LECTURE SERIES

Mobile Ubiquitous Service Environment

3

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The Mobile Ubiquitous Service Environment (MUSE), established through the coordination and integration of mobile telecommunications and ubiquitous network, in the pursuit of Always Best Experience (ABE), represents the major development trend for the next generation mobile wireless network. Research on MUSE will involve the integration of the computing model system, service platform system, operating system and terminal structure system, all of which involve exploration and innovation of a new networking structure, its control and management as well as its measurement. The change in network resources triggers the change in network computing models. To let readers have a basic understanding of MUSE, this lecture introduces MUSE in four sections. This section focuses on the system structure of the MUSE service platform.

6 System Structure of MUSE Service Platform

6.1 Structure Model

MUSE stands up for the development trend of future Internet and wireless mobile networks. With the target of Always Best Environment (ABE) for users, and from the view of service provision, MUSE unifies network and terminals into a ubiquitous service environment that is able to support mobility and customization. The heterogeneity, as well as the reconstruction, of such a service environment in network and terminal aspects is emphasized. The MUSE service platform also pays much attention to the cooperation between network and terminal service environments (especially to different operation modes for personal and wide area wireless environments, and to rich possibilities of service expansion brought about by the cooperation). Moreover, the service platform highlights the diversity of service creation, application-oriented unified interface, and the capability of shielding any changes of the bottom layer network structure. In the conception model of MUSE, network and terminal are abstracted as the combination of capabilities and mechanisms. These capabilities are representable, quantizable, perceptible and adaptable, so they facilitate the fulfillment of the cooperative work and of efficient and intelligent controllability and manageability of the system.

The MUSE service platform lies between the bottom layer communication network and the upper layer mobile environment. The platform encapsulates the abilities extracted and drawn from the bottom layer into a standard service enabler. It offers convenient service development environment for upper layer Service Providers (SP) and Content Providers (CP). It simplifies the difficulty of service development, cuts down the service development period, lowers the risk of service development, and realizes user management, authentication and accounting for end users. Moreover, it supports diversified intelligent applications, improves user experience, and enables easy and safe maintenance by providing unified management of subscribers and services.

The MUSE service platform is a system for service access and provision, with the purpose of offering a flexible, unified, convenient operation and management model. The system is dependent on basic service abilities offered by the heterogeneous network to complete operation, maintenance and management of services.

MUSE is also a service lifecycle management system. It supervises and manages the creation, deployment and execution of existing and new services.

Based on the analysis above, the MUSE service platform architecture is presented in Figure 1. The service platform includes two planes: the service operation management plane, and the service lifecycle management plane. The former plane comprises complex service, service adaptation, service enabler and service management support modules. The latter consists of service creation, service deployment and service execution modules. The service operation management plane, oriented to user groups of the platform, offers new services to end users, and provides maintenance persons and third-party SP/CP with a standard platform interface for service maintenance and creation. The bottom-layer communication network is responsible for providing communication ground, including heterogeneous networks and access gateways. The bottom-layer network adopts multiple mature technologies and

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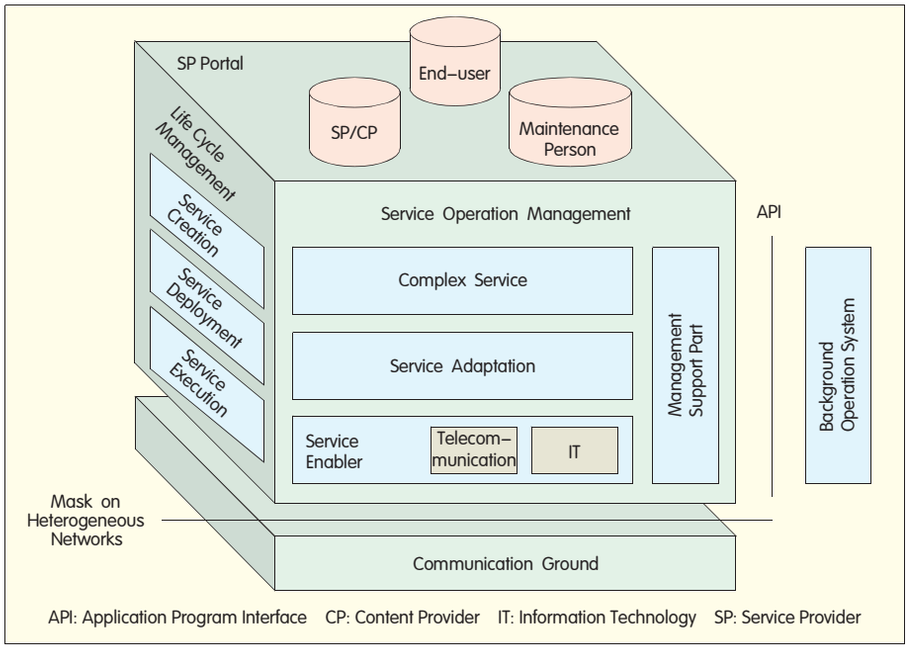


▲Figure1. MUSE service platform architecture.

protocols to provide various capabilities that can be encapsulated.

6.2 Planes and Their Relationship

6.2.1 Service Operation Management Plane

The MUSE service platform, above the network communication ground, has service enabler, service adaptation, and complex service layers from top to bottom. Moreover, it has a service management support part, which is responsible for operation support of integrated services. Figure 2 shows the structure of the service operation management plane.

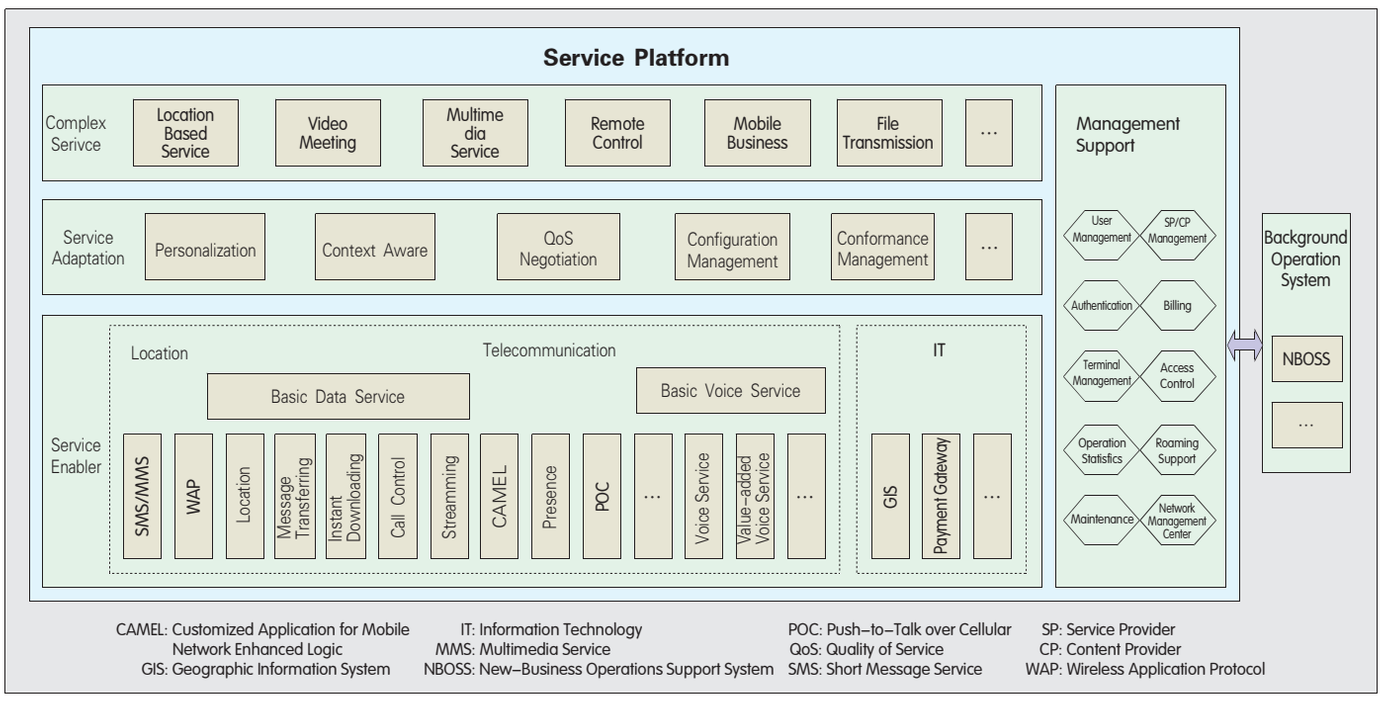
(1) Service Enabler Layer

The service enabler layer is located at the bottom of the service model. It acquires the capabilities of network and terminal from the network communication ground, and abstracts them as basic service capabilities. These basic capabilities are then encapsulated into independent service engines to offer standard and open interfaces to the upper layer. The enabler promotes secondary development and integration of services.

Typical service enabler includes basic data service capabilities, basic voice service capabilities (such as voice service and value-added voice service), and service functions (such as Geographic Information System (GIS) and payment gateway) in IT domain. The basic data service capabilities include Short Message Service (SMS), Multimedia Service (MMS), positioning service, instant downloading, information transferring, call control, and Customized Application for Mobile Network Enhanced Logic (CAMEL).

(2) Service Adaptation Layer

The MUSE service platform catches its user's preferences in the light of the user's choices of network and terminal, of situation and change tendency of the environment where the user stays, of the user's personalized setting, and of the



▲Figure 2. Service Operation Management Plane.

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user's historical record. In order to meet personalized demands of the user in a specific time, place or situation, the platform changes the content, provision method and representation form of services intelligently, proactively, dynamically, and adaptively based on the information it caught. This is service adaptation.

Having multiple intelligent capability modules for control and decision-making, including data convergence, context-aware, and Quality of Service (QoS) negotiation, the service adaptation layer can dynamically collect, selectively extract and intelligently analyze the user's environment information, and can then make proactive decision and real-time feedback. In this way, the layer may fulfill the secondary development and integration of the basic service capabilities offered by the service enabler layer, and quickly create complex services to meet specific demands.

(3) Complex Service Layer

A complex service is the product of the service adaptation mechanism integrating the basic service capabilities that are encapsulated by the service enabler. Unlike basic service capabilities, complex services can be given to users as an independent and complete application with intact service logic. As for the application developer, the complex services can be treated as modules for constituting more complex applications.

Generally, the complex services can be seen as a series of standardized applications such as file transmission and location-oriented services.

(4) Service Management Support Part

The service Management support part is responsible for the management, operation and maintenance of the MUSE service platform. Moreover, it offers unified management strategy to utilize the resources of the communication ground. The part provides common support functionality oriented to end user service operation and to SP/CP network capability operation. It also offers a management portal for maintenance persons. Moreover, the part provides the third party Operations Support System (OSS) and Business Support System (BSS) with open interfaces and function division for their integration into the MUSE service platform. This facilitates integration of different systems, and avoids repeated construction.

(5) Background Operation System

The background operation system is the peripheral system of the service platform, and the third party provider offers operations support for it. The system, such as New-Business Operations Support System (NBOSS), offers the functions of both BSS and OSS. The BSS functions include billing settlement, business accounting and customer care, and the OSS function is support of network management and maintenance. Moreover, the system is compatible with related standards, which makes interoperating of different systems possible.

6.2.2 Service Lifecycle Management Platform

The service life cycle management platform is composed of Service Creation Environment (SCE), Service Deployment Environment (SDE) and Service Execution Environment (SEE) from top to bottom, as shown in Figure 3.

(1) SCE

The SCE, including the service catalog, service integration development environment and a series of development tool sets, is responsible for the definition, development and testing of services.

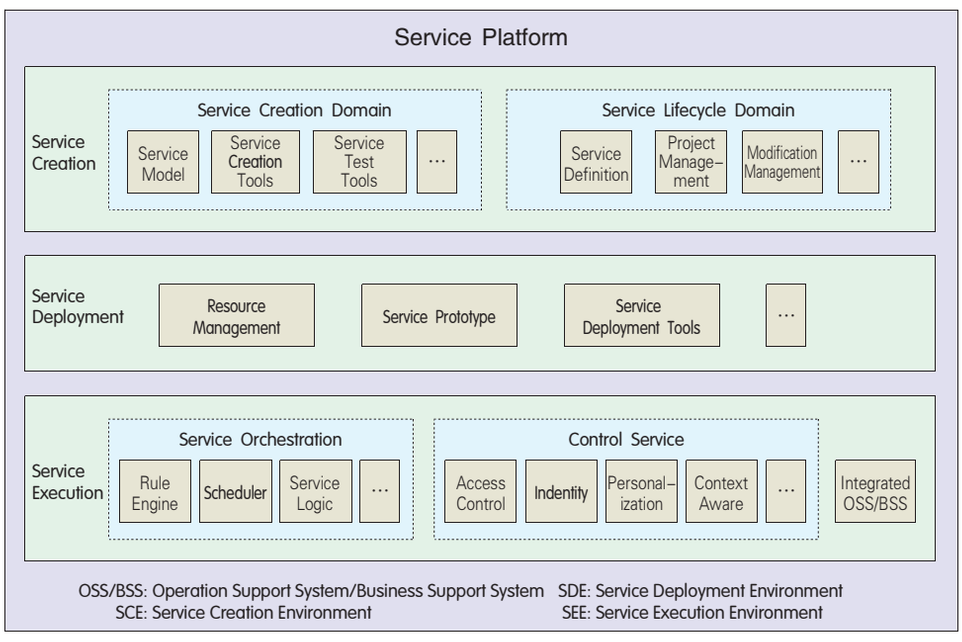
It is logically divided into the service creation domain and the service lifecycle domain. The former domain implements service model, system architecture design, and service development and test. The latter domain deals with service definition, project management, and modification management.

(2) SDE

Based on service deployment tools and mechanism, the SDE is capable of setting service prototype and deploying services. It distributes and installs the service software (such as service logic), created by the SCE, into network elements. This guarantees that users can access the services they want from the nearest network element. SDE also supports resource management, which helps the system administrator manage the existing services in distributed networks.

(3) SEE

SEE is in charge of service execution. It is composed of three parts: service orchestration, control service, and integrated OSS/BSS. The service orchestration part, based on a certain standard processing flow, assembles and integrates the basic service capabilities offered by the service enabler, and executes service logic. The control service supports



▲ Figure 3. Service Lifecycle Management Plane.

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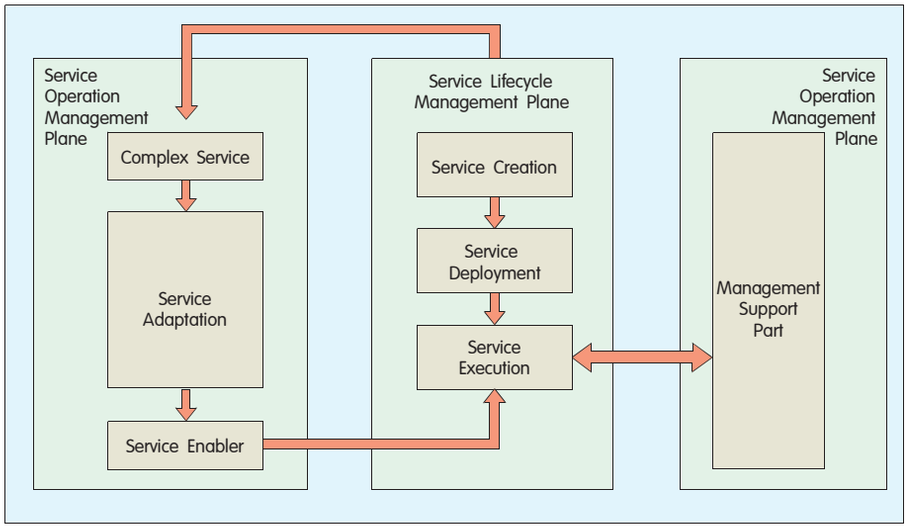

▲ Figure 4. Relationship between two planes of the MUSE service platform.

access control, identity, and personalization.Besides, it creates a measurement engine for billing data records, as well as an event notification engine.

6.2.3 Relationship between Planes

Figure 4 illustrates the relationship between the service operation management plane and the service lifecycle management plane.

The service enabler abstracts the capabilities from the bottom layer network and terminal. The capabilities, together with the outputs of SCE and SDE, are imported into SEE to offer new complex services to end users. Besides, the management support part helps operate these new services. Standard and open interfaces between the OSS/BSS integrated module in SEE and the management support part are used to integrate OSS/BSS systems offered by the third party.

The Muse service platform pays attention to changing users' environment and situation. It focuses on intelligent service provisioning and diversified service creation modes. It also enables services to adapt to changes of the bottom layer network and terminal. Moreover, based on the basic service capabilities offered by the heterogeneous network, the Muse service platform performs operation, maintenance and management of various services.

(to be continued)

Biographies

Zhang Ping is a professor and a doctoral supervisor of Beijing University of Posts and Telecommunications (BUPT). He is the director of Wireless Technology Institute (WTI) of BUPT, deputy chairman of the Editorial Committee of BUPT Academic Journal, and member of the Academic Committee of BUPT. He is also members of many important expert groups, including China C3G Research Group, Future Mobile Telecommunications Project Group of National 863 Program, the Wireless World Research Forum (WWRF) and its Prospect Committee, and 3G Mobile Telecommunications Technology Laboratory under the Ministry of Information Industry of China.

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Roundup

ZTE USA and Sprint Sign WiMAX Master Purchase Agreement

Reston, VA – July 17, 2007 – ZTE USA, Inc., a subsidiary of ZTE Corporation, a leading global provider of telecommunications equipment and network solutions, announced today that it has entered into a master purchase agreement with Sprint Nextel (NYSE: S). Under the terms of the agreement, ZTE will supply Sprint with WiMAX PC cards in express and USB form factors, and advanced modem solutions for home networking. The agreement was marked by a contract signing ceremony today at Sprint's Herndon, Va. offices involving Mr. Hou Weigui, chairman of ZTE Corporation, and Barry West, President of 4G Mobile Broadband, Sprint.

Sprint has a plan to make its WiMAX services commercially available to 100 million people in the U.S. by the end of 2008.

"We chose ZTE because we found the company to be a cutting-edge innovator backed by the engineering resources of an established, leading global brand," said Mr. West.

ZTE's express and USB cards will equip Sprint subscribers with anywhere wireless data access on their laptop, desktop or mobile device. The home modem can serve as a replacement networking solution for the home cable modem, enabling service providers to quickly roll-out fixed broadband wireless service access via their network. ZTE's modem is also equipped to enable carriers to offer VoIP-based voice services. (ZTE)

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