Browser Interoperability Requirements

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Open Mobile Alliance

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1. Scope (Informative)

The mobile web industry has produced an extensive range of devices using a variety of mobile web browsers. The variety of web browsers and the variations in their supported browsing capabilities results in complex and effort-intensive work for both Content Developers and Service Providers in creating and maintaining web applications that are interoperable across the wide range of devices in order to achieve consistent end-user experience.

This document therefore defines requirements that will lead to the resolution of specific areas of mobile web browser functionality that currently results in mobile web browser and web application interoperability issues.

It is expected that the resolution to the identified interoperability issues and derived requirements will be in the form:

- Change Requests against specifications forming existing OMA Browser enabler releases;
- Change Requests against existing OMA Enabler Test Requirements;
- Change Requests against existing OMA Enabler Test Specifications;
- New OMA conformance specifications, if required.

The delivery of a new OMA Enabler release is not expected as part of this activity.

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3. Terminology and Conventions

3.1 Conventions

The key words “MUST”, “MUST NOT”, “REQUIRED”, “SHALL”, “SHALL NOT”, “SHOULD”, “SHOULD NOT”, “RECOMMENDED”, “MAY”, and “OPTIONAL” in this document are to be interpreted as described in [RFC2119].

All sections and appendixes, except “Scope” and “Introduction”, are normative, unless they are explicitly indicated to be informative.

3.2 Definitions

Capability Negotiation	Capability negotiation is the mechanism for agreeing on session functionality and protocol options. Session capabilities are negotiated during session establishment. Capability negotiation allows a server application to determine whether a client can support certain protocol facilities and configurations
Client	A device (or application) that initiates a request for connection with a server.
Content	Subject matter (data) stored or generated at an origin server. Content is typically displayed or interpreted by a user agent in response to a user request.
Device	A network entity that is capable of sending and receiving packets of information and has a unique device address. A device can act as both a client and a server within a given context or across multiple contexts. For example, a device can service a number of clients (as a server) while being a client to another server.

3.3 Abbreviations

CA	Certificate Authority
CJK	Chinese, Japanese and Korean
CSS	Cascading Style Sheets
HTML	HyperText Markup Language
HTTP	HyperText Transfer Protocol
HTTPS	Hyper Text Transfer Protocol Secure
MIME	Multipurpose Internet Mail Extensions
OMA	Open Mobile Alliance
RFC	Request For Comments
SI	Service Indication
SL	Service Loading
SMS	Short Message Service
SSL	Secure Socket Layer
TLS	Transport Layer Security
UA	User Agent
UAProf	User Agent Profile
URI	Uniform Resource Identifier
URL	Uniform Resource Locator

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W3C	World Wide Web Consortium
WAP	Wireless Application Protocol
WML	Wireless Markup Language
WTLS	Wireless Transport Layer Security
XHTML	Extensible HyperText Markup Language
XML	Extensible Markup Language

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4. Introduction (Informative)

To ensure the continuing growth of the mobile web market it is necessary to focus on improving the experience of the end-user who consumes web applications, and to continue to make available richer devices and web applications.

Today, the mobile web industry has produced a rich variety of devices that use mobile web browsers. In many ways this is one of the most exciting aspects of the mobile market; the rich variety and wide availability of devices provides the end-user with extensive choices on how they can interact with the mobile web.

However the multitude of mobile web browsers and the variations between the browser implementations due to the optional nature of browser support for browser capabilities causes complex and effort-intensive work for both Content Developers and Service Providers in creating and maintaining web applications that are interoperable across the wide range of devices.

In summary, the main factors that influence the lack of interoperability of mobile web browsers, and which subsequently impact mobile web-based service growth are:

- Inconsistency and complexity of content negotiation;
- Inconsistent HTTP feature support;
- Inconsistent interpretation of CSS and XHTML features.

These factors give rise to the need to focus efforts on:

- Simplifying the task of creating interoperable web applications across mobile web browsers from a content support perspective (i.e. the need to address Browser content conformance requirements);
- Ensuring a reliable baseline of HTTP feature support across all mobile web browsers;
- Ensuring that mobile web browsers interpret CSS and XHTML features in a consistent manner and as expected by the Content Developers.

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5. Use Cases (Informative)

5.1 Use Case 1. Reliable and consistent content negotiation and minimum features for browser interoperability

5.1.1 Short Description

This use case describes a scenario where several end-users all browse the same web page, and where each end-user uses a different mobile web browser implementation. All served content is displayed correctly on the mobile web browser and the end-user's browsing experience is good.

5.1.2 Actors

End-user:

- The end-user consumes the served content that they requested and experiences consistent and an expected quality of service. This also means that any cached content on the mobile web browser represents the latest version served by the Service Provider.

Service Provider:

- The Service Provider serves mobile web content in response to an end-user's mobile web browser request.

5.1.2.1 Actor Specific Issues

End-user:

- The end-user expects a consistent (or improved) browsing experience with no (or limited) user experience browsing faults, across a range of different mobile web browser, e.g. this may occur when an end-user either purchases a new phone or upgrades their existing phone;
- The end-user expects that any cached content on their mobile web browser represent the latest version served by the Service Provider. Inconsistent interpretation of caching directives and management of session information means that some mobile web browsers do not correctly handle the caching of web pages. This could result in the user being presented with an out of date web pages.

Service Provider:

- The Service Provider expects to be able to serve all mobile web browsers, and their specific versions, without effort intensive and costly mobile web browser-specific handling techniques. Due to the lack of information or inconsistent information relating to the capabilities of mobile web browsers the Service Provider either assumes the supported mobile web browser capabilities and tailors content as "best effort", or they simply serve default content (e.g. text and hyperlinks), which might not be compatible with specific mobile web browsers, or different versions of the same mobile web browser. These issues are further described by the following examples:
  - For a Service Provider that performs content negotiation upon the **User Agent** header, which contains only limited information about the user-agent, sent by the mobile web browser (i.e. browser-specific handling) the issues faced include:
    - With an increasing availability of mobile web browsers, the Service Provider spends significant time and effort (and hence cost) in ensuring that when new mobile web browsers are launched into the market place that the capabilities of these mobile web browser are determined as accurately as possible and proprietary libraries for each mobile web browser are developed, before the launch of that mobile web browser, in order to ensure as best as possible that their content is compatibly with the new mobile web browser;
    - If the Service Provider is not able to spend the resources required to stay ahead of mobile web browser launches, or the Service Provider is not able to prepare support for a specific browser before its launch, the Service Provider must fallback to a least-common-denominator approach, delivering a subset of content types that are very likely to be supported.

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- For a Service Provider that performs content negotiation upon the **HTTP Accept** headers sent by the mobile web browser, the issues faced include:
  - When a mobile web browser sends only the "*/*" MIME type in the HTTP Accept headers the Service Provider is forced to either assume content compatibility, or use browser-specific handling based upon the User Agent header;
  - The number of supported MIME types in the HTTP Accept header varies considerably across mobile web browsers. Additionally, when a mobile web browser sends only a limited supported set of media types in the Accept headers (i.e. not all supported media types are advertised) the Service Provider cannot reliably depend upon the Accept headers. If a specific media type is not included in the Accept header, the Service Provider is forced either to assume that the mobile web browser does not support the specific media, or resort to exception handling based upon the User Agent header. However, if mobile web browser sends all possible supported MIME types in the Accept headers then the performance of those mobile web browsers (e.g. latency) are worse than those mobile web browsers that send a limited number of headers.

- The Service Provider, in order to determine more accurately the capabilities of the mobile web browser, uses not only the information provided in the UA header and the Accept headers, but leverages the information provided by the device's UA Profile. Even though UAProf is not used in the content negotiation process, the information collectively provided in UAProf, HTTP Accept and UA header aids the Service Provider to ensure content interoperability on each mobile web browser. However, the use of UAProf gives rise to a number of issues for the Service Provider:
  - UAProf implementations are not consistent, e.g. there is inconsistent support of elements due to the optional nature of UAProf, the vocabulary (semantics) of UAProf differs across implementations, and a number of important elements needed by the Service Provider to develop content suitable for mobile web browsers (e.g. usable screen size, video camera, streaming media format) are not supported;
  - In some cases, information contained in UAProf and information contained in the Accept headers are inconsistent and incorrect (e.g. UAProf indicates that the device supports a feature when in practice the feature is not supported);
  - Not all mobile web browsers support the x-wap-profile: uaprof header. Additionally, mobile web browsers use x-wap-profile and its elements inconsistently. For example, to identify and distinguish between 2G and 3G bearers:
    - One mobile web browser supporting 3G supports:
      - x-wap-profile:"http://vendorA.com/…/Profile/deviceA_NO_BEARER.rdf"
      - x-wap-profile:"http://vendorA.com/…/Profile/deviceA_WITH_BEARER.rdf"
    - The same make of mobile web browser supporting only 2G supports:
      - x-wap-profile:"http://vendorA.com/…/Profile/deviceA_NO_BEARER.rdf"
    - Another mobile web browser supporting 3G supports:
      - x-wap-profile:"http://vendorA.com/…/UAProfile/deviceA-3G.XML
    - The same make of mobile web browser supporting only 2G supports:
      - x-wap-profile:"http://vendorA.com/…/UAProfile/deviceA.XML
    - Another mobile web browser supporting 3G provide not indication
      - x-wap-profile:"http://vendorA.com/…/uaprofile/deviceA.XML

- The Service Provider needs to adapt and manage the content for different mobile web browsers and mobile web browser versions. In some cases, if the Service Provider is not aware or informed of firmware updates for a mobile web browser, content served, which could be correctly displayed before the update, no longer works after the update. Today, there are real examples where an end-user receives different browsing experiences based on different firmware versions of the same mobile web browser.

- The Service Provider needs to be aware of the caching directives supported by each mobile web browser. Inconsistent support and interpretation of caching directives and management of session information, and multiple methods (e.g. meta=http-equiv="cache=Control" or meta name="cache control") to invoke or prevent a mobile web browser from caching web pages/content means that some mobile web browsers do not correctly handle the caching of web pages and content. These issues result in the end-user being presented with an out of date web page and

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content or having to revalidate pages that should have been revalidated. This also means that the Service Provider is not aware that cached content on a mobile web browser is out-of-date.

- The Service Provider needs to be aware of not only the size of a mobile web browsers cache but also how each mobile web browser manages its cache and cache size. The Service Provider needs to know the capabilities of the mobile web browsers cache in order to specify how specific content is cached (e.g. for a specific period of time).

5.1.2.2 Actor Specific Benefits

End-user:

- The end-user browses to a web page and all content is presented correctly (e.g. rendered appropriately, and is presented with an up-to-date cached page) and the end-user experiences good browsing experience;
- The end-user experiences a consistent (or improved) browsing experience without incurring browsing errors, across a range of different mobile web browsers and different versions of the same mobile web browser, through a range of Service Providers, and across a number of access technologies.

Service Provider:

- Reliable Content negotiation (without the need for costly specific mobile web browser handling mechanisms such as libraries of mobile web browser profiles) between Service Provider and mobile web browser is achieved and the Service Provider receives all mobile web browser capabilities, including the supported mechanisms for mobile web browser control (e.g. for caching purposes), which allows the Service Provider to be confident that content served is compatible with a mobile web browser that has negotiated its capabilities with the Service Provider.

5.1.3 Pre-conditions

- A mobile web browser is configured (i.e. it can be connected to the Internet) to browse the web and a Service Provider's portal;
- There is support of reliable and consistent content negotiation and features between different mobile web browsers (and versions of the same mobile web browser) and the Service Provider;
- The Service Provider supports the mechanisms to generate content for different mobile web browser capabilities.

5.1.4 Post-conditions

- The end-user is provided with content compatible with their mobile web browser;
- The content served by a Service Provider is made available for consumption across a wide range of mobile web browsers and end-users.

5.1.5 Normal Flow

1. An end-user purchases a new mobile device that supports the latest web browser;
2. The end-user launches the mobile web browser and then selects a link (URL) that initiates a request to the Service Provider;
3. The Service Provider receives the request and detects the mobile web browser's content compatibility, without any preparation, or knowledge, of the new mobile web browser;
4. The Service Provider serves content that is compatible with their mobile web browser without any preparation of the content;
5. The browser processes the content for the end-user and the end-user consumes the content. The end-user has a good browsing experience;
6. Any cached content is refreshed (revalidated) and referred to when appropriate, which means that the end-user always consumes the latest version of the available content.

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5.1.6 Alternative Flow

- Alternative Step 1: The end-user (or the Vendor of that mobile web browser) upgrades the mobile web browser.
- Alternative Step 1: The end-user migrates their subscription from one Service Provider to another Service Provider.

5.1.7 Operational and Quality of Experience Requirements

None

5.1.8 Open Issues

None

5.2 Use Case 2. Handling of HTTP messages and parameters at the browser

5.2.1 Short Description

This use case describes a scenario where an end-user browses a web page. All served content is displayed correctly on the mobile web browsers and the end-users browsing experience is good.

5.2.2 Actors

End-user:

- The end-user consumes the served content that they requested and experiences consistent and expected quality of service (e.g. error free interactions).

Service Provider:

- The Service Provider serves web content in response to an end-user's mobile web browser request.

5.2.2.1 Actor Specific Issues

End-user:

- The end-user experience is inconsistent and in some cases the end-user is unable to consume content because, e.g. the application and/or the mobile web browser crashes. Specifically, the end-user receives poor user-experience when their mobile web browser receives corrupt or spurious HTTP information, and the mobile web browser does not know how to handle the error condition. To avoid poor user experience, the mobile web browser needs to be able to handle the reception of spurious or corrupt HTTP information. Examples of spurious or corrupt HTTP information received at the mobile web browser include:
  - Multiple headers (repeated HTTP headers) with the same name, and reception of headers that are not separated by commas. If a duplicated header does not support comma-separated values (e.g. Content-Length) then some mobile web browsers do not know the correct order for accepting the headers and hence give rise to an error condition;
  - HTTP header with no name or value, just a colon (":") on a line by itself, i.e. it is an empty header field. (See Appendix B: Empty header field);
  - HTTP header parameter where only the name is defined but the value of the parameter is empty. (See Appendix B: Empty parameter field);
  - Multiple HTTP headers where there are more than one CRLF between the headers. (See Appendix B: Spurious CRLF in headers);
  - HTTP header that consists of a single word, e.g. a response containing a field with a name, but no colon separator or value. (See Appendix B: Missing separator and value);

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- HTTP message that contains a field name, a colon, a CRLF and then the value for that field. Some mobile web browsers are unable to associate the header value with the header name;
- LF instead of CRLF as a line terminator;
- WWW-Authenticate header that contains more than one challenge. Some mobile web browsers are not aware of how to determine potential multiple challenges and identify the strongest challenge that it supports. (See Appendix B: Multiple challenges);
- Multiple Cache warnings, where each warning contains alternate versions of the same information. Some mobile web browsers either do not display any cache warning and presents the first warning it receives, or does a best attempt to determine which warning should be presented first (e.g. by the language of the text);
- Unknown or unexpected HTTP 1*xx* status responses. For example some servers are known to send more than one "100 Continue" response to a single "Expect: 100-continue" request. Some mobile web browsers are unsure of how to handle multiple "100 Continue" response to a single request. In other cases when the mobile web browser receives an unexpected HTTP 1*xx* response it either ignores the message and continues to expect another response or tries to process the message, which gives rise to an error. (See Appendix B: Unknown informational);
- HTTP Informational message (e.g. "100 Continue") that contains associated headers or body. Some mobile web browsers assume a 1*xx* response will only contain a start-line, and are unable to process this and subsequent messages. (See Appendix B: Informational headers and body);
- Chunk-encoded data with a chunk size larger than the data sent. Some mobile web browsers identifies that the server has stopped sending and eventually gives up, and presents the available data to the end-user. However, some mobile web browsers potentially wait indefinitely, or fail the entire page;
- Corrupt chunk headers. Some mobile web browsers are not able to parse corrupt chunk headers;
- Empty HTTP response to a HTTP request, which would normally require a response (i.e. response with a content-length of zero). Some mobile web browsers are unable to recover from this error. (See Appendix B: Empty Response).

Service Provider:

- The Service Provider needs to be aware that spurious or corrupt HTTP information may result in poor user experience and even failure of the service or mobile web browser.

5.2.2.2 Actor Specific Benefits

End-user:

- The end-user can reliably consume the Service Provider's services;
- In cases of error conditions the user experience is managed as best as possible (e.g. instead of the device crashing the service may fail gracefully).

Service Provider:

- The Service Provider is able to offer services to a large variety of mobile web browsers, and is confident that end-users are able to consume their services and if errors occur then the user experience is managed as best as possible (e.g. instead of the device crashing the service may fail gracefully).

5.2.3 Pre-conditions

- The device supporting a web browser is configured (i.e. it can be connected to the Internet) to browse the web and a Service Provider's portal.

5.2.4 Post-conditions

- The end-user is provided with content compatible with their mobile web browser and the service works as expected.

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5.2.5 Normal Flow

1. The end-user launches the mobile web browser and then selects a link (URL) that initiates a request to the Service Provider;
2. The Service Provider serves content that is compatible with their web;
3. The mobile web browser processes the content for the end-user and the end-user consumes the content. The end-user has a good browsing experience.

5.2.6 Operational and Quality of Experience Requirements

None

5.3 Use Case 3. Use of large cookies in mobile web browsers

5.3.1 Short Description

This use case describes the ability for a Service Provider to offer services that utilise large cookies to end-users using a variety of mobile web browsers.

5.3.2 Actors

End-user:

- The end-user consumes the services and served content that they request and experience consistent and expected quality of service (e.g. error free interactions).

Service Provider:

- The Service Provider serves web content in response to an end-user's mobile web browser request;
- The Service Provider offers services (e.g. Search and Locate type services, or stock quote services) that use large cookies.

5.3.2.1 Actor Specific Issues

End-user issues:

- The end-user expects to able to consume services offered by Service Providers. They need to be able to supply specific service requested information (e.g. user personal preferences/specific service information such as their username and password or desired location for requested whether forecast, departing train station, favoured hotel etc) and expect to receive accurate results in response to their query.

Service Provider:

- Service Providers expect to be able to offer services utilising large cookies that can be reliably served to mobile web browsers. The Service Provider needs to be aware of those mobile web browsers that do not support large cookies, or those that have inadequate cookie storage size. The Service Provider is unable to offer their services to end-users using mobile web browsers that do not support large cookies.

5.3.2.2 Actor Specific Benefits

End-user:

- The end-user is able to reliably consume the Service Provider's services that utilise large cookies without errors;
- The end-user is not required to re-submit specific information (e.g. username and password) each time they access the service during a specific sessions.

Service Provider:

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- The Service Provider is able to reliably deploy and offer services that utilise large cookies to their customers.

5.3.3 Pre-conditions

- The device supporting a mobile web browser is configured (i.e. it can be connected to the Internet) to browse the web;
- The Service Provider provides services that utilise large cookies;
- The mobile web browser supports large cookies including large cookie size.

5.3.4 Post-conditions

- The end-user is offered services utilising large cookies and they consume these services without experiencing any errors;
- The services that utilise large cookies offered by a Service Provider are made available for consumption across a wide range of mobile web browsers and end-users.

5.3.5 Normal Flow

1. A Service Provider responds to an end-user's request with content that utilises large cookies;
2. The mobile web browser successfully displays the content utilising large cookies;
3. The end-user submits their personal information/preferences as requested in the served content and submits their query;
4. The Service Provider successfully processes the request, and returns the appropriate results;
5. The end-user consumes the results;
6. The end-user then switches services (i.e. they start to consume another service) and after some period of time they switch back to the previous service;
7. All end-user personal information/preferences are maintained and the end-user is able to consume the service without having to resubmit their information.

5.3.6 Alternative Flow

None

5.3.7 Operational and Quality of Experience Requirements

Use of very large cookies (e.g. >2048 octets) may significantly slow the responses to end-user requests, thus should be used only when necessary.

5.4 Use Case 4. Use of long URLs in browsers

5.4.1 Short Description

This use case describes the use of long URLs in browsers, which, for example, are caused by inter-server information exchange through server URL redirection, and URL based forms with associated URL variables (name/value pairs).

5.4.2 Actors

End-user:

- The end-user consumes the served content that they have requested and experiences consistent and expected quality of service (e.g. error free interactions).

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Service Provider:

- The Service Provider serves web content in response to an end-user's mobile web browser request;
- The Service Provider is able to offer rich services that rely on long URLs.

5.4.2.1 Actor Specific Issues

End-user:

- The end-user expects a consistent (or improved) browsing experience with no (or limited) browsing faults, across a range of different mobile web browsers;
- On particular mobile web browsers the end-user is unable to submit, view or download content via URLs that exceed the supported mobile web browser's maximum length (e.g. 256 characters).

Service Provider:

- Service Providers expect to be able to offer rich services that can be reliably served to mobile web browsers;
- The Service Provider needs to be aware that some mobile web browsers are unable to support long URLs, e.g. greater than 256 characters, which prohibits the end-user from consuming the Service Provider services;
- They need to be aware that some mobile web browsers do not support all escape characters, which results in their content either not being displayed, or which causes critical errors conditions (e.g. the mobile web browser crashes).

5.4.2.2 Actor Specific Benefits

End-user:

- The end-user browses to a web page and all content is presented correctly (e.g. rendered appropriately, and all images are displayed appropriately) and the end-user's browser experience is good;
- The end-user can reliably consume the Service Provider's rich services.

Service Provider:

- The Service Provider is able to use long URLs to support and provide complex services;
- The Service Provider is confident that the end-users are able to consume their complex services.

5.4.3 Pre-conditions

- The mobile web browser supports minimum URL lengths of 1024 characters;
- The mobile web browser supports all escape characters.

5.4.4 Post-conditions

- The end-user is provided with content compatible with their mobile web browser and the service works as expected.

5.4.5 Normal Flow

1. The end-user launches the mobile web browser from their device and then selects a link (URL) that initiates a request to the Service Provider's Travel web site;
2. The end-user then selects the air travel option;
3. The Service Provider receives the request for air travel and then redirects the request to another Service Provider that manages and offers the appropriate travel information;
4. The second Service Provider receives the request, and responds with the requested content (e.g. air travel queries form);
5. The mobile web browser processes the content for the end-user;

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6. The end-user completes the provided air travel query form and submits the completed form;
7. The results (the requested travel information) are successfully returned to the end-user.

5.4.6 Alternative Flow

1. As per normal flow;
2. The end-user selects the air travel option. Before submitting their request the end-user also submits their travel itinerary (as part of the URL variables (name/value pairs));
3. The Service Provider receives the request for the air travel option and then redirects the request along with the itinerary to another Service Provider;
4. The second Service Provider receives the request, along with the end-user's itinerary and responds with the results of the request (e.g. air travel flight details);
5. The results are successfully provided to the end-user.

5.4.7 Operational and Quality of Experience Requirements

None

5.5 Use Case 5. Long URLs in WAP Push

5.5.1 Short Description

This use case describes the need for the support of a minimum URL length in WAP Push. To ensure that applications, e.g. news report alerts or latest weather reports, which utilise long URLs can be delivered to mobile web browsers using WAP Push SI and SL messages.

5.5.2 Actors

End-user:

- The end-user consumes the served content and experiences consistent and expected quality of service (e.g. error free interactions).

Service Provider:

- The Service Provider serves content via applications (e.g. latest weather reports) utilizing long URLs that are delivered to mobile web browsers using WAP Push.

5.5.2.1 Actor Specific Issues

End-user:

- The end-user expects to encounter few errors when using services that deliver notifications using WAP Push, i.e. they need to able to consume content as indicated in the WAP Push message.

Service Provider:

- The Service Provider expects to be able to reliably use WAP Push as a means to deliver content via long URLs to mobile web browsers;
- The Service Provider expects to be able to use WAP Push as a means to reliably deliver content via long URLs to mobile web browsers without impacting network and service performance by sending excessive numbers of SMS to support long URL lengths.

5.5.2.2 Actor Specific Benefits

End user:

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- The end-user can reliably consume the Service Provider's services and content that utilizes WAP Push.

Service Provider:

- The Service Provider is able to reliably deploy services that use WAP Push to deliver long URLs.

5.5.3 Pre-conditions

- The mobile web browser supports URL length of at least 1024 characters;
- WAP Push SI and SL each support URL length of at least 250 characters;
- The end-user is subscribed to the Service Provider's services, e.g. latest weather reports.

5.5.4 Post-conditions

- The end-user receives WAP Push notification and is able to consume the content as referenced through the contained long URLs.

5.5.5 Normal Flow

1. The Service Provider pushes a "weather alert" message containing a textural message "latest weather report – view now?" and a URL consisting of 250 characters to and end-user;
2. The end-user receives the "weather alert" message on their mobile web browser;
3. The end-user selects the link (URL) as presented in the notification and the device launches the mobile web browser;
4. The mobile web browser processes the content and the end-user consumes the provided weather report.

5.5.6 Alternative Flow

None

5.5.7 Operational and Quality of Experience Requirements

WAP Push containing long URLs that are delivered over SMS bearer may result in extensive Segmentation and Reassembly processing at the mobile web browser, which may cause poor operational and quality of experience. Long URLs (>250 characters) using SMS should therefore be avoided.

5.6 Use Case 6. Browser protocol redirects

5.6.1 Short Description

This use case describes several scenarios where an end-user browses a web site and based on the service being requested, and the type of end-user interaction, is redirected to another web site, which in some cases may be a secure web site.

5.6.2 Actors

End-user:

- The end-user consumes the served content that they requested and experiences consistent and expected quality of service (e.g. error free interactions).

Service Provider:

- The Service Provider serves web content in response to an end-user's mobile web browser request;
- The Service Provider is able to offer premium services that can be consumed by authorised actors.

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5.6.2.1 Actor Specific Issues

End-user:

- On particular mobile web browsers the end-user is unable to consume content that requires end-user credentials (e.g. username/password) to be submitted before the content can be consumed;
- On particular mobile web browsers the end-user is unable to use applications that require the end-user to submit information as requested by an application (e.g. taxi reservation form, train time table request forms). In particular, error situations may occur following an original HTTP POST method from the mobile web browser to an old web site, which redirects the browser using HTTP GET method to the new assigned permanent URL. Redirecting from HTTP POST method to HTTP GET method using 301 Moved Permanently, 302 Found, and 307 Temporary Redirect HTTP status codes may cause the original request to fail with an HTTP 405 Method Not Allowed. In similar situations, the end-user may not be informed of the required redirection;
- On particular mobile web browsers an end-user that uses an appropriate search type applications is unable find specific information (e.g. nearest restaurant). Based on end-user interaction (e.g. an end-user enters certain search criteria) a form submission using a HTTP POST method is made from the mobile web browser. The destination URL (server and application logic) processes the posted information to determine the best match, which is returned to the mobile web browser as a 303 Redirect HTTP status code. The mobile web browser then initiates a HTTP POST method (instead of HTTP GET) to a URL that may have no knowledge about the original request which means that the service may fail with an HTTP 405 Method Not Allowed status code;
- In some cases mobile web browsers that connect to a destination URL using HTTPS may fail because the mobile browser may not implement the same transport layer security protocol (i.e. WTLS, TLS or SSL) as the web server;
- End-users using particular mobile web browsers that do not support compatible SSL/TLS/WTLS certificates are unable to access secure web sites;
- Because some mobile web browsers may support an insufficient set of root CA certificates an end-user is not able to invoke an SSL/TLS/WTLS session to connect to a secure web site from a mobile web browser.

Service Provider:

- The Service Provider needs to be aware that some mobile web browsers are unable to redirect certain protocols such as HTTP and HTTPS, which prohibits the end-user from consuming their services;
- The Service Provider needs to be aware that redirecting requests between URLs and changing HTTP methods (e.g. redirecting from HTTP POST to HTTP GET method) may cause their applications to fail on some mobile web browsers;
- The Service Provider needs to be aware that some mobile web browsers use the HTTP POST method following a HTTP 303 status code instead of a HTTP GET method. This may cause their applications to fail on some mobile web browsers.

5.6.2.2 Actor Specific Benefits

End-user:

- The end-user can reliably consume the Service Provider's services after they submit their personal credentials.

Service Provider:

- The Service Provider is able to offer services to a large variety of mobile web browsers, and is confident that end-users are able to consume their services once authorised.

5.6.3 Pre-conditions

- The mobile web browser supports a number of protocols including HTTP: and HTTPS:
- The end-user has an existing account with the Service Provider.

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5.6.4 Post-conditions

- The end-user is provided with content compatible with their mobile web browser and the service works as expected.

5.6.5 Normal Flow

1. The end-user launches the mobile web browser from their device and then selects a link (URL) that initiates a request to a web site;
2. At the web site the end-user then selects the meeting information option and submits their credentials (username/password) to enter the members only area;
3. In the members only area the end-user then selects the meeting registration option and the end-user is redirected to the secure registration site;
4. The end-user submits their personal information (name, company, days attending etc) and then selects payment method and submits personal details including billing address, credit card details;
5. The payment request is successfully processed and the end-user registered for the meeting.

5.6.6 Alternative Flow

1. The end-user launches the mobile web browser from their device and then selects a link (URL) that initiates a request to a web site, e.g. local taxi service;
2. At the web site the end-user is presented with a form (e.g. taxi reservation form);
3. The end-user completes the online form by submitting their personal information (e.g. name, address, destination and place to be collected);
4. The end-user submits (posts) the completed form;
5. Following the submission of the completed form the end-user is notified that the request is to be redirected to a new web site (i.e. URL);
6. The end-user accepts the redirection request (e.g. either by key press or by application timer) and the form along with end-user's submitted information are redirected to new web site.
7. The taxi reservation request is successful.

5.6.7 Alternative Flow

1. The end-user launches the mobile web browser from their device and then selects a link (URL) that initiates a request to a web site search engine;
2. At the web site search engine the end-user types a question (e.g. local restaurants in Sydney?);
3. The end-user is redirected to a web site that best matches the end-user's question;
4. The end-user searches the web site and selects a restaurant.

5.6.8 Operational and Quality of Experience Requirements

None

5.7 Use Case 7. Consistent interpretation of CSS features

5.7.1 Short Description

This use case describes a scenario where a Service Provider applies a specific style using CSS to some content. This styled content is made available to a large number of end-users who all browse the same content using different mobile web

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browser implementations. All served content is displayed correctly (i.e. as expected by the Service Provider) on the mobile web browser and the end-users browsing experience is good.

5.7.2 Actors

End-user:

- The end-user consumes the served content that they requested and experiences consistent and expected quality of service (e.g. error free interactions).

Service Provider:

- The Service Provider develops the content and applies specific style to the developed content using CSS;
- The Service Provider serves web content in response to an end-user's mobile web browser request.

5.7.2.1 Actor Specific Issues

End-user:

- The end-user expects a consistent (or improved) browsing experience with no (or limited) browsing faults, across a range of different mobile web browsers, e.g. this may occur when an end-user either purchases a new mobile web browser or upgrades their existing mobile web browser;
- The end-user expects browsed content served by several Service Providers to be correctly displayed on their mobile web browser, e.g. content is rendered appropriately for the mobile web browser, and all images associated with the content are displayed correctly.

Service Provider:

- The Service Provider needs to be aware of the capabilities of each mobile web browser in order to ensure that their content can be correctly displayed on a wide range of mobile web browsers. This involves extensive effort in terms of creating and maintaining CSS files for each mobile web browser and each version of the same mobile web browser. In particular, the Service Provider needs not only to know what CSS properties are supported by each mobile web browser implementation but how each value associated with the following CSS parameters are interpreted:
  - **Colors, borders and background**: The Service Provider has to ensure that each mobile web browser implements and interprets the values of color, borders and background as expected, e.g. if the Service Provider styles content (e.g. an image) where background color is red and the border is a transparent then the Service Provider must be confident that this style is displayed in the same across different mobile web browsers. Examples relating to the issues faced by the Service Provider in terms of colors, borders and background are illustrated in Appendix C;
  - **Padding and Margin**: The Service Provider has to ensure that each mobile web browser implements and interprets the values of padding and margin in a consistent manner, e.g. If the Service Provider specifies padding=0 and margin=0 then the Service Provider must be confident that the content (e.g. image) is displayed in the same way/position across different mobile web browsers. Examples relating to the issues faced by the Service Provider in terms of padding and margin are illustrated in Appendix C;
  - **Absolute and relative positioning**: The Service Provider has to ensure that each mobile web browser implements and interprets the values of absolute and relative positioning in a consistent manner, e.g. If the Service Provider specifies absolute positioning of 'left:0px; top:0px' or 'right:0px: bottom:0px', then the Service Provider must be confident that the content (e.g. image) is displayed in the same way/position across different mobile web browsers. Examples relating to the issues faced by the Service Provider in terms of absolute and relative positioning are illustrated in Appendix C;
  - **Float**: The Service Provider has to ensure that each mobile web browser implements and interprets the values of float in a consistent manner, e.g. If the Service Provider specifies a float: left (and margin=1) then the Service Provider must be confident that the content (e.g. image and text) is displayed in the same way/position across different mobile web browsers. Examples relating to the issues faced by the Service Provider in terms of float are illustrated in Appendix C;

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- **Tables**: The Service Provider has to ensure that each mobile web browser implements and interprets the values of table margins and caption margins, table width and table cell in a consistent manner, e.g. If the Service Provider specifies caption-side: bottom, margin left: 2em, table margin-left=4 the Service Provider must be confident that the content (e.g. table and text) is displayed in the same way/position across different mobile web browsers. Examples relating to the issues faced by the Service Provider in terms of tables are illustrated in Appendix C;
- **Font Size**: The Service Provider has to be aware of not only the supported font-sizes but also the increment (gap or difference) between the single font-sizes (i.e. xsmall, small, medium, large, xlarge) as supported by different mobile web browsers and mobile web browsers, e.g. If the Service Provider specifies font-size with absolute-size=medium, then the font size must be consistent across all mobile web browsers, and the increment (gap or difference) between the other supported font-sizes should be consistent across all mobile web browsers. Examples relating to the issues faced by the Service Provider in terms of font size are illustrated in Appendix C;
- **Cascading**: In addition, the Service Provider also needs to be aware how each mobile web browser interprets CSS inline, external and internal elements. Although the Service Provider is able to select which styling methods they wish to apply, some mobile web browsers not only appear to override the Service Provider's specified style, but also in some cases, appear to change the ordering of the specified styles. Examples of these issues are illustrated in Appendix C;
- **Dynamic pseudo-class**: Focus. The Service Provider has to ensure all mobile web browsers implement and interpret the values of the dynamic pseudo-class: Focus (and the associated color property), in a consistent manner, e.g. If the mobile web browser does not support or implement the Focus class and associated property color according to the styled content then the Service Provider is unable to offer certain visual types of services in a consistent manner (e.g. services that allow the end-user to highlight (e.g. using a box with/without boarder and color) particular parts of a web page, e.g. focus on anchors). Examples relating to the issues faced by the Service Provider in terms of Dynamic pseudo-class: Focus are illustrated in Appendix C.

5.7.2.2 Actor Specific Benefits

End-user:

- The end-user browses to a web page and all content is presented correctly (e.g. rendered appropriately, and all images are displayed appropriately) and the end-user's browser experience is good.

Service Provider:

- The Service Provider is able to serve the same version of content to a wide variety of mobile web browsers with minimal complexity in maintaining CSS files and hence minimizing cost;
- The Service Provider is confident that the style of their developed content is displayed on a wide variety of mobile web browsers as expected.

5.7.3 Pre-conditions

- The device supporting a mobile web browser is configured (i.e. it can be connected to the Internet) to browse the web and a Service Provider's portal;
- The Service Provider has developed content and has styled the content in a particular manner;
- The Service Provider supports the mechanisms to render and style content for different mobile web browser capabilities.

5.7.4 Post-conditions

- The end-user is provided with content compatible with their mobile web browser;
- The content served by a Service Provider is made available, in the expected style, for consumption across a wide range of mobile web browsers and end-users.

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5.7.5 Normal Flow

1. The end-user launches the mobile web browser from their device (this may either be mobile web browser known to the Service Provider, a mobile web browser that has been upgraded, or a new mobile web browser just launched by the Vendor of that mobile web browser make) and then selects a link (URL) that initiates a request to the Service Provider;
2. The Service Provider receives the request and detects the mobile web browser's content compatibility, without any special preparation, or knowledge, of the new mobile web browser;
3. The Service Provider serves content that is compatible with their mobile web browser without any special styling preparation of the content;
4. The browser processes the content for the end-user and the end-user consumes the content with good browsing experience.

5.7.6 Alternative Flow

None

5.7.7 Operational and Quality of Experience Requirements

None

5.7.8 Open Issues

None

5.8 Use Case 8. Consistent interpretation of XHTML features

5.8.1 Short Description

This use case describes a scenario where a Service Provider uses XHTML to develop content for a large number of end-users who all browse the same content using different mobile web browser implementations. All served content is displayed correctly (i.e. as expected by the Service Provider) on the mobile web browser and the end-users browsing experience is good.

5.8.2 Actors

End-user:

- The end-user consumes the served content that they requested and experiences consistent and expected quality of service (e.g. error free interactions).

Service Provider:

- The Service Provider develops the content using XHTML and applies specific style to the developed content using CSS;
- The Service Provider serves web content in response to an end-user's mobile web browser request.

5.8.2.1 Actor Specific Issues

End-user:

- The end-user expects a consistent (or improved) browsing experience with no (or limited) browsing faults, across a range of different mobile web browsers, e.g. this may occur when an end-user either purchases a new mobile web browser or upgrades their existing mobile web browser;

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- The end-user expects browsed content served by several Service Providers to be correctly displayed on their mobile web browser, e.g. content is rendered appropriately for the mobile web browser, and all images associated with the content are displayed correctly.

Service Provider:

- The Service Provider needs to be aware of the capabilities of each mobile web browser in order to ensure that end-users are able to consume content and services offered by the Service Provider. This involves extensive effort in terms of creating and maintaining XHTML files for each mobile web browser and each version of the same mobile web browser;
- Specifically, the Service Provider needs not only to know what XHTML ***Form*** elements are supported by each mobile web browser implementation but the element values associated with each of the following elements:
  - **Input (Radio and multiple Radio buttons)**: The Service Provider has to ensure that each mobile web browser implements a minimum size for the number of single/multiple *Radio* buttons within a single Form. If the mobile web browser does not support or implement a consistent size for the number of Radio buttons then the Service Provider is unable to launch certain promotional/questionnaires type services to particular end-users using these mobile web browsers;
  - **Option**: The Service Provider has to ensure that each mobile web browser implements a minimum size for the support of "drop-down" options. If the mobile web browser does not support or implement a consistent size for the number of *Options* then the Service Provider is unable to launch certain promotional/questionnaires type services to particular end-users using these mobile web browsers;
  - **Text area**: The Service Provider has to ensure that each mobile web browses implements a minimum size for a *text area*. If the mobile web browser does not support or implement a minimum size for a text area then the end-user of the Service Provider's service is unable to submit all their personal details (e.g. their full address details for credit card authorization) required to purchase goods etc;
  - **Anchors (Links)**: The Service Provider has to ensure that each mobile web browses consistently implements a minimum size for a number of anchors (e.g. hyperlinks). If the mobile web browser does not support a minimum size for supported links then all the links within the content served by the Service Provider will not be displayed to the end-user, and they will not be present with all possible choices (e.g. URLs to music sites) that the Service Provider makes available.

5.8.2.2 Actor Specific Benefits

End-user:

- The end-user browses to a web page and all content is presented correctly (e.g. rendered appropriately, and all images are displayed appropriately) and the end-user browsing experience is good;
- The end-user browses to a web page and is able to use all services offered by the Service Provider.

Service Provider:

- The Service Provider is able to serve the same version of content to a wide variety of mobile web browsers with minimal complexity and cost in maintaining XHTML files;
- The Service Provider is confident that their developed content (and services) are displayed, and usable, as expected on a wide variety of mobile web browsers, as expected.

5.8.3 Pre-conditions

- The mobile device supporting a web browser is configured (i.e. it can be connected to the Internet) to browse the web and a Service Provider's portal;
- The Service Provider has developed content using XHTML.

5.8.4 Post-conditions

- The end-user is provided with content and services compatible with their mobile web browser;

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- The content served and services offered by a Service Provider are made available, in the expected manner, for consumption across a wide range of mobile web browsers and end-users.

5.8.5 Normal Flow

1. The end-user launches the mobile web browser from their device (this may either be mobile web browser known to the Service Provider, a mobile web browser that has been upgraded, or a new mobile web browser just launched by the Vendor of that mobile web browser make) and then selects a link (URL) that initiates a request to the Service Provider;
2. The Service Provider receives the request and detects the mobile web browser's content compatibility, without any special preparation, or knowledge, of the new mobile web browser;
3. The Service Provider serves content that is compatible with their mobile web browser without any special modification to the content for specific mobile web browser handling;
4. The browser processes the content for the end-user and the end-user consumes the content with good browsing experience.

5.8.6 Alternative Flow

None

5.8.7 Operational and Quality of Experience Requirements

None

5.8.8 Open Issues

None

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6. Requirements (Normative)

6.1 High-Level Functional Requirements

Label	Description	Enabler Release
[BROWSER-IOP-1]	HTTP content negotiation headers MUST be generated and applied in a consistent manner between User Agent and Service Provider. (For reference see use-case 1)	
[BROWSER-IOP-2]	Mobile web browsers MUST support a consistent set of information fields, and associated syntax (e.g. use of "quotes" and character "case"), within supported HTTP headers. (For reference see use-case 1)	
[BROWSER-IOP-3]	Via the combination of Accept headers and User Agent Profiles, mobile web browsers MUST provide an accurate description of supported content types when they request web content. (For reference see use-case 1)	
[BROWSER-IOP-4]	The size of an Accept header SHOULD NOT result in performance issues (e.g. latency) in mobile web browsers according to its underlying network characteristics. (For reference see use-case 1)	
[BROWSER-IOP-5]	In Accept headers, mobile web browsers MUST identify at minimum the set of browser markup languages supported. (For reference see use-case 1)	
[BROWSER-IOP-6]	The behaviour of a mobile web browser (i.e. UA cache directive processing) when it retrieves content from its cache SHALL be consistent. (For reference see use-case 1)	
[BROWSER-IOP-7]	Mobile web browsers MUST support an interoperable set of caching directives by mandating at least one method of expiration, e.g. the Max-Age attribute of the Cache-Control header or the Expires header. Mobile web browsers MUST also use the HTTP Date header, if available, when cache freshness lifetime is calculated based on the Expires header. (For reference see use-case 1)	
[BROWSER-IOP-8]	Mobile web browsers MUST support an interoperable set of directives for cookie expiration by mandating at minimum one method of expiration, e.g. Max-Age or Expires attribute. Mobile web browsers MUST also use the HTTP Date header, if available, when cookie freshness lifetime is calculated based on the Expires attribute. (For reference see use-case 1)	
[BROWSER-IOP-9]	The caching of resources MUST be supported by a mobile web browser in accordance with [RFC2616] to improve network optimization, performance and usability (e.g. A browser must be able to allocate sufficient memory for caching purposes to avoid unnecessary reload of web pages). (For reference see use-case 1)	
[BROWSER-IOP-10]	It SHALL be possible for the Service Provider to accurately and consistently determine the supported content types using the information provided in the UA profile and/or Accept header. (For reference see use-case 1)	
[BROWSER-IOP-11]	When a mobile web browser indicates that it supports similar MIME types (e.g. image/mng, image/x-mng, video/mng, video/x-mng, image) it SHALL include a quality value. (For reference see use-case 1)	
[BROWSER-IOP-12]	A consistent format and vocabulary MUST be applied to all implementations of UAProf. (For reference see use-case 1)	
[BROWSER-IOP-13]	Mobile web browsers MUST indicate the bearer (e.g. 2G or 3G) that it supports in a consistent manner. (For reference see use-case 1)	
[BROWSER-IOP-14]	The x-wap-profile header MUST be consistently populated with consistent syntax across all mobile web browsers. (For reference see use-case 1)	
[BROWSER-IOP-15]	Information provided in a UAProf MUST be consistent with the	

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	capabilities supported by the associated mobile web browser. (For reference see use-case 1)	
[BROWSER-IOP-16]	A Mobile Web Browser SHALL be capable of communicating the size of its available cache memory at any given point in time. (For reference see use-case 1)	
[BROWSER-IOP-17]	Upon the reception of spurious and corrupt HTTP messages the mobile web browser MUST either fail the current request gracefully (e.g. the mobile web browser is recoverable without end-user intervention) or continue to function without impacting user-experience. (For reference see use-case 2)	
[BROWSER-IOP-18]	When available, a mobile web browsers SHOULD use a network-based time source to ensure correct cookie/cache expiration. (For reference see use-case 1 and 3)	
[BROWSER-IOP-19]	Service Providers SHOULD NOT rely upon cookie and cookie expiration for fine-grained application semantics. (For reference see use-case 1 and 3)	
[BROWSER-IOP-20]	A Mobile web browser MUST support a minimum cookie size of 2048 octets. (For reference see use-case 3)	
[BROWSER-IOP-21]	A Mobile web browser MUST support a minimum of 4 cookies. (For reference see use-case 3)	
[BROWSER-IOP-22]	A Mobile web browser MUST support a minimum cookie storage of 8Kbyte cookie space. (For reference see use-case 3)	
[BROWSER-IOP-23]	The behaviour of web browsers MUST be consistent when the maximum cookie limitation is exceeded. (For reference see use-case 3)	
[BROWSER-IOP-24]	A mobile web browser MUST support a minimum URL with a minimum length of 1024 Unicode/ISO 10646 encoded characters as defined in [RFC3987] (See Note 1). (For reference see use-case 4)	
[BROWSER-IOP-25]	A mobile web browser MUST allow as many name/value pairs as possible bounded by requirement [BROWSER-IOP-24]. (For reference see use-case 4)	
[BROWSER-IOP-26]	Mobile web browser MUST support escape characters within URLs according to the appropriate specifications. (For reference see use-case 4)	
[BROWSER-IOP-27]	A URL length of at least 256 characters MUST be supported by WAP Push SI and SL (see Note 2). (For reference see use-case 5)	
[BROWSER-IOP-28]	A mobile web browser MUST support transport security through at least one means of connection. (For reference see use-case 6)	
[BROWSER-IOP-29]	A mobile web browser MUST support HTTP Redirection 3xx status codes including 301 Moved Permanently, 302 Found, 303 See Other, 307 Temporary Redirect. (For reference see use-case 6)	
[BROWSER-IOP-30]	A mobile web browser MUST initiate an HTTP POST method when it receives a 301 Moved Permanently status codes. (For reference see use-case 6)	
[BROWSER-IOP-31]	A mobile web browser MUST initiate an HTTP GET method when it receives an HTTP 303 Redirection status code. (For reference see use-case 6)	
[BROWSER-IOP-32]	A mobile web browser MUST support WTLS for a WAP 1.x (WSP) based protocol stack, and MUST support TLS for a WAP 2.x (W-HTTP) based protocol stack as the transport security protocols. The mobile web browser MAY also support SSL for a WAP 2.x protocol stack. (For reference see use-case 6)	
[BROWSER-IOP-33]	A mobile web browser MUST support the OMA Certificate and CRL profile Specification [CertProf]. (For reference see use-case 6)	
[BROWSER-IOP-34]	All certificates supported by a mobile web browser, and that are used with transport security protocols (TLS/SSL/WTLS) MUST be compliant to	

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	OMA Certificate and CRL Profiles specification [CertProf]. (For reference see use-case 6)	
[BROWSER-IOP-35]	A mobile web browser MUST have the capacity to support a minimum number of WTLS/TLS/SSL certificates, e.g. a minimum of 20 WTLS/TLS/SSL certificates. (For reference see use-case 6)	
[BROWSER-IOP-36]	A mobile web browser MUST accurately interpret and render CSS Padding and Margin properties applied to content, as intended and specified by a Service Provider (See Note 3). (For reference see use-case 7)	
[BROWSER-IOP-37]	A mobile web browser MUST accurately interpret and render CSS Border, Color and Background properties applied to content, as intended and specified by a Service Provider (See Note 3). (For reference see use-case 7)	
[BROWSER-IOP-38]	A mobile web browser MUST accurately interpret and render CSS Absolute and Relative positioning schemes applied to content, as intended and specified by a Service Provider (See Note 3). (For reference see use-case 7)	
[BROWSER-IOP-39]	A mobile web browser MUST accurately interpret and render the CSS Float property applied to content, as intended and specified by a Service Provider (See Note 3). (For reference see use-case 7)	
[BROWSER-IOP-40]	A mobile web browser MUST accurately interpret and render the CSS Font Size property applied to content, as intended and specified by a Service Provider (See Note 3). (For reference see use-case 7)	
[BROWSER-IOP-41]	A mobile web browser MUST accurately interpret and render CSS Tables as intended and specified by a Service Provider (See Note 3). (For reference see use-case 7)	
[BROWSER-IOP-42]	The web browser SHOULD accurately interpret the parameters associated with Dynamic Pseudo-class: Focus. (For reference see use-case 7)	
[BROWSER-IOP-43]	Content specified font sizes MUST be mapped to the web browser's supported font sizes in a non-decreasing manner (e.g. the medium font displayed will be smaller than the large font displayed). (For reference see use-case 7)	
[BROWSER-IOP-44]	Mobile web browser MUST apply a consistent ordering of CSS inline, external and internal features. (For reference see use-case 7)	
[BROWSER-IOP-45]	In isolation a mobile web browser MUST be able to support at least 30 XHTML Form "Option" elements per "Select" element (See Note 4). (For reference see use-case 8)	
[BROWSER-IOP-46]	In isolation a mobile web browser MUST be able to support at least 30 XHTML Form "Input (Radio and multiple Radio)" elements (See Note 4). (For reference see use-case 8)	
[BROWSER-IOP-47]	In isolation a mobile web browser MUST be able to support at least 30 XHTML Form "Text area" elements (See Note 4). (For reference see use-case 8)	
[BROWSER-IOP-48]	In isolation a mobile web browser MUST be able to support at least 100 Anchor elements (See Note 4). (For reference see use-case 8)	
[BROWSER-IOP-49]	In isolation the "Text area" of a mobile web browser MUST be able to support at least 512 bytes. (For reference see use-case 8)	
[BROWSER-IOP-50]	A mobile web browser MUST support at least 80 bytes in a text box (e.g. used for the HTTP authentication dialog and XHTML page). (For reference see use-case 8)	
[BROWSER-IOP-51]	A mobile web browser SHOULD be able to render benchmark files with reasonable complexity as defined by the Browser Interoperability enabler. The benchmark files may consist of combinations of media content, e.g.	

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	images, CSS and XHTML. (For reference see use-case 8)	
[BROWSER-IOP-52]	When the size of an applied XHTML file exceeds that of the supported XHTML file size on a mobile web browser then the mobile web browser MUST fail gracefully (e.g. the mobile web browser is recoverable without end-user intervention).	

Table 1: High-Level Functional Requirements

NOTE 1. Specifying a minimum URL in terms of octets leads to varying sizes of URLs depending on the internal implementation, e.g. a URL stored as a URI [RFC3986] would have all characters UTF-8 encoded into one to four octets (bytes) per character. Any unreserved octets would then be percent encoded, yielding up to 12 octets for a single character, or a worst-case encoding of 12kbyte to store a 1024 character URL. A URL stored as an IRI [RFC3987] would have an encoding of two bytes per character or 2kbyte. However, a URL must be encoded as a URI in an HTTP request.

NOTE 2. With a 7bit SMS the maximum length of a URL is 140 characters, and the header uses the remaining 20 characters. The figure of 256 is proposed to ensure that Segmentation & Resemble is supported. However, it should be noted that sending excessive SMS over an SMS bearer to support long URLs (>256) would impact network performance.

NOTE 3. The requirement is bounded by a mobile web browser capabilities and language context, e.g. CJK.

NOTE 4. These requirements represent generic support of the features on a ***per document*** basis and are not intended to imply a specific User Experience. For example, the support of 100 Anchors does not imply the support of 100 Anchors in the viewable screen.

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Appendix A. Change History (Informative)

A.1 Draft/Candidate Version 1.0 History

Document Identifier	Date	Sections	Description
Candidate Versions OMA-RD-BrowserInteroperability-V1_0	09 Feb 2006	n/a	Status changed to Candidate by TP TP doc Ref# OMA-TP-2006-0064-BrowserInteroperability-V1_0-RD-for-Candidate-Approval
OMA-RD_BrowserConformance-V1_0-20051214-D	10 Jan 2006	2, 6	Following REQ formal review, changes made according to RDRR (see OMA-RDRR-BrowserInteroperability-V1_0-20060117-D)
OMA-RD_BrowserConformance-V1_0-20051214-D	14 Dec 2005	2, 6	Inclusion of OMA-MAE-2005-371R01.
OMA-RD_BrowserConformance-V1_0-20051130-D	30 Nov 2005	All	RD migrated to latest RD template
OMA-RD_BrowserConformance-V1_0-20051129-D	29 Nov 2005	5.6.2.1, 6,	Inclusion of OMA-MAE-2005-287R03; 344R01. Editorial tidy-up before formal review of RD (see editorial changes described in OMA-MAE-2005-0347R01)
OMA-RD_BrowserConformance-V1_0-20051108-D	08 Nov 2005	5, 6, Annex B.	Inclusion of OMA-MAE-2005-0295R01, 282R01, 283R01, 291R01
OMA-RD_BrowserConformance-V1_0-20050826-D	31 Aug 2005	5, 6, Annex B.	Inclusion of OMA-MAE-2005-0181R01, 182R02, 188R01, 193, 194R03. Tidy-up of Annex B, reduce length of REQ IDs, rename annex b heading and removal of word “concatenated” following feedback during REQ informal review.
OMA-RD_BrowserConformance-V1_0-20050824-D	24 Aug 2005	2, 3, 4	Inclusion of OMA-MAE-2005-0180.
OMA-RD_BrowserConformance-V1_0-20050621-D	21 Jun 2005	5, Appendix B, 6.1	Inclusion of contributions OMA-MAE-2005-0105, 0094R01, 0095R02, 106R01, 0107, 109R01. Inclusion of third column in requirements table and number alignment between each requirement and associated use-cases.
OMA-RD_BrowserConformance-V1_0-20050414-D	14 Mar 2005	5, 6.1	Inclusion of contributions OMA-MAE-2005-0046R01, 0047R01, 0052R01.
OMA-RD_BrowserConformance-V1_0-20050202-D	28 Jan 2005	1, 4	First skeleton draft of RD as presented in OMA-MAE-2005-0017R01

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Appendix B. Examples of corrupt HTTP Headers and messages

B.1.1 Empty header field

```
HTTP/1.1 200 OK
Content-Type: text/html
:
Content-Length: 1074
...
```

Figure 1– Example of empty header field

B.1.2 Empty parameter value

```
HTTP/1.1 200 OK
Content-Type: text/html; charset=
...
```

Figure 2– Example of empty parameter value

B.1.3 Spurious CRLF in headers

```
HTTP/1.1 200 OK
Content-Type: text/html

Content-Length: 1074
...
```

Figure 3– Example of spurious CRLF in headers

B.1.4 Missing separator and value

```
HTTP/1.1 200 OK
Content-Type: text/html
Connection
Content-Length: 1074
...
```

Figure 4– Example of missing separator and value

B.1.5 Header split over multiple lines

```
HTTP/1.1 200 OK
Content-Type:
text/html
Content-Length: 1074
...
```

Figure 5– Example of a header split over multiple lines

```
HTTP/1.1 200 OK
Content-Type: text/html
Last-Modified: Tue, 15 Nov 2005
06:25:24 GMT
Content-Length: 1074
...
```

Figure 6– Example of a header split over multiple lines

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B.1.6 Multiple challenges

```
HTTP/1.1 401 Unauthorized
WWW-Authenticate: Basic realm="WallyWorld", Digest realm="testrealm@host.com",
      qop="auth,auth-int",
      nonce="dcd98b7102dd2f0e8b11d0f600bfb0c093",
      opaque="5ccc069c403ebaf9f0171e9517f40e41"
Content-Type: text/html
Content-Length: 1074
...
```

Figure 7– Example of multiple challenges

B.1.7 Unknown informational

```
HTTP/1.1 100 Continue

HTTP/1.1 100 Continue

HTTP/1.1 200 Ok
Content-Length: 7302
Content-Type: text/html
```

Figure 8– Example of unknown informational

```
HTTP/1.1 147 Below Tuesday
Content-Type: text/html
...

HTTP/1.1 200 OK
Content-Length: 7302
...
```

Figure 9– Example of unknown informational

B.1.8 Informational headers and body

```
HTTP/1.1 100 Continue
Date: Tue, 15 Nov 2005 06:25:24 GMT
Server: MyServer/1.2.6
```

Figure 10– Example of informational headers and body

B.1.9 Empty Response

```
HTTP/1.1 200 OK
Content-Type: text/html
Content-Length: 0
```

Figure 11– Example of empty response

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Appendix C. Browser and content interoperability error case examples

C.1 Mobile web browsers interpretation of CSS features

C.1.1 Colour, boarder and background

Colour, boarder and background source code.

```
<!DOCTYPE html PUBLIC "-//WAPFORUM//DTD XHTML Mobile 1.0//EN" "http://www.wapforum.org/DTD/xhtml-
mobile10.dtd">
<html>
<head>
                <title>Colors, Borders and Background</title>
    <style type="text/css">
        hr{
            color:#FF0000;
        }
        div{
            width:150px;
            height:80px;
        }
        div.border{
            border: medium solid #FF0000;
            background-color:#CCCCCC;
        }
        div.borderdt{
            border: thin dotted #FF0000;
            background-color:#CCCCCC;
        }
        div.bgcolor{
            background-color:#FF0000;
            color:#FFFFFF;
        }
        div.bgimage{
            background-image:url('sample.gif');
        }
        div.bgimagerx{
            background-image:url('sample2.gif');
            background-repeat:repeat-x;
            background-color:#CCCCCC;
        }
        div.bgimagery{
            background-image:url('sample2.gif');
            background-repeat:repeat-y;
            background-color:#CCCCCC;
        }
        div.bgimagern{
            background-image:url('sample2.gif');
            background-repeat:no-repeat;
            background-position:74px 39px;
            background-color:#CCCCCC;
        }
    </style>
</head>
```

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```
<body>
    <h3>Colors, Borders and Background</h3>
    <hr/>
    1. The above, horizontal ruler must be red.<br/><br/>
    <div class="bgcolor">
        2. This box must be red, while this text must be white.
    </div>
    <br/>
    <div class="bgimage">
        3. The background of this box must be a white diagonal grid on gray.
    </div>
    <br/>
    <div class="bgimagerx">
        4. This box must be gray with a horizontal, red line on top.
    </div>
    <br/>
    <div class="bgimagery">
        5. This box must be gray with a vertical, red line on its left side.
    </div>
    <br/>
    <div class="bgimagern">
        6. This box must be gray with a red dot in its exact center.
    </div>
    <br/>
    <div class="border">
        7. This box must be gray with a red border.
    </div>
    <br/>
    <div class="borderdt">
        8. This box must be gray with a thin, red dotted border.
    </div>
</body>
</html>
```

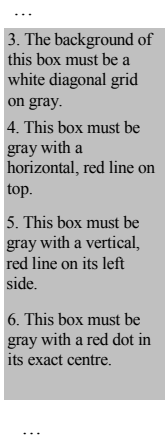

Figure 12– Colour, boarder and background display of mobile web browser 1

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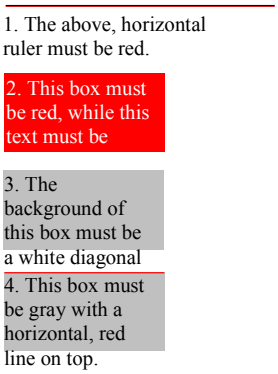

Figure 13– Colour, boarder and background display of mobile web browser 3

Note: The text exceeds the red box and therefore the text cannot be seen on the white background.

C.1.2 Padding and margin

Padding and margin source code.

```
<!DOCTYPE html PUBLIC "-//WAPFORUM//DTD XHTML Mobile 1.0//EN" "http://www.wapforum.org/DTD/xhtml-
mobile10.dtd">
<html>
<head>
                <title>Padding and Margin</title>
    <style type="text/css">
        body{
            margin:0px;
        }
        h3{
            padding-left:10px;
            padding-top:15px;
        }
        div.box{
            padding-left:50px;
            margin-left:50px;
            margin-top:10px;
            background-color:#CCCCCC;
            width:100px
        }
    </style>
</head>
<body>
    <h3>Padding and Margin</h3>
    <div class="box">
        Each of this gray boxes must have...
    </div>
    <div class="box">
        1. a 50 pixel horizontal distance to the left page-border.
    </div>
    <div class="box">
        2. a 10 pixel vertical distance to its above element.
    </div>
```

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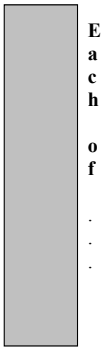
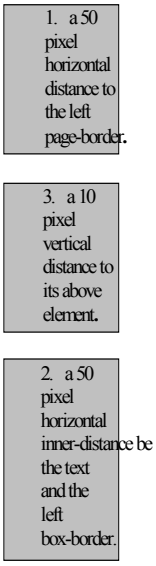
```
    <div class="box">
        3. a 50 pixel horizontal inner-distance between the text and the left box-border.
    </div>
</body>
</html>
```



…

Figure 14– Padding and margin display of Mobile web browser 2



…

Figure 15– Padding and margin display of mobile web browser 3

C.1.3 Absolute and relative positioning

Absolute and relative source code

```
<!DOCTYPE html PUBLIC "-//WAPFORUM//DTD XHTML Mobile 1.0//EN" "http://www.wapforum.org/DTD/xhtml-
mobile10.dtd">
<html>
<head>
```

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```
                <title>Absolute and Relative Positioning</title>
    <style type="text/css">
        #first{
            position:absolute;
            left:20px;
            top:50px;
            width:100px;
            height:100px;
            background:#CCCCCC;
        }
        #second{
            position:absolute;
            left:70px;
            top:100px;
            width:100px;
            height:100px;
            background:#FF0000;
            color:#FFFFFF;
        }
        #third{
            position:absolute;
            left:20px;
            top:230px;
        }
        .fourth{
            position:relative;
            left:0px;
            top:0px;
            width:100px;
            background:#FF0000;
            color:#FFFFFF;
        }
        .fifth{
            position:relative;
            left:20px;
            top:0px;
            width:100px;
            background:#CCCCCC;
        }
    </style>
</head>
<body>
    <h3>Absolute and Relative Positioning</h3>
    <div id="first"></div>
    <div id="second">
        1. This box must overlap the downright quarter of the gray box.
    </div>
    <div id="third">
        <div class="fourth">2. None of the following boxes may overlap another box.</div>
        <div class="fifth">3. The gray boxes must be right shifted by 20 pixel.</div>
        <div class="fourth"> </div>
        <div class="fifth"> </div>
        <div class="fourth"> </div>
    </div>
</body>
```

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```
</html>
```

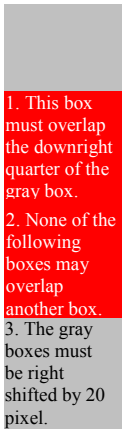

Figure 16– Absolute and relative positioning display of mobile web browser 1

Figure 17– Absolute and relative positioning display of mobile web browser 3

Note: The text exceeds the red box and therefore the text cannot be seen on the white background. On the Web Browser, it is not possible to scroll past the last line, “shifted by 20 pixel”.

C.1.4 Float

Float source code.

```
<!DOCTYPE html PUBLIC "-//WAPFORUM//DTD XHTML Mobile 1.0//EN" "http://www.wapforum.org/DTD/xhtml-
mobile10.dtd">
<html>
<head>
                <title>Float</title>
    <style type="text/css">
        div{
            background-color:#CCCCCC;
            width:150px;
            height:150px;
        }
    </style>
```

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```
</head>
<body>
    <h3>Float</h3>
    <div>
        <img src="sample.jpg" align="right"/>
        1. The picture must be aligned at the right top corner of the gray box, while this text must
float left and beneath the image within this box.
    </div>
</body>
</html>
```

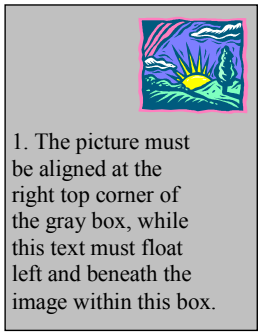

Figure 18– Float display of mobile web browser 1

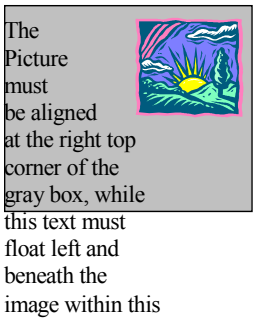

Figure 19– Float display of mobile web browser 3

Note: The last word “box” is not displayed, and it cannot be scrolled to.

C.1.5 Tables

Tables source code

```
<!DOCTYPE html PUBLIC "-//WAPFORUM//DTD XHTML Mobile 1.0//EN" "http://www.wapforum.org/DTD/xhtml-
mobile10.dtd">
<html>
<head>
                <title>Tables</title>
    <style type="text/css">
        table.collapse{
            border-collapse:collapse;
            width:150px;
        }
        table.separate{
            border-collapse:separate;
```

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```
            width:150px;
        }
        td.red{
            background-color:#FF0000;
            vertical-align:top;
            width:50%;
        }
        tr.red{
            background-color:#FF0000;
            text-align:center;
        }
        td.gray{
            background-color:#CCCCCC;
            text-align:right;
        }
        td.padding{
            background-color:#CCCCCC;
            padding:20px;
        }
    </style>
</head>
<body>
    <h3>Tables</h3>
    <table class="collapse">
        <tr>
           <td class="red">1. This text must be vertically topaligned.</td>
           <td class="gray">2. This text must be horizontally rightaligned.<br/><br/>3. The red and gray
cell of this table must directly touch each other.</td>
        </tr>
    </table>
    <br/>
    <table class="separate">
        <tr class="red">
            <td colspan="2">4. This cell must be red and this text must be centered.</td>
        </tr>
         <tr class="red">
            <td colspan="2">5. Between this and the above cell there must be a slight distance (white
line).</td>
        </tr>
    </table>
    <br/>
    <table class="collapse">
        <tr>
            <td class="padding">6. In all directions there must be a 20 pixel inner distance between
this text and the border of this cell.</td>
        </tr>
    </table>
</body>
</html>
```

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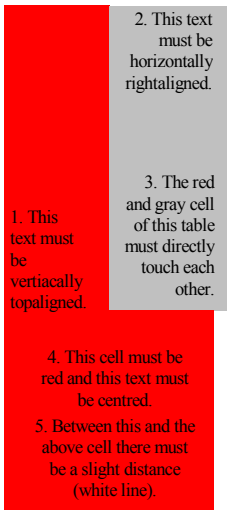

Figure 20– Table display of mobile web browser 1

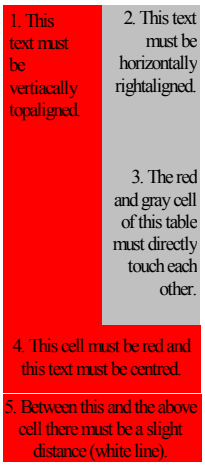

Figure 21– Table display of mobile web browser 2

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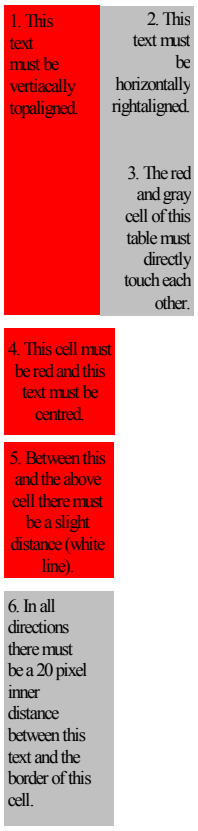

Figure 22– Float display of mobile web browser 3

C.1.6 Font size

Font size source code

```
<!DOCTYPE html PUBLIC "-//WAPFORUM//DTD XHTML Mobile 1.0//EN" "http://www.wapforum.org/DTD/xhtml-
mobile10.dtd">
<html>
<head>
                <title>Font Size</title>
    <style type="text/css">
        .xs{
           font-size:x-small;
        }
        .s{
           font-size:small;
        }
        .m{
           font-size:medium;
        }
        .l{
           font-size:large;
        }
        .xl{
           font-size:x-large;
        }
        div{
           background-color:#CCCCCC;
```

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```
        }
    </style>
</head>
<body>
    <h3>Font Size</h3>
    <div>
         
        <span class="xs">X-Small</span> 
        <span class="s">Small</span> 
        <span class="m">Medium</span> 
        <span class="l">Large</span> 
        <span class="xl">X-Large</span> 
    </div>
    <br/>
    1. Each of the above words must have its own font size, according to its meaning.<br/>
    2. The increase of the font size (from x-small to x-large) should be linear.
</body>
</html>
```

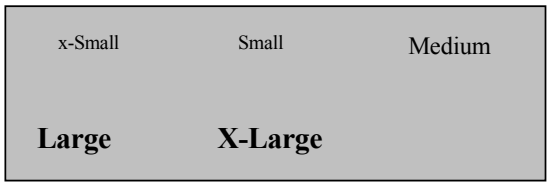

Figure 23– Font size display of mobile web browser 1

Note: From an end-user's perspective X-Small and Small are the same. There is a notable difference between Small, Medium and Large. Large and X-Large are the same.

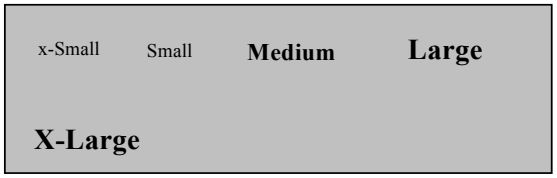

Figure 24– Font size display of mobile web browser 2

Note: From an end-user's perspective X-Small and Small are the same. There is a notable difference between Small, Medium and Large. Large and X-Large are the same.

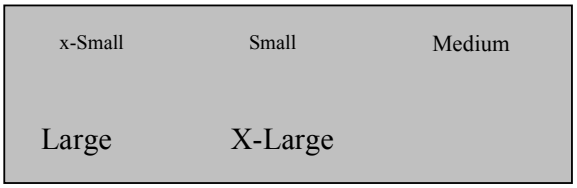

Figure 25– Font size display of mobile web browser 3

Note: From an end-user's perspective X-Small and Small are the same. Minimum difference between Small and Medium . Large and X-Large are the same.

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C.1.7 Inline, external and internal

Inline, external and internal source code.

```
<!DOCTYPE html PUBLIC "-//WAPFORUM//DTD XHTML Mobile 1.0//EN" "http://www.wapforum.org/DTD/xhtml-
mobile10.dtd">
<html>
<head><title>CSS - inline vs. internal vs. external</title><link rel="stylesheet" type="text/css"
href="external.css"><style type="text/css">body{color:lightgreen}</style></head>
<body>
<div>background color externally set to black</div><br/>
<div>textcolor internally overwritten to lightgreen</div><br/>
<div style="color:red">textcolor inline overwritten to red</div><br/>
</body>
   </html
```

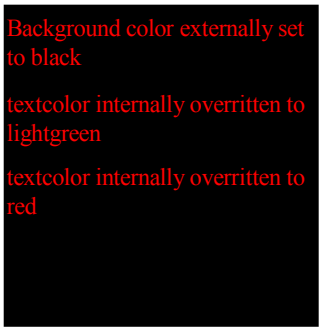

Figure 26– Inline, external and internal display of mobile web browser 1

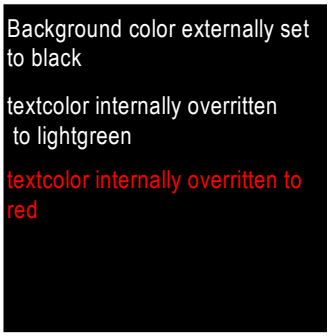

Figure 27– Inline, external and internal display of mobile web browser 2

C.1.8 Pseudo-class: Focus

```
Pseudo-class: Focus
<!DOCTYPE html PUBLIC "-//WAPFORUM//DTD XHTML Mobile 1.0//EN" "http://www.wapforum.org/DTD/xhtml-
mobile10.dtd">
<html>
<head>
                <title>Focus Colors</title>
                <style type="text/css">
                                a{color:#CC0000}
                                a:focus{color:#FFFFFF;background-color:#CC0000}
```

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```
                </style>
</head>
<body>
                <h3>Focus Colors</h3>
                <a href="#">Testlink</a><br/>
                <a href="#">Testlink</a><br/>
                <a href="#">Testlink</a><br/>
                <hr/>
The textcolor of the above anchors (Testlink) should be red. If one such anchor gains focus (joystick
movement), it should get a red background, while the text itself becomes white. (To see the desired
outcome on your desktop, please open this with latest Firefox and use 'Tab' 'Shift+Tab' to move the
focus!)
</body>
</html>
```

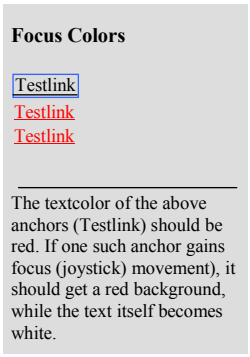

Figure 28– Pseudo-class: Focus - Display of mobile web browser 1

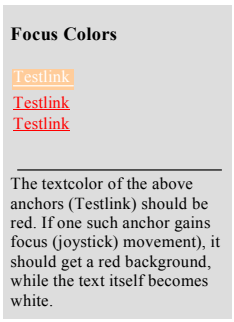

Figure 29– Pseudo-class: Focus - Display of mobile web browser 2

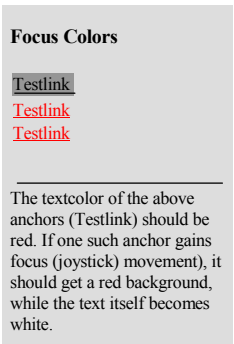

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Figure 30– Pseudo-class: Focus - Display of mobile web browser 4

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