



Location Framework Overview

Version 12-September-2001

Wireless Application Protocol
WAP-256-LOCFW-20010912-a

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1. Scope

Wireless Application Protocol (WAP) is a result of continuous work to define an industry wide specification for developing applications that operate over wireless communication networks. The scope for the WAP Forum is to define a set of specifications to be used by service applications. The wireless market is growing very quickly and reaching new customers and providing new services. To enable operators and manufacturers to meet the challenges in advanced services, differentiation, and fast/flexible service creation, WAP defines a set of protocols in transport, session and application layers. For additional information on the WAP architecture, refer to “*Wireless Application Protocol Architecture Specification*” [WAPARCH].

Location based WAP services, i.e., services dependent on a geographical location, represent a class of applications with specific needs. The WAP location framework addresses these needs by providing a transparent and position procedure independent location application interface. It also provides considerations for location related privacy.

This specification defines the overall architecture for the access of location information. The scope of this document is harmonized, as much as possible, with similar emerging standards for access of location information.

2. References

2.1. Normative References

This is an informative document and thus normative references are not applicable.

2.2. Informative References

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3. Terminology and Conventions

3.1. Conventions

This is an informative document, which is not intended to provide testable requirements to implementations.

3.2. Definitions

Application	An application, in the context of the WAP Location specifications, is the user of location information. An application may execute on a WAP Client or on a web server.
Application Server	An application server, in the context of the WAP Location specifications, is a web server executing an application.
External location entity	Entity in the network or in the terminal that can provide a location as a response to a given request information. External is to be interpreted as not being specified by WAP Forum.
Location	Reference to a position.
Location Information	Information related to a position, including both various location formats (different coordinate systems and datum), and other types of location information such as geo-codes, velocity, altitude, etc.
Position	Coordinates in a reference system.
Possessor	<p>The possessor of a particular piece of location information is the person/entity/organisation that generated the information. Examples:</p> <ul style="list-style-type: none">• If the WAP Client contains a GPS receiver, then the WAP Client or the owner of the WAP Client is the possessor of the GPS based position information.• If the location of a WAP Client is determined using network resources, e.g. an GMLC, then the carrier is the possessor of the location information.• If the location of a WAP Client is determined using assisted GPS with assistance provided by the carrier, then the WAP Client or the owner of the WAP Client is the possessor of the raw GPS data, whereas the carrier may be the possessor of the improved data.• If the location of a WAP Client is determined using an external entity outside the carrier network, then the external entity is the possessor of the location information.
Position/Location dependent service	Service that is only available within a certain geographical area.
Position/Location based service	Service that uses information about the location of clients.
Subscriber	The entity or customer that pays the subscription for the client. The user and the subscriber need not be the same person - e.g. a company (the subscriber) may supply terminals to its employees (the users).
Terminal	A device that holds the WAP client typically used by a user to request and

receive information. Also called a mobile terminal or mobile station.

User	A user is a person that interacts with a user agent to view, hear or otherwise use rendered content.
User Agent	User agent (or content interpreter) is any software or device that interprets WML, WMLScript or other content. This may include textual browsers, voice browsers, search engines etc.
WAP Client	<p>In the context of push, a WAP client is a device (or service) that can receive push content from a server. In the context of pull, a WAP client is a device that can initiate requests to a server for content.</p> <p>In the context of the WAP Location specifications, a WAP Client may include WAP Query functionality or WAP Attachment functionality.</p>
WAP Proxy	A WAP Proxy is a WAP feature enhancing or performance enhancing proxy [WAPARCH].

3.3. Abbreviations

DTD	Document Type Definition [XML]
GPS	Global Positioning System
GMLC	Gateway Mobile Location Centre [3GPP_MLC]
HTTP	Hypertext Transfer Protocol 1.1 [RFC2616]
LMU	Location Measurement Unit
MPC	Mobile Position Centre [ANSI_MPC]
PDE	Position Determination Element
PPG	Push Proxy Gateway
URL	Uniform Resource Locator
WAP	Wireless Application Protocol
XML	eXtensible Markup Language [XML]

4. Introduction

The purpose of this document is to give a high level understanding of the WAP location framework. The framework addresses the needs of different users, such as application developers, operators and manufacturers of infrastructure and terminals. Throughout this document the term *location* will be used for both location and position.

The framework supports both applications executing on application servers and applications executing in terminals. It provides a set of Location Services to application developers, supporting a variety of applications. In all cases the application is independent of the actual positioning methods used to derive the location.

The Location Services provided to applications by the WAP location framework are:

- **Immediate Query Service**

The Immediate Query Service allows an application to query WAP Location Query Functionality for the location of a WAP client, with an immediate response.

An example application that could use the Immediate Query Service is a tracking application (e.g. for fleet management) that wants to track WAP Clients by request.

- **Deferred Query Service**

The Deferred Query Service allows an application to query WAP Location Query Functionality for the location of a WAP client, with (possibly multiple) deferred responses.

An example application that could use the Deferred Query Service is a tracking application (e.g. for fleet management) that wants to track WAP Clients periodically.

- **Location Attachment Service**

The Location Attachment Service attaches location information to a WAP Client request.

5. An example application that could use the Location Attachment Service is a “find the nearest restaurant” application

Location Framework Architecture

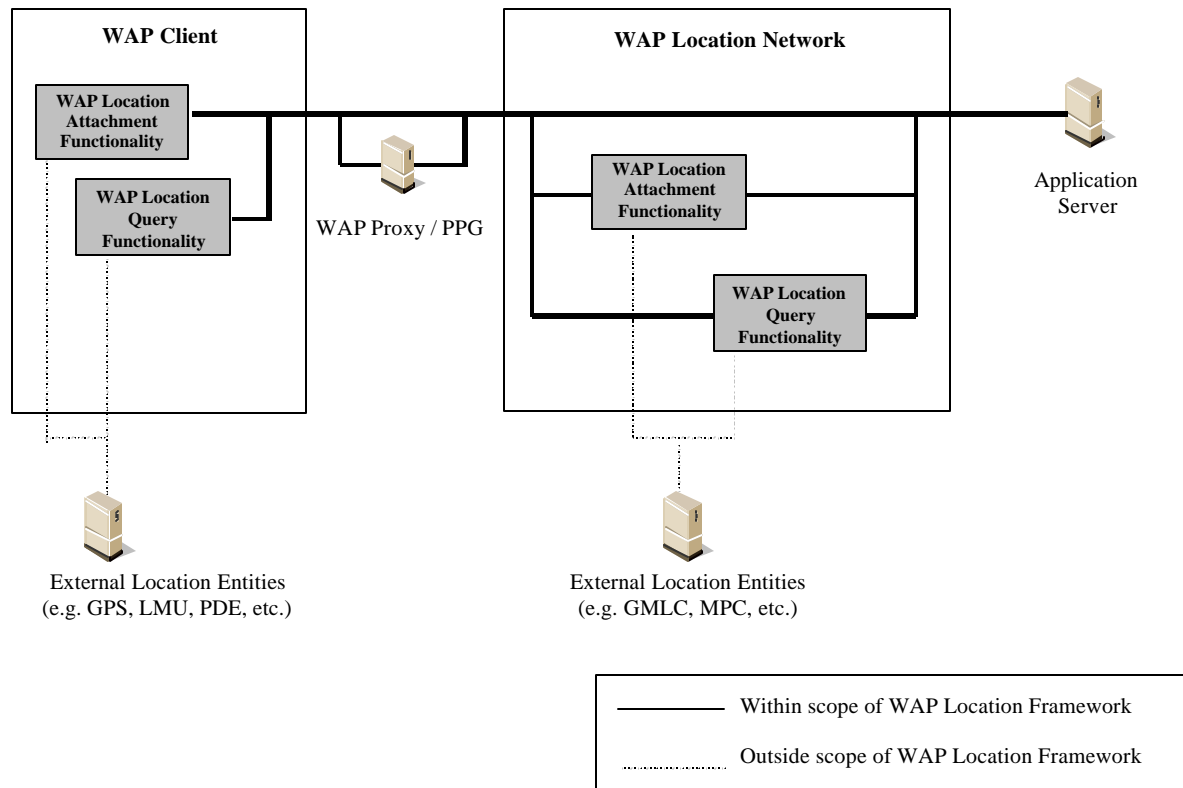


Figure 1: The WAP Location Framework Architecture

Figure 1 gives an overview of the WAP location architecture. This figure only shows entities that are relevant to the location framework. The areas in the figure, which are in grey, are defined within the WAP location framework.

The solid lines indicate possible paths within the WAP Location Framework. For example a request may be routed via the WAP Location Attachment Functionality residing in the WAP Location Network, or it may be routed directly to the application server. The dotted lines indicate possible relationships to other location related entities, which are beyond the scope of the WAP Location Framework.

The following entities can be distinguished in Figure 1:

- WAP Client: May include WAP Location Query Functionality and/or WAP Location Attachment Functionality.
- WAP Location Network: May include WAP Location Query Functionality and/or WAP Location Attachment Functionality.
- Application Server: See definition Section 3.2
- The WAP Location Framework is only concerned with the three services provided by the WAP Location Query Functionality and WAP Location Attachment Functionality, further described in Section 6. It is out of the scope, how the Location information is gathered.

The WAP Location Query Functionality provides the Immediate Query Service (Section 6.1) and Deferred Query Service (Section 6.2), see [LOCPROT] for details. This functionality can reside within the WAP Client or as a Supporting Server [WAPARCH] in the WAP Location Network.

The WAP Location Attachment Functionality provides the Location Attachment Service [LOCPROT] further described in section 6.3. The implementation of this functionality can reside within the WAP Client or as a Feature Enhancing Proxy [WAPARCH] in the WAP Location Network.

The WAP Location Attachment Functionality and the WAP Location Query Functionality are logical functionalities. These can be implemented in different physical entities. Examples include, but are not limited to, WAP Client, WAP gateway (for a WAP 1.x architecture [WAPARCH]), GMLC, MPC, etc. The WAP Location Framework does not mandate the implementation of the Functionality in any particular physical entity or even logical entity.

5.1. Application using the Immediate Location Query Service

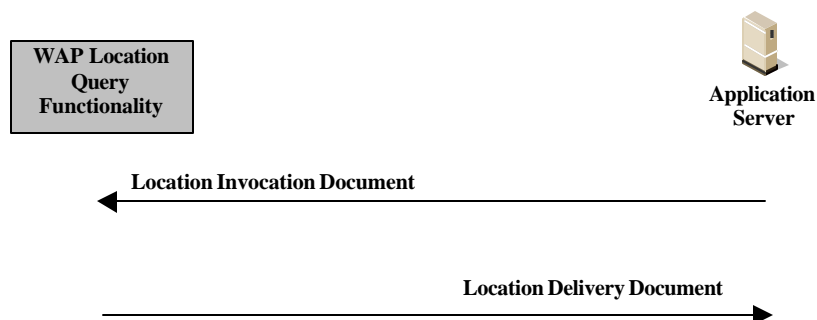


Figure 2: Example of the Immediate Query service.

An application wants to find out the location of a WAP Client. The application initiates the query by sending an XML Location Invocation document containing an address of the WAP Client, the requested quality of position, the requested format etc. to the WAP Location Query Functionality.

The location of the WAP Client is returned in an XML Location Delivery document to the application. The delivery document contains the location, and location related information such as the provided quality of position.

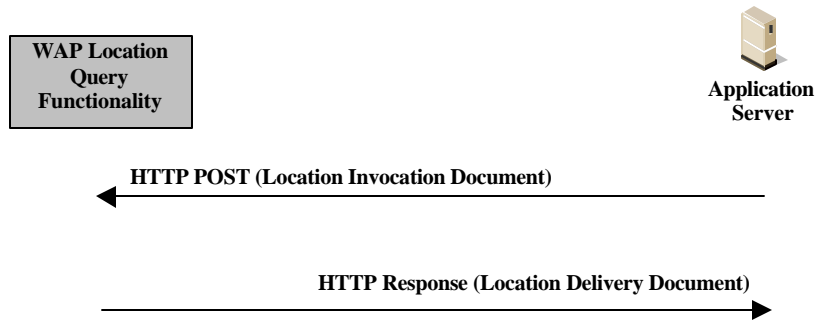


Figure 3. Example of mapping the immediate query service to HTTP.

The WAP Location services are independent of the transport protocols. The WAP location services can be mapped to different forms of transport. Figure 3 shows an example of how the query service is mapped to HTTP. The XML Location Invocation document is passed in the body of an HTTP POST to the WAP location query functionality. The XML Location Delivery document is returned in the body of the HTTP Response to the POST.

5.2. Application using the Deferred Location Query Service

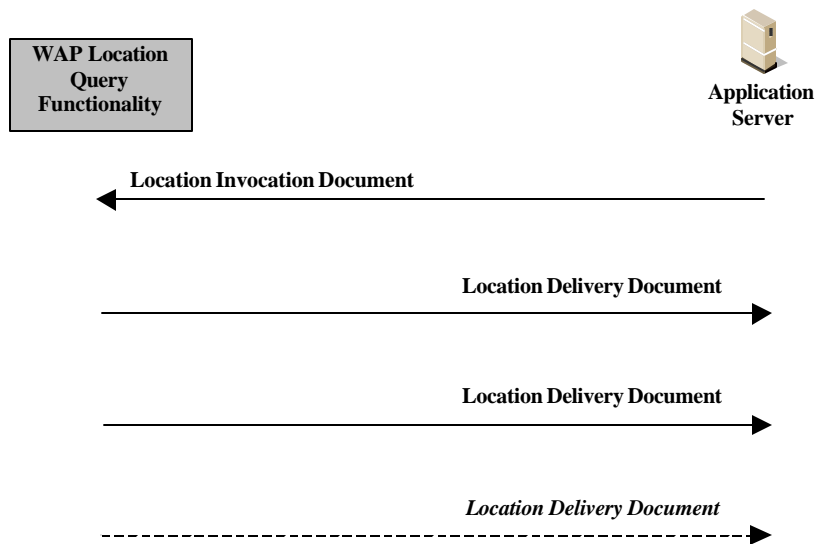


Figure 4: Example of the Deferred Location Query Service.

An application (e.g. tracking) wants to periodically find out the location of a WAP Client. This application initiates by sending a deferred location query to WAP Location Query Functionality. In this query it supplies an XML Location Invocation document containing an address of the WAP Client, the requested quality of position, the requested format etc. It also includes the requested reporting frequency, and a recipient address for the location information.

Depending on the transport (see [LOCPROT]), the WAP location query functionality may return an acknowledgement message that the request for periodic reporting was successful.

The location of the WAP Client is returned in an XML Location Delivery documents sent periodically to the application. The delivery document contains the location, and location related information such as the provided quality of position.

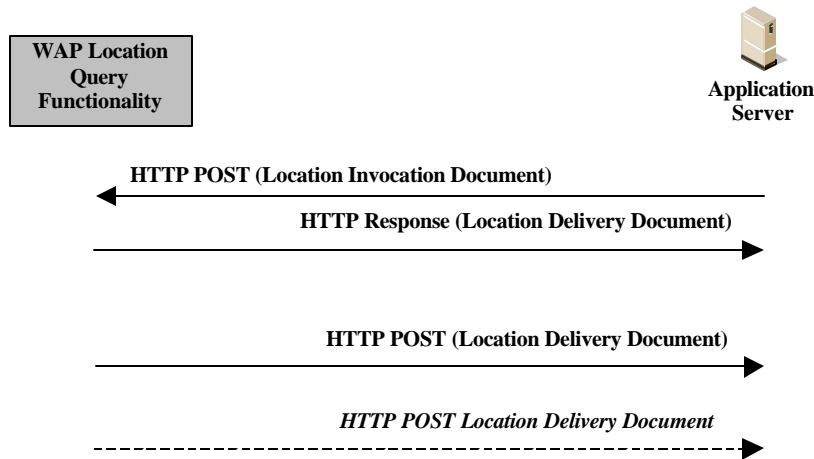


Figure 5. Example of mapping the deferred query service to HTTP.

The WAP Location services are independent of the transport protocols. The WAP location services can be mapped to different forms of transport (see [LOCPROT]). Figure 5 shows an example of how the deferred query service is mapped to HTTP.

In the HTTP case, the XML Location Invocation document is passed in the body of an HTTP POST to the WAP location query functionality, as in the case of immediate queries. An XML Location Delivery document is returned in the body of the HTTP Response to the POST, but without location information. The purpose of this document is just to pass on status information, as to whether the request was successful or not.

Location information is then sent periodically by sending an HTTP POST to the recipient address (defined in the invocation document), containing an XML Location Delivery document in the body of the POST.

5.3. Application using the Location Attachment Service

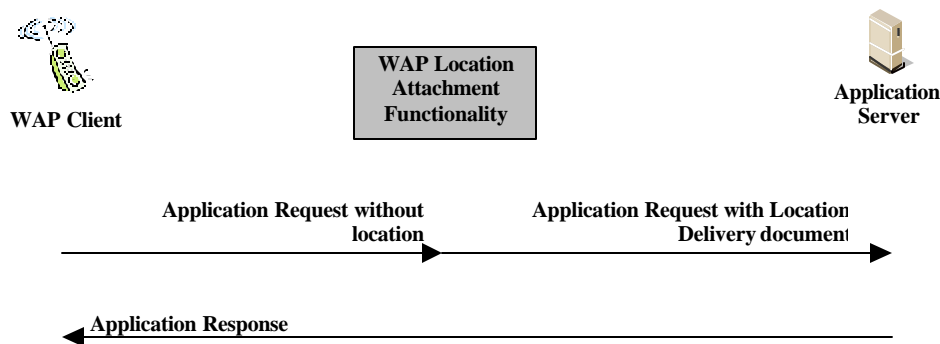


Figure 6: Example of the Location Attachment Service.

A user requests information, that is location dependent (e.g. nearest restaurant), by sending an ordinary request for content to the application URL. A WAP Location Attachment Functionality attaches the location of the WAP Client to this request as a Location Delivery XML document.

The application server uses the attached location information within the Location Delivery XML document to find the location dependent content. In this example it then returns the nearest restaurant information as ordinary WML content. Note that the application server does not need the address of the WAP Client.

If this application server receives a request without the location information attached, it may return a Location Invocation XML document to indicate the need for location information. The original request may then be reissued with the Location Delivery XML document attached.

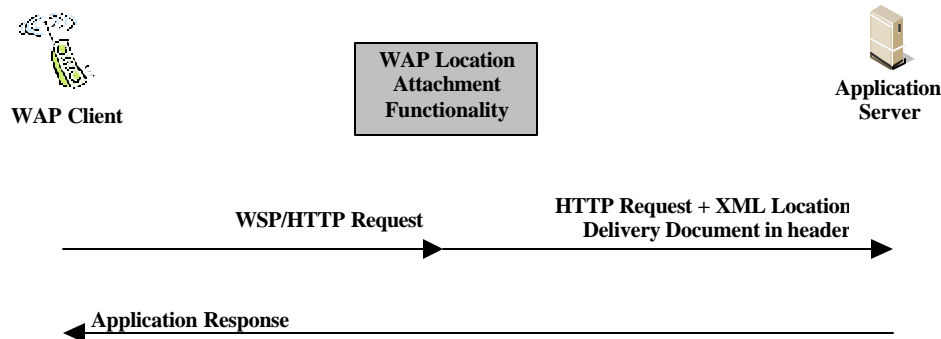


Figure 7. Example of mapping the attachment service to HTTP.

The WAP Location services are independent of the transport protocols. As with the other services, the attachment service can be mapped to different forms of transport (see [LOCPROT]). Figure 7 shows an example using HTTP.

A WAP client issues a normal client request. In this example it is assumed that the WAP location attachment functionality resides in the WAP location network, for example in a WAP proxy, but other configurations are possible (see [LOCPROT]).

The WAP location attachment functionality determines the location of the client (given privacy consent etc.), and attaches an XML Location Delivery document to the request by adding it in a header, before passing the request on to the application server.

5.4. Example application using multiple location services

An application provides periodic notifications to a user about weather forecasts. The application is initialised by a user issuing a request for the service to an application server. The application is provided with the initial location of the user by a Location Attachment Service and returns current weather information to the WAP Client.

The application then uses the Location Query Service to periodically track the location of the user, and pushes weather information to the WAP client.

Note the requirement for the weather information application to know the address of the WAP Client within this example.

6. Service Descriptions

The WAP Location Framework defines the following services (for details, see [LOCPROT]):

6.1. Immediate Query Service

This service is used when an application in the WAP client or in the application server wants location information of some WAP client immediately. The Immediate Query Service requires the server to identify the WAP client for which location is needed. This client address must be either a network addressable ID such as a phone number, IPv4, IPv6 or a unique identifier which can be mapped to a network addressable ID. In case of e.g. HTTP, the querying entity sends an HTTP POST with the XML Location Invocation document [LOCFORM] in the message body. The response with location information is returned with the XML document in the body.

6.2. Deferred Query Services

A Deferred Query Service is used e.g. for tracking a WAP client. It supports periodic positioning so that one request from an application can result to many location deliveries. The Deferred Query Service requires the server to identify the WAP client for which location is needed. This client address must be either a network addressable ID such as a phone number, IPv4, IPv6 or a unique identifier which can be mapped to a network addressable ID. In case of e.g. HTTP, the querying entity sends an HTTP POST with the XML Location Invocation document in the message body. The initial HTTP response includes an XML document with an acknowledgement (e.g., 'request accepted and being processed', or 'network congested request denied'). This initial HTTP transaction is then followed by one or more HTTP POSTs with the XML Delivery document in the body, each followed by empty HTTP responses from the location recipient.

6.3. Location Attachment Service

An Attachment Service is used when a WAP client or some entity in the network attaches the location information to the WAP client request. The Attachment Service is triggered by the client, or by the receipt of an HTTP query at a network proxy. When location information is attached is implementation specific. It may be based on an internal set of predefined triggers or an explicit request message from the Application Server.

6.4. Differences between Query and Attachment Services

To further clarify the differences between query and attachment services, the following issues are noted:

- The attachment service is always stateless in the sense that the application does not need to maintain any state information (e.g. WAP Client address) in order to match a location delivery. In the case of the query service, the application may be either stateless (Immediate Query Service) or stateful (Deferred Query Service).
- The attachment service always applies to a single client, since the location information is appended to a query message initiated by a client. The query service, on the other-hand, may apply to a single client, a group of clients, or multiple unrelated clients.
- The query services require the server to identify the WAP client for which location is needed. This WAP Client address must be either a network addressable ID such as a phone number, or a unique identifier which can be mapped to a network addressable ID. Attachment service does not require that the application server know the WAP client address.

7. Document data types

This chapter defines the different documents used in the WAP Location Framework to convey location related information.

7.1. Location Invocation XML document

The Location Invocation XML document is used to request location information. The document format is defined by a DTD and may contain the following information, but is not limited to

- Requested location format
- Requested Quality of Position
- Requested criteria for response, e.g., how often and under what conditions a Location information is expected.
- Client address (only needed for the Location Query Service)

7.2. Location Delivery XML document

The Location Delivery XML document is used to deliver location information. The document is in DTD format and may contain the following information, but is not limited to:

- Location information
- Provided Location format
- Provided Quality of Position
- Status code e.g. "accepted" or "location access denied"

8. Scopes of the different Location documents

- Location Framework Overview (This document)

The starting point for anyone who wants to know more, at a high level, about WAP Location.

- Location Protocols [LOCPROT]

This specification normatively defines the services in the Location Framework. It shows the generic message sequences for the services and also the mapping of the messages onto the underlying transport mechanisms.

- Location XML Document Formats [LOCFORM]

This specification normatively defines the Location Invocation document and the Location Delivery document.

Appendix A. Privacy and Security Considerations

Privacy

Any entity implementing any of the WAP location services is recommended to ensure privacy agreement before releasing location information. The Privacy agreement could be solved using methods in the WAP client, in the network, or in a combination of the two. It can be based on other standards, on deployment specific methods, on written contracts or on any other mechanism.

The WAP Location Framework currently does not specify anything regarding these issues (e.g. where agreements are stored or how they are negotiated), since this depends on factors such as:

- deployment specific requirements
- country specific law environments
- governmental regulations

This specification only gives recommendations for privacy management. The privacy recommendations are:

User privacy

A user should be able to control when and to whom location information is provided.

Subscriber privacy

A subscriber should be able to control when and to whom location information is provided.

Network Operator privacy

An operator should be able to override subscriber and user privacy preferences if required to do so by law.

Possessor privacy

The possessor of the location information should be able to control when and to whom location information is provided, e.g. depending on applicable law.

Client Identity and Location

There may be cases where a recipient of location information could potentially associate that information with the corresponding client's identity. This can happen, for example, when the client identity is provided in a message conveying location information. It can also occur when location information is provided in response to a query keyed by the client address (or some other form of client identity). The release of location information without protecting the effective anonymity of the user should be under the control of the user and/or subscriber.

Security

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The WAP Location Framework currently does not specify any particular security mechanism regarding these issues (e.g. application authentication). Depending on deployment specific requirements, the WAP Location Framework can be used with any standard security and authentication mechanism, e.g.:

- Use of Session-level Certificates (WTLS [WTLS], TLS [RFC2246], SSL [SSL])
- Use of Object-level Certificates (Signed and/or Encrypted Content)
- HTTP Authentication [RFC2617]

Appendix B. Change History

(Informative)

Type of Change	Date	Section	Description
Class 0	11 September 2001		Current