Overview of the Alcatel Managed Communications Services Delivery Architecture

Deliver compelling services to enterprises of all sizes through the right combination of network and premises-based solutions.

The convergence of several technology streams is simultaneously enabling new services and introducing new transforming competitive pressures in the enterprise market. The Alcatel Managed Communications Services Delivery Architecture (MCSDA) enables service providers to meet these new challenges with a holistic solution that addresses the spectrum of enterprise communication requirements – from small businesses to complex large organizations. This white paper explores the challenges facing service providers, and describes how the MCSDA addresses the following challenges.

■ Establishing the right network foundations not only to securely support application-level services, but also to deliver rich Managed Network Services.
■ How to enable mobile users to fully participate in these new applications as well as existing enterprise solutions.
■ How to deliver consistent user experience across network and premises-based solutions, by leveraging a service-oriented architecture and federation.

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Introduction

WiFi walks the line between fixed and mobile. Metro Ethernet muddies the water between LAN and WAN. Is collaboration a communications technology or a desktop application? The lines continue to blur. Obviously, these changes affect the capabilities available to enterprise users in a dramatic and positive way. Equally importantly however, they profoundly challenge traditional deployment scenarios and business models. As the lines between technology domains fade, so the boundaries between enterprise user and residential user, between enterprise and service provider, or even between different service providers, become more flexible.

Several capabilities that could until recently only be delivered by local premises-based solutions can now be more effectively delivered from a hosted location inside a service provider network – in fact, as we will see, for some mobility-related services this is the only practical approach. These dramatic changes in the telecommunications application architecture in turn drive new complementary requirements into the network and security infrastructure. At the same time, the increasing complexity of the enterprise communications environment is pushing enterprises to consider alternative, simpler, more cost-effective approaches that enable them to better focus on their core businesses.

Alcatel's holistic solution for delivering Managed Communications Services (MCS) enables service providers to meet these new challenges and opportunities in the enterprise market. It fundamentally recognizes that enterprise solutions will include both network and premises-based elements – in whatever is the most appropriate combination for a particular organization. It also recognizes that service providers will take many forms – be they telecommunications operators, systems integrators, application service providers or the internal service provider of a large enterprise.

Managed Communication Services and Enterprise Transformation

What each of these categories of service provider has in common is that they face a transformation in enterprise Information and Communications Technology (ICT). This transformation is driven by an unprecedented number of **major technology changes occurring at the same time**. Fundamental changes in broadband network technology, combined with new, application-enabling technologies like IMS and Web Services, are revolutionizing what is possible in terms of services, from versatile managed network services to presence-based mobile collaboration and conferencing, through to advanced service chain management and business process integration.

At the network level, service-aware networking enables broadband technologies like carrier-grade Ethernet, high-speed xDSL and passive optical networking to provide the customer-specific QoS and security required to deliver truly sophisticated **location-independent** enterprise applications. To deliver those applications in a consistent way between fixed and mobile networks, IMS provides a common session control architecture including support for global roaming between different mobile service providers. At the same time, users moving around inside enterprise premises have a compelling new access alternative in the form of **dual-mode**

cellular/WiFi phones. This is strategically significant, because around a third of mobile phone calls today originate inside the home or work premises[1].

Overlaid on this increasing flexibility of access are fundamental changes to how we will initiate communications and integrate communications into our business processes. Historically, phone calls have been initiated by dialing a phone number, but this "dialed number paradigm" is giving way to a "click-to-call" model of **presence-based** communication initiation, where the user simply clicks on a name from a buddy list or directory to place a call. Both service providers and enterprises will need to accommodate the complexities of this migration, including the integration of existing IN and PBX infrastructures.

In parallel we will see the **end of the mobile island,** as mobile handsets become full participants in the enterprise telephony environment. That means that users can have a single number, a single contact list, a single voice mailbox, consistent features across their desk and mobile phone, and access from anywhere to advanced applications such as **conferencing and collaboration**. Similarly, the sophisticated intelligence applied to customer interactions needs to move out of the physical constraints of the call center, to be available to anyone who forms part of the **service chain** involved in serving customers.

Managed Communication Services Challenges

The increasing complexity of the enterprise environment offers real opportunities to differentiate strongly through the cost-effective delivery of compelling, reliable, secure MCS services. But in order to execute that vision, service providers must overcome key challenges.

Build the Right Foundations

A *service-aware* packet network, combined with appropriate broadband access, not only enables high value Managed Network Services with *Rich Customer Self Service*, but also provides the *Secure, QoS-capable* IP transport that underpins other MCS services. An additional benefit for IP TV operators is that MCS can share a *common network with Triple Play*, with appropriate extensions to embrace mobile networks.

Enable the Mobile Enterprise Today

Driven by the impact of WiFi, mobility is the area of greatest change and opportunity for enterprises. What is a mobile enterprise? It is an enterprise where users are as productive as possible wherever they are – which means consistency of service, regardless of device or location. To realize that goal, an MCS solution must provide tight integration of circuit-switched and IMS mobile phones with a *broad range of PBXs*. The ability to use a single phone is a beginning, but an effective mobile enterprise needs more – a true *unified communications* solution that provides simplification of phone numbers, contact lists, messaging and bills.

Deliver Compelling Applications

Obviously, it is not sufficient to simply add mobility to the existing telecommunications paradigm, when that paradigm itself is changing. The move to presence-based call initiation

[1] 30% of all calls according to a 2004 Yankee Group survey

is driven in the enterprise by *conferencing and collaboration* applications. At the same time, the extremely sophisticated call-routing capabilities of the contact center, combined with mobility, promise to revolutionize the rest of the *service chain*. The technology challenge is not only to deliver such applications consistently via premises-based and hosted deployment models, but also to ensure that such solutions can both deliver services stand-alone, and elegantly add value to any third-party applications that an enterprise wishes to use – such as Microsoft Office Communicator.

Provide Value and Visibility

The service provider must clearly articulate why MCS is a more attractive proposition than an enterprise "doing it themselves". Beyond the service offerings, the business case must also be compelling. Fortunately, MCS can offer economic advantages both in terms of deployment flexibility – the ability to *mix network and premises-based* solutions to optimize costs – as well as the flexibility of *pay-as-you-go* contract options. However, value for money alone is not enough. Alcatel and third-party research consistently shows that *visibility and control* are also significant enterprise considerations that service providers must address.

Optimization and Innovation

How does a service provider *industrialize* its MCS service offerings so that *costs are optimized* while ensuring *rapid deployment of new services*? Key considerations in optimizing costs are a *smooth migration to IMS* – which helps optimize the timing of major network investments in both fixed and mobile – and a reduction in systems complexity through adopt-ing a *service-oriented architecture (SOA)* based on Web Services. The good news is that these same technologies also provide the best mechanisms to speed up the delivery of new services, by simplifying service innovation and streamlining the service creation process.

The Alcatel Managed Communication Services Delivery Architecture

To help service providers meet these challenges, we have developed the Alcatel MCS Delivery Architecture (MCSDA) – a **reference architecture** that describes network, service delivery, management and support systems capabilities as an **integrated solution** for delivery of compelling Managed Communication Services. The key design goals of the MCSDA directly address the challenges faced by service providers:

- provide rich customer self-service that fully leverages network capabilities;

- secure, QoS-enabled IP peering between premises-based and network solutions;

- integrate tightly with both IMS and circuit-switched network control – thereby providing a smooth migration to IMS, without constraining network choices;

- sophisticated interoperation between mobile phones and a broad range of PBXs;

- a complete, unified communications solution for all enterprises including mobile users;

Figure 1: High-level MCSDA
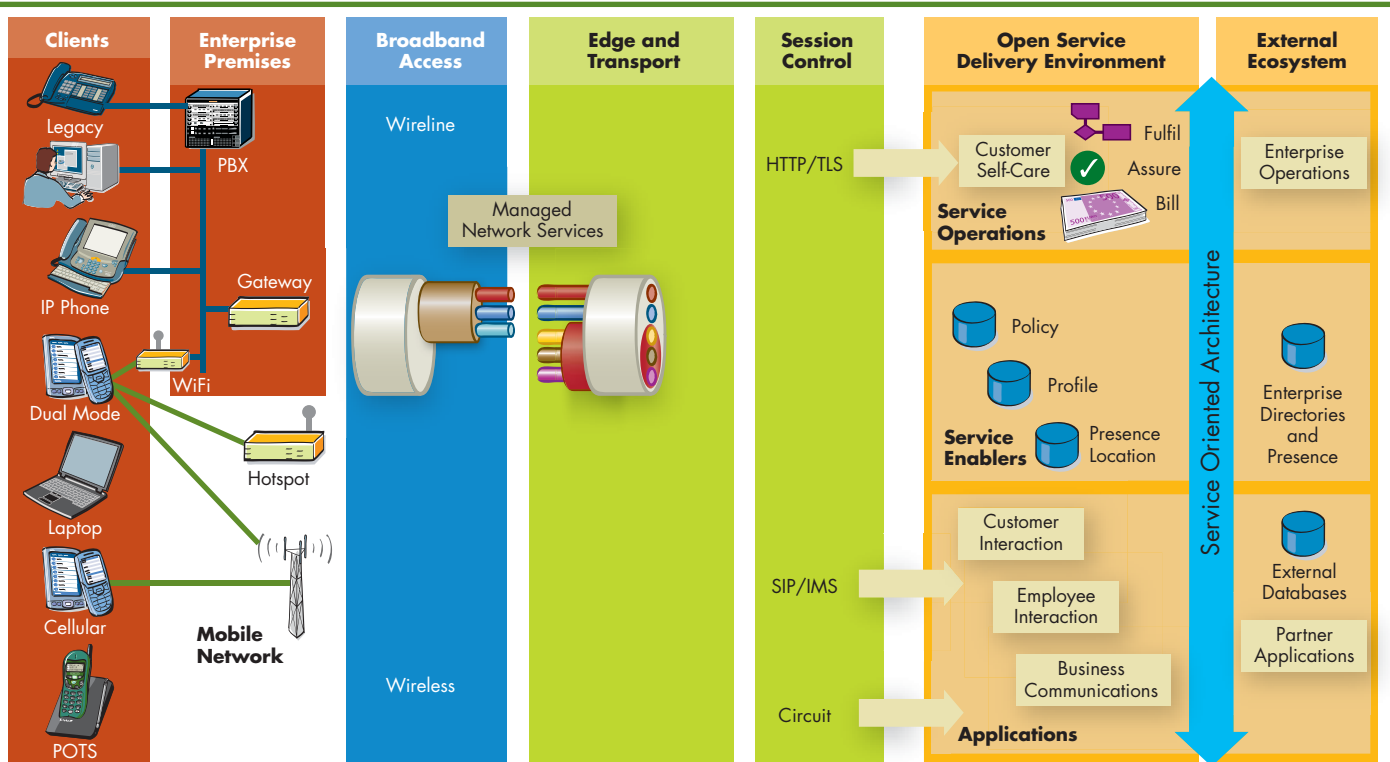
- conferencing and collaboration that works with or without premises solutions;

- extend the contact center to the rest of the service chain with mobile support;

- deliver consistency of user experience, regardless of deployment model;

- leverage SOA to reduce integration complexity and rapidly deploy new services.

Comprising several functional domains, the Alcatel MCSDA is unique in that it offers an integrated **end-to-end** view of network, service delivery and support systems (Figure 1).

Applications that deliver end-user services share **common Service Enablers** such as profile, presence and policy servers with the applications for Service Operations including Fulfill, Assure, Billing and Self-Service.

When hosted in a service provider network, this application environment is based on the Alcatel Open Service Delivery Environment (OSDE), which ensures a **common architectural approach** across different Alcatel solutions. However, consis-

tent with the MCSDA goal of deployment flexibility, it is important to emphasize that the application environment need not be fully hosted – it may equally be partially or fully **deployed in enterprise premises.**

The application layer supports the delivery of MCS services across different session control mechanisms including **IMS and circuit-switched**. These in turn share a common IP transport leveraging **service-aware routing** across a variety of broadband access types that terminate on a premises gateway appropriate to the combination of premises type and MCS service.

Building the Right Foundations

By leveraging the same service-aware network foundations used by Alcatel's Triple Play solutions, the MCSDA is able to deliver not only the secure, QoS-enabled IP transport required by application-level services, but also sophisticated layer 2 and layer 3 Managed Network Services with rich customer self-service (Figure 2).

Alcatel is leading the industry in service routing and switching solutions, offering products that are purpose-built for service-oriented layer 2 (virtual private LAN service – VPLS) and layer 3 (RFC 2547bis IP-VPN) solutions.

Figure 2: The Right Foundations
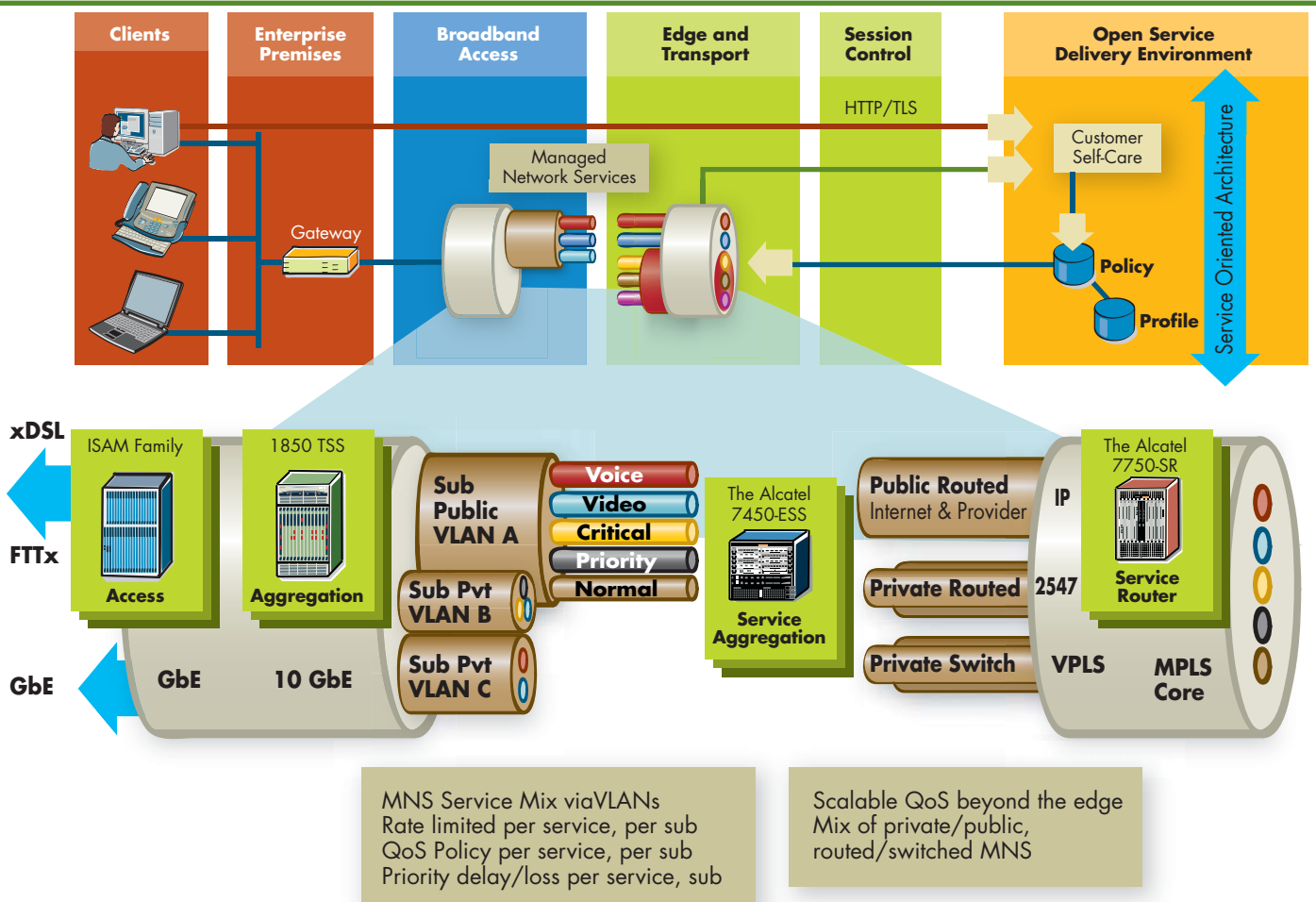
Service edge functions are delivered by a combination of the Alcatel 7450 ESS (for layer 2 services) and the Alcatel 7750 SR (for layer 2 and layer 3 services). The A7450 ESS and the A7750 SR provide non-stop operation, with restoration around a link failure in less than 50ms using VPLS/MPLS fast re-route, and recovery in milliseconds from a control plane failure.

More importantly, this architecture delivers per-customer QoS at the service aggregation level where it scales. An MPLS core provides "hard" quality of service, providing deterministic service guarantees. However, the MCSDA takes this further by leveraging hierarchical scheduling, which allows service providers to prioritize different services – such as VPLS and Internet access – over the same physical connection, and combine them into one overall Service Level Agreement (SLA). Such capabilities in turn enable meaningful per-site service-level controls and service-level reporting through a high-value Customer Self Service portal. The value that can be delivered through the portal is directly related to the capabilities of the network! It is critical not to underestimate the importance of this element – 90% of IT Exec-

ilarly, the unique IP features of the Alcatel 7302 ISAM family extend service intelligence across diverse access architectures including DSL technologies (e.g., ADSL2plus and VDSL2) and deep fiber deployments (e.g., FTTN and PON).

Finally, at the customer premises, the MCSDA leverages Alcatel premises solutions (such as the Alcatel Omniswitch 6200/6850 and the Alcatel 7250 Service Access Switch) to provide an integrated, end-to-end Managed Network Services solution supporting multiple access types with rich customer self-service.

Enabling the Mobile Enterprise

Prompted in part by the emergence of WiFi and dual mode phones, enterprise managers are increasingly looking at how mobile solutions can improve business performance, and how mobile phones will interact with the rest of the enterprise telecommunications environment.

In an all-IP world, SIP provides an elegant path to achieve this integration between mobile phones and enterprise appli-

Figure 3: Enabling the Mobile Enterprise
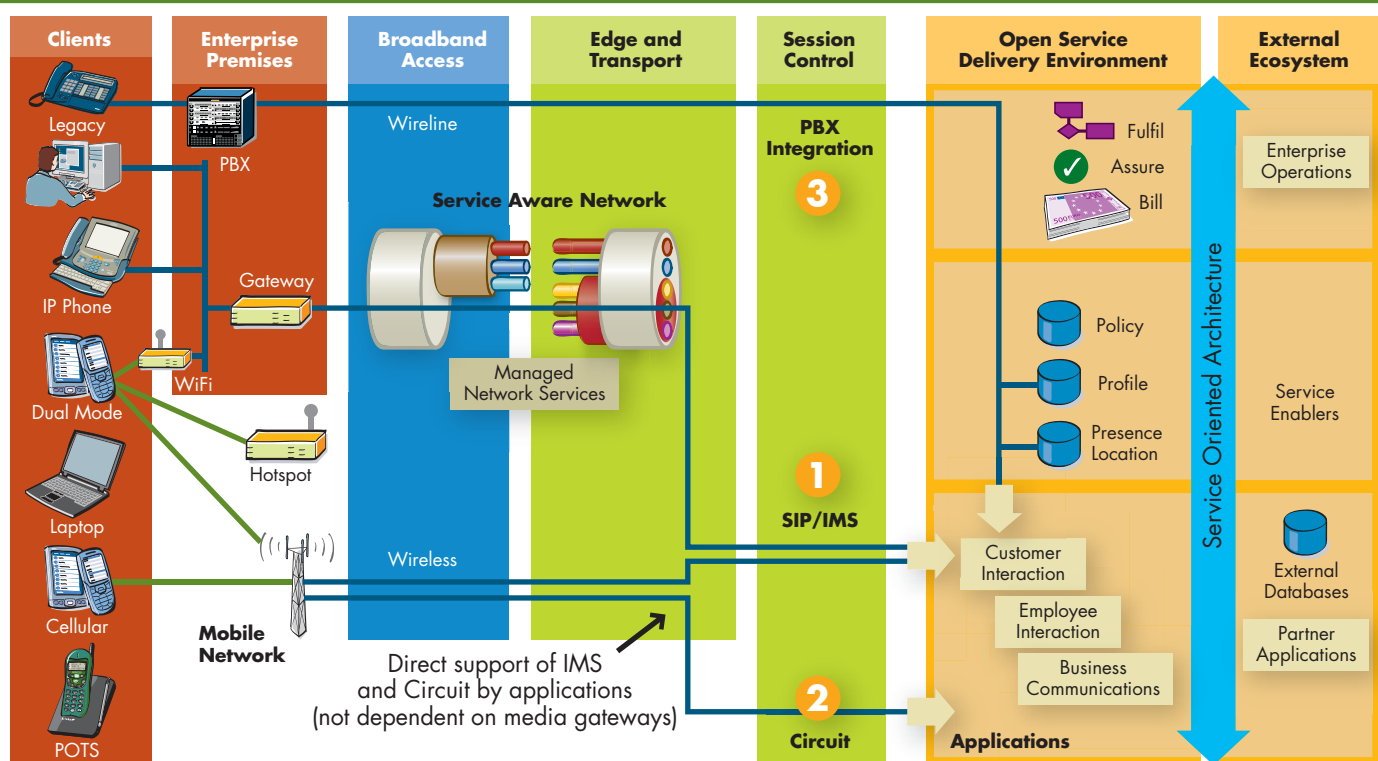
utives consider real-time visibility and control to be an important factor when selecting a Managed Network Service.

But how can a service provider ensure that these capabilities are available to the widest possible geographic coverage? While both the A7450 ESS and the A7750 SR can directly support Ethernet leased lines, in situations where connectivity is required towards PDH traditional leased lines, the Alcatel 1850 Transport Services Switch can support both PDH and Ethernet from the same platform. This provides cost-effective physical aggregation, while connecting towards the A7450 ESS and the A7750 SR service-aware elements as a spoke in a hierarchical VPLS cloud. Sim-

cations. As illustrated by circle (1) in Figure 3, SIP-based session control inherently enables fixed and mobile devices to share the same applications – lowering complexity and improving the consistency of the user experience. For fixed and mobile service providers, the MCSDA specifies an IMS core based on the Alcatel 5020 Softswitch.

However, in parallel with the deployment of IMS, many users (especially mobile phone users) will continue to be supported by circuit-switched networks for some time. There are two different mechanisms for support of circuit-switched devices by

a common application environment: either the use of media gateways (e.g. the Alcatel 7510 and the Alcatel 7515) to control the circuit-switched network via an SIP/IMS interface on the application server; or direct support of both SIP/IMS and circuit-switched (intelligent network) interfaces on the application servers themselves, as illustrated by circle (2) in Figure 3. In the MCSDA, relevant applications – such as the Alcatel 8640 Corporate Mobility Manager (CMM) – support both approaches. This unique flexibility is important, because there are significant differences in network economics between the two approaches, depending on the specifics of a particular service provider.

Another area where the MCSDA provides engineering flexibility is in the choice of mechanisms for session continuity – that is, the ability to continue a session when moving between WiFi coverage and cellular coverage (primarily in the case of dual-mode phones). For example, for a CMM Virtual PBX user, session continuity could be provided at the network level via UMA utilizing just the CAMEL interface on the CMM – the UMA phone appears just like a regular GSM phone to the CMM Virtual PBX. Alternatively (and more commonly with CMM deployments), session continuity is performed at the application level by the Intelligent Mobile Redirect (IMR) module, running alongside the Virtual PBX module on the CMM. In this case, both the SIP and CAMEL interfaces on the CMM are used (for WiFi and circuit-switched cellular access respectively), and the IMR module handles the session continuity. A similar application-level solution is available for premises-based deployments (the Alcatel OmniPCX Enterprise Mobility Server). The application-level solutions provide a richer feature set, while the UMA approach can be attractive in terms of its simplicity and the associated speed-to-market advantage for mobile service providers. Either way, the MCSDA provides an elegant migration for "one-phone" services as mobile networks move from circuit-switched to IMS.

The emergence of compelling "wireless PBX" applications (such as the CMM Virtual PBX) means that, for some smaller enterprises, it is no longer necessary to maintain their own on-site PBX. However, for most larger enterprises, that is not a practical option, so the key question is how to make the mobile phone interoperate seamlessly with the existing PBX infrastructure – illustrated by circle (3) in Figure 3. Protocol suites that can be used for such PBX integration include the Session Initiation Protocol (SIP) and related standards for Voice over IP; Q-SIG, which supports interoperation of different vendors' PBXs over TDM; and Computer Telephony Integration (CTI) mechanisms. At first glance, SIP or Q-SIG gateways appear attractive in terms of simplicity, but can only support basic features. To deliver the more sophisticated features that are typical enterprise requirements – such as manager-secretary features, ring back when free, twinning (simultaneous ringing of PBX extension and mobile) – it is necessary to use a CTI-based PBX integration mechanism. Because of its broad enterprise portfolio, Alcatel can support each of these PBX integration approaches. However, because it is important to support advanced features that enterprise users have come to expect from their PBXs, the MCSDA specifies a CTI-based solution using Genesys T-Server technology, which can support nearly any PBX from any major vendor.

The ability to work with such a broad range of PBXs is a very strong differentiator for the Alcatel MCSDA, and allows service providers to maximize their addressable market. However, in many situations the service provider (perhaps in combination with other channel partners) will deliver an end-to-end solution combining network-based services with premises-based solutions, such as Alcatel's OmniPCX Enterprise and OmniPCX Office, for larger and smaller businesses respectively. In such situations, the MCSDA ensures that an end-to-end Alcatel solution delivers an even richer and more consistent user experience.

While advanced integration of PBXs is an important strength of the MCSDA, it is important to emphasize that MCS must go well beyond "mobile enablement" of the traditional PBX-oriented "dialed-number" paradigm of enterprise telecommunications. Instead, MCS service offerings must anticipate and embrace the revolution in enterprise communications caused by a shift to presence-based call initiation. The MCSDA therefore naturally incorporates Alcatel's best-of-breed solutions for the three application areas addressed by Alcatel's MCS Framework: Business Communications, Employee Interactions, and Customer Interactions. In fact, the richness of this application environment is arguably the greatest strength of the MCSDA. Since it encompasses diverse applications, across the spectrum from rich multimedia collaboration and conferencing to the market-leading Genesys Contact Center range, it is in itself a broad topic. The application environment, and its evolution to mobility, will therefore be addressed, along with more detail on mobility considerations, in a separate white paper entitled "MCS Delivery Architecture: Enabling the Mobile Enterprise".

Secure Federation in a Service-Oriented Architecture

Where practical, the MCSDA leverages Web Services and Service-Oriented Architecture. Among telecommunications vendors, Alcatel is unique in the concrete steps it has taken to deliver on the promise of Web Services. Firstly, building on initial industry standardization efforts, Alcatel has defined an Alcatel Web Services Profile that will be used on all Alcatel Web Services interfaces. Secondly, for enterprise services, Alcatel has already defined and implemented a broad set of Web Services interfaces that are used by some 450 application partners to deliver rich, vertically-oriented solutions. These are currently available on the Alcatel OmniPCX and Unified Communications solutions, and will be extended to other elements of the MCSDA.

Web Services are an important part of the MCSDA integration solution, but by no means the only part. From a telecommunications architecture perspective, it could sometimes be tempting to suggest that everything would be simpler if all service enablers were network-based – especially profile and presence. And while some enterprises might be attracted to this approach, the reality is that a majority of larger enterprises will, often for good reasons, maintain their own profile, policy and presence solutions.

Despite this, the MCSDA must deliver on the promise of consistency between network and premises-based deployments.

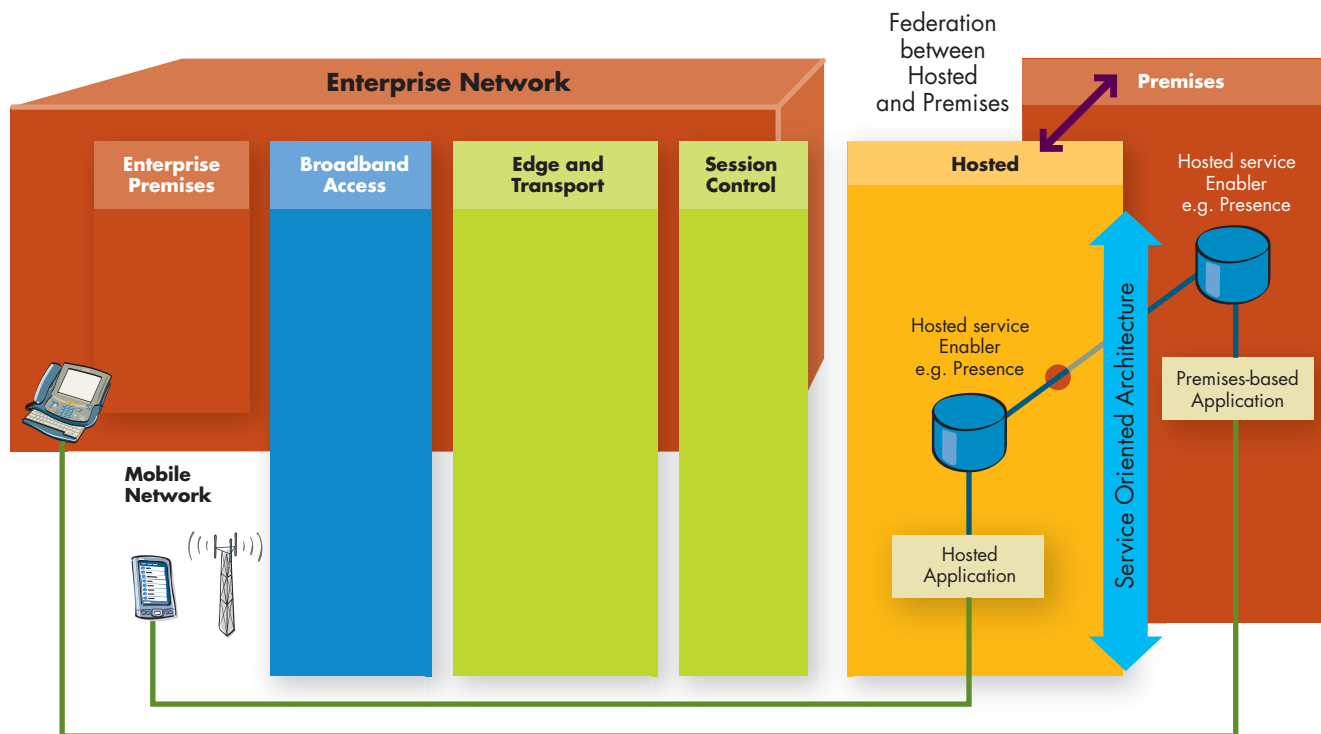**Figure 4: Federation between Hosted and Premises Applications**

Figure 4 illustrates how a hosted application (e.g., Alcatel 8628 Multimedia Instant Conferencing) using a shared service enabler (e.g., the Alcatel 5350 Presence Server) federates information with an equivalent combination of service enabler and application in the premises (for example Alcatel myTeamwork, or a third-party solution such as Microsoft Live Communications Server).

Conclusion

The MCSDA brings together a wide range of Alcatel capabilities, including many that are unique to Alcatel: managed network services that leverage service-aware routing; network applications that directly support both IMS and IN protocols; a proven, multi-vendor PBX integration solution shared across mobile enablement, collaboration and contact center solutions; conferencing solutions that offer sophisticated features, either stand-alone or integrated with third-party solutions; and, most importantly, consistency between network and premises-based solutions, backed up by a huge range of third-party application developers.

What the MCSDA adds on top of all these unique capabilities is something else unique to Alcatel – it encapsulates the very hard work of determining how the different solutions fit together to enable enterprise services that are truly compelling and cost-effective.

As with Alcatel's other end-to-end integrated solutions, that up-front work means that service provider customers can meet the very real new challenges in the enterprise market more quickly, more efficiently, and – most importantly – more competitively.
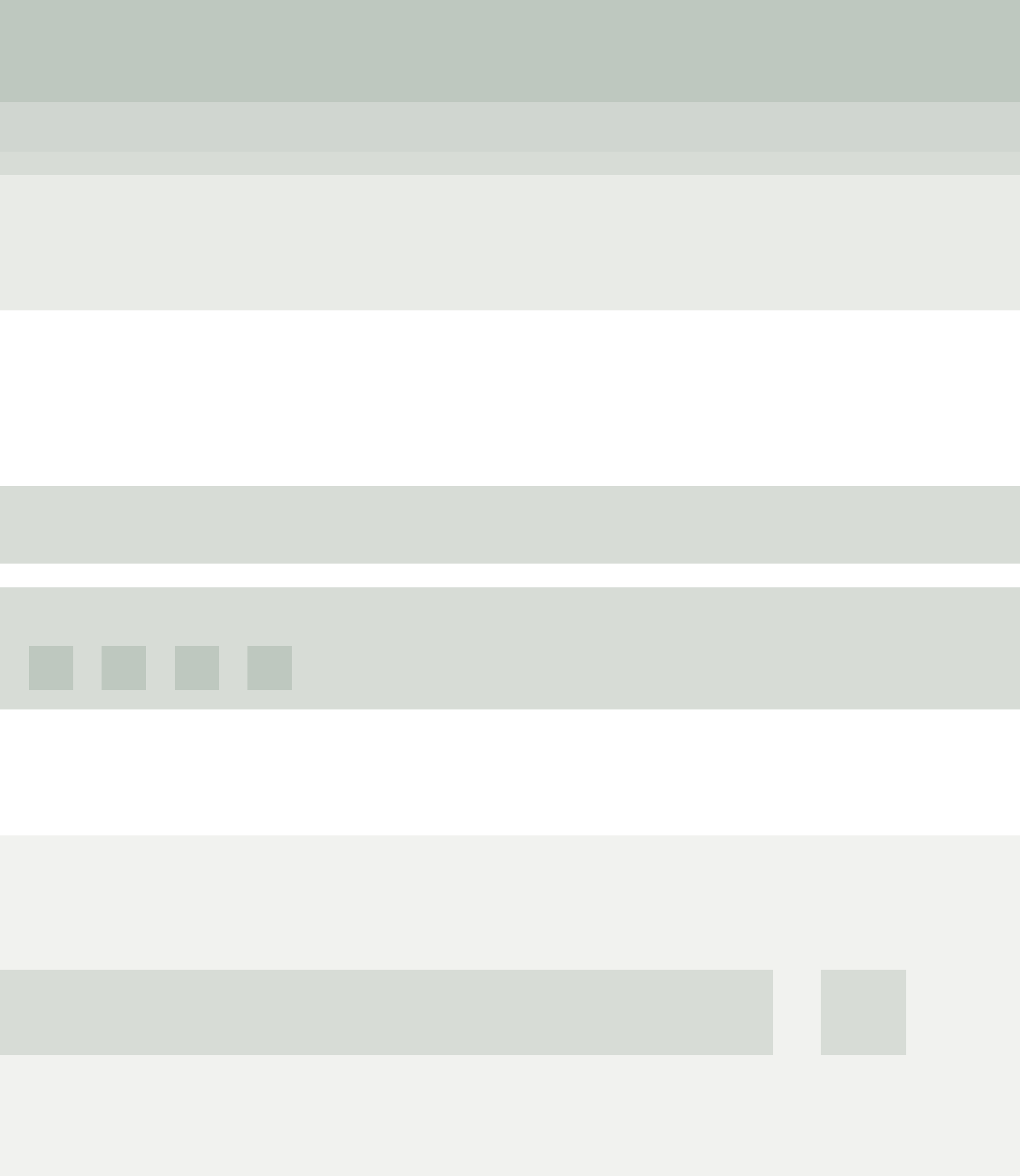
Glossary

BPEL	Business Process Execution Language
CAMEL	Customized Application for Mobile Enhanced Logic
CC-XML	Call Control XML
CDMA	Code Division Multiple Access
CMM	Corporate Mobility Manager
CTI	Computer Telephony Integration
DIAMETER	IETF Authentication protocol
DSL	Digital Subscriber Line
ESS	Ethernet Service Switch
FTTN	Fiber To The Node
GbE	Gigabit Ethernet
GPRS	Generalized Packet Radio Service
GSM	Global System for Mobile Communications
HTTP	Hypertext Transfer Protocol
ICT	Information and Communications Technology
ICT	Information and Communications Technology
IMR	Intelligent Mobile Redirect
IMS	IP Multimedia Subsystem
IN	Intelligent Network
ISAM	Intelligent Service Access Manager
IVR	Interactive Voice Response
LAN	Local Area Network
LDAP	Lightweight Directory Access Protocol
MCS	Managed Communication Services
MCSDA	MCS Delivery Architecture
NGN	Next-Generation Network
OSS	Operation Support System
PBX	Private Branch Exchange
PDSN	Data mode in a CDMA network
TLS	Transport Layer Security

PON	Passive Optical Networking
PSTN	Public Switched Telephone Network
QoS	Quality of Service
RFC	Request For Comments
SIP	Session Initiation Protocol
SOA	Service-Oriented Architecture
SR	Service Router
UMA	Unlicensed Mobile Access
Voice XML	Markup for IVR interactions
VPLS	Virtual Private LAN Service
WAN	Wide Area Network
WiFi	Set of standards for high-speed, short-distance wireless data transmission
WiMAX	An emerging standard for medium-distance wireless data transmission
XML	Extensible Markup Language

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