

## Making it happen: the next-generation communications platform

Alcatel's **solution** for next-generation public networks

- **Multimedia services in the new communications era must match the quality and feature richness of today's voice services while proving equally profitable.**
- **Value-added features will unlock the revenue potential of new, convergent services.**
- **Effective convergence of services is achieved through convergence in networks.**
- **Different players need different networking solutions. Yet all solutions need to maximize operator value.**
- **Networks should be built from a toolbox of functional components that together provide the required capabilities.**

These statements describe the main challenges for next-generation networking. They imply a need for new, enhanced platforms to enter fully the new communications era.

Alcatel's service-ready platforms enable operators and service providers to cut costs and boost efficiency while leveraging the new era's many revenue opportunities. Switching and routing solutions from Alcatel harness the latest technologies to deliver the integrated market-driven services. They incorporate the flexibility needed to adapt as market changes continue to transform the future.

### 1. Solutions for a changing marketplace

Booming opportunities have spurred a host of new players to enter the communications industry, changing the market dynamics for everyone involved. The breakdown of the conventional value chain is redefining roles and technology is constantly advancing. Traditionally separate infrastructures — such as fixed and mobile, voice and data — are converging, even integrating. End-users are becoming more demanding. The definition of communications services is expanding and changing as the choice of new communications services is exploding.

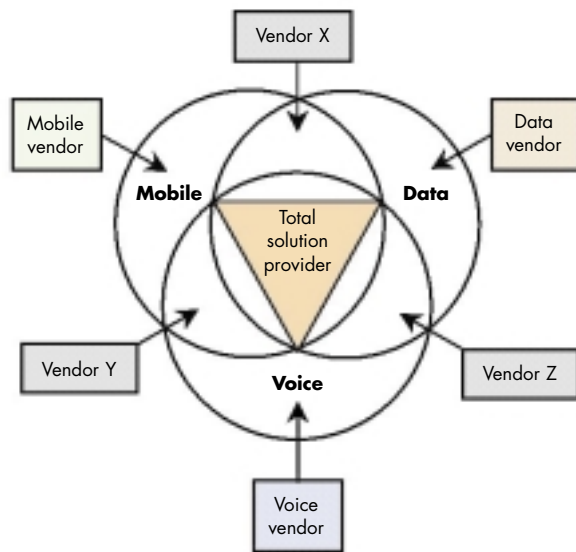
To deliver effective networking solutions for this new communications era of integrated services, expertise is needed in a number of areas. Next-generation platforms must integrate the

sophisticated call control of state-of-the-art voice networks with the efficient transport mechanisms of data networking. The stability and reliability of fixed networks need to be extended to integrated fixed-mobile service. Integration capabilities are required in order to deliver total solutions from a vast range of building blocks.

As a total solutions provider, Alcatel has capabilities in all these areas (see Diagram 1). Alcatel's broad portfolio, vast expertise, proven networking experience and industry-leading position makes it the natural networking partner choice for operators and service providers.



Diagram 1: Key areas of expertise for a total solutions provide



### 1.1 Switching and routing in the context of Alcatel 2iP Solutions

The Alcatel 2iP<sup>1</sup> portfolio is an integrated range of powerful next-generation end-to-end solutions, from desktop access through core transport. Harnessing native Alcatel know-how (including recently acquired technology from Internet leaders), Alcatel 2iP enables operators and service-providers to offer corporate customers and residential end-users complete communications solutions for the IP era.

The portfolio extends from high-speed access via ADSL<sup>2</sup> and HFC<sup>3</sup>, to wire-speed gigabit routing, broadband switching, fixed-mobile convergent platforms, and a host of other networking elements. End-to-end service capability is ensured through a shared network-wide intelligence platform.

Alcatel's new enhanced switching and routing products are the cornerstones of these next-generation solutions. In high-performance voice networks, switches already control the delivery of end-user services. At the core of data networks, routers transport ever-increasing traffic volumes. Next-generation networks need to combine this service-delivery capability and high-volume transport capacity into value-generating multimedia service platforms.

**Switches and routers created from long experience in communications services and leveraging leading-edge data technologies are the engines of next-generation networks.**

## 2. Key building blocks

Network solutions must be built from a toolbox of elements that together provide the needed capabilities while allowing new components to be added as requirements and business visions change.

This section gives details on the main tools Alcatel is offering for next-generation networking solutions.

### 2.1 Call control

In simple terms, a communications service consists of delivering contents optimally through the network with any desired value-added features. A major task in providing such a service is carried out by call control — handling the call or session through the network path — and service control. In traditional voice networks, both functions are carried out by narrowband exchanges.

For next-generation multimedia networks, Alcatel offers two solutions for call control, based on the proven capabilities of the Alcatel 1000 switching system:

- The Alcatel 1000 Call Server ensures high-level service features in voice-over-packet and multimedia networks;
- The Alcatel 1000 Multimedia Multiservice switch-router heightens the Alcatel 1000's call-control and switching performance by integrating next-generation services.

**The Alcatel 1000 Call Server and the Alcatel 1000 Multimedia Multiservice switch-router leverage Alcatel's experience and expertise in call control and service control.**

The Alcatel 1000 Call Server and the Alcatel 1000 Multimedia Multiservice switch-router are both based on proven technology for service provisioning, call processing, and signaling, and both deliver carrier-class multimedia services. By delivering this capability with two vehicles, Alcatel has optimized its resources to handle two different implementation scenarios.

#### **Alcatel 1000 Call Server**

In essence, the call server makes it possible to support today's high-quality voice service in data networks, while creating multimedia services that run along with legacy services. The main responsibilities of the call server are signaling, call set-up and call release. The call server effectively routes voice calls over the data network, providing communications services to voice-over-data customers.

In order to perform this service successfully, the call server must be based on proven call control functionality. This further ensures error-free interworking with voice networks as well as service transparency across networks.

### **Call server implementation scenarios**

A highly flexible component, the call server performs specific services depending on the networking scenario.

#### **Voice trunking over data network**

In this scenario, the call server converts narrowband signaling to ATM or IP signaling and tells the network to convert traffic from specific voice channels to and from packets using selected coding algorithms. The call server routes calls from a source gateway to the right destination gateway. In this simple scenario, the call server provides only call control.

#### **Transit exchange replacement**

If there is an operator boundary between the circuit-switched voice network and the data network, the call server performs additional services involving an enhanced call handling function. Typically, the transit network operator wants to provide services such as IN, credit card, ISDN interfaces, and charging. (Note: The call server can also provide the transit facility in a single-operator network.)

#### **Local exchange alternative**

Local exchange substitution is relevant in two cases. First, an incumbent operator may decide to expand a data network to carry telephony traffic. Second, a new operator without a local exchange yet wanting to offer telephony services over traditional copper access and terminals needs an alternative solution. In both cases, the voice-over-data network has to play the role of a complete voice network including local exchange services. Subscribers should be unaware that voice calls are carried over a data network.

With a call server solution, POTS and ISDN users connect directly via an access device to a gateway. (The gateway may also be integrated with the access device.) For service continuity, the call server provides all local exchange services.

The Alcatel 1000 Call Server is a high-density standalone version of the Alcatel call control system. From its predecessor it inherited call-processing software and service functions. IP<sup>4</sup>-related interfaces (such as the H.323<sup>5</sup> and MGCP<sup>6</sup> standards and the SIP<sup>7</sup> interface) and service logic for data and convergent services have been added to create a true multimedia-enabling product.

### **The Alcatel 1000 Call Server enables next-generation networks to offer high-quality multimedia services.**

The benefits offered by the Alcatel 1000 Call Server further includes the following capabilities:

- The server runs on open industry-standard computing platforms;
- Multi-unit configurations can support millions of subscribers;
- The control server can be collocated with a gateway or a switch, or it can be located with centralized control centers that manage geographically dispersed gateways;
- It can be deployed in both voice-over-IP and voice-over-ATM<sup>8</sup> networks

### **Alcatel 1000 Multimedia Multiservice switch-router**

Today, nearly one billion subscribers are connected to narrowband exchanges. These networks operate reliably and offer a rich set of services, thanks to advanced provisioning of services, management, call control, and signaling. It is natural to capitalize on these proven switching capabilities for next-generation networks. At the same time, next-generation networks should take advantage of the latest technology advances in telecommunications.

### **Capitalizing on Alcatel 1000's proven narrowband performance, the Alcatel 1000 Multimedia Multiservice switch-router is a platform for key next-generation network services.**

Alcatel 1000's flexibility enables operators to take both these considerations into account. It evolves smoothly to the next generation with simple enhancements that provide new service modules. In this way, exchanges now in circuit-switched networks are upgraded to serve the multimedia communications era optimally.

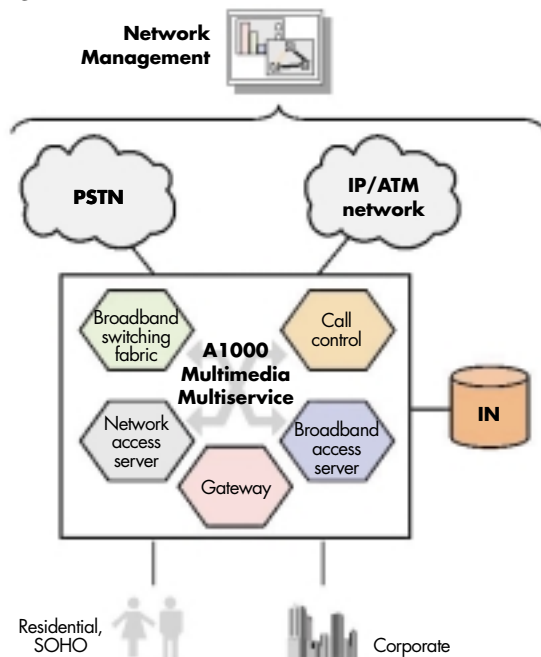
This development path allows the Alcatel 1000 to grow in three dimensions. First, to handle the rising traffic, the capacity and scalability of the switching nodes are being enhanced significantly, with respect to both processing power and total configuration. Second, programming interfaces are now open to allow for greater flexibility. Lastly, the exchanges support a broader range of services, handling traffic from a variety of access sources.

Specifically, the next-generation Alcatel 1000 enables introduction of the following new service classes:

- ATM connections (permanent and switched);
- Voice-over-ATM interworking, with access to an ATM transport network in circuit-emulation or switched mode;
- Interworking of Voice over IP trunking;
- IP Virtual Private Networks, and leased lines over ATM and over SDH<sup>9</sup>/SONET<sup>10</sup>;
- Voice over IP access.

Diagram 2 illustrates the key capabilities of the Alcatel 1000 Multimedia Multiservice switch-router in a next-generation public network.

Diagram 2: Alcatel 1000 Multimedia Multiservice switch-router



- The control element provides the sophisticated call-handling capabilities and rich service profiles of traditional voice networks;
- The gateway module allows the switch to connect directly to a packet network for transport of voice-over-data traffic;
- The narrowband network access server function terminates data over voice traffic<sup>11</sup>;
- The broadband access server terminates data over voice traffic originating from high-speed, broadband access methods such as ATM, cable TV, and ADSL<sup>11</sup>;
- The switching fabric is upgraded to a broadband matrix with integrated TDM<sup>12</sup>, ATM, and IP switching capabilities.

To augment the switching matrix further, the Alcatel 1000 Multimedia Multiservice switch-router provides an integrated IP-routing function, effectively enabling it to serve as an edge switch-router in a data network.

**The Alcatel 1000 Multimedia Multiservice switch-router is a compact network engine for new operators, ensuring carrier-grade Quality of Service.**

The service concentration provided by the Alcatel 1000 Multimedia Multiservice switch-router is optimized for full-service providers. Both incumbents and new operators will benefit from the growth of proven capabilities compared to developing completely new products. For the installed Alcatel 1000 base, additional advantages are smooth evolution and guaranteed interworking with the existing network, plus service continuity. Specifically,

the Alcatel 1000 Multimedia Multiservice switch-router supports users on legacy Alcatel 1000 switching systems.

**The Alcatel 1000 Multimedia Multiservice switch-router enables existing Alcatel operators to protect 95% of their network investment, and use existing exchanges to offer customers new services.**

The Alcatel 1000 Multimedia Multiservice switch-routers also serve as next-generation mobile switching centers — supporting the GPRS<sup>13</sup> and UMTS<sup>14</sup> standards — and as combined narrowband/broadband transit exchanges.

## 2.2 Gateways linking voice and data

Integrated services — spanning voice and data, fixed and mobile — depend heavily on the interworking of networks: the passing of information and calls from one network to another. This is where the gateway plays an important role in the next-generation network. Simply put, the voice gateway allows voice calls to pass from the circuit-switched network to a data network, and vice versa. Main functions performed by the gateway include voice processing and signaling between the circuit and packet networks.

**The gateway provides the means for delivering communications services across circuit-switched and packet-switched network platforms, as well as between fixed and mobile networks.**

The specific gateway implementation depends on the specific networks involved, the topology of these networks and the location of the gateway in the network. Alcatel's comprehensive gateway family delivers different mixes of the required capabilities. The portfolio has been developed with extensive input from Assured Access, an Alcatel company that is an industry leader in IP technology and remote access nodes.

### Access gateways

Integrating a broad range of access means, the access gateway is a key enabler for efficient multimedia services. Alcatel has designed a sophisticated range of multiservice access nodes and access concentrators to perform these services.

The Alcatel 1000 RSU and CSN access units are highly flexible concentrators enabling operators to address any mix of customers, even allowing a unit to be dedicated to only one type of access.

**Access gateways to next-generation networks must be flexible enough to be optimized for any network scenario, allowing operators to serve any combination of customer access preferences.**

The Multiservice Access Node and the Litespan merge traditional data access devices, xDSL access products and voice concentrators into a single unit interfacing to the network. The resulting mix of services include traditional voice, ISDN<sup>15</sup>, leased lines, and broadband services such as ATM, frame relay, and IP.

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**The Multiservice Access Node allows operators to take advantage of new revenue opportunities easily, and enables major network cost savings.**

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Alcatel's access portfolio has been developed to optimize operators' profitability:

- Operators can serve different types of customers accessing the same network infrastructure. In particular, operators can immediately address new market opportunities arising in the area covered by the access gateways.
- Integrating different types of traffic at the access levels means that different services can be transported transparently through the network core.
- For a typical operator, 40 - 60% of ownership cost is in the access network, and some 90% of operations and maintenance costs are in the local loop. Several access technologies implemented as line cards in a single product unit achieves significant savings in equipment and management costs.

### **Trunking gateway**

The trunking gateway allows traffic to be exchanged between any two different networks. Sitting between the circuit- and packet-switched networks, it provides the adaptation function required for media of various types (including voice, fax, modem data and video) for transport as packets in the packet network (and as analog or digital streams in the circuit-switched network) without loss of integrity or degradation of quality.

### **Access servers**

A Network Access Server terminates different types of dial-up IP originating from circuit-switched networks (fixed and mobile, POTS and ISDN). The Broadband Access Server performs the same service for broadband traffic. Additionally, the access servers handle comprehensive authentication, authorization, and accounting. As a flexible network component, the network access server supports a wide range of routing and security protocols along with many system and network management interfaces. It is further required to handle a large subscriber base.

Typically, the access server is placed in front of the core network, handling user access to the network. The access server can, however, also be located between two networks, "bridging" them at the UNI<sup>16</sup> level for calls that pass transparently across the first network.

Alcatel's Universal Access Gateway is a state-of-the-art implementation of this concept. This highly scalable product supports voice, fax and dial-up data on the same physical interface, enabling service-providers to deliver all services cost-effectively and keeping the network as simple as possible.

### **Alcatel call signaling gateway**

Most Internet users are still accessing their Internet Service Provider through a circuit-switched dial-up to the network access server. The huge recent influx of Internet and e-mail traffic has overwhelmed many legacy circuit-switched networks with data traffic, requiring them to be re-dimensioned.

The Alcatel Call Signaling Gateway gives operators a new, powerful way of dealing with this traffic without changing the existing network topology. The Alcatel Call Signaling Gateway triggers the originating switch to route data calls directly to the network access server and onto the data network, thus avoiding voice tandem switches and trunks. In effect, transit data traffic is off-loaded from the voice network, and the operator does not need to invest in extra capacity to cope with this traffic in the circuit-switched network.

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**The Alcatel Call Signaling Gateway effectively routes data traffic onto the packet network without blocking the circuit network.**

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Additionally, the Alcatel Call Signaling Gateway integrates signaling support for voice-over-IP services, allowing voice-over-IP calls to be transferred transparently between circuit and packet networks. IN further enhances this capability by enabling service-providers to migrate IN-based services — such as call routing based on network capacity — to data networks.

### **Multiservice gateway configurations**

End-users will increasingly access next-generation networks in different ways, using a variety of communications means, and looking for innovative services. Alcatel's multifunctional gateway configurations are vital components of this service environment, housing different services for voice-data interworking. The configurations are developed using a "mix-and-match" principle to let operators combine required access and interworking capabilities depending on their specific network environments.

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**Alcatel's multiservice gateway configurations meet operators' requirements for customized solutions, maximum flexibility, and optimized concentration of functionality.**

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The **Multiservice Gateway** combines access and trunking gateway services with those of a Network Access Server. With these three gateway components, the Multiservice Gateway becomes an all-in-one interworking vehicle between packet- and circuit-switched networks. It can be accessed via any low- and high-speed access technology to forward the huge new data traffic volumes to the packet-switched network. The service concentration simplifies network topology and enables cost-efficiencies by minimizing the product units required in the network. (Diagram 5, page 10.)

**The Multiservice Gateway executes true integrated communications by accommodating any access means and allowing transparent transport across different network technologies.**

The **Multimedia Switch Router** goes one step further in terms of service provisioning. It incorporates switching and routing capability with all supplementary services, together with the Network Access Server and the trunking gateway function. Operators keen to save on operations and management costs thus get a concentrated unit providing all the key services they need at the edge of the data network or network media layer.

### 2.3 Backbone switching and routing

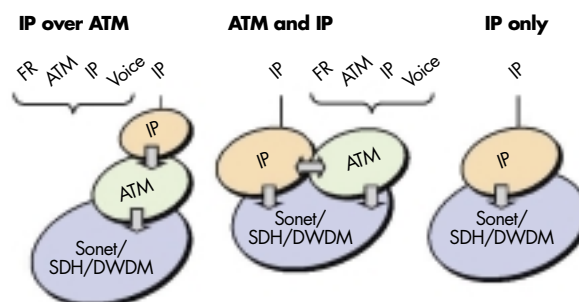
Which technology is going to rule the future domain of networking — ATM or IP? Convincing arguments can be made for both. The only certain thing certain is that neither ATM nor IP will take over networking as a whole any time soon. Instead, each operator and service-provider needs to examine carefully the advantages and disadvantages of the available technologies. Choice of implementation will depend on each operator's specific circumstances, from the standpoints of technology as well as business model.

**ATM and IP have different technological strengths. The choice of technology will depend on the individual operator's business model and networking scenario.**

Overall, most operators are likely to follow one of two deployment paths. Some will focus on IP-centric backbones as their only communications infrastructure, whereas others will deploy multiservice ATM backbones. For still other operators, it makes sense to deploy two backbones: an IP network for connectionless services such as web browsing, and an ATM backbone for connection-oriented traffic such as video. Some of these scenarios are depicted in Diagram 3.

As a vendor partnering with service providers and operators in all market segments, Alcatel's rich product portfolio accommodates all these networking scenarios, offering the backbone solution best suited to each operator.

Diagram 3: Backbone scenarios



#### The IP core backbone

The tremendous surge in communications traffic following the "data invasion" is spurring construction of high-capacity network backbones to transport large traffic volumes efficiently. Major players are focusing on an IP core network to handle this traffic explosion, planning to carry all traffic as IP packets — including delay-sensitive traffic. This strategy is based on the fact that IP now represents more than 80% of data traffic. Equally important, operators can leverage recent advances for IP native traffic engineering and bandwidth management. Finally, with IP over DWDM<sup>17</sup>, no extra layer is required between IP and transmission, and migration to optical network interfaces is easier.

Promising IP solutions have attracted a diverse range of actors seeking IP core products for different functions. As a result, different characteristics are valued in the IP backbone for different networking scenarios. Backbone wholesalers place high priorities on IP and DWDM integration, whereas support for differentiated IP services is key for ISPs. Moreover, most market segments for IP core solutions expect future growth to be enormous. As traffic volumes continue to grow at steep rates, demand for backbone switching capacity is quickly reaching 50 Gbps<sup>18</sup>, while high-speed interfaces of 2.4 Gbps are now thought to be insufficient within a few years for the largest backbones.

Responding to these market challenges, Alcatel's family IP core routers excel in two market-critical areas:

- Scalability — to grow as demands increase for output and capacity;
- Flexibility — to allow operators to deploy IP core routers in different networking scenarios and evolve the network as business conditions and models change.

**Operators need highly scalable and flexible solutions for IP core routing that can grow at the pace of the market.**

Alcatel's backbone solutions pave the way for giant IP backbones with total capacities exceeding hundreds of gigabits, and even reaching terabit speeds. Meeting today's market expectations while readying flexibility for future demands requires a

highly dynamic portfolio. Powerful new vehicles are being added to serve traffic growth, and a program is ensuring smooth evolution of current products. Routers that initially make up the network core can be moved towards the edge as core capacity demand grows, thus protecting investment.

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***Alcatel's IP core router family meets the requirements for a powerful next-generation backbone vehicle with carrier-class solutions based on industry-leading technology.***

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Alcatel's range consists of high-quality IP core routers offers compelling advantages for operators of backbone networks:

High-speed interfaces of 10 Gbps and beyond, so fewer network links are needed.

- High total capacity means that network nodes are minimized and less capacity is consumed by linking to other routers.
- Integration of transmission functions (SDH, SONET, DWDM) reduces optical-electrical converter requirements, cutting equipment investment and managements costs.

***The IP edge router***

At data networks' edge, need for high-capacity transport comes with a requirement to support differentiated IP services — specifically, support for MPLS<sup>19</sup>, which opens the door for end-to-end IP Virtual Private Networks and IP Quality of service.

In the next-generation Alcatel data network, the OmniSwitch router and PowerRail delivers this capability, depending on the network capacity required.

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***In a test carried out by Data Communications magazine, the PowerRail delivered letter-perfect results in Layer 2 and 3 forwarding-rates.***

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The award-winning PowerRail is a switch-router developed by IP-expert Packet Engines, an Alcatel unit. The product is designed around four key customer requirements: routing capacity, mission-critical reliability, application-aware networking, and continuous investment protection. PowerRail has been recognized for its industry-leading port density, interface flexibility, and Quality-of-Service features. With these properties, PowerRail serves as an edge router in large-scale networks or forms a network backbone.

***Multiservice backbone solutions***

ATM's proven Quality-of-Service capabilities has led many multiservice operators to favor it as backbone and edge technology to maintain flexibility in meeting market demand.

Alcatel's portfolio includes two market-leading solutions for optimizing ATM-based multiservice networks. The OmniSwitch ATM aggregator and the OmniCore ATM core switch were developed by Xylan, a datacoms industry leader and now an Alcatel company. The two companies' longstanding relationship has helped ensure that OmniSwitch and OmniCore fit perfectly within Alcatel's total next-generation solution.

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***ATM backbone products will remain pillars in next-generation multiservice networks.***

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OmniSwitch is effectively a multilayer "super" switch providing powerful ATM capability as well as software-based routing services. With routing placed inside switches, it is pushed out to the network's edge, allowing for more efficient traffic flows and reducing backbone traffic. Additionally, OmniSwitch integrates IP firewalls, putting a security barrier in front of servers, mainframes and other sensitive resources.

Whereas OmniSwitch is an edge product with 13 Gbps capacity, the 88-Gbps OmniCore is a backbone product — a high-end edge vehicle. For large networks, OmniCore provides ATM aggregation for a network core of IP core routers.

**2.4 Network intelligence**

Alcatel's IN platform is in service with a growing number of operators, implementing a wide range of value-added services, including (prepaid) calling card, premium rate, freephone, wake-up and other services. Where IN used to add value to the voice network, IN products are now expanded to unite voice and data, fixed and mobile networks.

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***For next-generation networks, Alcatel's IN portfolio is being expanded to deliver existing and new services in the multimedia environment.***

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IN components are part of a toolbox for creating, executing, and managing value-added services for the combined voice-data network.

IN also triggers the implementation of fixed-mobile integrated services, facilitating a complete set of common services. In particular, IN enables exchange of information needed to provide service transparency and to locate the end user.

The key benefits offered by the Alcatel IN platform include the following:

- Powerful service creation mechanisms, enabling service-providers and end-users to specify, create and customize services to their specific requirements;

- Customer care capabilities, extending management to billing systems, customer databases, fraud and complaint handling, service provisioning and support system integration;
- Flexible control for service charging, allowing operators to apply custom-tailored charging

#### **Four stages for deploying IN in next-generation networks**

**Reuse.** As IN is already providing value-added services in the voice environment, these services can be reused for subscribers accessing the Internet through the voice network.

**Interwork.** The implementation of an interworking interface between the IN platform and the data network allows a full-service operator to reuse existing IN services when offering Internet access or IP telephony.

**Integrate.** At this stage, IN is distributed across different components in the data network, such as gatekeepers, domain name servers, routing tables, policy databases, and contents servers.

**Interoperate.** The IN platform's interfaces to all service equipment in the network make it a common intelligence centre for the integrated voice -data network, located outside the respective sub-networks.

## **2.5 Integrated management**

Integrated management is a crucial aspect of building multiservice next-generation networks. Nevertheless, the convergence of fixed and mobile, voice and data networks clearly makes management a challenge. The increased number of connectivity options has further led to greater complexity and responsibility-sharing for network management. Essentially, a fundamental shift in the approach to management is required to manage services based on market parameters (as opposed to managing a multitude of "boxes" using technological parameters).

Total service control refers to one-touch service provisioning and activation along with automated service surveillance by means of network-wide, end-user-oriented service views. In today's competitive communications environment, total service control is a key differentiator, allowing the service-provider to integrate a wide range of different services, thus providing "one-stop shopping" of communications services to end users.

**Management of integrated service platforms requires transition from technology management to global service control.**

The Alcatel Management Platform has already demonstrated this capability by providing integrated management across different technologies, different vendors and different applications. In this way, the Alcatel Management Platform effectively bridges the gap between technology-dependent network operations and technology-independent end-to-end services.

#### **Key properties of the Alcatel Management Platform**

- Open interfaces that comply with international network management standards
- Open platform that is based on a distributed, object-oriented architecture, along with a common hardware and software platform for all applications
- Common management services with a homogeneous "look and feel", as well as common maps, network management functionality and system management applications
- A set of service control features that hides the complexity and diversity of the underlying network functions
- A set of services customized to the service provider's business model

The Alcatel Management Platform delivers the following benefits for the operator and service provider:

- Rapid product definition and exploitation;
- Quick deployment of service across multivendor, multi-technology networks;
- Provisioning of end-user services independent of means of access;
- Increased efficiency and optimization of networking resources;
- Ease of operation;
- Ease of integration;
- Re-use of existing infrastructure wherever possible, as well as extension of the network where required for introducing new service introduction.

#### **The Service Management Center**

In a marketplace increasingly moving to integrated multimedia services, management of the many new services is a key success factor. The Service Management Center (SMC) performs key management functions such as identification, authorization, accounting and management of Service Level Agreements, in accordance with the right Quality of Service level.



### 3. Making it happen: building solutions

Next-generation building blocks provide the key capabilities required for integrated network solutions delivering multimedia services. Together they compose a rich toolbox of capabilities making it possible to build sophisticated networks for all players in the market.

**Alcatel's next-generation solution enables multimedia IP or ATM services for fixed and mobile end users, extending proven call control features to IP and ATM. This is further enriched by IN and added value at the network level.**

Overall, the network functionality will be organised according to two basic models: the integrated solution, and the distributed solution.

#### 3.1 Integrated solution

The integrated solution targets operators looking for an optimized all-in-one solution — typically full-service operators — as well as operators with an existing network based on Alcatel 1000 switching systems. For existing Alcatel operators, an integrated network solution enhances existing investment in network infrastructure by adding services to existing components or by upgrading existing equipment.

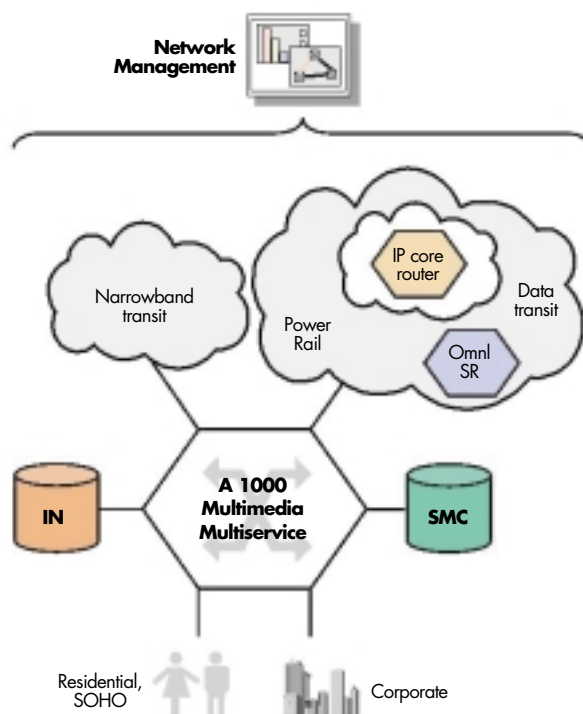
**The integrated model achieves cost efficiencies through consolidation of services, reducing the number of product units required.**

The focal point of the integrated solution is the Alcatel 1000 Multimedia Multiservice switch-router, consolidating key next-generation capabilities into a single product unit. The resulting reduction of network elements rationalizes network investment through lower capital costs, lower operational costs and reduced need for central office space.

In the integrated model, the Alcatel 1000 Multimedia Multiservice switch-router connects directly to the ATM or IP data network created with backbone and edge switches/routers.

The IN platform links to both parts of the network, ensuring seamlessness and service transparency. A unified network management system ties all network components together, both for operations and service provisioning. Diagram 4 shows an IP implementation of the integrated next-generation solution. An infinite number of different combinations is possible, creating a multitude of customized solutions.

Diagram. 4: Alcatel integrated solution



#### 3.2 Distribution solution

The distributed network model is optimized for a flexible deployment of network services. The solution offers the same total value as the integrated model but distributes key next-generation functionality across the network in separate components:

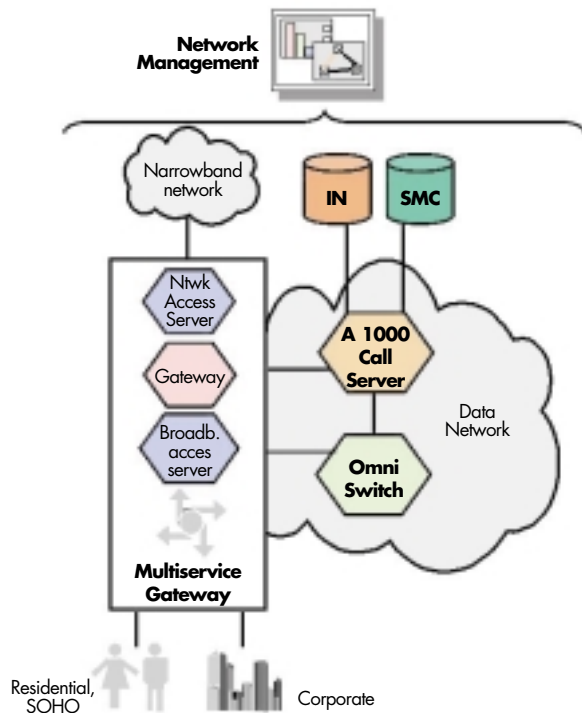
- The Alcatel 1000 Call Server
- The Multiservice Gateway (or separate gateway products)
- Edge switches/routers.

Separation of services and standard interfaces allows these components to be deployed in a variety of networking scenarios. An illustrative case would be a new operator deploying the distributed solution instead of a traditional narrowband network for offering voice-over-data services. Another scenario is an existing operator implementing the distributed network on top of its narrowband network. (Typically the existing infrastructure would be a network from another vendor than Alcatel, which cannot be economically developed any further.)

**The distribution of services and standard interfaces create a very flexible solution that can be deployed in a host of scenarios.**

Diagram 5 illustrates an example of how the distributed solution can be implemented (in this specific case, with a multiservice ATM backbone).

Diagram. 5: Alcatel distributed solution



The call server is responsible for the call control and services across the network, together with the service management center. The gateway links the narrowband and broadband network elements. All elements — including any components supplied by third parties — are managed by the Alcatel Management Platform.

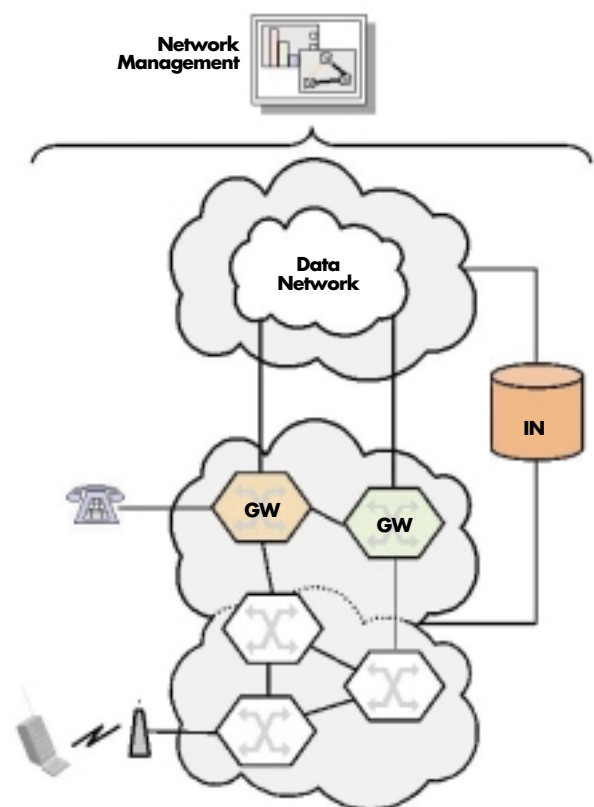
### 3.3 Fixed-mobile convergence

Second and third-generation mobile voice and data communications are just another access technology to the worldwide telecommunications network. Alcatel network solutions enable an operator to create a seamless service infrastructure offering fixed and mobile access to the same services by simply combining fixed and mobile access gateways to the relevant call servers.

The high-capacity ATM switching cores of Alcatel 1000 Multimedia Multiservice switch-routers provide an evolution path to UMTS through support for IP trunking, integrated routing, and AAL2<sup>20</sup>. Gateways will assure connectivity between mobile and fixed subscribers and allow users to send and receive calls on mobile or fixed terminals according to their preferences.

Diagram 6 shows the concept of an integrated network for fixed and mobile services.

Diagram. 6: Fixed-mobile integrated network



## 4. Providing value to operators and service providers

Alcatel's next-generation network solutions maximize network value for operators and service-providers, both in terms of supporting revenue generation and reducing operation costs.

### 4.1 Minimizing cost of operation

The Alcatel next-generation solution optimizes all factors related to cost of ownership.

**Cost effectiveness.** The flexibility inherent in products such as the Multiservice Gateway allows service providers to provide the best means of access for any customer, using the same equipment.

Integration of services at the network element layer in the Alcatel 1000 Multimedia Multiservice switch-router reduces operating and maintenance costs due to consistent repair and provisioning systems. Physical integration allows for reduced cost of investment and smaller footprint due to common components for power supply, clock, alarm, etc. and less cabling.

**Capacity.** The A1000 Multimedia Multiservice has a high-capacity switching matrix of several hundred Gbps. The higher the capacity of one switch, the more the number of switches is reduced, resulting in more efficient the use of network resources, less floor space, and less power consumption.

The outstanding processing power of eight million BHCA<sup>21</sup> results in increased traffic throughput levels.

**Scalability.** As demand for capacity grows, operators can add capabilities to the Alcatel 1000 switching system, creating the fully-fledged Alcatel 1000 Multimedia Multiservice switch-router. In this way, the network platform scales at the pace of the operator's business.

**Smooth evolution.** The growth of the Alcatel 1000 switching system into the Alcatel 1000 Multimedia Multiservice switch-router safeguards investment in the installed base.

**Integration.** All components of an Alcatel next-generation solution are managed by the Alcatel Management Platform. This ensures consistent maintenance and provisioning procedures, no need to invest in a new network management system, fewer staff, less training, etc.

**Open solutions.** Both the integrated and distributed solutions provide open interfaces between the network elements, in conformance with all major established and emerging standards, such as H.323 and MGCP<sup>22</sup>. The open Service-Creation Environment and open control interfaces of the Alcatel 1000 Multimedia Multiservice switch-router allow operators to deploy Alcatel solutions in multi-vendor networks. For incumbent operators it further opens the opportunity to reuse existing equipment, irrespective of origin. Honing this advantage additionally, the Alcatel Management Platform enables integration of network elements from different vendors.

## 4.2 Maximizing revenue

With an Alcatel next-generation network, operators and service providers can maximize the revenue potential offered in the IP communications era.

**Service provisioning capabilities.** The Alcatel service architecture provides services such as secure access to corporate Virtual Private Networks, web dial services, virtual second line services, unified messaging and pay per surf.

The Alcatel 1000 Call Server handles voice calls and signaling for voice over ATM (for fixed and mobile networks) and voice over IP, depending on its position in the network.

The Service Management Center ensures services are easy to sell, manage and bill. With the Alcatel IN platform, new innovative services (such as Browse'n'Talk — see below) that leverage market potential, are easy to implement.

**Service guarantees.** With the Alcatel 1000 Call Server, service guarantee is addressed for voice-over-data services. The OmniSwitch and OmniCore products also use mechanisms to ensure voice-over-IP Quality of Service.

**Standard solutions.** Alcatel's rigorous adherence to standards and industry standardization means that the Alcatel product portfolio easily interfits with networking equipment from other vendors and helps optimize the operator's total networking solution.

### Browse'n'Talk

When telephone users with only one analogue line connect to the Internet, they block their line for incoming and outgoing calls. Investment in a second line, ISDN or xDSL may be too expensive to be justified. The Browse'n'Talk service allows these web surfers to maintain both Internet and voice telephone communications simultaneously over one analog line.

With Browse'n'Talk, incoming calls are delivered to a call destination selected by the user. The alternative call destinations include the telephone set (with automatic disconnection from and reconnection to the Internet Service Provider), a second line (analogue or ISDN), a voice mailbox, a voice attachment to an e-mail, etc. Depending on the user's preferences, he/she is notified through a pop-up window or an e-mail message.

As voice over IP is becoming a mature technology, incoming calls can also be rerouted to a voice-over-IP gateway, and delivered to the surfer's PC over the IP network.

**Transparency.** Since the Alcatel Management Platform manages all components of the total network solution, service transparency across technologies, vendors and access methods, is ensured.

**Reliability.** Alcatel's longstanding experience with public networks implies that carrier-class quality is a top priority for all products in the Alcatel portfolio.

## 5. Conclusions - The Alcatel value

The value of next-generation network solutions lies in end-user services. The Alcatel 1000 switching systems already support hundreds of services, including supplementary services, IN service switching functions and highly secure accounting services. Based on proven call and service control, the Alcatel 1000 Multimedia Multiservice switch-router and the Alcatel 1000 Call Server move these services forward to provide integrated capabilities in the converged world of voice and data, fixed and mobile communications.

These products are cornerstones of Alcatel's next-generation solutions, complemented by leading-edge solutions for backbone transport in a packet environment. The added value of Alcatel's IN platform and the Alcatel Management Platform to every network component puts the focus on the total capability delivered by the network, whether implemented in an integrated or distributed model. Bringing together the best from Alcatel's broad experience in all areas of public telecommunications networks, carrier-grade quality is ensured network-wide.

**Alcatel is making it happen.**

- 1 *Intelligent IP Platform*
- 2 *Asymmetric Digital Subscriber Line*
- 3 *Hybrid Fiber Coax*
- 4 *Internet Protocol.*
- 5 *International Telecommunication Union standard for multimedia videoconferencing on packet-switched networks*
- 6 *Media Gateway Control Protocol*
- 7 *Session Initiation Protocol*
- 8 *Asynchronous Transfer Mode*
- 9 *Synchronous Digital Hierarchy*
- 10 *Synchronous Optical Network*
- 11 *See also description in section 2.2*
- 12 *Time Division Multiplexing*
- 13 *General packet radio service.*
- 14 *Universal mobile telecommunications system.*
- 15 *Integrated Services Digital Network*
- 16 *User-to-network interface.*
- 17 *Dense wavelength-division multiplexing.*
- 18 *Gigabits per second.*
- 19 *Multi-protocol label switching.*
- 20 *ATM adaption layer 2.*
- 21 *Busy Hour Call Attempts*
- 22 *Media gateway control protol.*

