A CLOUD TELECOM OPEN PLATFORM FOR CONVERGING IMS AND WEB 2.0

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Abstract: Nowadays, Web 2.0 becomes more and more popular depending on interacting and collaborating with other users in a virtual community. End users can use Web 2.0 services in All-IP network provided by sites to create innovative services, so Web 2.0 services are an open-garden.IMS is introduced to adapt to control based on IP in the telecom world. In order to expose the IMS capabilities, WIMS 2.0 initiative was presented to guide telecom operators to realise the convergence between IMS and Web 2.0.Cloud computing is focussed on open and share, and make the most use of resources including computing, store and network bandwidth. Therefore, the cloud-based platform for converging IMS and Web 2.0 is reasonable. This paper proposes a design of Cloud Telecom Open platform for exposition of IMS capabilities though open APIs.

1 INTRODUCTION

Some great changes have happened dramatically in the telecom world in recent years. According to the long tail theory, 20% of the telecom services satisfy 80% of the customers, however the demands of customers' are not aligned with operator's services.

In order to meet the demands and overcome the limitations, IMS (IP Multimedia Subsystem) (3GPP, 2007) is introduced to deliver Internet protocol multimedia services. On one side, IMS builds new value chains and business models for operators, and on the other side enhances the end-user experience through converged and blended services.

At the same time, a large number of social services have appeared in the Web 2.0 (O'Reilly, 2005) world. The key point of Web 2.0 services is that ende-user takes part in the process of design and development. The centre of the service is becoming the user and the Internet becomes the place where new services are produced. In many cases, services are not built by developers themselves, but integrated data and functions using published APIs, the so-called Mashup.Mashups have played an active role in the evolution of social networks and Web 2.0.

Moreover, there is a tendency that communication features in the Internet services are needed even in the mobile world.IMS and Internet services seem to have many common features, but they differ in some points, such as access control and business models,etc.In a word, IMS capabilities is not open or shared outside the mobile world, and are a walled-garden.

To solve the problems that telecom abilities are needed to expose to the Internet world and provide new approaches, a new method named Telco 2.0 (The Telco 2.0 TM Initiative) was born, with the emergence of Web 2.0. Telco 2.0 offers a new view of seeing and thinking telecom business models.

According to Telco 2.0, WIMS 2.0 (Web 2.0 & IMS) initiative (Lozano, 2008; Moro, 2008) is proposed as a solution to enable the convergence between Web 2.0 and mobile world.WIMS 2.0 defines a two-sided strategy, which allows providing telecom capabilities to the Web 2.0 as well as enriching the telecom services of operators'.

To achieve the convergence along with the guidelines presented in WIMS 2.0 initiative, a

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reference model is established which is shown in Figure 1. In the figure, the entities and relationships among them are depicted.

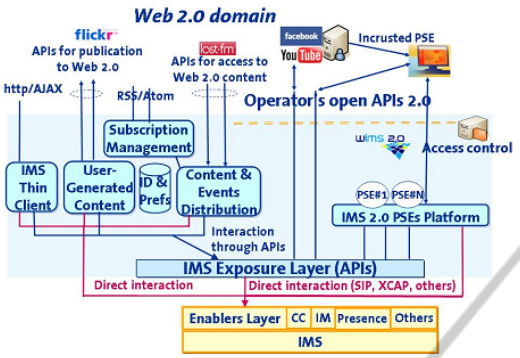

Figure 1: Entities within the WIMS 2.0 reference model (Lozano, 2008).

The philosophy of Cloud computing (Cloud Computing) seems to centralize the resources and provides pay-as-you-go services. In the cloud computing world, there is a kind of service called PaaS (Platform as a Service) which delivers a computing platform as a service and facilitates deployment of applications without the cost and complexity of managing the hardware and software.

This paper is therefore aimed at creating a platform in the style of Cloud platform which puts telecom capabilities together and offers the abilities to the end-users for enriching services to realise convergence between Web 2.0 and IMS.The Cloud Telecom Open platform concentrates on the exposition of telecom capabilities through open Web APIs.

2 THE CLOUD TELECOM OPEN PLATFORM

The Cloud Telecom Open Platform (CTOP) absorbs and draws on the Internet open mode, which has open, integrated features, and be able to integrate various kinds of elements both in communication network world and Internet world in heterogeneous environment. Telecom operators can utilize the properties of integrating heterogeneous abilities to create killer applications. The objective of CTOP is to provide basis communication abilities to Internet world and make the convergence of Internet business services and telecom communication business abilities come true.

In the reference model proposed in WISM 2.0 initiative, the component for exposure of IMS capabilities is the IMS Exposure Layer, the responsibility of this component is to expose IMS capabilities to the outer world by open Web APIs which mostly is REST (Representational State Transfer) style (Fielding, 2000; Fielding and Taylor, 2000), because REST APIs are simpler and result readable than other RPC-based methods (e.g. SOAP).

Therefore, Cloud Telecom Open Platform must own some functions to meet demands which are put forward by IMS Exposure Layer, such as providing unified and standard interfaces to expose telecom business capabilities, connecting to Internet business capabilities platform and telecom business capabilities platform, controlling the authentication and authorization of accessing to different capabilities from various applications and so on.

The Architecture of Cloud Telecom Open Platform is shown in figure 2.

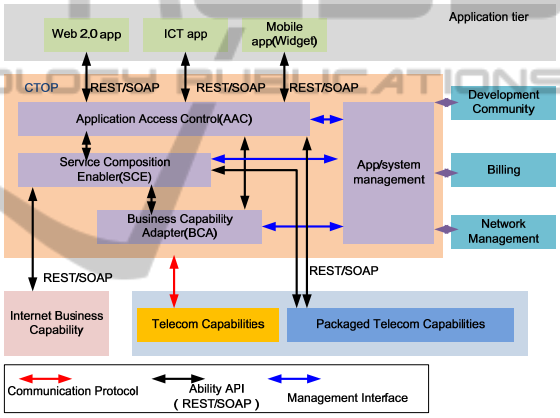

Figure 2: The Architecture of Cloud Telecom Open Platform.

The platform is composed by four modules: application access control, service composition enabler, business capabilities adapter and app/system management.

The modules are in the form of service is on the purpose of making the architecture loosely coupled and achieving seamless integration and timely update.

- **Application Access Control.** It works as an entry point in the platform. The core functionality of this service is to accept request from various type of service consumers. When applications need access the platform to invoke some kinds of telecom business capabilities through specific access API, otherwise this module is also in charge of authentication and

authorization functions to assure that invokes are legal.Finally, application access control also protect data security by means of encryption to protect the user/business data secure, and ensure that critical data and privacy data are not lost.

- **Service Composition Enabler.** Composition of services is a tough task because of the different objectives and lack of inherent organizational arrangements or behaviour regulations. Composition enabler supports the automated service composition to facilitate user's requirement by taking a sound understanding of user's request and a global view of all the available services. First, different service APIs are parsed and analyzed to encapsulate to unified form, and then according to the demand finish the composition of services.
- **Business Capabilities Adapter.** This module is the key point to implement transformation between telecom capabilities and Internet services. In this module, there is a business integration engine to accomplish the adaptation of various types of business capabilities. For example, SMS component implements the protocol conversions from WIMS SMS API to SMS gateway, and MMS component achieves the protocol convention from WIMS MMS API to MMS gateway. Business capabilities adapter is responsible for accessing to different business platforms, collecting different business capabilities including Internet business capabilities and telecom business capabilities in the meantime.
- **App/system Management.** management module is indispensable for any kind of platform, so this platform consist of a couple of components to make the platform manageable.SLA management component implements controls to ensure user-contracted QoS and SLA offered by service provider. Billing component ensures the connections with OCS/CCF system and generates the required billing information which will be uploaded to the OCS/CCF system. Routing processing component enables to achieve routing mechanism among network – side business enablers. Configuration management is in charge of connection between Web service interfaces and business management system, and realising the configurations of business capabilities, applications, users and business providers. Log component is responsible for collecting system logs and finishing unified management for logs.

The Cloud Telecom Open Platform achieves the concentration of different telecom business capabilities and exposition of these capabilities.

3 THE BUSINESS PROCESS FOR CTOP

As the architecture of Cloud Telecom Open Platform mentioned above, the business processes of CTOP are also very important to operate the platform.

As we all know, the business process does not exist indepently, and each one is corresponding to different roles, so before introducing the processes, roles need be divided for platform at first.

There are three main roles taking part in the platform, which are developer, application and end-user. Developers are persons who will use open APIs to create new services to enrich service world. Applications are legal APIs' invokers which are developed by developers and run in some sites or platforms. End-users are service consumers who use those applications mentioned above.

The Cloud Telecom Open Platform consists of four kinds of business processes, which are authentication process, authorization process, registration process and capabilities invoke process.

- **Authorization Process:** open APIs provided by CTOP must be used after authorization process. According to three kinds of roles; authorization can check the request from these roles and decide the request whether legal.
- **Authentication Process:** because open APIs are exposed to Internet, CTOP has some verification approaches to meet demands. Basic HTTP verification, token-based verification and Oauth verification are contained in the verification process.
- **Registration Process:** when CTOP communicates with IMS core network, the user's authentication credentials IMS must first be obtained, in lieu of the user through the IMS authentication.
- **Capabilities Invoke Process:** through open APIs CTOP invokes 2G/3G basic communication capabilities. This process is core for CTOP and plays an important role in CTOP.

The sequence chart for capabilities invoke process is shown in figure 3.

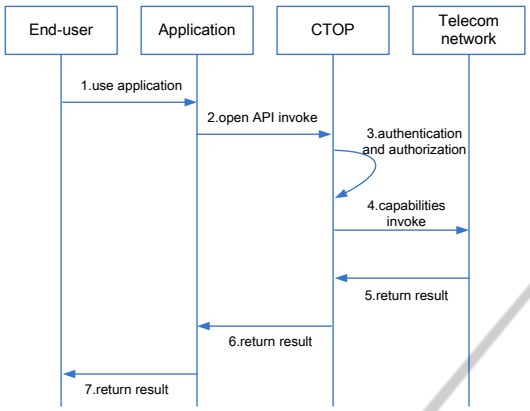

Figure 3: The sequence chart for capabilities invoke process.

Process description:

1. End-user runs applications;
2. CTOP application invokes open API, carrying the parameter information such as USER_ID, APP_ID;
3. The platform authenticates the request with relevant parameters;
4. The platform achieves the telecom capabilities invoke through protocol conversion;
5. The operator's network returns the invoke result;
6. The platform returns results back to CTOP applications;
7. The invoke result is sent to the end-user.

In a word, the business process is not exclusive, and these processes are introduced according to different situations faced by operators. These processes not only ensure the service open, but also support the sustainable development of the implementation technology, which is meaningful.

4 THE OPEN API FOR CTOP

The Cloud Telecom Open Platform provides a set of open APIs which are in a consistent habit of Internet developers, and do not care much about program language and operating system. Developers can choose the language which they are familiar with and achieve basic communication capabilities.

Figure 4 depicts the interfaces offered by CTOP, which contain eight kinds.

- Web 2.0 application: RESTful API and SOAP-based API are used to connect all kinds of applications with CTOP.
- OCS/CCF: CTOP communicates with OCF/CCF following the Diameter protocol.
- Business management system: interface between CTOP and business management system is in a style of web service.
- WAP Gateway: interface following PAP protocol.
- SMS Gateway: SMPP protocol is used in this interface.
- MMS Gateway: MM7 protocol is utilized to connect CTOP with MMS Gateway.
- LBS Gateway: MLP protocol is applied to link CTOP with LBS Gateway.
- CSCF: CTOP connects CSCF using SIP protocol and gains instant message, state presence from IMS domain.

Taking the operation requirement of the open API into consideration, here, we propose a set of the open API for exposing telecom capabilities to Internet world and realise convergence between Web 2.0 and Telecom domain.

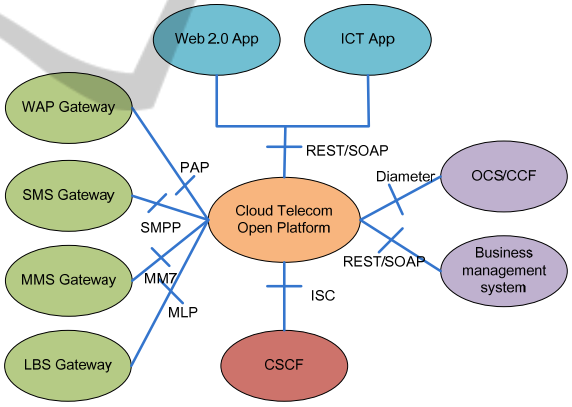

Figure 4: The open API of CTOP.

5 CONCLUSIONS

Open and sharing are tendency of Internet and telecom services. Telecom capabilities world is walled-garden for a long time.WIMS 2.0 initiative proposes a thinking pattern to overcome those limitations and try to handle the problem for converging Web 2.0 and IMS.This paper presents a telecom open platform based on cloud concept, whose architecture, business process and open APIs are all described in detail, according to a reference model mentioned in WIMS 2.0 initiative. The Cloud

Telecom Open Platform has two-side functions, one is to collect different telecom capabilities hosted in different platforms, and the other is to offer these capabilities to the outer world through fine-defined open APIs.The aim of CTOP is to construct a base platform to achieve convergence and business model change and helps the users to become the centre of the services.

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