

# Research of Network Convergence-Oriented Open Service Platform Architecture

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## Abstract

*By well defining API, the network convergence-oriented open service platform can open the functions of network to various service applications, which make the service layer is independent from lower layers of network. In this paper, we describe the based architecture model of network convergence-oriented open service platform as six parts: service logic execution environment subsystem, service creation environment subsystem, service management environment subsystem, virtual home environment subsystem, service capability subsystem, network protocol adaptive subsystem. With this architecture, we can use the open API to develop more service without knowing the lower communication mechanism, which will make the network resource used more reasonable.*

**Keywords:** network converged; open service; open service platform

## 1. Introduction

With the users need to network service becoming more personalized, comprehensive, diversification, the network convergence-oriented open service platform architecture which can supply various service including voice, video, image and data has become more important.

By well defining API, the network convergence-oriented open service platform can open the functions of network to various service applications, which make the service layer is independent from lower layers of network. The based architecture model of network convergence-oriented open service platform has six parts: service logic execution environment subsystem, service creation environment subsystem, service management environment subsystem, virtual home environment subsystem, service capability subsystem, adaptive network protocol subsystem.

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## 2. Capacity characteristics of network convergence-oriented open service platform

### (1) Converged network capacity

Open Service Platform can collect, abstract and package various heterogeneous network capacity and resources, then offer the standard interfaces for the business development (such as the Parlay API), making business development can truly exist regardless of the bearer network. It can not only support various single-network services and inter-network services, but also provide personalize and diversification services converged a wide range of network capabilities.

### (2) Offering open service capacity interface

Open Service Platform extract the service capacity from the network functional entity, provide service-oriented interface, shield the complexity of the network, making staff can develop abundant application using standard interfaces without understanding communications knowledge. It simplifies the service development, which is the basis for widely using and commercialization of network capacity.

### (3) Controlling the degree of openness of the network capacity

Open Service Platform can open the network service capacity to the CP / SP with controlling, and protect the low-level network resources from damaging by external applications, manage the safe use of network resources.

### (4) Well scalability

Open Service Platform shielding changes of the network, when confronting with network upgrading or network equipment changing, you can just modify the interface implement, no need to change interfaces, which will not impact the service application. open business platform has well scalability, which making

service developing independently, breaking the restrict of network changes.

(5) Supporting business reusability and scalability

Service building in the open service platform using its standard interfaces, making the service functions modularization, componentize, then reusability and scalability. SP can reuse the developed service functions components, to form a new service; they also can registration, and published its own services to the service platform for users or other SP to do the secondary development. More flexible of the services expansion can adapt to the growing and changing needs of customers.

(6) Operational

Open service platform can open and deploy new services conveniently, support unified service management, user management, CP / SP management, accounting management and so on.

(7) Sharing rich content resources

Open service platform can share network resources from not only different network but also different services. Content resources supplied by the CP, unified managed by open service platform. Content resources can be accessed using standard interfaces by various terminals various access methods and various network.

(8) VHE characteristics

By addressing the issue of mobility - the terminal mobility and service mobility we can achieve the service portability of different places. Terminal mobility is realized through the terminal adaptive subsystem by adapting to the service implementation according to various terminals dynamically. Service mobility is realized by unified access and unified accounting management primarily. It can adapt to a variety of network (fixed network, mobile network and the Internet) and a variety of terminals (telephone, mobile phones, computers), provide different kinds of common and fast creating method for various service applications and service modules, support of the same content adaptation for different terminal devices and the terminal mobility, support service mobility in different places.

Network convergence-oriented open service platform integrate a wide range of basic service capabilities, open a variety of network resources, offer support and unified management to the CP / SP and its

service development. Network convergence-oriented open service platform connect service providers and network operators effectively, build a bridge between service applications and networks capacity, making developers can provide a wide range of convergence-oriented personalized services quickly, to meet the growing needs of users.

### **3. Network convergence-oriented open service platform architecture**

The basic composition of network convergence-oriented open service environment is an open service platform, application server and core network elements. the basic model of open service platform includes six main parts: service logic execution environment subsystem, service creation environment subsystem, service management environment subsystem, virtual home environment subsystem, service capability subsystem, network protocol adaptive subsystem. Structure of the network convergence-oriented open service platform is as follows.

### **4. The core component of the network convergence-oriented open service platform**

The basic model of network convergence-oriented open service platform includes six main parts: service logic execution environment subsystem, service creation environment subsystem, service management environment subsystem, virtual home environment subsystem, service capability subsystem, network protocol adaptive subsystem. As follows:

(1) Service logic execution environment subsystem (SLEE)

SLEE is the presence and execution environment for the service logic of various value-added services and intelligent services. SLEE should simplify service development in two ways, the first is shielding the lower heterogeneous networks and the details of distributed computing, and the second is offering standard infrastructure interface of statistics, log, transaction, concurrent processing, and load balancing data access for the service development.

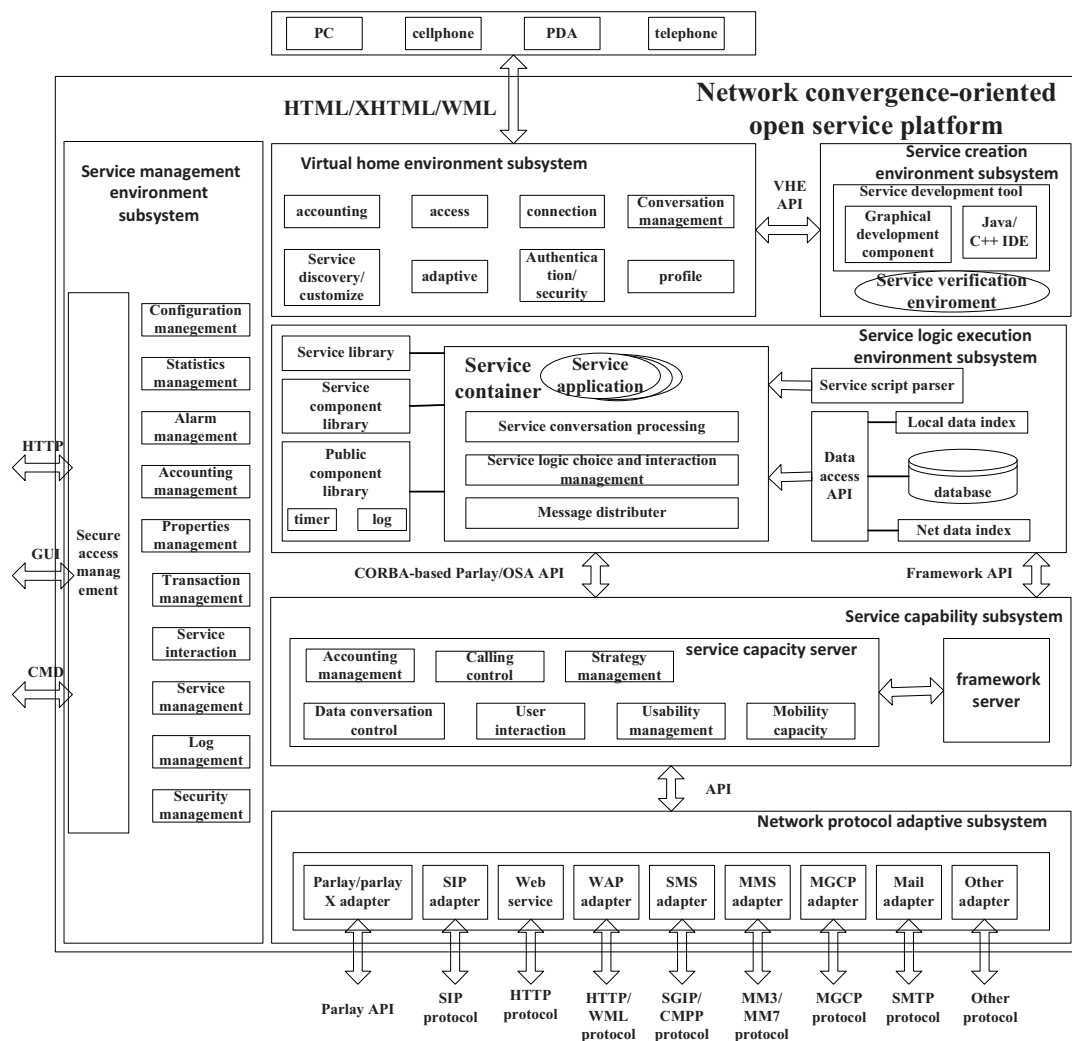


Figure1. Structure of the network convergence-oriented open service platform

(2) Service creation environment subsystem (SCE)  
Based on the open API offered by SLEE, SCE provide service development interfaces at different level of capacity and abstraction for service developer (API-level, component / framework and script-level), as well as the functions like service tests , service simulation and service verification, which will realize a development kit supporting WYSIWYG.

(3) Service management environment subsystem (SME)  
SME offer public supporting service to other subsystems in the network convergence-oriented open service platform, including offering management to the service deployed to the service logic execution environment: secure access, QoS management, accounting, log, alarm, load management. SME and SLEE communicate by the open standard interfaces to each other and helping each other to complete the life

cycle management of service, service access and order, management of service data and user data.

(4) Virtual home environment subsystem (VHE)  
VHE system includes access component, profile component, discovery component, conversation component, connection component, adapter component and accounting component. All components in VHE platform are built above the OSA / Parlay API, supporting a variety of mobile service environment, as well as providing standard VHE API to value-added service (VASP), realizing advanced service features, such as adaptation, continuity and personalization, conversations mobility and so on.

(5) Service capability subsystem (SC)  
SC includes the framework server and the service capacity server (SCS).

The service capacity server offer service capacity of bearer network to the service / application, while the framework server offer the basic operating mechanism like management, discovery, integration, certification to the service capacity.

#### (6) Network protocol adaptive subsystem

Network protocol adaptive subsystem is the protocol interface layer between the service capacity subsystem and underlying network resources, completing of the convergence and translation of various network protocols.

## 5. Conclusions and Future Work

With the cooperation of subsystems of network convergence-oriented open service platform, it can offer support to service developer helping they develop high-quality and flexible new service quickly and easily. It can not only share resource in different networks, different services, reduce operating costs effectively, but also can make business expansion more flexible then meeting the growing and changing customer needs.

In the future work, security is the most important challenges we should concern about and we will study more on that.

## 6. References

- [1] C. Aurrecochea; A. A. Lazarand R. Stadler: Opening Network Services for Management: Open Architectures and Network Programming, 1998 IEEE ,3-4 April 1998 Page(s):61 – 71.
- [2] Sang Ki Kim, Byung Sun Lee, Kyung Pyo Jun: Open Service Platform: A Service Creation and Provisioning Environment for BcN Infrastructure. Broadband Convergence Networks, 2006. BcN 2006. The 1st International Workshop on.7-7 April 2006 Page(s):1 – 9.
- [3] Guo Leshen; Cheng Junliang; Su Sen: Security for next generation intelligent network based on Parlay API. Autonomous Decentralized System, 2002. The 2nd International Workshop on. 6-7 Nov. 2002 Page(s):101 – 107.
- [4] de Gouveia, F.C.; Magedanz, T.; Good, R.; Ventura, N.: The role of open IMS testbeds in complex service delivery platforms. AFRICON 2007,26-28 Sept. 2007 Page(s):1 – 7.
- [5] Hoag, J.C.: An Architecture for Network Operations and Management Based on State and Services. Broadband Convergence Networks, 2006. BcN 2006. The 1st International Workshop on.7-7 April 2006 Page(s):1 – 4.
- [6] Kataria, D.; Logothetis, D.: Fixed mobile convergence: network architecture, services, terminals, and traffic management. Personal, Indoor and Mobile Radio Communications, 2005. PIMRC 2005. IEEE 16th International Symposium on. Volume 4, 11-14 Sept. 2005 Page(s):2289 - 2300 Vol. 4.
- [7] Rui Zhang; Yi-Jun Li; Xue-Feng Liang; Yong Guo: Auction Mechanism Research for Universal Service of Information Network Convergence. Machine Learning and Cybernetics, 2007 International Conference on. Volume 7, 19-22 Aug. 2007 Page(s):4064 – 4068.
- [8] Imhoff, F.: Efficient integration and translation of value added services for converging networks using middleware platforms. Computer Communications and Networks, 2000. Proceedings. Ninth International Conference on. 16-18 Oct. 2000 Page(s):164 – 169.
- [9] Falchuk, B.; Chiang, J.; Hafid, A.; Cheng, Y.-H.; Natarajan, N.; Lin, F.J.; Cheng, H.: An open service platform for deploying and managing services at network edges. Open Architectures and Network Programming, 2003 IEEE Conference on. 4-5 April 2003 Page(s):77 – 86.
- [10] Hendrich, N.; Jianwei Zhang: Multistandard Integrated Network Convergence for Mobile and Broadcast Technologies. Communications and Networking in China, 2007. CHINACOM '07. Second International Conference on. 22-24 Aug. 2007 Page(s):670 – 675.
- [11] Walter, U.; Zitterbart, M.; Charzinski, J.: Flexible Strategy Configuration for efficient operation of a Next Generation Network. Network Operations and Management Symposium, 2006. NOMS 2006. 10th IEEE/IFIP. 3-7 April 2006 Page(s):1 – 4.
- [12] Jinhong Yang; Hyojin Park: A Design of Open Service Access Gateway for Converged Web Service. Advanced Communication Technology, 2008. ICACT 2008. 10th International Conference on. Volume 3, 17-20 Feb. 2008 Page(s):1807 – 1810.
- [13] Habich, D.; Richly, S.; Ruempel, A.; Buecke, W.; Preissler, S.: Open Service Process Platform 2.0. Congress on Services - Part I, 2008. SERVICES '08. IEEE. 6-11 July 2008 Page(s):152 – 159.
- [14] Khlifi, H.; Gregoire, J.-C.: IMS Application Servers: Roles, Requirements, and Implementation Technologies. Internet Computing, IEEE. Volume 12, Issue 3, May-June 2008 Page(s):40 – 51.
- [15] Argyroudis, P.; McAdoo, R.; Toner, S.; Doyle, L.; O'Mahony, D.: Analysing the Security Threats against Network Convergence Architectures. Information Assurance and Security, 2007. IAS 2007. Third International Symposium on. 29-31 Aug. 2007 Page(s):241 – 246.
- [16] Sarin, A.: The Future of Convergence in the Communications Industry. Communications Magazine, IEEE. Volume 45, Issue 9, September 2007 Page(s):12 – 14.