

Telecom management for ENGINE

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Ericsson envisions a new, robust, broadband multiservice network infrastructure which is based on new packet-switching and routing technologies and has been designed for real-time services. The infrastructure has been developed to support the business models of operators who embrace the new world of mobile and fixed broadband Internet. According to this definition, ENGINE is more than a set of technologies. It is a promise of a complete relationship with the operator (this is how Ericsson builds customer relationships and demonstrates its commitment to customer success); complete solutions (this is how Ericsson approaches and executes system integration and delivers other customer services); and a step-by-step technology roadmap (this is how Ericsson pragmatically provides products, through a step-by-step progression toward *all-IP* networks with fixed/mobile synergies).

The ENGINE family of products and services comprises a wide variety of next-generation network solutions. In particular, the *ENGINE Integral Network* solution offers the tools that are needed to implement packet-based multiservice networks. To round out the offering, Ericsson provides a comprehensive and efficient telecom management solution for *ENGINE Integral Network*. The solution includes the multiservice network operations support system (MN-OSS), network management and service assurance (NM&SA), and customer management and service provisioning.

The author describes the telecom management solution, showing how it facilitates the running of an *ENGINE Integral Network* and thus fits into a complete next-generation network scenario.

Mind-set change

Historically, the purpose of management systems has been to save money—the use of efficient support systems has helped operators to cut the costs associated with running a network. Today, however, by automating and eliminating as many tasks as possible, management systems have taken on an extended role: that of *moneymaker*.

The challenge facing every operator is to provide the full spectrum of services that customers demand—today and tomorrow. Obviously, in order to provide these services, operators and service providers alike

must address the worlds of both telecommunications and data communications. That is, to deliver the services that fulfill customer requirements, they must enter into the realm of multiservice networks. By improving profitability and efficiency, and by reducing cost of ownership, the telecom management solution for ENGINE gives operators the control they need to run a multiservice network.

The solution is based on an open and flexible technology that makes use of best-of-breed functionality to support changes in customer service demands, business models and network technology. Support of legacy management solutions protects existing investments and facilitates the transition from “saving money” to “making money.” The solution’s modular and scalable composition facilitates the integration of multi-vendor applications, such as

- billing mediation;
- trouble management;
- service level agreement (SLA) management; and
- network traffic management.

To enable business growth, Ericsson meticulously monitors the solution’s interfaces and functions, to ensure that it remains updated and that it makes a sizeable contribution to operator profits.

The modular structure of the solution ensures maximum flexibility when changes are made to the connectivity network. Consequently, the impact of these changes on the management system is minimal and can be controlled. The upper levels of the solution are protected from the connectivity layer; the lower layers can easily be extended to accommodate new network elements or technologies.

All operators can benefit from the telecom management solution for ENGINE, regardless of whether they have an installed base or represent start-ups that are implementing entirely new networks and management solutions. The solution is built on components which deliver the necessary availability, scalability and security features that ensure a cost-effective and profitable network environment. Thus, Ericsson has defined a management solution together with the network solution.

Contemporary network development

Packet switching will eventually replace circuit switching, and telecommunications

BOX A, TERMS AND ABBREVIATIONS

ATM	Asynchronous transfer mode	MML	Man-machine language
BICC	Bearer independent call control	MN-OSS	Multiservice network operations support system
CRM	Customer relationship management	MPLS	Multiprotocol label switching
CSR	Customer service request	MSG	Multiservice gateway
DSL	Digital subscriber line	NM&SA	Network management and service assurance
FAB	Fulfillment, assurance, billing	OSS	Operations support system
H.248	Standard for allowing a media gateway controller to control media gateways (also known as the Megaco protocol)	POTS	Plain old telephone service
IP	Internet protocol	PVC	Permanent virtual connection
IRP	Integration reference point	QoS	Quality of service
ISDN	Integrated services digital network	SLA	Service level agreement
MGW	Media gateway	TeS	Telephony server

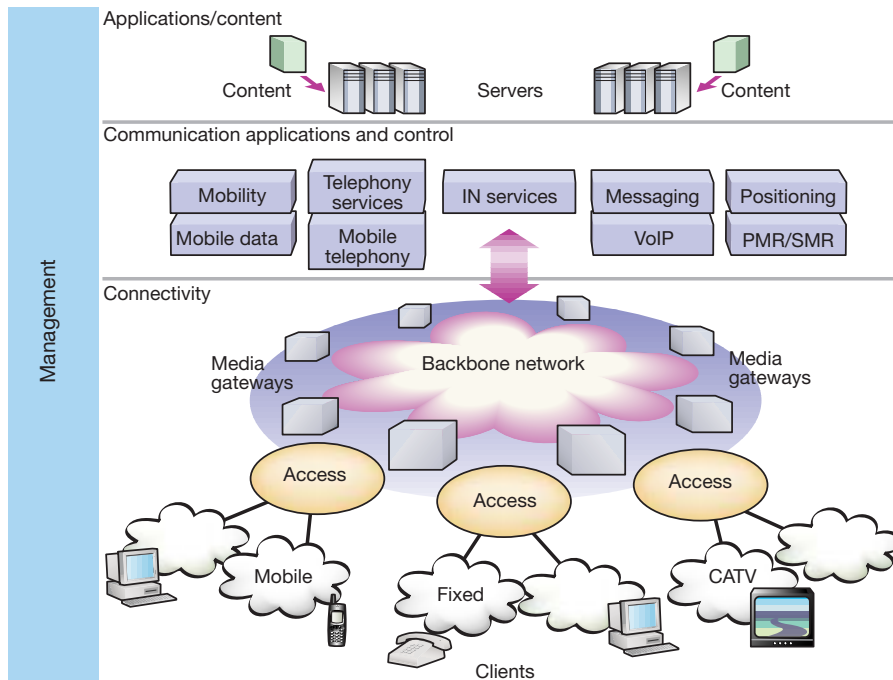


Figure 1
The multiservice network.

and data communications will converge. This is why next-generation network solutions must support systems that facilitate the migration of narrowband networks into a single broadband network that provides all imaginable combinations of voice, data, mobile and fixed telephony, and multimedia services.

Present-day networks have mostly been integrated in a vertical fashion—a complete, separate network structure is needed for each individual type of service. By contrast, the horizontal approach of *ENGINE Integral Network* means that a single connectivity network can manage all switching and bit transport for, say, a videoconference, phone call, or Internet session—one network does it all (Figure 1).

ENGINE Integral Network uses high-speed packet switching for all services, including traditional telephony. Most of the services are IP-based. Asynchronous transfer mode (ATM) technology gives adaptable bandwidth options straight to business user premises, and soon, to private homes. ATM technology is well suited to voice traffic, since it provides large-scale, on-demand bandwidth connections. This, combined with the guaranteed quality of service (QoS) that it brings to real-time services, makes ATM an ideal choice for transporting packet voice service.

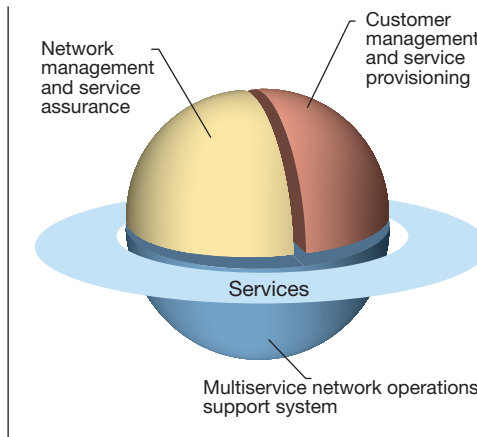
The *ENGINE Integral Network* concept joins separate networks into a single broadband network. It thus provides access for users at work or home. *ENGINE Integral Network* supports mobile access to almost any service, including remote logon to the company network.

The *ENGINE* program ensures smooth migration into future packet-based multi-service networks. In short, *ENGINE Integral Network* provides a full-fledged server solution that is based on, for example, the bearer-independent call control (BICC) and H.248 standards. Operators can thus choose equipment from different vendors. And because the telephony server is based on AXE, the solution encompasses a wide range of market-specific telephony functions. Future enhancements of *ENGINE Integral Network* will provide telephony server solutions with IP transport. These will include interworking and the ability to upgrade from the ATM-based *ENGINE Integral Network* solution.

The telecom management solution for ENGINE

The telecom management solution for the *ENGINE* family of products consists of a several components that give the operator a comprehensive set of management tools for

Figure 2
The telecom management solution for ENGINE.



a multiservice network environment (Figure 2):

- multiservice network operations support system (MN-OSS);
- network management and service assurance (NM&SA);
- customer management and service provisioning; and
- services.

The overall purpose of a network management solution is to support operator business. Operations support systems are designed to support and automate operator business processes for the operation and maintenance of networks and services. The challenge is not what telecom management systems do, but *how* they do it for each in-

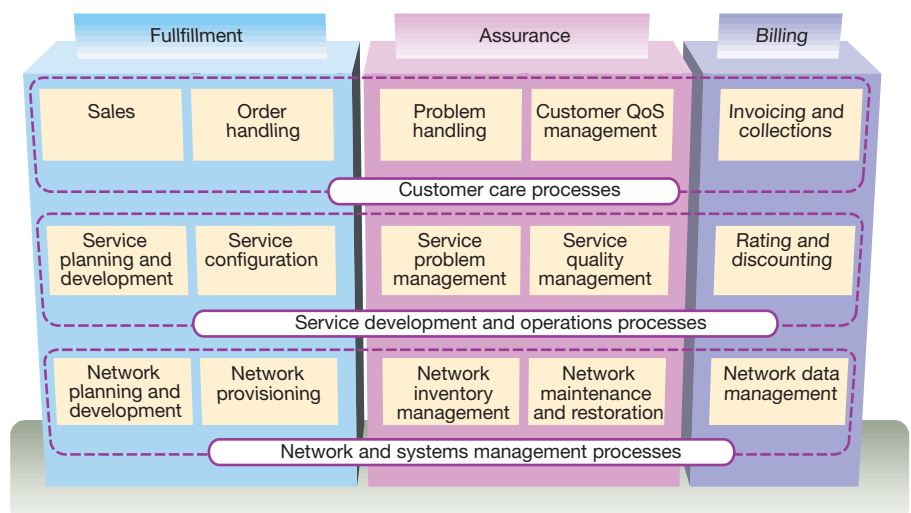
dividual operator. Given the current variety of legacy systems, migration strategies, service offerings and charging models, it is virtually impossible to build a one-size-fits-all management solution. This is why the market for management systems is so fragmented and why standardization in this area has been so fraught with difficulty. To assist in the description of the network management process, the TeleManagement Forum has described the fulfillment, assurance and billing (FAB) model (Figure 3). In the context of telecom management, the FAB model describes the end-to-end business processes involved in delivering service to a customer:

- fulfillment—timely and correct provisioning of what the customer has ordered;
- assurance—maintaining the service, including timely response and resolution of customer- or network-triggered problems, tracking, reporting, managing and taking action to improve performance for all aspects of a service; and
- billing—timely and accurate invoices, knowledgeable and responsive billing enquiry support, including timely adjustment handling and payment collections.

Ericsson incorporated the FAB model, or process view, adhering to the following strategic corporate policies when it defined the telecom management solution for ENGINE:

- integrate and enhance best-of-breed applications, including those from third-party vendors;

Figure 3
The fulfillment, assurance, and billing (FAB) model.



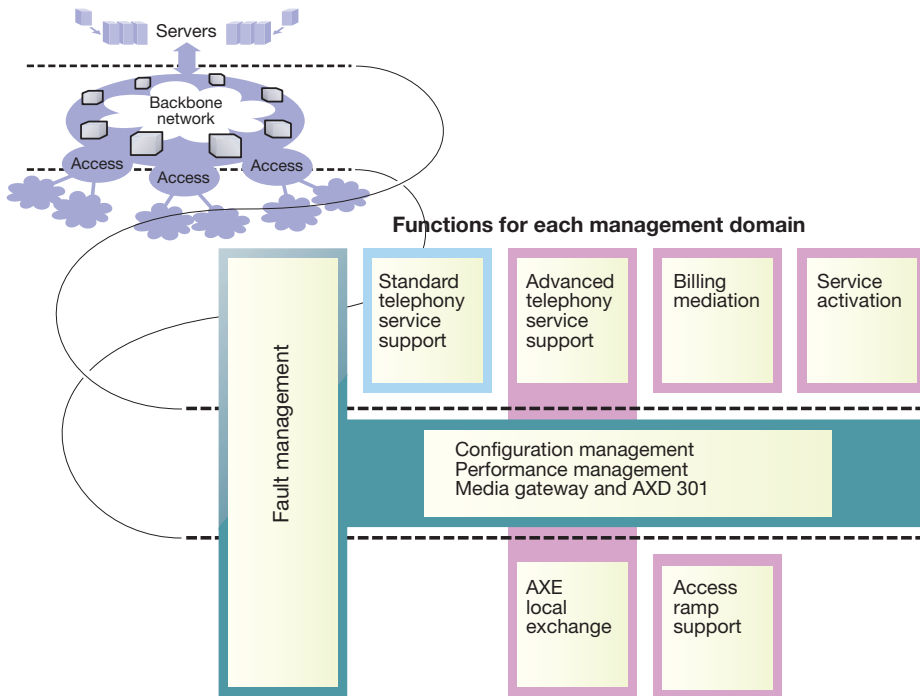


Figure 4
Multiservice network operations support system for ENGINE.

- make use of well-defined integration reference points (IRP) promoted within standardization bodies; and
- employ an integration process that balances custom-made solutions and short lead times.

Multiservice network operations support system

The multiservice network operations support system provides the essential management capabilities for the ENGINE network as well as open, single-point interfaces for upper-level management (Figure 4).

The MN-OSS is built around the fault manager, which monitors all equipment in every layer of the solution. The fault manager, which has been designed to accommodate the integration of alarms from any network element, is easy to configure and adjusts effortlessly to changes in network interfaces and in the network structure. Different tools or suites of applications have been developed to suit each of the different layers.

Advanced telephony server support for the service layer

One suite of applications includes functions for handling man-machine language (MML), script support, and files. Optional

applications can be added for handling software and number analysis support.

Configuration and performance management connectivity layer

Another suite of applications manages devices at the connectivity layer—for example, multiservice gateways (MSG) and ATM core switches.

Configuration and performance management access layer

Yet another suite of applications manages devices at the access layer—for example, *ENGINE Access Ramp* for broadband and narrowband access.

Optional MN-OSS management functions

The MN-OSS package also includes optional billing-mediation functionality, which enables secure collection of billing data, data processing, and distribution to upstream systems. Another option in MN-OSS is service activation, which enables rapid activation of services ordered from upstream systems.

Network management and service assurance

The network management and service assurance tool set contains complementary

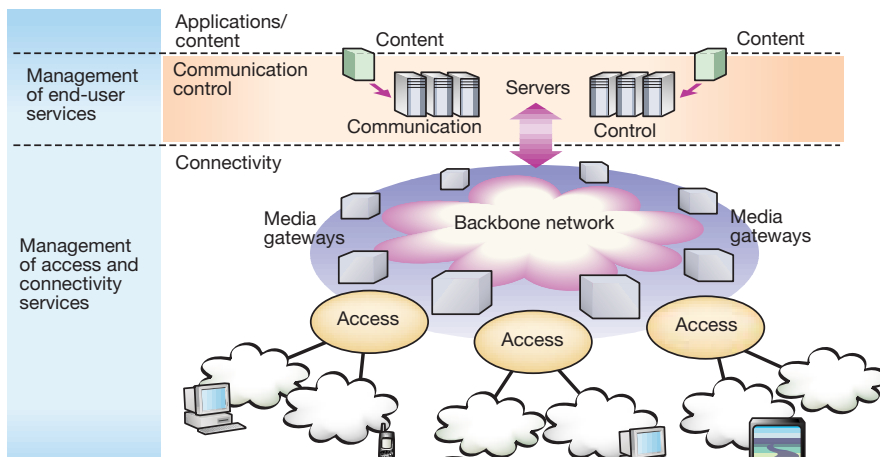


Figure 5
Scope of the network management and service assurance (NM&SA) solution.

functions that provide enhanced and cross-domain network-management capabilities, including the management of faults, performance, trouble tickets, inventory, service quality, and service level agreements (Figure 5). These tools can also handle equipment from other vendors. NM&SA for ENGINE networks includes

- network fault management;
- network configuration management;
- network performance management;
- network traffic management; and
- service assurance.

Network fault management

The network fault-management function collects alarms from other NM&SA components as well as from network elements. An expert rule engine correlates alarms, and identifies and isolates root causes. The alarms provide valuable information, giving operators full control over network-related faults, and an opportunity to proactively address network-related problems before they affect service. This functional area also gives the operator a powerful, efficient and organization-wide process for resolving network problems. Trouble tickets and tasks or work orders are registered and then either automatically assigned to the most appropriate staff member, or carried out automatically by a predefined recovery script. The process helps operators to speed up

restoration and ensures high quality of service to the end-customer.

Network configuration management

The network configuration management function speeds up the process of checking inventory, equipment handling, installation, administration, and the configuration of network elements. At the same time, it supports the service-provisioning process. A complete record of installed hardware and software and an overview of the network topology are stored in a central repository.

Network performance management

The network performance management function keeps track of relevant network-related data that operators need to plan their network and services. Operators can thus analyze data and gain an integrated view of performance in access, core, and service networks.

Network traffic management

The network traffic management function actively manages traffic streams for optimized service delivery, and provides the operations department with a tool for real-time management of traffic streams in the core telephone network and between interconnected partners. The purpose of this solution area is to optimize total service delivery and network usage at all times.

Service assurance

Quality of service and end-to-end service performance are key differentiators for service providers who operate multiservice or ENGINE networks. Providing service assurance is a major challenge, since services are implemented across multiple technologies and often affect multiple operators in a wholesale/retail business model. The solutions in this area include support for handling service level agreements between operators and end-users, or between different operators.

Customer management and service provisioning

The customer management and service provisioning tool set contains complementary offerings that provide advanced support for efficient customer relationship management (CRM), order handling, service provisioning and billing. This tool set has three functional areas: customer care and billing, service provisioning, and usage mediation. Each of these functional areas addresses a

particular business need and can be individually customized and integrated into an operator's existing environment (Figure 6).

The *customer care and billing* package focuses on the support needed at a customer operation center. Typical application areas include customer relationship management, order handling, and Help Desk, as well as rating, invoicing, revenue assurance, interconnect, billing, and clearing.

The *service provisioning* package focuses on service fulfillment and life-cycle management of service delivery processes. It supports flow-through automation and more complex service provisioning.

The *usage mediation* package focuses on collecting charging and usage information from all parts of the network. By providing advance pre-processing functions, such as filtering, correlation, and aggregation, it provides a very efficient, easy-to-use, single-point source for other systems. Typical recipients of this information are rating and billing modules, interconnect modules, business-analysis modules and decision-support modules.

Services

Ericsson can contribute qualified expertise, to guarantee an optimized telecom management solution for ENGINE that realizes the business objectives of the service provider. The optimal management-system solutions, together with the right operational processes, are thus implemented in a well-prepared organization. All elements have been tailored to utilize the service providers' full business potential. The service portfolio consists of the *advise*, *establish*, and *assist* service elements.

Advise

The objectives of the *advise* service are to gain understanding of how the business objectives can be transformed into a realizable solution, and to ensure that the service provider is able to make a well-founded decision pertaining to investments in a management solution. The service covers the following activities:

- information collection relating to the objectives of introducing new services;
- analysis of all relevant information;
- solution outline of all technical, process and organizational issues;
- gap analysis, to define all necessary steps; and
- presentation and conclusion, to facilitate a well-founded decision.

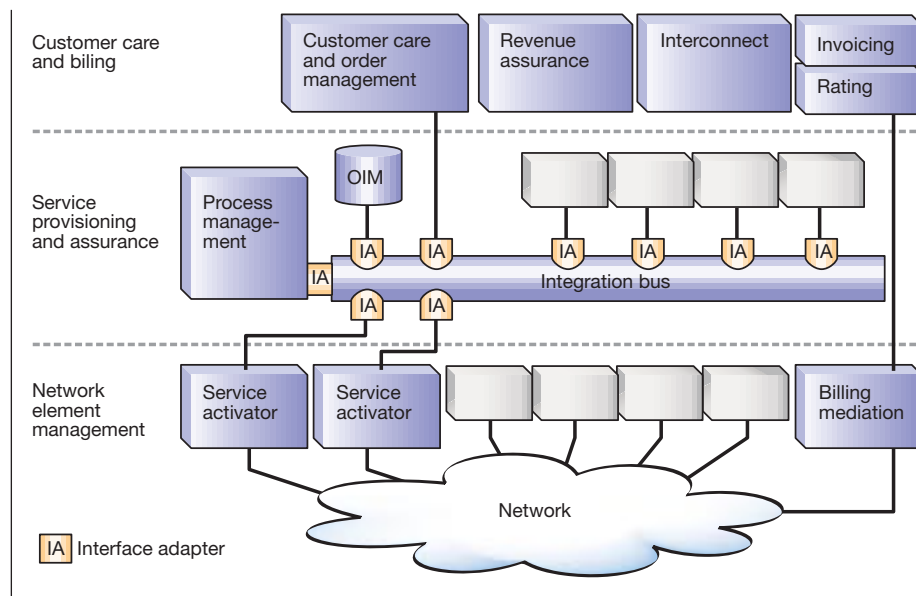


Figure 6
Customer management and service provisioning for ENGINE.

All activities are carried out in close cooperation with the service provider.

Establish

The objectives of the *establish* service are to design and implement the service-provisioning solution. The results from the advisory assessment serve as input. The service is carried out as a typical system integration project and consists of

- a detailed analysis of the service provider's requirements, yielding a detailed definition of the architecture of a tailored-to-fit technical and organizational solution; and
 - implementing the solution with staff who have been recruited and trained to use it.
- A professional implementation team delivers the service using a proven process-oriented method that guarantees the quality of the work as well as effective implementation. The delivery process includes
- detailed requirement analysis and confirmation;
 - a detailed technical solution, including implementation analysis and costing;
 - project planning;
 - customization—processes, interfaces, and configuration and verification; and
 - training.

Assist

The objective of the *assist* service is to overcome any particular operational problems that the service provider might have. This service typically involves the transfer of expert knowledge. Examples of situations that require the technical assistance service are

- consultation on technical problems;
- consultation on operational routines;
- new service implementation;
- on-the-job training; and
- support—customer service request (CSR) handling and emergency support.

Operator and user benefits

To facilitate rapid implementation, the telecom management solution for ENGINE has, to a large extent, been “pre-integrated.” Support for future technologies, multiple vendors and new business demands is guaranteed thanks to the solution’s flexible and open structure. To reduce the time from idea to implementation, Ericsson seeks early opportunities to discuss strategic business goals and needs with operators.

Being a service enabler, the telecom management solution for ENGINE helps operators to roll out new services faster. The solution also contributes toward high service quality by reducing service downtime. It does so by quickly determining the cause of faults and resolving them through a unified overview of the entire network. Through filtering and the correlation of secondary alarms, the system focuses staff attention on the most critical faults.

Performance management helps identify any degradation of network elements to determine when they need to be repaired or replaced, thereby avoiding service outage. A proactive approach to detecting potential network problems can be taken by observing usage patterns.

Smooth and efficient billing is the core success factor for any operator. This will become even more important as differentiated services emerge and usage-based billing is introduced for IP-based services. The telecom management solution for ENGINE supports convergent voice, data and IP services for residential and business customers.

Ericsson’s strategy for ensuring that the overall solution delivers the required avail-

ability, scalability and security is to employ best-of-breed components. This approach supports the carrier-class management environment favored by operators.

Productivity is enhanced because centralized network management reduces the number of staff required to operate the network. This, in turn, enables skilled staff members to work with other, more qualified tasks.

The protection of existing investments is also a critical success factor that must be addressed seriously. The ENGINE solution is based on the idea of exploiting previous investments in management solutions and evolving them. This approach works equally well for start-up operators going for an IP solution as it does for operators with a legacy circuit-switched network that needs to be evolved.

The partnership concept is central to the ENGINE solution framework. Ericsson will gladly share its experience and knowledge of the world’s telecommunications market.

The ENGINE solution family

Several products from Ericsson’s ENGINE program are already being used commercially or in field trials. ENGINE encompasses Ericsson’s total solutions offering for next-generation networks for fixed operators. In the area of circuit-to-packet migration, there are currently three ENGINE solutions:

- *ENGINE Bridgehead Network*—a telephony server, single-domain solution based on a telephony server (TeS) and media gateways (MGW);
- *ENGINE Integral Network*—a packet-based multiservice network solution that delivers voice and data services in a cost-effective way over a connectivity network that other applications can share; and
- *ENGINE Access Ramp*—an integrated access platform for voice and data over existing copper lines. The platform integrates narrowband (POTS and ISDN) services and broadband (xDSL) services in the same system.

ENGINE Integral Network

ENGINE Integral Network is a next-generation network solution that allows the

implementation of packet-based multiservice networks. As such it facilitates smooth and rapid evolution of existing circuit-switched networks into packet-based multiservice networks.

In contrast to existing networks, which are dedicated to a specific application (such as telephony or data), a multiservice network employs a common switching and transport layer, and a common connectivity network that can be shared by numerous services and applications. *ENGINE Integral Network* is thus the perfect tool for migrating from circuit-switched networks to packet-switched networks. Operators who migrate their networks can benefit from the broadest range of telecommunications management solutions and services. The multiservice network architecture of *ENGINE Integral Network* comprises the following principal network elements:

- telephony server (TeS), which controls the media gateway (MGW) application to provide the voice and narrowband data services support; and
- multiservice gateway, which can simultaneously support several applications—for example, when it serves as a media gateway for voice services, it can also serve as an edge or core ATM switch, a frame relay node, or a multiprotocol label switching (MPLS) router.

The powerful *ENGINE Integral Network* architecture supports a wide variety of multiservice functions, including

- voice and narrowband data services (comprising the N-ISDN voice-band data services and 64 kbit/s unrestricted data service) via a server-based concept;
- transport of IP on ATM permanent virtual connections (PVC), or soft PVCs, or by means of MPLS;
- transport of frame relay over ATM;
- native ATM services; and
- network management.

An *ENGINE Integral Network* implementation, with its ATM interconnect network and its multiservice gateways (AXD 301), is thus capable of simultaneously supporting narrowband services (MGW/TeS) as well as broadband data and video transport services. It handles different traffic types (voice, data, and video) with efficient use of bandwidth for each and without compromising quality of service.

Conclusion

The ability to present services quickly and effectively to old and new customers is what attracts operators to multiservice management systems. The rationale is straightforward—services are one of the few powerful competitive devices that operators can use to make a difference on the market.

In order for multiservice management systems to be successful, they must support the business models that operators are compelled to create. Take, for example, the variety of broadband multimedia services: users pay for service content instead of for call duration. To handle this, operators rely heavily on multiservice management systems to regulate customer service levels as well as customer relationships.

Saving costs and automating management processes are the two main parts of a multiservice network-management solution. In addition, the solution should also

- minimize response time in the event of a fault;
- optimize network performance, to ensure that customers receive the quality of service they request; and
- monitor network performance to support automated optimization of network resources, in order to maximize the use of invested capital.

To remain competitive, operators need to control operational costs and stay at the forefront of technical evolution. An advanced and comprehensive management solution helps operators to achieve these goals, by supporting the development of network strategies that harness the operators' competitive power.

The worlds of telecommunications and data communications are in a state of continuous evolution. Likewise, the technology environment is constantly changing. Customer demands vary from market to market, and from time to time. Therefore, a successful multiservice management system must cater for two sometimes mutually exclusive needs and find a balance between off-the-shelf products (inflexible, but quick and inexpensive to implement) and tailored solutions (very flexible, but slow and costly to implement). This balanced solution exists. It is Ericsson's telecom management solution for *ENGINE*.