

SPECIAL TOPIC

NGN-oriented Business and Operations Support System

Abstract:

The Next Generation Network (NGN) is based on packet switching and open network architecture. Therefore, the NGN business and operations support focuses on customers, totally different from that of the conventional telecommunications network, which concentrates on network operation and maintenance. An NGN operations and maintenance support system should be customer-focused, market-oriented and profit-targeted. Based on its unified NGN operations and maintenance support system, ZTE has implemented an integrated network management system that covers every functional level of the NGN. Accordingly, technical updates can be implemented flexibly on the network to meet the requirements of technology revolution, and new customer-oriented services can be offered to operators.

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The telecom operations support system is usually a combination of the Operations Support System (OSS) and the Business Support System (BSS), and also generally refers to all kinds of platforms supporting telecom operations and development. In a broader perspective, the telecom operations support system should also include the Management Support System (MSS). Operations support involves network management, system management, billing, operation, accounting and customer service, and is important for operators to develop integrated services^[1].

There are two outstanding characteristics of current telecom operations support systems. One is the merging of numerous new services with a much shorter developing period and deployment period. As for the other characteristic, service tie-in-sale strategies and charge-packages of operators are ever changing, since the operators pay more attention to marketing. These two characteristics

create higher requirements for the OSS.

1 Architecture of NGN

With the development of computer and communication technology, the Next Generation Network (NGN) is emerging, which symbolizes the coming of new generation telecom networks. Seen from a developing perspective, the conventional Public Switched Telephone Network (PSTN) based on circuit switching is changing to the NGN based on packet switching. The NGN takes over all the services of the PSTN, and transfers lots of data transmission work to its core IP network to ease the heavy load on the PSTN. Besides, new characteristics of IP technology used for the NGN help improve old services and add new ones^[2].

The NGN adopts open architecture, and separates the functional modules of traditional switches as independent network elements. Each network element can develop independently according to its function, and the protocol interfaces

between network elements are based on related standards. Modulization makes the original telecom network more and more open, and operators are, therefore, able to choose functional modules freely to set up their networks according to their business requirements. The standardization of protocol interfaces between network elements can fulfill interconnections of networks with different structures.

The NGN has 5 functional layers, as shown in Figure 1.

(1) Edge Layer

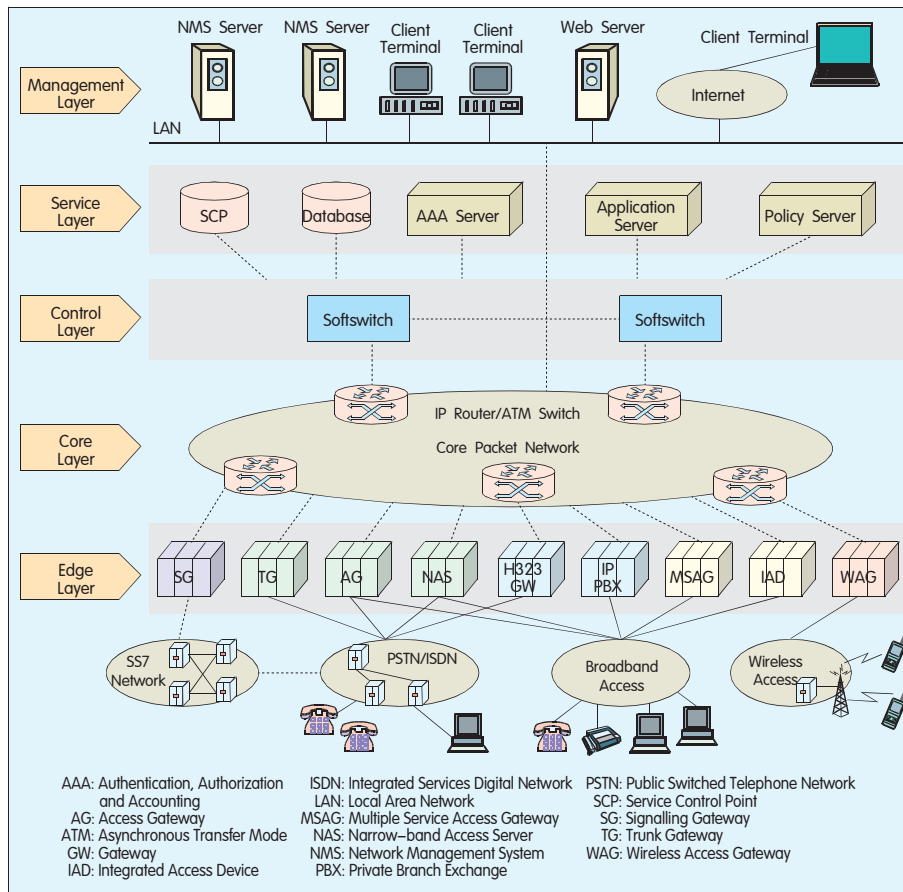
The edge layer connects customers to the network, and centralizes customer services and transports them to the proper destination. It includes all kinds of access methods.

(2) Core Layer

The core layer changes information formats to the kind that can be transmitted through the network, for instance, dividing voice signals into ATM signal elements or IP packets.

(3) Control Layer

Calling functionality is implemented



▲ Figure 1. Functional structure of NGN.

at the control layer. This layer decides the services customers can receive, and has control on the handling of lower-layer network elements on service flow.

(4) Service Layer

The service layer provides extra services based on call establishment. It is impossible to change the current networks into the NGN over night. Therefore, the current networks will coexist with the NGN for a long time. This requires that the new network interwork with the current networks. Accordingly, the following functions are required to be implemented in the new network: interworking between the Time Division Multiplexing (TDM) transmission network and SS7 signal network, interworking with available services such as services provided by the intelligent network, and converging with the existing PSTN system.

(5) Management Layer

The management layer manages network equipment. The management

includes equipment configuration, operation status monitoring, operation index feedback, and more. This layer supports the operation of the whole system. Meanwhile, the layer provides the operations support interface in order to facilitate the data collection and analysis for the OSS.

The management layer at the top manages all kinds of equipment at the service layer, core layer, control layer and edge layer. At present, the management layer has implemented the management of equipment at the control layer and edge layer, including Softswitch, Trunk Gateway (TG), Access Gateway (AG), Signalling Gateway (SG), and Integrated Access Device (IAD). The management of equipment at the service layer and core layer will be gradually implemented. The equipment at the service and core layers includes ATM/router, Authentication, Authorization and Accounting (AAA) equipment, and application servers. Meanwhile, the management layer provides data to the

OSS through various interfaces.

2 OSS of NGN

Compared with conventional telecom network management, the operations management of NGN is much more complex, and requires a unified, remote, safe and active system. However, the network management of NGN should be much simpler than that of the conventional telecom network, because the NGN, originally adopting open protocols, supports access of diversified services and provides good compatibility to equipment from different vendors. Facing the escalating competition in the telecom industry, foregone monopoly and dropping profit, telecom enterprises will be more rational in investing in network construction and conduct more market-and-maintenance-cost-oriented network improvement.

With the development of NGN, NGN network operations support management has changed from the network-operation-and-maintenance-centered to customer-centered^[3]. Therefore, a modern NGN operations and maintenance system should have the following 3 objectives:

(1) Customer-centered

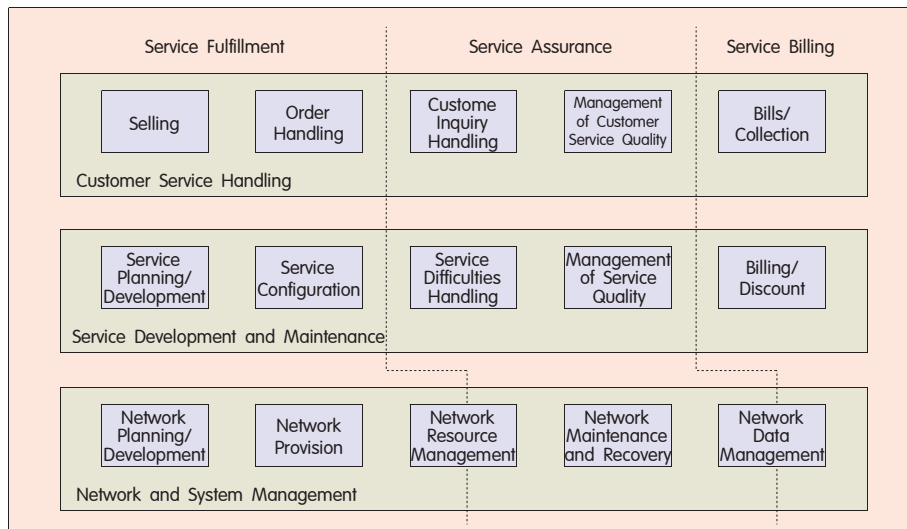
Customer-centered marketing models are developed based on product-oriented marketing. Resources are bundled into product packets, and sold by marketing departments and retailers. Customers' requirements are the key factors to be considered when making and packaging products as well as making promotion plans. Meanwhile, individualized customer marketing, service and management are offered. Customers with different levels can order for different product packages and enjoy different promotion activities and discount rates. In addition, they can have different service approaches and channels^[4].

(2) Market-oriented

This means prompt reaction to the market, rapid launch of new products, quick creation of business plans, and fast restructuring of company's resources.

(3) Profit-targeted

Income and cost can be apportioned to every service, product, customer



▲ Figure 2. Service composition of NGN telecom operations support system.

group and even every customer, making reasonable the distribution of a company's resources.

2.1 Services of NGN OSS

According to the definition established by the TeleManagement Forum (TMF), NGN telecom operations support system consists of service fulfillment, assurance and billing, as shown in Figure 2.

With the launch of NGN services, control of network planning and deployment would also be included into operations support, which is positioned before the service fulfillment layer in the new OSS structure.

Transversely, the NGN telecom operations support system is divided into network planning and deployment, service fulfillment, service assurance and service billing.

Longitudinally, it consists of network and system management, service development and maintenance, and customer service handling layers.

Seen from the system structure, NGN telecom operations support system in general includes the following parts:

(1) Billing and Settlement System

The system is capable of collecting data from telecom network devices and calculating bills according to the rules set up in advance. Meanwhile, if a customer has anything to do with other operators while he uses the services of an operator, settlement should be made for the inter-network expenses.

(2) Business and Accounting System
The system is capable of receiving and processing service requirements. In addition, it creates a bill according to the telecom network resources that a customer has used.

(3) Customer Service System
The system, on one hand, offers quick and convenient services to the customers, and on the other hand, provides corresponding function assurance when new services are not opened.

(4) Decision Support System
The system is capable of dynamically and selectively collecting and updating effective information from data sources

and related information from out of the enterprises, analyzing intelligently, processing, forecasting and simulating, and finally providing in-time, scientific and effective analysis reports to decision makers or professionals to be good information and intelligence support.

2.2 Functional Structure of NGN OSS

The functional structure of NGN OSS is divided into 4 layers, as shown in Figure 3.

(1) Network Element Management Layer

It fulfills the management and control of basic telecom network elements.

(2) Network Management Layer

It provides network management functions, and simultaneously outputs all data reported by the network elements upward for later data analysis.

(3) Service Management Layer

It handles all service in OSS, and gives feedback to the customer service layer.

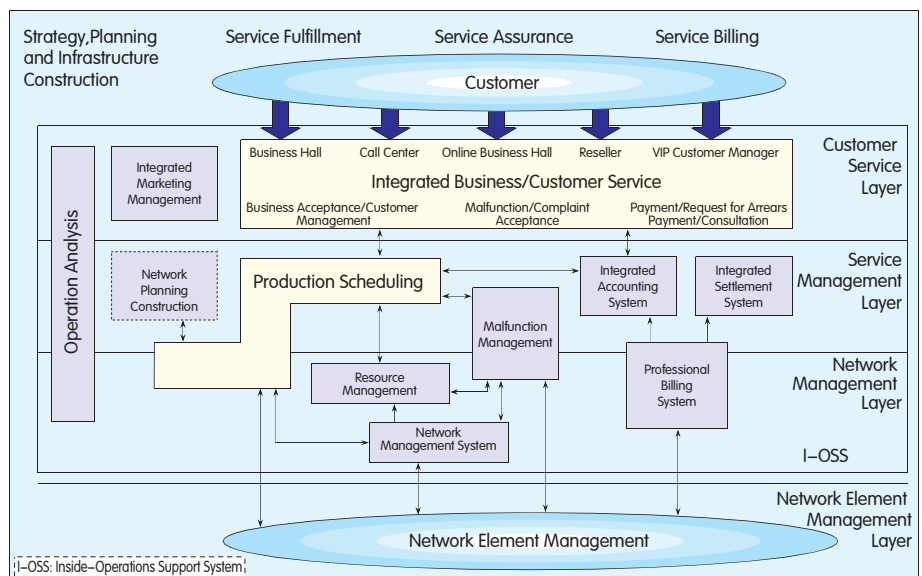
(4) Customer Service Layer

It provides customer service to the OSS, as well as all kinds of management interfaces.

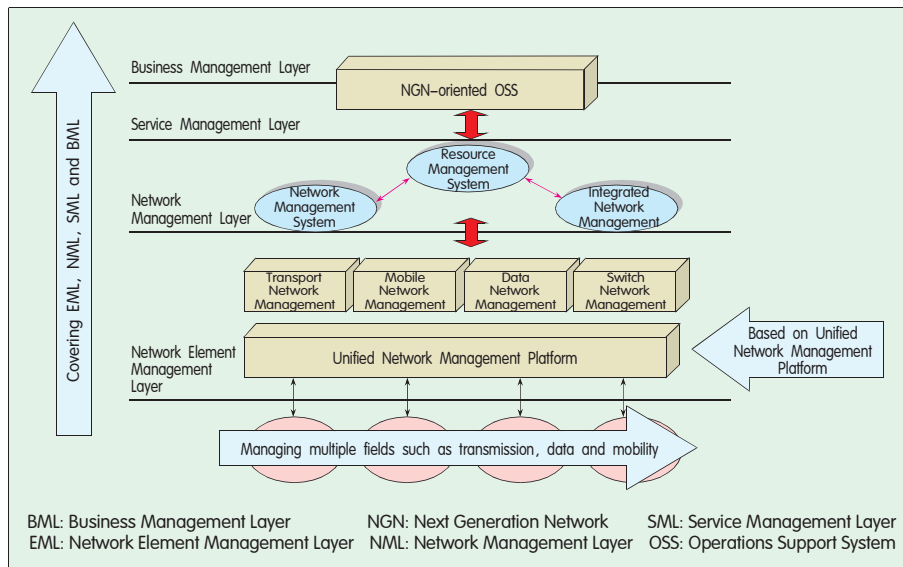
The following are 2 examples of how services are processed in NGN OSS.

(1) Process of Customer's Application for Services

- A customer applies for a new service through the integrated business customer service system.
- The customer's application is



▲ Figure 3. Functional structure of telecom operations support system.



▲ Figure 4. Basic architecture of NGN OSS from ZTE.

transferred to the production scheduling system to conduct order review, after it is accepted.

- The resource management system makes scheduling design for the application.
- The results of the scheduling design are returned back to the production schedule system that then generates a construction management instruction notification.
- The construction unit changes network elements through the network element management layer in order to make the network elements meet the requirements of the customer.
- The resource management layer fulfills resource synchronization according to the instruction notification at the same time of construction.
- After completion of construction, the production scheduling system is responsible for completion check and acceptance.
- Passing the check of completion, the production scheduling system sends a task completion notification to the accounting system to make the related accounting filing.
- At the same time, the production scheduling system sends a notification to the resource management system to file the resources.
- After filing, the production scheduling system sends a completion notification to the business customer service system.

- The business customer service system notifies the customer that the service for which he/she applied has been opened.

(2) Process of Answering Customer Complaint for Malfunction

- A customer makes a complaint for malfunction through the integrated business customer service system.
- The production scheduling system informs the malfunction handling system to handle the malfunction after the business system accepts the complaint.
- The malfunction management system needs to make a resource inquiry positioning through the resource management system as it handles

the malfunction.

- The malfunction management system restores the function of the network element to clear the malfunction through the network element management layer.
- If the function recovery fails, the malfunction management system will inform the production scheduling system to start emergency scheduling.
- The emergency scheduling enters the resource management system to conduct emergency scheduling design.
- The resource management informs the production scheduling system to carry out handling management, and makes emergency malfunction handling through the network element management layer.
- After the recovery of the malfunction, the production scheduling is responsible for completion check and acceptance, and informs the accounting system to make related accounting filing.
- The production scheduling system informs the malfunction management system and resource management system to file the malfunction and resources respectively.
- Finally, the production scheduling system sends a completion notification to the integrated customer service system that further informs the customer about the malfunction recovery.

2.3 Basic Architecture of NGN OSS from ZTE

ZTE has a completed network



management system covering all the functional layers of the NGN network. All network management is implemented on a unified network management platform, which supports flexible technical upgrading to meet the requirements of technology evolution. The professional network management systems tend to converge at the network and service layers, and uniformly provide good support for the uppermost level of business operations system, as shown in Figure 4.

Services based on NGN will create many new requirements for customer service, which may have influence on the NGN OSS. ZTE takes such influence into consideration in the design of NGN OSS, and its system is able to provide operators with new customer-oriented services.

3 Conclusions

At present, the network coverage and technical advance of Chinese telecom operators have ranked at the top of the world, but the network management level, operations level and economic

returns are left behind. After entering the World Trade Organization (WTO), all telecom operators in China face the challenge of "how to reduce cost and retain customers". Both external and internal markets have increasing pressure. All the operators are finally turning their attention to OSS in order to solve this problem^[5-9].

The deployment of NGN has put higher requirements on OSS, which is expected by operators to play a better role in reducing operation cost, increasing operation income and enhancing comprehensive competence. Good understanding of the development tendency of OSS will make the operators more confident when facing the uncertainty of future business and operation models.

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Biographies



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Roundup

ZTE to Expand Mali's CDMA WLL Network

ZTE Corporation is to install the first wireless telecommunications system in Timbuctou, for centuries a by-word for the most remote places on earth.

ZTE has signed an agreement to install Mali's first Wireless Local Loop (WLL) network for Sotelma, the state owned fix-line telecoms operator, which will expand an existing network in Mali's capital city Bamako and cover important centres in Mali including Mopti, Segou, Sikasso and Timbuctou. The agreement was signed during the time when China foreign minister Mr. Li Zhaoxing visited Mali and the agreement signing was witnessed by Mali's telecommunication minister Mr. Gaoussou Darabo and the Chinese ambassador to Mali Mr. Wei Wenhua.

WLL technology provided by ZTE enables a telecommunications network to be set up without installing cables, avoiding the construction costs of poles, trenches and cables reaching the home of every potential phone customer.

This network expansion follows the installation by ZTE of a 6 000 line CDMA2000 1X WLL in Bamako in 2005.

The network will enable homes in Timbuctou to

communicate with the worldwide telephone system, removing in one stroke the centuries-old isolation of this town surrounded by hundreds of miles of desert.

"ZTE has brought affordable modern telecommunications to many millions of people who were previously unable to make telephone calls or access the Internet. Bringing wireless telecommunications to Mali including Timbuctou is just the latest example of this," said Miss Zhang Jie, ZTE's representative in Mali.

"Mali is a big country with a relatively small population and ZTE's CDMA WLL technology is ideal for telecommunications networks in environments like this. As China's largest wireless telecoms equipment exporter, ZTE has extensive experience and proven technology to support Mali's telecommunications development."

ZTE's CDMA telecommunications products have successfully entered 60 countries through 100 operators' networks with 30 million lines around the world. ZTE Corporation has accordingly become one of the tier-one CDMA equipment manufacturers in the world.