

WAP:

The point of this standard was to means internet contents on wireless clients, like mobile phones. The WAP protocol is that the leading standard for information services on wireless terminals like digital mobile phones.

- WAP is an application communication protocol.
- WAP is used to access services and knowledge.
- WAP is inherited from Internet standards.
- WAP is for handheld wireless devices like mobile phones, pagers, two-way radios, smartphones and communicators.
- WAP could also be a protocol designed for micro browsers.
- WAP enables the creating of web applications for mobile devices.
- WAP uses the mark-up language WML (not HTML). WML is defined as an XML 1.0 application.
- The WAP standard is based on Internet standards (HTML, XML and TCP/IP). It consists of a WML language specification, a WML Script specification, and a Wireless Telephony Application Interface (WTAI) specification.
- WAP is published by the WAP Forum, founded in 1997 by Ericsson, Motorola, Nokia, and Unwired Planet. Forum members now represent over 90% of the worldwide handset market, also as leading infrastructure providers, software developers and other organizations.
- WAP supports most wireless networks. These include CDPD, CDMA, GSM, PDC, PHS, TDMA, FLEX, ReFLEX, iDEN, TETRA, DECT, DataTAC and Mobitex.
- All operating systems support WAP. Devices specifically designed for handheld devices include PalmOS, EPOC, Windows CE, FLEXOS, OS/9 and Java OS.
- The WAP, which uses a display and accesses the Internet, runs a so-called micro browser-a browser with a smaller file size that can accommodate the low memory limitations of handheld devices and the low bandwidth limitations of wireless handheld networks.
- Although WAP supports HTML and XML, WML language (an XML application) is specifically designed for little screens and one-handed navigation without a keyboard. WML can be expanded from two-line text display to graphic screens found on items such as smartphones and communicators.
- WAP also supports WML Script. It is similar to JavaScript, but has the lowest memory and CPU power requirements because it does not contain many unnecessary functions found in other scripting languages.
- WAP micro browser: In order to be suitable for small wireless terminals, WAP uses a micro browser. A micro browser is a small piece of software that requires the least hardware, memory, and CPU. It can display information written in a restricted mark-up language called WML. The micro browser can also interpret a simplified version of JavaScript called WML Script.
- What is WML? : WML stands for Wireless Mark-up Language. It is a mark-up language inherited from HTML, but WML is based on XML, so it is much stricter

than HTML. WML is used to create pages that can be displayed in the WAP browser. The pages in WML are called DECKS. The deck is constructed as a set of cards.

- What is WML Script: WML uses WML Script to run simple code on the client. WML Script is a lightweight JavaScript language. However, the WML script is not embedded in the WML page. WML pages only contain references to script URLs. WML scripts need to be compiled into byte code on the server before they can be run in the WAP browser.

WAP usage example

1. View train table information
2. Buy tickets
3. Check in
4. Check traffic information
5. Check weather conditions
6. Find inventory value
7. Find phone number
8. Find address
9. Find athletic performance

WAP: Main Features

Browser

- "Micro browser", similar to existing web browsers.

Mark up/scripting language

- Similar to HTML/Java script, suitable for mobile devices.

Gateway

Transition from wireless to wired world.

Server

- "Wap/Origin Server", similar to existing web servers.

Protocol layer

- Transport layer, security layer, session layer, etc.

Phone application interface

- Access phone functions.

WAP communication model:

- WML, WML Script and WBMP content usually resides on WWW servers on the Internet. The WAP gateway is placed between the mobile network and the Internet content server. The WAP gateway uses the binary WAP communication protocol to receive WAP requests. The WAP gateway converts these requests from the WAP binary protocol to the text-based World Wide Web protocol, and then uses the TCP/IP network protocol to forward the converted requests to the content server.
- The WAP gateway waits for the response of the WWW text protocol to the original request, receives the response via TCP/IP, and then reformats it into the

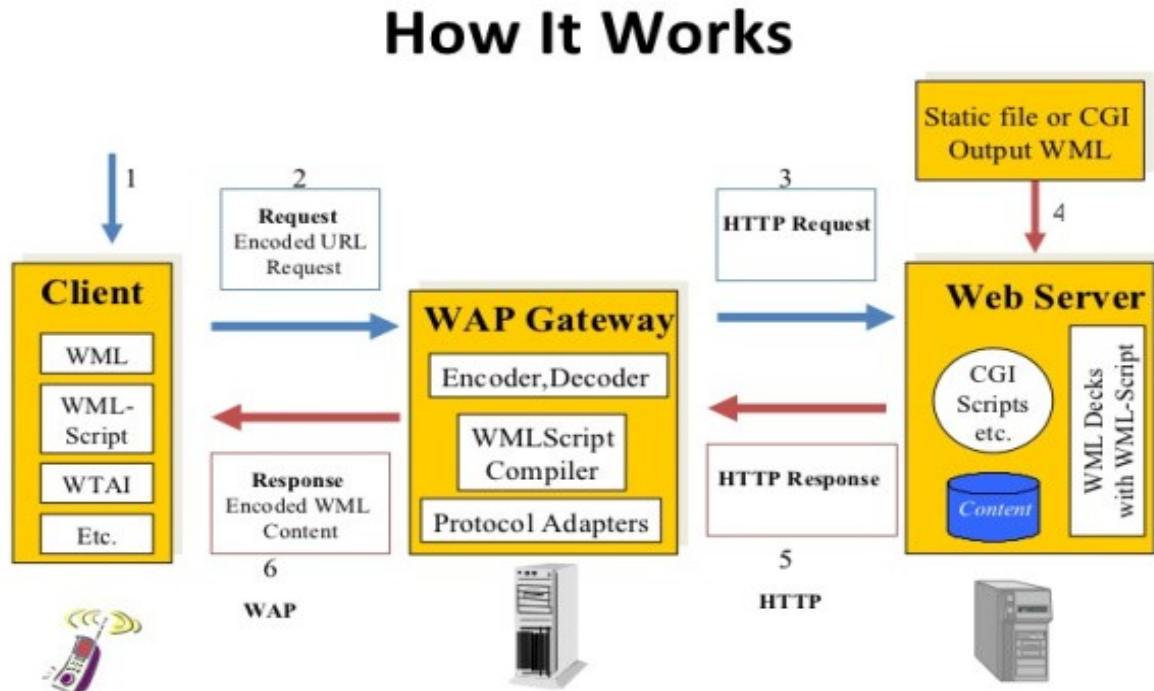
binary WAP protocol. The WAP gateway sends the reformatted response to the WAP client through WDP.

Architecture goals WAP Forum architecture goals:

The goals of the WAP forum architecture are as follows-

- Provides a Web-centric application model for wireless data services that utilizes the telephony, mobility, and other unique features of wireless devices and networks, and provides vendors with maximum flexibility and capabilities to enhance user experience.
- Enable the personalization and customization of the device, the content delivered to the device, and the presentation of the content.
- Provide support for secure and private applications and communications in a manner consistent with the Internet security model and interoperable.
- Supports wireless devices and networks currently or soon to be deployed, including various bearers from narrowband to broadband.
- Provides secure access to local handset functions.
- Promote the provision of services by network operators and third parties.
- Define a layered, scalable and extensible architecture.
- Use existing standards as much as possible, especially existing and evolving Internet standards.

WAP communication model (WAP architecture):



WAP Designation:

Wireless application environment

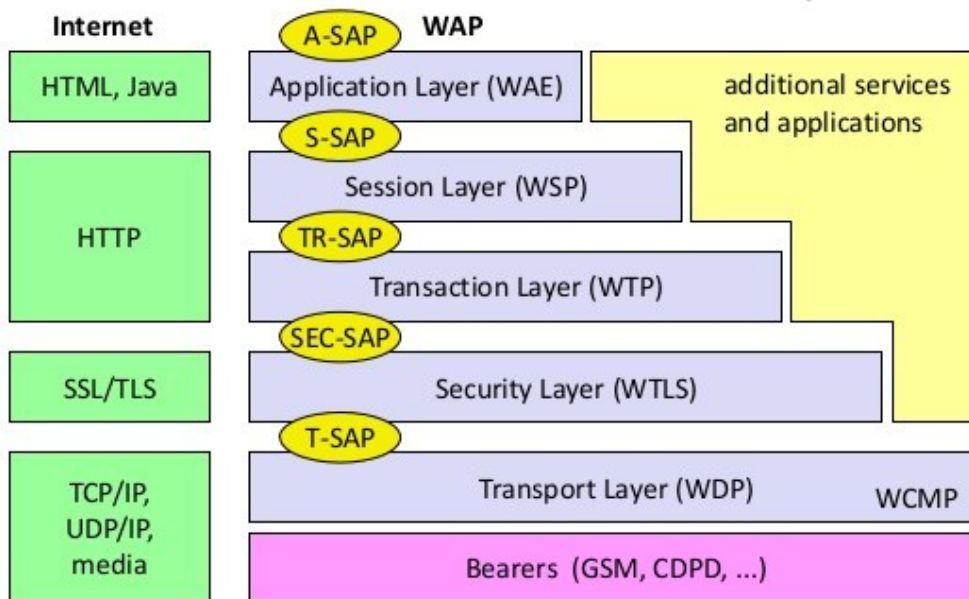
- WML micro browser.
- WMLScript virtual machine.
- WMLScript Standard Library.
- Wireless Telephone Application Interface (WTAI).
- WAP content type.

Wireless protocol stack

- Wireless Session Protocol (WSP).
- Wireless Transport Layer Security (WTLS).
- Wireless Transaction Protocol (WTP).
- Wireless Datagram Protocol (WDP).
- Wireless network interface definition.

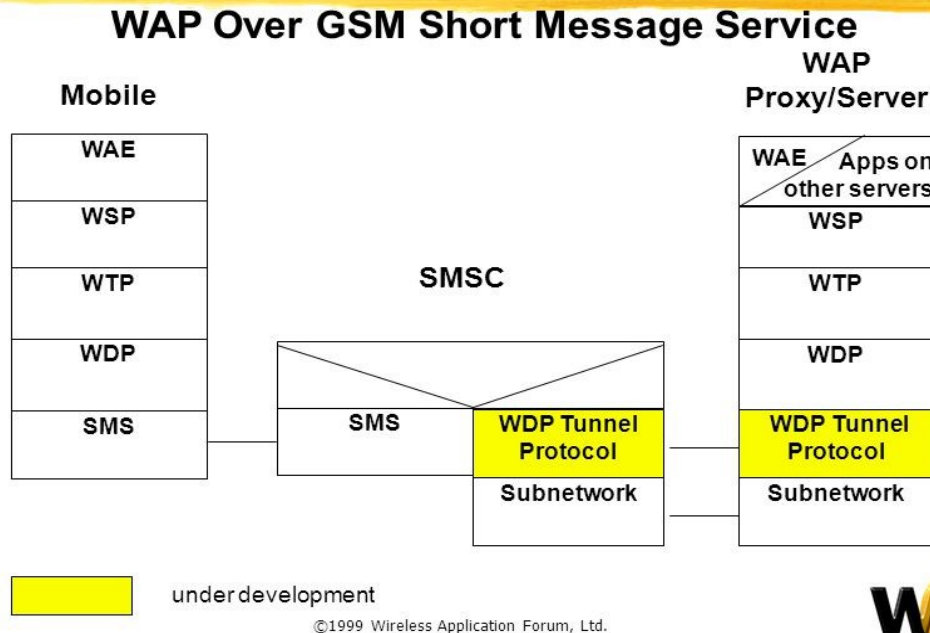
WAP: reference model :

WAP - reference model and protocols



WAE comprises WML (Wireless Markup Language), WML Script, WTAI etc.

Service, Protocol, and Bearer Example



WAP Stack:

WAE (Wireless Application Environment):

Architecture: application model, browser, gateway, server

- WML: XML syntax, based on card stack, variables,...
- WTA: Telephone services, like call control, phone book, etc.

WSP (Wireless Session Protocol):

- Provide HTTP 1.1 function
- Support session management, security, etc.

WTP (Wireless Transaction Protocol):

- Provide reliable message transmission mechanism.
- Ideas based on TCP/RPC.

WTLS (Wireless Transport Layer Security):

- Provide data integrity, privacy, identity verification functions.
- Based on TLS/SSL ideas.

WDP (Wireless Datagram Protocol):

- Provide transport layer functions.
- UDP-based ideas.
- Content encoding, optimized for low-bandwidth channels and simple devices.

WDP: Wireless Datagram Protocol:

- Transport layer protocol in WAP architecture.
- WAP Datagram Protocol WDP is a datagram-oriented network layer protocol that imitates the User Datagram Protocol (UDP) used on the Internet.
- WDP allows WAP to be independent of the bearer by adjusting the transport layer of the basic bearer. WDP provides a consistent data format to the higher layers of the WAP protocol stack, thereby providing application developers with the advantage of bearer independence.
- Transmission mechanisms using different bearer technologies.
- Provide a common interface for high-level protocols.
- Although the technology is different, transparent communication is still possible.
- Addressing use port number.
- WDP on IP is UDP/IP.
- WDP will not try to confirm the transmission, resend lost packets or correct errors in the transmission. This is left to high-level agreement.
- If any error occurs when sending a WDP datagram from one WDP entry to another WDP entry (for example, the target is not accessible, no application is listening on the specified target port, etc.), the Wireless Control Protocol (WCMP) provides an error handling mechanism for WDP. WCMP contains control messages similar to ICMP (Internet Control Message) protocol messages, and can also be used for diagnosis and information purposes. WDP nodes and gateways can use it to report errors. WCMP messages are target unreachable, parameter problems, message too large, reassembly failure, echo request/reply.
- T-SAP (Transport Layer Service Access Point) is a public interface used by higher layers and has nothing to do with basic n/w.

WTLS: Wireless Transport Layer Security:

WTLS includes security functions based on the established Transport Layer Security (TLS/SSL) protocol standards. It includes data integrity checking, privacy, denial of service and identity verification services.

- Optimized for low bandwidth communication channels.
- Provide -
 - Privacy (encrypted).
 - Data integrity (MAC).
 - Authentication (public key and symmetry)
- Use a special adaptive mechanism for wireless use
 - Secure session longevity.
 - Optimized handshake program.
- SEC-SAP (Security Layer Service Access Point) is a general interface used by higher layers and has nothing to do with the basic n/w.

WTP: Wireless Transaction Protocol:

- Designed to run on very thin clients (such as mobile phones).
- The advantages over different transaction services enable applications to provide higher reliability than datagram services, higher efficiency than connection-oriented services, and support for transaction-oriented services such as Web browsing.
- Used to provide a simplified protocol suitable for low-bandwidth wireless stations.
Low memory requirements, suitable for simple devices.
Wireless transmission efficiency.
Supports peer-to-peer, client/server and multicast applications.
- WTP transaction service
Category 0: Unreliable message transmission.
Type 1: Reliable message transmission, no result message.
Type 2: Reliable message transmission, containing only a reliable result message.

WSP - Wireless Session Protocol:

Provide shared status between client and server to optimize content transmission.

- Session management (establish, release, pause, resume).
- Effective competence negotiation.
- Key management, identity verification, Internet security services.
- Content encoding.

WSP is a general session protocol, WAP has specified wireless session protocol/browsing (WSP/B), which contains protocols and services suitable for browsing type applications. WSP/B provides the following functions suitable for web browsing:

- HTTP/1.1
- Exchange of session titles.
- Push-pull data transmission service.
- Asynchronous request.

Wireless Application Environment:

Aims-

- Create a general application environment mainly based on the existing technology of WWW.
- To allow service providers, software manufacturers or hardware vendors to integrate their applications so that they can effectively access various wireless platforms.
- Equipment and network independent application environment.
- For low-bandwidth wireless devices.
- Taking into account the slow link, limited memory, low computing power, small display, simple user interface (compared to desktop), special security and access control functions.

- Integrated Internet / WWW programming model.
- High interoperability.
- Minimize wireless traffic and resource consumption on handheld devices.

WAE components:

Building

- Application model, micro browser, gateway, server.

User agent

- WML/WTA/other
- Content format: vCard, WML.

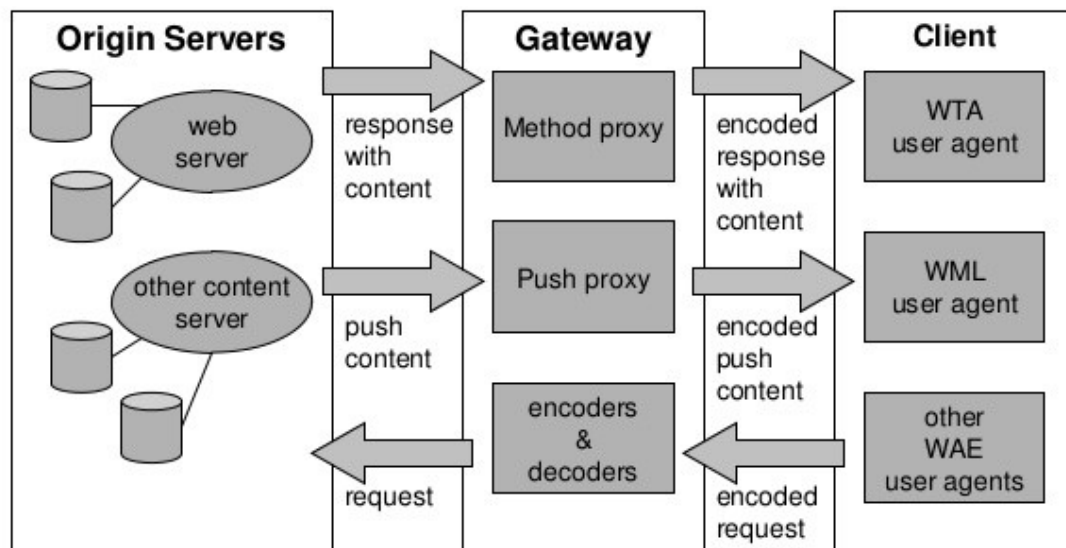
WML/Script

- XML syntax, based on card stack, variables.

WTA

- Telephone services, such as call control, SMS, phone book.

WAE: Logical Model



WAP Push Architecture with proxy gateway:

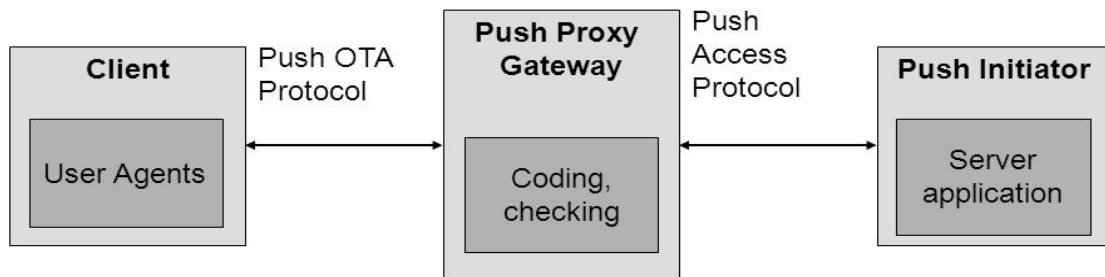
WAP push architecture with proxy gateway

Push Access Protocol

- ❑ Content transmission between server and PPG
- ❑ First version uses HTTP

Push OTA (Over The Air) Protocol

- ❑ Simple, optimized
- ❑ Mapped onto WSP



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In the push context, the server, not the client, initiates message transmission. This server is called a push initiator (PI) and transmits content to the client through a push proxy gateway (PPG). Push Access Protocol (PAP) controls the communication between PI and PPG. The over-the-air push (OTA) protocol is used between the PPG and the client. If PI can use the Push OTA protocol, it can also communicate directly with the client. Example usage scenarios for push messages are news, traffic conditions, email instructions, etc.

Push proxy gateway: PPG provides many functions to convert the protocol messages and content exchanged between the server and the client. PPG accepts the push message from PI and checks whether the message can be forwarded to the client. The inspection includes mapping the customer address to a format valid in the mobile network. PPG can also multicast a message to a group of recipients.

Push access protocol: PAP transfers content from PI to PPG. Although PAP was developed independently of basic transport services, PAP over HTTP was the first implementation. PAP provides the following operations:

- Push submission
- Result notification

- Push cancel
- Status query
- Client function query

Push OTA protocol: This is a very simple protocol used on top of WSP. The protocol provides the delivery of push messages, selects transmission services for push messages, and authenticates PI. The standard bearer for push messages in GSM is SMS, because this is usually the only way to access the phone from within the network.

WAP Applications:

Some interesting applications of WAP (already existing or under development) are:

Computer Sciences Corporation (CSC) and Nokia are working with a Finnish fashion retailer who plans to use a mixture of cursor, touch screen technology and WAP to send clothing offers on to mobile phones to enable potential shoppers to be hot-linked to the order entry network On the page.

In Finland, children are already playing new versions of competitive games, like "Battleship", via cellular networks. Within the music industry, Virgin Mobile within the UK downloads the newest popular songs to customers a day.

Scala has developed several WAP products for little and medium-sized companies. For instance, field sales personnel can access customer order information and inventory availability details through WAP mobile phones.

The key growth area of the technology are going to be business-to-employee, and corporations can use WAP applications to contact employees at any time. Scala is currently performing on timetable applications and technology for entering and submitting expense claims via mobile phones.

Nokia said that applications that might enjoy WAP include customer service and provisioning, message notification and call management, email, map and site services, weather and traffic alerts, sports and financial services, address book and directory services, and company intranet applications program.

It can be seen from the above example that WAP services are currently limited to simple information services, but with the emergence of higher speeds and the resolution of some technical problems specific to WAP, several new types of services will appear, including:

Infotainment: They may include weather forecasts, stock quotes, horoscopes and news

Messaging: e-mail, voice mail and unified messaging services.

Personal information management: telephone management and personal directory services that can modify personal information

Financial services: mobile banking and mobile e-commerce services.

Mobile Computing
Mr. Saurabh Singh

Location-based services: Location-based services include maps and vehicle location information.