

Standards for Mobile Internet Technologies

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Abstract:

In order to ensure interoperability of basic mobile applications, the Open Mobile Association (OMA), from the perspective of mobile application, developed the mobile application layer technical standards for technology engines and carried out the interoperability test. From the perspective of fixed Internet, the World Wide Web Consortium (W3C) developed the technology standard based on basic Web applications, laying the foundation for Web-based mobile Internet applications. There are a number of important technology engines supporting mobile Internet services, including the engine for Internet access and download, the engine for providing status of mobile users and mobile terminals, the engine for community/group administration, the engine for mobile search, and the engine for classification-based content filtering.

1 Characteristics of Mobile Internet

Without a unified definition, the mobile Internet is usually understood as the Internet that uses mobile communication networks as the access network and its services. The mobile Internet should have the following elements:

- Access through mobile communication networks, including 2G, 3G and Beyond Third Generation (B3G) systems, but not through Wireless Fidelity (Wi-Fi) and fixed broadband radio access systems.

- Public Internet services (WAP and WWW).

- Terminals, including handsets, Mobile Internet Devices (MIDs) and laptop PCs with data cards.

The public Internet services come with two different modes. One is the so-called "walled garden" based on WAP access. A typical example of the mode is Monternet of China Mobile. This mode enables Content Providers (CPs) and Service Providers (SPs) to access the gateway of China Mobile, be managed by the mobile operator and make a profit from commissioned

charges. The other mode is the open Internet. A mobile subscriber accesses the Internet through mobile network gateways (Gateway GPRS Support Node, GGSN, for instance). The CP and SP make an indirect profit from advertisements as the traditional Internet business goes.

Thanks to the mobility and personalization of mobile communications, the mobile Internet boosts anywhere, anytime and personalized services which are not available in the fixed Internet.

(1) Mobility

A mobile subscriber is able to easily access the radio network anytime and anywhere. The mobility management helps acquire precise location of subscribers and their mobility-related information.

(2) Personalized experience

The terminal, network and content/application are bringing subscribers personalized experience.

- Personalized terminal: Personal presentation by binding mobile terminals with individuals.

- Personalized network: The mobile network precisely reflects and extracts user demand and action information, and makes use of Internet application

technologies (such as Mashup) and electronic maps.

- Personalized Internet content/application: This is strengthened when Web2.0 technologies, including Social Networking Service (SNS), blog, Really Simple Syndication (RSS) and Widget, combine with the personalized terminal and the personalized network.

2 Technical Standards for Mobile Internet

Challenges and disputes are on the way to settling on standardization of mobile Internet^[1-2] as the services and applications, which the mobile Internet is centralized on, are highly innovative and practical. To make sure of the interoperability of basic mobile applications, the Open Mobile Association (OMA) developed the specifications for technical engines on the mobile application layer compiled and carried out the interoperability test, some of which are supporting the mobile Internet to some extent. On the other hand, the World Wide Web Consortium (W3C), from the perspective of fixed Internet, compiled the technical specifications based on basic Web application technologies, laying the

foundation for the mobile Internet applications developed on the basis of Web technologies.

2.1 OMA Standards

In the initial stage of mobile service and application, many mobile services were only available to certain a vendor's equipment, certain handset brands, certain a CP or certain an operator's network. This situation is attributed to the lack of standards and inconsistency among standards. There have once been more than ten forums and organizations engaged in formulating technical specifications related with the mobile service. In early June of 2002, the OMA was set up with its main tasks of collecting market requirements on mobile services, compiling related specifications, clearing the way to developing interoperability, and facilitating the development and application of various new enhanced mobile information and entertainment services. The technical standard research of OMA in the field of mobile service application is targeted at providing barrier-free accessibility, controllable and fully open network and subscriber information, integrated information communication approaches, flexible and perfect computation system, and chargeable, manageable and multi-level security guarantee mechanism. This makes it technically possible for the mobile network and mobile terminals to realize the market environment for an open and orderly mobile Internet.

The OMA defines an even wider service scope than the mobile Internet does. Its some research results can be taken as the basic service capabilities of the mobile Internet applications:

(1) The mobile browse technology can be deemed as the most basic capability of the mobile Internet. Among the applications of mobile Internet, Over The Air (OTA) mobile downloading is a basic service that provides downloading service for other services such as Java and Widget. It is also one of the important fundamental mobile Internet technologies.

(2) As opposed to the fixed Internet, the mobile Internet can combine different states of subscribers and terminals to

provide more precise services. The state information covers location, presence information, and terminal model and capabilities. The OMA defines many service specifications that can provide the mobile Internet service with basic user and terminal state information capabilities, such as presence, location and equipment management.

(3) The mobile search service capability specifications of the OMA define a set of standard frame structures, search message streams and interface adaptability function set, making mobile research application and other service capabilities able to effectively share the technical achievement of commercial search engine of the current Internet.

(4) The various mobile service application capability specifications of the OMA support the mobile community service. As an effective means of locking subscribers, the instant messaging is a core application of community services. The user groups in XML Document Management (XDM) can be used for mobile community service to form friend groups of blog users. The Push to Talk over Cellular (PoC) groups for discussions of specific topics can be transplanted to groups of related special mobile community, hence adding the communication modes for these subscribers.

2.2 W3C Standards

The W3C is an international forum that formulates WWW-related standards. Main tasks of the W3C is to research and compile open specifications so as to improve interoperability of Web-related products. To solve the incompatibility problem brought by different platforms, technologies and developers involved in Web applications and guarantee smooth and complete flow of Web information, the W3C has worked out a series of standards, and urged the Web application developers and CPs to follow these standards. At present, the W3C is devoted to the research of trustworthy Internet, mobile Internet, Internet voice, and Semantic Network. Topics such as barrier-free web page, globalization, device-independent and quality management have also been integrated to the technologies of the W3C. The W3C is now trying to transform the WWW from

its initial design (including the basic Hypertext Markup Language (HTML), Uniform Resource Identifier (URI) and Hypertext Transport Protocol (HTTP)) to the mode needed in future, to help the future WWW become the fundamental framework that is highly stable, scalable and much adaptable in the information world.

The W3C has recently released two standards for the mobile Web: XHTML Basic 1.1 and mobile Web Best Practice 1.0. XHTML Basic 1.1 is the mobile Web markup language suggested by the W3C. The W3C follows these principles in designing the mobile Web:

- To design unified Web pages for varied mobile devices. Lower cost and more flexibility are considered. In addition, the Web standard should guarantee compatibility of different devices.
- To optimise the graphs and colours and minimize the display size and file size for more convenient input by mobile subscribers. The information provided by the mobile Web should be terse and clear.
- To save on the access bandwidth. The automatic refresh and redirection technologies are not used. Not too many external resources are invoked. The page cache should be made full use.

2.3 Standardization of Chinese Mobile Internet

The China Communications Standards Association (CCSA) is engaged in the research work of mobile Internet standards. Some of its standardization projects come from the industrial innovation in China, and many others are combined those of the W3C and the OMA.

So far the CCSA has worked in the fields of WAP, Java, mobile browse, Multimedia Message Service (MMS), Mobile E-Mail (MEM), push-to-talk, real-time status, XDM, Instant Messaging (IM), Secure User Plane Location (SUPL), and mobile broadcast (BCAST). Its ongoing projects include the standard research on Mobile Advertisement (MobAd), Mobile Search (MobSrch), Converged IP Messaging (CPM), mobile community, Mobile 2-dimensional Bar Code, and mobile payment. The work for mobile Web2.0

has just kicked off and works have been done in mobile convergence (Mashup) and mobile Internet P2P.

3 Important Technology Engines for Mobile Internet Services

3.1 Technology Engine for Internet Access and Downloading

(1) Mobile Browsing

The mobile browsing technology can be deemed as the most fundamental service capability of the mobile Internet. The WAP forum initially works out the radio application protocol for the radio network browse. The mobile subscriber uses the WAP capability of the mobile terminal for easy access to the information and service available on the Internet. Along with more capabilities being made workable on the mobile devices, WAP changes too. The OMA WAP2.X series of standards have been released as a result.

(2) Mobile Downloading

The mobile downloading technology is one that enables remote downloading of a media object through the air interface of the mobile communication system. The SP and CP can continue to develop more personalized service applications and media content, including mobile game, location service and mobile commerce. The handset users can download any media object and service application they like from the network into their handsets and install them for use.

3.2 Technology Engine for Providing Status of Mobile Subscribers and Mobile Terminals

(1) Presence Service

The presence service makes the participating entity (a person or an application) able to issue and modify his personalized information on the network in real time. Such information includes location, mood, and connectivity (out for meal, in a meeting, for instance). The participating entity may also control the scope for issuing the existing information by way of subscription and authorization. People will often turn to the presence service when they are using the instant communication service.

(2) Location Service

The radio location service is to acquire the location information of a mobile station through a set of location technologies and provide the information to the mobile subscriber himself or others and the communication system, thus enabling the location-related services. The OMA has on the one hand done much work in roaming and interfacing with external service provider and has compiled the roaming location protocol and privacy check protocol, and on the other hand worked out the user plane-based location service mode specifications. Acquisition of user terminal's location information provides the mobile Internet with the basic capability of precise service.

(3) Terminal Device Management

The device management is mainly used for third-party management and setting the configuration and environment information of the devices (the handset terminal as well as the functional object in the terminal, for instance) of the radio network. The terminal management technology can be used to collect terminal information in OTA mode, configure terminal's parameters, download packets from network to the terminal, install them and update permanent information, and deal with the events and alarm information produced in the terminal device. Since the terminals are becoming increasingly complicated, the maintenance cost of terminal manufacturers is getting higher, many more service applications are emerging, and the mobile Internet is prone to be open, the needs are all the more intense for the operators to deploy new services and configure parameters.

Besides the basic protocol of device management, other related standards have also been worked out for a range of applications including: connection management object, diagnosis and monitoring, firmware update management object, preset task life cycle management, device capability management object, software component management object,



intelligent card use and Web service interface.

3.3 Technology Engine for Community and Group Management

The success of Internet community services has given rise to similar services on the mobile Internet. In the virtual world provided by the mobile Internet, to customize services for communities is drawing attention from all.

(1) Instant Messaging

Among all application products of the mobile Internet, those for instant communication are used most. For example, mobile Fetion, handset MSN and handset QQ. The IM service enables multiple participants to exchange various media contents among themselves in real time and get to know the real-time status of each other so that a proper communication approach can be selected.

There are two standards for real-time status and instant message. One is Instant Messaging and Presence Service (IMPS) based on the wireless village. The other is the real-time status and instant message based on Session Initiation Protocol (SIP) for Instant Messaging and Presence Leveraging Extensions (SIMPLE)/SIP. The real-time status and instant message based on SIMPLE/SIP serves as the major trend of service development as they are able to take advantage of the session control mechanism of IP Multimedia Subsystem (IMS). Besides, they are also two important service capability standards achieved by the OMA.

(2) Converged Message Service

Thanks to the rapidly developing

global mobile services, Short Message Service (SMS), multimedia message, mobile e-mail and mobile IM are now widely applied as an important supplement to the mobile voice service. Because all existing message services are designed as of the "silo" structure, different message services bring about different user experiences. Meanwhile, since different message services construct different structures and platforms, the various message services with similar functions cannot replace each other. For better user experience and simplified message system structure and to separate message service from the platform, the OMA set up the first IP-based converged message service in the industry. The converged message will ultimately be made into an architecture, based on which the message services can be flexibly tailor-made to requirements. The traditional message service will be able to communicate with the converged message anyway.

(3) XDM and Converged Address Book (CAB)

The XDM is a basic capability entity of the instant communication service. The authorized PoC and IM entities may acquire, add to, delete and modify these documents, hence fulfilling the group and list information management. The XDM can help launch contact list and group application. The CAB is a network-based contact information storage service that stores and manages the contact information. The CAB supports convergence and update of the contact information. That is, the user may adjust and publicize some personal information if he likes to do so and put together information coming from varying services, such as messages, games, meetings, value-added services and other address book information, and then share the information with other contacts for information update. The user may manage his contact information on other platforms, for example, to access the contact information through the Internet or intelligent telephone and synchronize the information stored on the network to his own terminals.

3.4 Technology Engine for Mobile Search The Mobile Search Framework (MSF)

service is a typical mobile Internet service. It refers to all search technologies based on the mobile network. The service enables a user to search in a range of modes such as SMS, WAP and Interactive Voice Response (IVR) and to acquire the WAP site and Internet information, mobile value-added service content and local information.

The main purpose of the OMA to research the mobile search service specifications is to provide the SPs, while they are configuring the mobile applications and value-added services, with a standardized and unified search function capability set. With the standardized information search interface and content data format, the search engines are provided with basic search resources and the service deployment can be simplified. Anyway, the OMA's mobile search service capability specifications do not standardize the technical cores of currently existing search engines, but rather research and define a set of standardized frameworks, search message streams and interface adaptation function set, so that the mobile search application itself and other service capabilities are able to effectively share the technical achievements of the current commercial search engines on the Internet.

3.5 Category-Based Content-Screening (CBCS) Technology Engine

The CBCS of the OMA is used to define a category-based content-screening framework that is applicable in both the mobile environment and web page environment. It is an important infrastructure for managing the service content of the mobile Internet.

A user may need some protection in the mobile Internet application environment, so that he is kept from receiving contents not wanted or permitted by him. For example, a minor should be controlled and restricted in exposing himself to porn and violence contents, and the company staff should be screened from contents unrelated to work.

The OMA CBCS specifies the rules-abiding interfaces between functional entities in the content

screening application. The interfaces can be used for any content dispatching service or protocol with the "content" scope not limited. That is, it is able to screen any information application contents coming from or going to the user.

4 Conclusions

The service application standard of the mobile Internet has always been a field that abounds with challenges. Both the industry and user are looking forward to unified specifications that however, are refused by the market or found to be not workable due to interest disputes and service uncertainties. Parties on the industry chain, for an even brighter future of the mobile Internet however, are still probing into the key elements for Internet service development and pressing the service application standards closely related with the elements.

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Biographies

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Wu Wei is a senior engineer and project team leader at the Institute of Communication Standards Research, China Academy of Telecommunication Research of MIIT of China. He is engaged in the technical research, standard compilation, and technical experiment and test in the field of mobile communications. He was once a

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