

# Technical Trends of Mobile Web 2.0: What Next ?

Jonghong Jeon

ETRI

161 Kajong-Dong, Yusong-Gu,

Daejeon, South Korea

+82-42-860-5333

hollobit@etri.re.kr

Seungyun Lee

ETRI

161 Kajong-Dong, Yusong-Gu,

Daejeon, South Korea

+82-42-860-5850

syl@etri.re.kr

## ABSTRACT

As one of the most programmatic web application trends, Web 2.0 has recently opened the 2nd golden age of the World Wide Web (WWW); thus wielding great influence on various industries. The effect of Web 2.0 is not confined to the wired Internet industry; in fact, it has dramatically spread to the mobile industry. In this paper, based on their definition of Mobile Web, the authors will discuss various related issues. First, the background and main characteristics of Mobile Web will be discussed. The core technologies related to Mobile Web will then be investigated. Such exploratory effort of discussing Mobile 2.0 is expected to provide a good overview of the current Mobile 2.0 trend and lead to further research on the area.

## Categories and Subject Descriptors

H.5.4 [Hypertext/Hypermedia]: User issues

## General Terms

Experimentation, Standardization

## Keywords

Mobile Web 2.0, Mobile 2.0, Mobile SNS, Mobile Media, MWI, W3C, Mobile UGC, iPhone

## 1. INTRODUCTION

The advancement of high-speed mobile telecommunications technology and handset technology is providing the momentum for the new mobile environment as it goes beyond 3G to 3.5G and 4G. Despite such hardware advancement, however, the software provided in the mobile environment is not that different from that of 2G. Under such condition, the next-generation mobile data service represented by Mobile Web 2.0 is recognized as the new growth engine for the mobile industry. Therefore, this paper seeks to observe the “Mobile Web 2.0” trend for the next-generation Mobile Web environment. Specifically, the concept and key technology trend of “Mobile Web 2.0” and future direction of key Mobile Web 2.0 will be discussed.

## 2. Emergence of Mobile Web 2.0

### 2.1 Definition of “Mobile Web 2.0”

Various discussions on “Mobile Web 2.0” began in 2005.

“Mobile Web” means accessing the Web from various mobile devices. Attempts to view Mobile Web from a different perspective have been made alongside the increasing interest in the Web 2.0 trend as well as Web standard and technology. Mobile Web 2.0 can be said to have been born when such

attempts were defined as “Mobile 2.0” or “Mobile Web 2.0” [1].

Few studies have been conducted on “Mobile Web 2.0,” however. Likewise, there are still different opinions on the concept and scope of “Mobile Web 2.0.” From the terminology perspective, “Mobile 2.0” and “Mobile Web 2.0” are used together and taken to mean the same thing. From the conceptual perspective, however, there are differences in the concept and definition according to which among mobile technology, Web standard technology, and “2.0” new trend is the focus.

Such different opinions on Mobile Web 2.0 can be classified into 3 perspectives: 1) simple adoption of Web 2.0 application and technology for the mobile environment such as mobile + “Web 2.0”; 2) view of “Mobile 2.0” as the next-generation mobile data service environment, or; 3) how the existing Mobile Web evolves into “Mobile Web 2.0” [ 1,4, 21, 23].

	Mobile Web 1.0	Mobile Web 2.0
Network	Low speed (<0.5MB)	High speed (>0.5MB) – HSPA, WiBro
Protocol	WAP protocol-based WAP browsing	(w)TCP/IP-based full browsing
Contents	HTML and WML-based contents	XML and XHTML-based contents
Business Model	Walled garden, backyard	Open business model and wired/wireless integrated model
Technical Model	Closed, proprietary	Open and standard based (MobileOK)
Browsing Method	Browsing of WAP sites	Ubiquitous browsing linked to RFID and LBS, real-world tagging and RSS reader function
Terminal	Connection through the mobile phone	Connection through various mobile devices
Service	Only hyperlink supported	REST-, SOAP-, and WSDL-based Mobile Web service
Authentication	Centralized authentication	Distributed authentication and identity management
Connection	Input the Entry URL	Automatic connection (WINC, mobile RFID, 2D barcode, etc.)
UI	One hand/Both hands/ Hands-free	Multi-modal/Ubiquitous Web access technology (voice, gesture, RFID, etc.)
API Interface	One service, some API	Mashups, Open APIs
Fee	Measured rate system (very expensive)	Flat rate system (normal)
Advertising	No advertising	New business model based on mobile advertising
Characteristics	Dedicated to browsing	Mobile Web as a platform

Figure 1. Compare for MW 1.0 and MW 2.0 [1].

### 2.2 Characteristics of Mobile Web 2.0

The concept and characteristics of Mobile Web 2.0 can be visualized vis-à-vis Mobile Web 1.0 as shown in [Figure 1].

To define the Mobile Web 2.0 environment in detail, standard-based, wireless and wired compatible Web contents such as XML and MobileOK are exchanged under the lump sum fee-based, low-cost, high-speed wireless environment; services are mutually linked in the form of Open API, enabling mashup using the Web services.

Second, the environment will allow the free use of various mobile devices rather than the mobile phone only. The user interface will apply ubiquitous Web access technologies to ensure the user-friendliness of mobile device users.

Third, for the business model for application and service, models linked to search and advertising, which used to be available only in the wired environment, can be delivered. Note that the model that considers The Long Tail, not the traditional business model, is targeted for the top 20%.

Finally, the most important difference is that the Mobile Web 2.0 environment is not delivered as a one-time application environment; rather, it becomes the base platform environment that integrates various services and applications.

### 3. Mobile Web 2.0 Technology Trend and Prediction

#### 3.1 Characteristics and Prediction of Mobile Web 2.0 Technology

The key technical trends for Mobile Web 2.0 can be summarized into 9 types as shown in [Figure 2]. Such technical trends have emerged in the process of searching for possible new mobile applications while overcoming the weaknesses and limitations of the existing mobile environment given external changes such as the Web 2.0 trend and environment changes of the mobile industry itself [1].



Figure 2. Technical Key Trends of Mobile Web 2.0

##### 3.1.1 Full browsing

Various technical requirements for the full browser and full browsing have been increasing alongside network performance improvement and increasing demand for access to wired contents. Demand for full browsing reflects the demand in the PC environment for diversified and rich information that is difficult to access from the mobile environment. Although there are different opinions on the issue of “Could full browsing provide complete access to wired contents?” as well as the limitation and scope of full browsing, most people agree that access to wired contents

through full browsing will enhance the utility of mobile devices and boost the entire contents market [1].

As such, many studies on effective mobile browsing considering the various limitations of mobile devices have been conducted. In addition to the virtual mouse-based interface technology, navigation technologies such as Zoom In/Zoom Out, MiniMap viewing, Thumbnail viewing, and Narrow viewing as well as various transcoding technologies and voice browsing technologies have been studied. Other studies include the analysis of UX (user experience) of the mobile browsing user and delivery of a corresponding effective mobile browsing method [5].

##### 3.1.2 mobileOK and W3C MWI

If full browsing is the attempt to improve browser-centered Mobile Web accessibility, Mobile Web standardization or mobileOK is the attempted approach from the overall standard perspective.

Mobile OK standardization as the Mobile Web standardization activity led by W3C since 2005 seeks to maximize Mobile Web utility and carries out programs on developing the benchmarking case for the Mobile Web environment, developing the terminal information sharing technology, and developing the mobileOK certification mark. It has begun the phase 2 programs after completing the phase 1 programs [15].

Phase 1 activities include the guideline for Mobile Web benchmark cases, mobileOK reference test specification, and standardization of mobile device data storage. For phase 2 activities, the extension of various standards considering the Mobile Web 2.0 environment, device data storage API standardization, and test suite standardization will be implemented [12].

##### 3.1.3 Mobile AJAX

AJAX is an application technology based on the asynchronous HTTP request method, DOM engine for XML processing, CSS and java script, and browsing event. These have gained recognition for enabling varied dynamic processing.

Interest in mobile AJAX is also on the rise because it can deliver an outstanding graphic environment and UI environment with only the Web interface-based application and without the need for development using Java unlike before. Furthermore, applications using AJAX such as widget are expected to provide user-friendlier interfaces in the mobile environment [13]. Nonetheless, the biggest strength of AJAX is standardized compatibility that allows wired AJAX applications such as Google Map to be used as is in the mobile environment.

With the various mobile AJAX platforms and AJAX applications recently emerging, compatibility between the AJAX platforms has become an issue; in particular, the standardization of ECMAScript, DOM event, and XMLHttpRequest has become a key issue [2, 3, 18, 19].

##### 3.1.4 Mobile Search and Ads

The main reason wired Internet, Web, and Web 2.0 companies were able to grow rapidly is the advertising-based business models rather than the subscriber-centered income model. Online advertising enabled the creation of a large online advertising market and Internet industry through keyword-based commercials showing information based on the user query linked to the search.

Similarly, the development of various advertising/search technologies for identifying advertising revenue models linked to

the search -- which goes beyond the subscriber-oriented content sales model -- is proceeding rapidly in the latest mobile environment.

Companies such as Google, Yahoo, and Microsoft are actively conducting studies on technology for linking mobile link and advertising. They are also seeking ways of collaborating with telecommunications carriers such as KDDI and China Telecom for the various forms of Mobile Web advertising technology and technique such as local search, mobile AdWord, and Click-to-Call. As shown by Yahoo Go! Mobile and Google Mobile service, attempts of linking search and existing services are being made. Likewise, Nokia is developing the technology for linking mobile games and advertising [1].

### 3.1.5 Mobile Mashup

Mashup involves creating a new service or application by combining one or more applications. It has spread following its publication by Google, what with the emergence of various services using Good Map API. With the expansion of wired OpenAPI and Mashup, the Mashup applications in the mobile environment using the wired OpenAPI are expected to emerge. In the future, the basic API for the mobile service is seen to advance to open API for linking wired and wireless applications [1].

While the recent mobile Mashup applications are being developed for the functions of transmitting the multimedia contents created in mobile devices to other sites or services using XML-RPC, more and varied types of mobile Mashup application can be expected in the future as the performance and function of mobile browsers are enhanced and mobile platform functions are improved [20].

### 3.1.6 Mobile RFID and 2D barcode

The biggest weakness of mobile browsing is the difficulty in entering the URL address to connect. To address such weakness, number-based services using the existing WINC code or hot number are available. Note, however, that such services have a disadvantage, i.e., need to remember certain numbers. As such, studies on the various methods of automatically acquiring the initial URL address are being conducted [1,22].



Figure 3. 2D Barcode and Physical Hyperlinks

Mobile services using the 2D barcode such as the QR Code of Japan, ColorZIP of Korea, and data matrix and mCode of the US have emerged. While the 2D barcode services have the advantage of applicability in the printed material and codeability by any user, it requires the high skill set of camera filming for recognition.

There have also been efforts to link the physical world and data world such as the pilot service linking the mobile RFID functions using 900MHz bandwidth or NFC using 13.56MHz bandwidth. In the future, 2D barcode and RFID are expected to be mutually

complementary, playing the important role of bringing up physical browsing [7, 17].

### 3.1.7 Mobile SNS

One of the application technologies that have been generating a lot of interest lately is mobile SNS. In particular, social networking technology in the mobile area is drawing interest as services such as Cyworld in Korea and MySpace in the US are becoming more popular and various technologies related to social book marking and social networking are being developed. The feasibility of mobile social networking can be considered to be high because of the characteristics of the mobile device as the personal terminal for holding important personal information and as a tool for communicating with others.

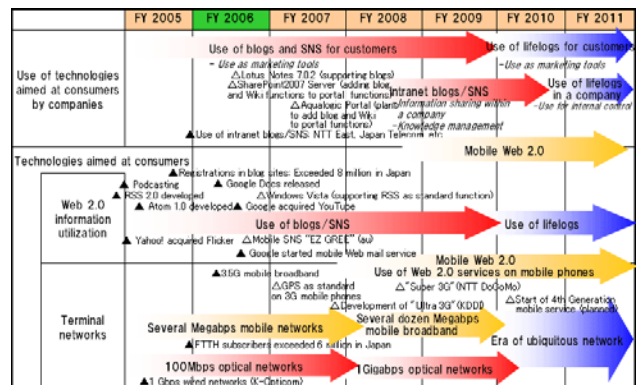


Figure 4. Web 2.0 Roadmap until 2011 [24]

The recent growth of EZ GREE, Mixi, and Mobagetown in Japan and linking of user-generated contents (UGC) suggest the potential of various mobile social networking applications. Facebook also shows the potential of SNS platform, with mobile terminals such as iPhone exhibiting the potential of mobile SNS. In the future, SNS is expected to advance to the platform linking various Internet applications and services in the wired and wireless integrated environment [9, 10].

### 3.1.8 UGC (User-Generated Content)

Interest in UCC technologies represented by user-generated video (UGV) has been increasing considerably alongside the growth of YouTube. As a result, interest in downstream technology using the mobile terminal and creation/distribution of mobile contents using the built-in camera and camcorder function in the mobile terminal is also on the rise [1].

Yahoo, etc., are developing the technology related to location tagging, i.e., tagging the location data to the multimedia content. LBS and automatic location tagging technologies are expected to bring about many benefits related to the storage and utilization of UGC.

With the distribution of smart phones, terminals are becoming the information creators, not just information consumers. Furthermore, the improving network speed and continuing reduction in storage media and platform cost are expected to pave the way for studies on various UGC technologies. In addition, the development of technologies concerning security, privacy, search, and advertising of UGC will likely be pursued [9, 10].

### 3.1.9 Smartphone and Web Phone

iPhone has been considered a milestone in the advancement of mobile phones, showing how the mobile phone has evolved from voice-oriented terminal to data service-based. Specifically, iPhone can be regarded as the terminal that allows unconstrained Mobile Web browsing; it shows that the browser and Web-based application platform are possible in the mobile environment [14].

The proliferation of the dual mode and Mobile Web is making the closed business model in the form of a Walled Garden less effective and handing over market control to the consumer. As such, more mobile terminals offering more convenience and control to the consumers and focusing on the Web and Internet utilization are expected to emerge. The evolution of terminals from voice communication-oriented to data service-oriented will be fast-tracked as well. Furthermore, more studies on UX (User Experience) with mobile terminals, i.e., analysis of the characteristics of mobile users and studies on the analysis and applications of UX as appropriate for the Mobile Web environment, are expected to be conducted [1].

## 4. CONCLUSIONS

The term "Mobile Web 2.0" was first recognized as the mobile application of some Web 2.0 technologies. Today, however, it is accepted as the common designation of next-generation "Mobile Web" and mobile data service.

Mobile Web 2.0 is transcending the boundaries between the various business domains and business roles while inducing new competition among mobile telecommunications carriers, device manufacturers, wired portals, and content providers. Likewise, it is continuously sending the message that the conventional carrier-dominated, subscriber-oriented, closed profit model must be transformed into the community-oriented, open profit model in the mobile broadband environment from a consumer-oriented perspective [1].

In this paper, the authors defined Mobile Web 2.0 and classified its 9 technical elements as the framework for the analysis. The trend and prediction of Mobile Web 2.0 were addressed as well, showing many studies on key technologies concerning full browser, mobileOK and Web standard, mobile AJAX, and widget application. Studies on mobile search and advertising, mobile OpenAPI and Mashup, mobile RFID and 2D barcode, mobile SNS, mobile UGS, and Web phone are also ongoing. Just as advertising and search technologies are converged including UGC technology and SNS technology, individual technologies are confirmed to be undergoing convergence with other technologies as well to create many changes and forms and that can only accelerate further in the future. Such changes will be fused with the "mobility and instantaneity" of the mobile environment to create new values available only through the Mobile Web to be differentiated with the wired environment.

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