, SOA-based solutions. By working with enterprises in the early stages of the solution development process, Avaya consultants can help ensure seamless integration between business processes and applications. Examples of such solutions include, Centralized IP agent greeting administration, and ‘click to dial’ MS Outlook functionality, as well as IP Telephony phone applications such as Webcam, hospitality menu, and news feeds to the phone’s LCD. Contact Center solution examples include web based reporting systems, and complex CTI applications such as business-driven intelligent routing, and self-serve speech enabled applications.

Avaya product support and managed service capabilities can play an important support role for the entire communications architectural model. Avaya software-based remote monitoring and management capabilities provide enterprises with highly reliable and available applications and network infrastructure. The availability and reliability of both are critical not only for existing telephony, contact center and collaboration but for new, communication enabled applications. Avaya Product Support Services are creating common software services and tools to deliver support across all the layers of the Avaya Communication Architecture. The Avaya Global Managed Services organization, through the award winning Enterprise Services Platform, provides remote manageability, serviceability, security, and reliability required for the complex communications infrastructures that support intelligent communications.

4.7 Summary of Avaya Communication Architecture Benefits

Delivering these critical components to support people, systems, processes, applications, portals, and partners requires a simple, easy way to integrate them into any business environment. That is the basis for the Avaya Communication Architecture—delivering the communication environment for the virtual enterprise today and into the future.

The Avaya Communication Architecture focuses on complete communication solutions that build upon existing as well as new infrastructures. It focuses well beyond converged infrastructure into intelligent communications and provides the framework upon which applications continually evolve to meet the enterprise’s changing needs.

In support of intelligent communications going forward, the Avaya Communication Architecture offers a set of communication services that can be shared by other application areas—including multimodal access, access control, personalization, context, and user directory. In addition, the architecture also offers an abstraction layer that separates the underlying infrastructure from the applications, enabling those applications to work seamlessly over a variety of multi-vendor, heterogeneous infrastructures. The framework supports anytime, anywhere and any mode communication on the user’s device of choice.
5 Utilizing Avaya Communication Services to Create Intelligent Communications

The Avaya model is evolutionary in its ability to accommodate existing infrastructures and investments while extending them to combine communications and data functions (horizontal dimension) and to take advantage of every form of communications resource from access to infrastructure (vertical dimension).

Scenarios for implementation are myriad, configurable to the needs of the enterprise. For example, a business process may invoke notification sequence as a service, which in turn invokes a multi-channel contact service. The services depend on the Intelligence Engine to utilize user presence and availability to reach a list of users (defined by the enterprise application) wherever they are and on their device of choice. It then sets up a conference-on-demand of all such users.

Other examples include a mortgage refinance request and response depicted in Figure 6, an airline rebooking scenario shown in Figure 7, and a personal productivity application in Figure 8.

In this example, Figure 6, a customer has previously requested a mortgage refinance through a business’ local branch advisor. The business’ employee evaluates the refinancing request, and desires to contact the customer for approval or rejection. The business’ financial transaction application uses a communications service to locate the customer, on whatever device the customer may be available, and communicates the refinancing quote. The customer receives the quote on their wireless device, which incorporates another communications service for text to speech translation, and allows the customer to use speech to approve or reject the quote. With spoken instructions, the customer can ask for more information, create a conference if need be (with the re-financing employee) and direct the financial...
application to perform some task, incorporating additional communications services to do so. This can be a branch office solution, and is not necessarily a customer contact center.

Figure 7 Airline Re-Booking Scenario

Figure 7 illustrates a scenario that defines a new level of service in air travel. A passenger is on board a scheduled flight awaiting departure when maintenance problems cause cancellation of the flight. The cancellation automatically alerts the reservation system, which then matches all affected passengers to alternative flights, tapping knowledge of both passenger preferences and booking histories. High priority messages, presence awareness and natural speech are employed so the passenger gets word of a rebooking commitment at the moment they walk off the plane. If need be, the passenger re-enters the process through contact with a human agent (Travel Advisor).
Figure 8 illustrates a personal productivity application enabled by communications. Joe has a scheduled conference call with Mary and Phil on his calendar. At the prescribed time, Joe’s “virtual assistant” dials his conference bridge number. The virtual assistant locates Joe based on his presence information, and locates Mary and Phil according to information in Joe’s local contacts list and their presence information. The virtual assistant then creates a conference-on-demand; conferences in Joe, Mary, and Phil; and brings up whatever information is necessary for their collaboration, such as the latest document revision, and transmits the information for retrieval by their device of choice.

The functional environment of the communications-enabled business model reflects Avaya’s intent to extend the range of software services that can make processes more efficient, more able to call for human decision, and most directly reach intended conclusions. Avaya offers both communication applications that can be integrated into an enterprise environment and also offers communications services that can be embedded into complex business applications, process flows and portals to achieve unique enterprise needs.

Avaya’s approach integrates with IT best practices in terms of service orchestration, shares common elements such as management and security capabilities with enterprise IT solutions and provides reliable, secure, distributable, high performance for real-time communications in concert with business. By actively participating in IT standards committees Avaya is infusing real-time communications into IT best practices.

The Avaya model is evolutionary in its ability to accommodate existing infrastructures and investments while extending them to combine communications and data functions and to take advantage of every form of communications resource from access to infrastructure.
6 Conclusion

Succeeding in business today is about using the power of communication—the power of converged networks, multi-service networking infrastructure, Contact Center, solutions for service providers unified communication, and communication as a service—to build deeper, more valuable, collaborative business relationships. The winners will be those businesses that integrate the inherent benefits of communication into their broader business, enabling efficient and long-lasting relationships and positioning themselves for the evolution to intelligent communications.

The Avaya Communication Architecture provides an evolving conceptual framework and migration path for delivering solutions that support this vision. The unified communications layer provides the anytime, anywhere, any mode personal communication that is required by the virtual enterprise. The business and communication applications layer enables the seamless integration of communication and business processes, increasing employee productivity and powering faster and better decisions among enterprises and their suppliers and partners. The converged infrastructure layer of this architecture provides the necessary converged networking cornerstone for the future evolution of enterprise communications.

Avaya is actively working with partners to create and deliver solutions for enterprises globally. Our strategic alliances range from business application providers such as Siebel Systems, to platform providers such as Microsoft and Sun, to a network of global systems integrators such as Accenture and IBM. In addition, Avaya works with industry innovators to develop third-party communications solutions for customers through its DeveloperConnection (DevConnect) program.

Enterprises need innovative partners to develop solutions that will capture opportunities and help them succeed. As a leader in communication networking with expertise in networking, communications and collaboration, Avaya is uniquely positioned to offer businesses a compelling framework for the future. Through the Avaya Communication Architecture, Avaya will continue to deliver the intelligent, interpersonal and integrated communication framework that enterprises need to exploit Intelligent Communications.

Avaya understands Intelligent Communications and its role in addressing the evolving challenges facing enterprises. Avaya has a long proud heritage and a clear focus on enterprise needs. With its industry-leading partners, Avaya provides a comprehensive set of solutions that allow customers to leverage existing investments and manage costs while improving productivity, increasing competitiveness and evolving at the pace required by their unique business needs.

Learn More

For more information on how Avaya can take your enterprise from where it is to where it needs to be, visit our Virtual Executive Briefing Centers for an online briefing click on Executive Briefings under “Connect with Avaya” at [www.avaya.com](http://www.avaya.com)
About Avaya

Avaya enables businesses to achieve superior results by designing, building and managing their communications infrastructure and solutions. For over one million businesses worldwide, including more than 90 percent of the FORTUNE 500®, Avaya’s embedded solutions help businesses enhance value, improve productivity and create competitive advantage by allowing people to be more productive and create more intelligent processes that satisfy customers.

For businesses large and small, Avaya is a world leader in secure, reliable IP telephony systems, communications applications and full life-cycle services. Driving the convergence of embedded voice and data communications with business applications, Avaya is distinguished by its combination of comprehensive, world-class products and services. Avaya helps customers across the globe leverage existing and new networks to achieve superior business results.

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