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A study on Mobile Devices Compatibility Issues for Web Services and Efforts Aimed at Improving Interoperability

Altaf A. Langda
Smt. K.B.Parekh College of Computer Science
Maharaja Krishnakumarsinhji Bhavnagar University Gujarat, India.

Hiren Joshi
Department of Computer Science,
Rollwala Computer Centre Gujarat University, Ahmedabad. Gujarat, India.

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Abstract

Web service is a software system designed to support interoperable machine to machine interaction over a network. Presently, a number of issues are associated with rendering web services correctly on mobile devices like variable size and resolutions, slow speed over network, lack of standard GUI controls etc. In this paper, I study various efforts undertaken by various organizations like W3C and some group formed as vendor associations to make browsing the web with mobile devices more reliable by setting standards and creating domains that web site designers can use to make their sites mobile-friendly.

Key Words: mobile web, web service, compatibility issues, improve interoperability, Solution efforts, design principles.

"A web service is a method of communication between two electronic devices over the World Wide Web. A web service is a software function provided at a network address over the web or the cloud, it is a service that is "always on" in the concept of utility computing" ("Web service").

The W3C defines the web service as "a software system designed to support interoperable machine to machine interaction over a network. It has an interface described in machine – processable format (Specifically, Web Services Description Language, known by the acronym WSDL). Other systems interact with the web service in a manner prescribed by its description using SOAP messages, typically conveyed using HTTP with an XML serialization in conjunction with other Web-related standards". The W3C also states, we can identify two major classes of web services, REST – compliant web services, in which the primary purpose of the service is to manipulate XML representations of web resources using a uniform set of "stateless" operations; and arbitrary web services, in which the service may expose an arbitrary set of operations" ("Web Services Architecture").

A wide range of web services are available for variety of purposes. *Some handy Web Services* ("actionscript.org") has list as below:

- Scientific Web Services that –
  - performs conversion between common units of accelerations (common units are - m/s2, ft/s2, Standard gravity, Gal)
  - performs conversion between common units of pressure (common units are – pascal (pa), bar , technical atmosphere (at), standard atmosphere (atm), torr, pound per square inch (psi))
- Validation Web Services that –
  - Validate a credit card number
  - Validate email address
  - Validate phone number etc.
- Business Web Services that–
  - Get stock quotes of particular company
- Geographic Web Services that –
  - Get IP address of person's computer
  - Find geo location on earth based on ZIP code etc
- Communication Web Services that–
  - Check and see if a Yahoo! User is online or offline
  - Send a FAX to someone etc.

"Mobile devices use more network traffic in consuming web services than do fixed-line systems. Most people find that their use of web services is increasing dramatically year after year. Indeed, the web is becoming a source of rich content for mobile devices" (Sosinsky 445).

As the screen size is small and resolution is less in mobile devices compared to desktop or laptop, it becomes a challenging task for web service designer to make it look good on them and for that reason many protocols aim at providing necessary translation required.

Issues:

"In the current market, the mobile web is fractured into many different competing operating systems and proprietary hardware" (Sosinsky 446).

Some proprietary operating systems like iOS or BlackBerry OS that comes preinstalled on iPhone or BlackBerry devices respectively; offer reliability, predictability and ease of use but does not offer expandable storage or facility to transfer data stored on it to devices using other operating systems so users feel like being locked-in to these devices. However, open-system alternatives like Android and Symbian OS are evolving quickly as there are more players and the work tends to get wider review. Open systems also place high emphasis on interoperability.

Mobile site optimization is very difficult considering vast number of different devices that exist which pose below listed problems.

- Small screen sizes make it very difficult to see text and graphics dependent on the standard size of a desktop computer screen ("Mobile Web").
- Variable resolutions (Sosinsky 446)
- Generally, on mobile web, only one page can be displayed at a time and pages can only be viewed in the sequence they were originally accessed thus not facilitating to work with multiple windows at a time ("Mobile Web").
- Standard graphical user interface controls lacks ("Mobile Web").
- Limited flexibility in navigation as mobile devices do not use mouse like pointer, but rather simply an up and down function for scrolling ("Mobile Web").
- Most devices do not support client-side scripting and storage of cookies, which are now widely used in most web sites to enhance user experience, facilitating the validation of data entered by the page visitor, etc. This also results in web analytics tools being unable to uniquely identify visitors using mobile devices ("Mobile Web").
- Exclusion of certain file formats like PDFs, access to pages with secured connection, Flash or other similar software or video sites etc ("Mobile Web").
- Slow transmission over the connection and limited rendering speeds on the device (Sosinsky 446).
- Broken pages ("Mobile Web").
- Compressed pages ("Mobile Web").
- Different methods of navigation through the interface (Sosinsky 446).
- Message size limitations in Email ("Mobile Web").

- Nonstandard and often onerous transmission costs (Sosinsky 446).

Efforts of solution

We shall start with the efforts being put in solving above mentioned issues by World Wide Web consortium, an international community that develops open standards for growth and sustainability of the web. "The W3C mission is to lead the World Wide Web to its full potential by developing protocols and guidelines that ensure the long-term growth of the web" ("W3C Mission"). W3C's design principle includes Web for All and Web on Everything. "The W3C Mobile Web Initiative accompanies this growth with its ongoing work in following areas" ("W3C Mobile Web Initiative").

- Mobile web applications can take full advantage of the technical progress in the Open Web Platform, including HTML5, CSS3, numerous JavaScript APIs – in particular device APIs who allow deeper integration with the hosting devices.
- W3C widgets offer a packaging format to distribute web-based applications
- The Mobile Web Best Practices (http://www.w3.org/TR/mobile-bp/) and The Mobile Web Application Best Practices (http://www.w3.org/TR/mwabp/) offer guidelines to developers on how to create contents and applications that work well on mobile devices

You also find tool to check your site / browser on the link http://www.w3.org/Mobile/. You just have to enter web site address and press "Is your site mobileOK?" button to get detailed report about any web site. For example, enter http://www.yahoo.com and press the button and a list of errors categorized as critical, severe, medium and low are presented to you. Some of the errors to mention when this site was checked were: There are more than 20 embedded external resources, the size of the document's markup exceeds 10 Kilobytes, The total size of the page (631.6 KB) exceeds 20 Kilobytes, The CSS style sheet is not syntactically valid CSS, A pop-up was detected etc.

Vendors generally approach the problem of interoperability by creating individual sites within a web site for different devices and then content is served based on device identification and content negotiation. Considering the rise of Smartphone applications, even frontend of their sites are being created by many organizations.

For example, compare the front page for Yahoo! Website on a standard 1600*900 resolution monitor in following figure versus the content displayed on an apple iPhone 480*320 resolution screens. These first image is searched using Google images, and the second image - a screenshots is taken from desktop, illustrate the different approaches that designers have taken to show dense content on different resolutions screen. While the computer display is loaded with ads, the iPhone apps displays on a single large advertisement. The content is displayed on the application with much less leading content, and in a strictly hierarchical navigational system.

Each story is a link in the form of a large button to the full text of the story. Many large links on the display have been replaced by fewer, but easier to select buttons. There is also less use of graphics and images on the application.

"One approach to improving interoperability that was considered by the Mobile Web Initiative's Device Description Working Group (http://www.w3.org/2005/MWI/DDWG/) was to create a database of device characteristics, called a Device Description Repository. This repository would then be used in concert with the DDR simple API to modify content so screen size, markup language, and image format support is delivered to a device correctly. This work ended in December 2008 with a recommendation for adoption to the W3C, but it hasn't resulted in an industry standard, although it might be incorporated into some later work" (Sosinsky 447).

Another effort is the creation of .MOBI domain which is maintained as a registry called the Mobile Top Level Domain (mTLD) for the producers and consumers of mobile services and products. This one is a sponsored domain and was created by a group of companies including Google, Ericson, Microsoft, Hutchison Whampoa, Samsung, and Vodafone. Although the clear purpose of site is to create sites that render correctly on mobile devices; it does not mandate that a web site use any specific technology, rather it just be mobile-device-friendly

Following figure shows the dotMobi (http://mtld.mobi/) registration service for this domain. "dotMobi offers a range of products and services to enable the best possible mobile web experiences" ("dotMobi") as listed below with brief description:

- goMobi – Creates a dynamic mobile Website for small businesses

- mobiForge – dotMobi developer forum which is a center for mobile web developer tools, resources and support. More than 25000 developers and designers meet here to compare notes, share tips, upload ideas and download expertise.
- mobiReady – Test your Website and presents a detailed report regarding its mobile-readiness.
- DeviceAtlas – one of the largest repositories of mobile device profiles, based on W3C recommendations.

However, "the establishment of .MOBI domain has been subject to criticism from the W3C's director, Tim Berners-Lee, on the grounds that the web sites on the Internet should be device-independent. It is suggested that a better mechanism for content compatibility on the mobile web is to use content negotiation, cascading style sheets or other devices" (Sosinsky 448). "Content negotiation is a mechanism defined in the HTTP specification that makes it possible to serve different versions of a document (or more generally, a resource representation) at the same URI, so that user agents can specify which version fit their capabilities the best. One classical use of this mechanism is to serve an image in GIF or PNG format, so that a browser that cannot display PNG images (e.g. MS Internet Explorer 4) will be served the GIF version" ("Content negotiation").

Another effort is an industry association group, formed in 2004 by several mobile vendors including Huawei, LG Electronics, Motorola, Nokia, Samsung and Sony Erricsson. This group is known as Open Terminal Platform (OMTP; http://www.omtp.org/) and aim at promoting standards on mobile networks. This group later became part of the larger group Wholesale Applications Community (WAC; http://www.wholesaleappcommunity.com/) that exists to promote the market for mobile applications. WAC is "not for profit" organization and it has now 60 members including mobile network operators, handset manufacturers and software development companies from all over the world.

The OMTP worked in many areas including creating universal charging standards for micro-USB devices, mobile security, position measurements, device management and standardized APIs. They have an initiative called the BONDI API (http://bondi.omtp.org/) based on a set of JavaScript APIs and a security framework based on XACML for creating mobile interfaces and subsystems. An open-source project has released an SDK (http://bondisdk.org/) Two other efforts to create standard mobile APIs like BONDI are:

GSMA OneAPI (http://www.gsmworld.com/oneapi/)

Joint Innovation Lab (JIL; http://www.jil.org/)

Conclusion:

In this paper, the use of web services on mobile was considered. Mobile devices present a number of challenges for web services and web site designers. There are many different device types, different mobile operating systems, and in many cases competing standards. Although a lot of schemes have been worked upon, till date a perfect answer is not found to address this issue. For example, designing frontends for only special devices like iPhone would be an injustice to other manufacturer's mobile users whereas establishing special domain like .MOBI for creating web sites for mobiles would violate the principle that the web should be device independent. It becomes clear that in future, content negotiation, should be dominating scheme where different documents would be presented to different devices going to the same URI, once they are identified as supported type devices.

Best Practices Working Group (BPWG), a part of W3C's Mobile Web Initiative has developed guidelines for creators, maintainers and operators of web sites. In order to allow content providers to share a consistent view of a default mobile experience the BPWG has defined the Default Delivery Context. The Default Delivery Context is defined as follows:

- **Usable Screen Width -** 120 pixels, minimum.
- **Markup Language Support** - XHTML Basic 1.1 delivered with content type application.
- **Character Encoding** UTF-8.
- **Image Format Support -** JPEG and GIF 89a.
- **Maximum Total Page Weight -** 20 kilobytes.
- **Colors -** 256 Colors, minimum.
- **Style Sheet Support -** CSS Level 1.
- **HTTP -** HTTP1.1

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