Wireless Access Protocol(WAP) architecture

While the evolution of cellular networks has resulted in many mobile services, such services are primarily for voice. Mobile phone users do have the desire to access the Internet. However, Internet protocols are not designed to operate efficiently over mobile networks. WAP, the standard developed by the WAP forum, addresses these issues nicely by adapting to the restrictions of the wireless network – low bandwidth, small display, limited input facilities, limited memory and CPU, and less connection stability. WAP interfaces with different entities through the use of a gateway/proxy and a set of lightweight data presentation/formatting scripts. Such scripts allow information to be formatted in such a manner that is suitable for transmission over wireless and for presentation on a small wireless device with limited display capability. In this paper, I will deal with the overall WAP model and architecture.

Introduction

While the evolution of cellular networks has resulted in many mobile services, such services are primarily for voice. Mobile phone users do have the desire to access the Internet. Hence, efforts were made to enhance the capability of mobile phones and devices. WAP is an open protocol for wireless multimedia messaging. WAP(Wireless Application Protocol) allows the design of advanced, interactive, and real-time mobile services, such as mobile banking or Internet-based news and travel services.

Internet protocols are not designed to operate efficiently over mobile networks. Standard HTML web content cannot be displayed fully on the small-size screens of wireless devices, pagers, and mobile phones. WAP addresses these issues nicely. WAP is a license-free wireless protocol standard that can bring data information and telephony services to wireless devices.

In the mid 1990s, Ericsson made advances in value-added services on the mobile networks through the creation of the Intelligent Terminal Transfer Protocol(ITTP). Nokia and others, however, made advances in device user interfaces, such as Handheld Device Markup Language(HDML) and HDTP(Handheld Device Transport Protocol). HDTP can be viewed as a new, lightweight protocol optimized for client/server transactions over wireless links. Further, Nokia again made another advancement through the introduction of the smart short message services(SMS) concept, which allows GSM users to access services present in the Internet. With such fragmentation of effort by different companies, a joint effort for a widely acceptable standard became a necessity. Hence, WAP was born.

The WAP Forum

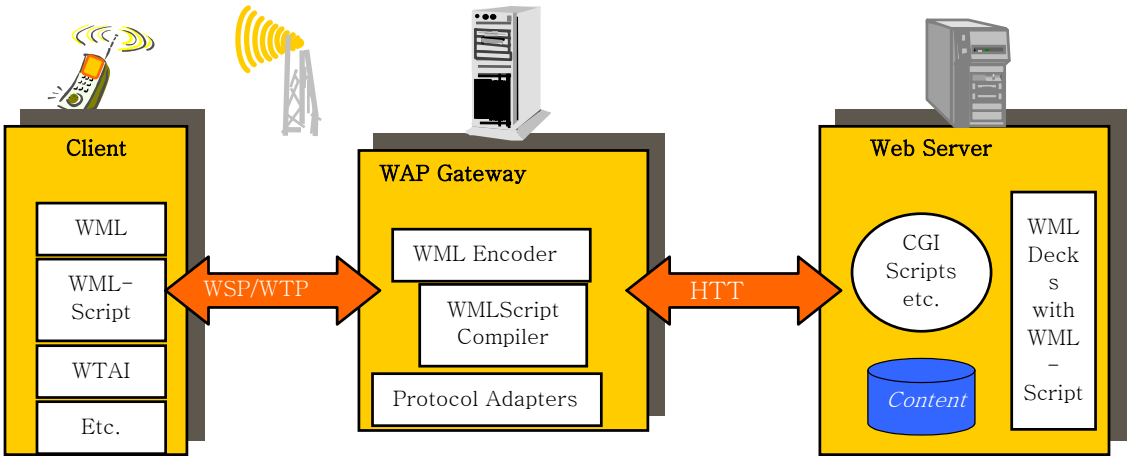
In 1997, Ericsson, Motorola, Nokia, and Unwired Planet formed the WAP Forum(www.wapforum.org). More than 90 companies in the wireless telecommunications business are members of the WAP Forum. WAP is the standard developed by the WAP Forum, a consortium formed by device manufacturers, service providers, content providers, and application providers. WAP specifies an application framework and protocols for wireless devices. WAP is a kind of fusion of mobile networking technologies and Internet technologies.

The WAP Forum's objectives include :

- To bring Internet content and advanced data services to digital cellular phones and other wireless terminals.
- To create an interoperable wireless protocol specification that will work across differing wireless network technologies.
- To enable the creation of content and applications that could scale across a wide range of wireless bearer networks and device types.
- To embrace and extend existing standards and technologies

The key features provided by WAP include :

- A programming model similar to the Internet
- Wireless Markup Language(WML)
- WMLScript
- Wireless Telephony Application(WTA)
- Optimized protocol stack

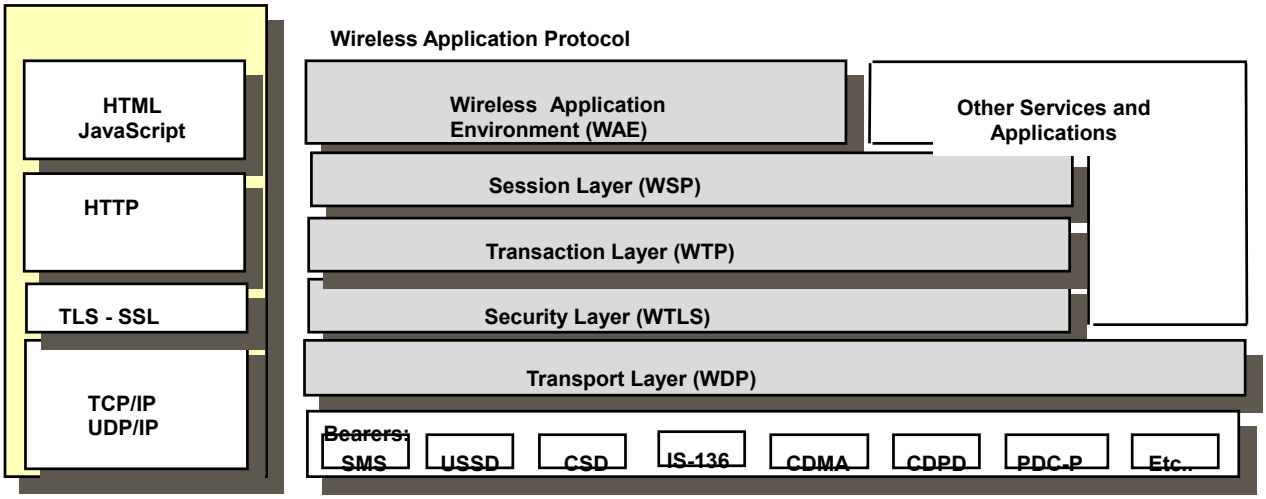


<WAP architecture >

The WAP Service Model

1. The user selects an option on their mobile device that has a URL with WML content assigned to it.
2. The phone sends the URL request via the phone network to a WAP gateway, using the binary encoded WAP protocol.
3. The gateway translates this WAP request into a conventional HTTP request for the specified URL, and sends it on to the Internet.
4. The appropriate Web server picks up the HTTP request.
5. The server processes the request, just as it would be any other request. If the URL refers to a static WML file, the server delivers it. If a CGI script is requested, it is processed and the content returned as usual.
6. The Web server adds the HTTP header to the WML content and returns it to the gateway.
7. The WAP gateway compiles the WML into binary form.
8. The gateway then sends the WML response back to the phone.
9. The phone receives the WML via the WAP protocol.
10. The micro-browser processes the WML and displays the content on the screen.

The WAP Protocol Architecture



<Comparison between Internet and WAP protocol architecture >

The WAP architecture provides a scalable and extensible environment for application development on mobile communication devices. It achieves this through a layered protocol design, covering protocols at Layer 4 and above. The WAP protocol stack is independent of the underlying network, which could take the form of GSM, CDMA, CDPD, iDEN, etc. Hence, WAP is essentially an application stack specification; it is not network-centric.

Wireless Application Environment(WAE)

Generally, WAE enables a spectrum of applications to be supported over WAP. WAE has two main elements, namely: (a) user agents, and (b) services and formats. The former includes the WML and WTA(Wireless Telephone Application) user agents. The latter consists of WML scripts, image formats, etc. A user agent can take the form of a Web browser. The WML user agent is responsible for the interpretation of WML and WMLScript. WAP employs the same addressing model as in the Internet, that is, it use Uniformed Resource Locators(URLs). A URL uniquely identifies an available resource. WAP also uses Uniform Resource Identifiers (URIs) to address resources that are not accessed via well-known protocols.

Wireless Session Protocol(WSP)

The WSP provides both connection-oriented and connectionless services. It is optimized for low-bandwidth networks with relatively long latency. WSP is a binary version of HTTP version 1.1, but with the additions of : (a) session migrations, (b) header caching, etc. WAP connection mode allows the establishment of sessions between a client and the WAP gateway or proxy. It can handle session interruptions as a result of mobility and reestablish session states at a later point in time. Header caching allows better bearer utilization since in HTTP, most of the requests contain static headers that need to be re-sent again.

Wireless Transaction Protocol(WTP)

WTP is designed for transaction-style communications on wireless devices. In a transaction, users express their intentions and financial commitments to service providers for processing. Very often, such transactions demand reliable, fast, and secure communications. WTP is a lightweight protocol suitable for implementation in thin clients. WTP implements selective retransmission of lost segments.

Wireless Transport Layer Security(WTLS)

WTLS is needed for WAP to ensure data integrity, privacy, authentication, and protection from denial-of-service. It is based on Transport Layer Security(TLS) 1.0, but optimized for wireless channels. It provides transport layer security between a WAP client and the WAP gateway/proxy. Digital certificates are used for authentication and nonrepudiation of server and client. Encryption is also used to enhance the degree of confidentiality.

Wireless Datagram Protocol(WDP)

WDP is the transport layer protocol in WAP. It has the same functionality provided by the Internet User Datagram Protocol(UDP). Whether WAP uses UDP or WDP, datagram delivery services are provided by port number functionality and the characteristics of different bearer services are hidden from the upper layers. WDP can be extended to provide segmentation and reassembly functions.

The future of WAP

The future of WAP depends largely on whether consumers decide to use WAP devices to access the Web, and also on whether a new technology comes along that would require a different infrastructure than WAP. On the consumer side, the factors largely involve the limitations of WAP and of handheld devices: the lower bandwidth, the limited input ability, and the small screens all require user to adapt from their regular Web-browsing expectations. The bottom line is that WAP is not and can never be the Web on your mobile phone. On the technological side, it is true that mobile phone data speeds will get faster, and this may require a different infrastructure, which will require different handsets to carry the technology. The new challenger is GPRS(General Packet Radio Service) and Mobile IP. Also, Web browser for the PC will also soon come with the ability to view WAP pages. What this means to the average user is that the instant information access available to mobile users can be combined with the rich content of the Internet. You will simply have two windows open on the PC-one for the traditional content and the other for the WAP content-thereby having the best of both worlds.

Conclusions

In this paper, we examined WAP, a protocol that has been standardized and deployed. WAP allows the introduction of mobile Internet services into mobile wireless devices via mobile cellular networks. WAP interfaces with different entities through the use of a gateway/proxy and a set of lightweight data presentation/formatting scripts. Such scripts allow information to be formatted in such a manner that is suitable for transmission over wireless and for presentation on a small wireless device with limited display capability. News, stock rates, shopping, and advanced calling services can all be done via WAP-enabled mobile devices.