ICT 9025

Mobile Applications & Technologies

Wireless Application Protocol (WAP)

Lecture 4

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WAP Overview

- Wireless Application Protocol (WAP)
  - was a worldwide standard for providing Internet communications on mobile devices such as:
    - mobile phones,
    - pagers
    - personal digital assistants etc.

WAP Overview

- WAP
  - an old standard that allowed early mobile phones to access the Internet through the **WAP Gateway**
    - The WAP Gateway is software that identified the device that was connecting to the Internet and could format the content sent to the device to match the screen size and type of device.
  - was created in 1999 by four companies:
    - Ericsson, Motorola, Nokia, and Unwired Plane
    - Gained popularity in 2000, over 450 members (companies) in 2000, including handset manufacturers,

WAP Overview

- a protocol designed for **micro browsers**
- enables the creation of web applications for **early mobile devices**
- WAP uses the mark-up language **WML** (not HTML)

WAP Overview

- WAP works with most Wireless networks such as:
  - CDPD, CDMA, GSM, PDC, PHS, TDMA, FLEX, ReFLEX, iDEN, TETRA, DECT, DataTAC, Mobitex
- WAP is independent of OS that means WAP can be implemented on any OS

WAP: Main Features

- Micro Browser
  - similar to existing web browsers
  - A micro browser is a small piece of software that makes minimal demands on hardware, memory and CPU.
- Mark-up language
  - Similar to HTML, adapted to mobile devices
  - developing WAP applications requires only a few modifications to existing web applications
- Script language
  - Similar to JavaScript, adapted to mobile devices

WAP Main Features

- WAP Gateway
  - connecting mobile devices to the Internet
  - connecting wireless networks to wired networks
- Server
  - “WAP Server/Origin server”, similar to existing web servers
- Protocol layers
  - Transport layer, security layer, session layer etc.
- Telephony application interface
  - Access to telephony functions

Purpose of WAP

- To enable easy, fast delivery of relevant information and services to mobile users
- Work with existing standards whenever possible and support as many wireless networks as possible
- Optimize for narrow-band bearers
- Optimize for efficient use of device resources
- Supports secure applications and communication

WAP Micro Browser

- Optimized for wireless devices
- Minimal RAM, ROM, Display, CPU and keys
- Provides consistent service UI across devices
- Provides Internet compatibility
- Enables availability of various content and applications

WAP Push

- Allows WAP content to be pushed to the mobile handset with minimum user intervention.
- A WAP Push is a specially encoded message which includes a link to a WAP address
- WAP Push can be delivered over any WDP-supported bearer, such as GPRS or SMS
  - WAP Push uses Push Access Protocol (or PAP), a protocol defined within WAP

Drawbacks of HTTP

- HTTP/HTML drawback (for earlier mobile devices)

  - ➢ High connection overhead
    - Each data transmission includes additional information, called overhead, this information is required to transmit the data to the proper destination location. HTTP has more overhead than WAP

  - ➢ Redundant data transmission
    - information regarding browser capabilities is included in every HTTP request (repetitive information)

Drawbacks of HTTP

Internet

HTTP/HTML

```
<HTML>
<HEAD>
<TITLE>NNN Interactive</TITLE>
<META HTTP-EQUIV="Refresh" CONTENT="1800,
URL=/index.html">
</HEAD>
<BODY BGCOLOR="#FFFFFF"
BACKGROUND="/images/9607/bgbar5.gif" LINK="#0A3990"
ALINK="#FF0000" VLINK="#FF0000" TEXT="000000"
ONLOAD="if(parent.frames.length!=0)top.location='ht
tp://nnn.com';">
<A NAME="#top"></A>
<TABLE WIDTH=599 BORDER="0">
<TR ALIGN=LEFT>
<TD WIDTH=117 VALIGN=TOP ALIGN=LEFT>
```

```
<HTML>
<HEAD>
<TITLE
>NNN
Intera
ctive<
/TITLE
>
<META
HTTP-
EQUIV=
"Refre
sh"
CONTEN
T="180
0,
```

Wireless network

WAP

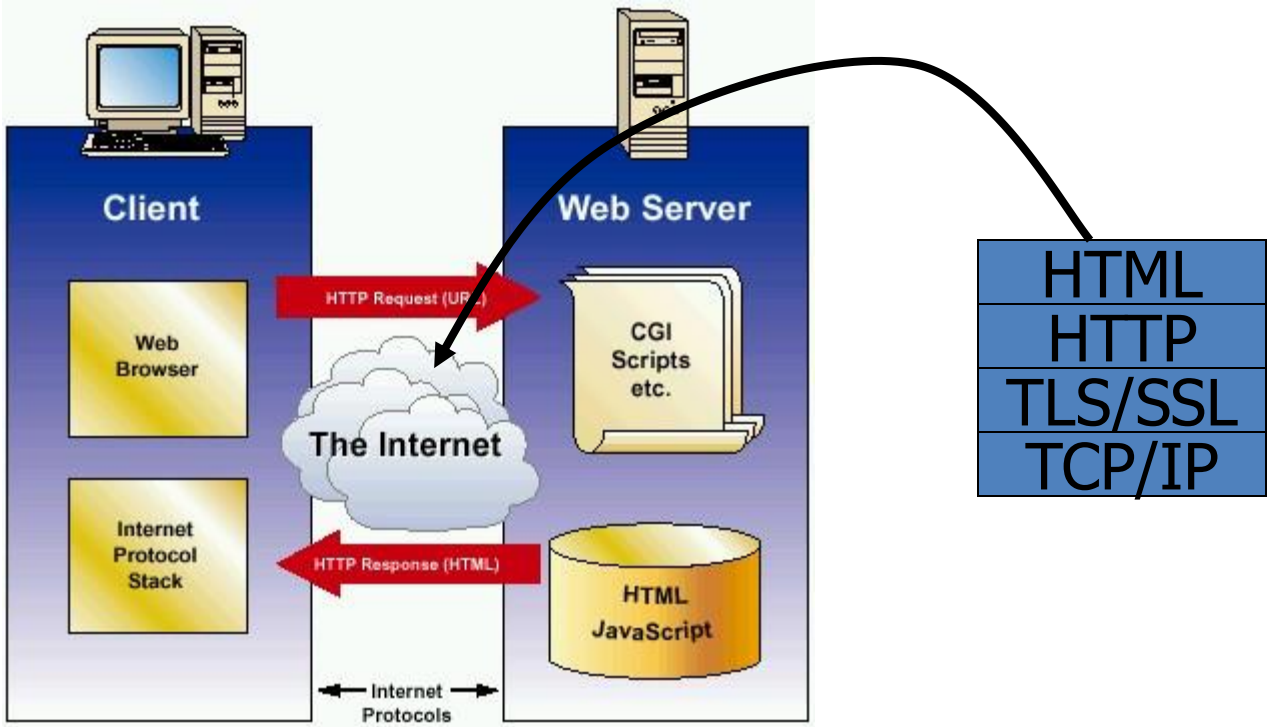
```
<WML>
<CARD>
<DO TYPE="ACCEPT">
<GO URL="/submit?Name=$N"/>
</DO>
Enter name:
<INPUT TYPE="TEXT" KEY="N"/>
</CARD>
</WML>
```

Content encoding

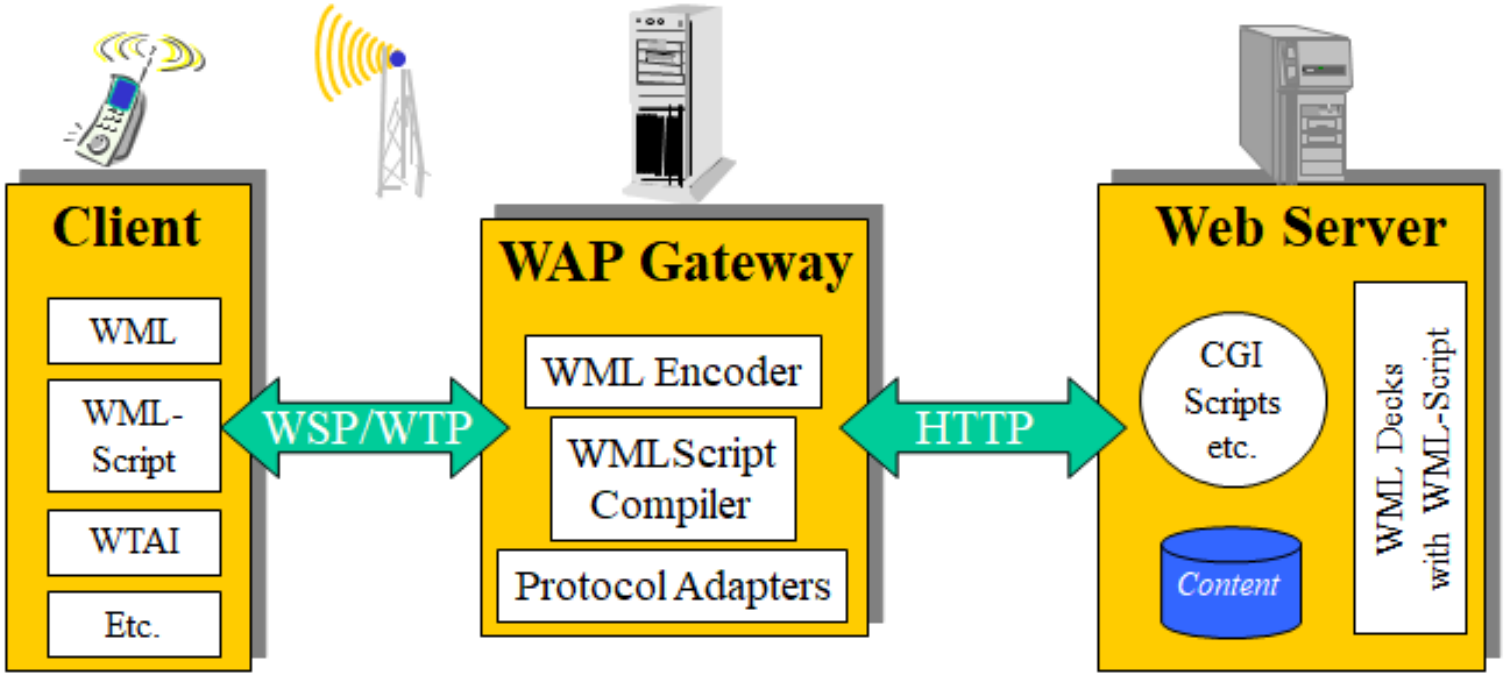
```
010011
010011
110110
010011
011011
011101
010010
011010
```

WAP encodes data, improving resource utilization for mobile devices

The Internet Model (HTTP)



WAP Architecture



WAP Proxy

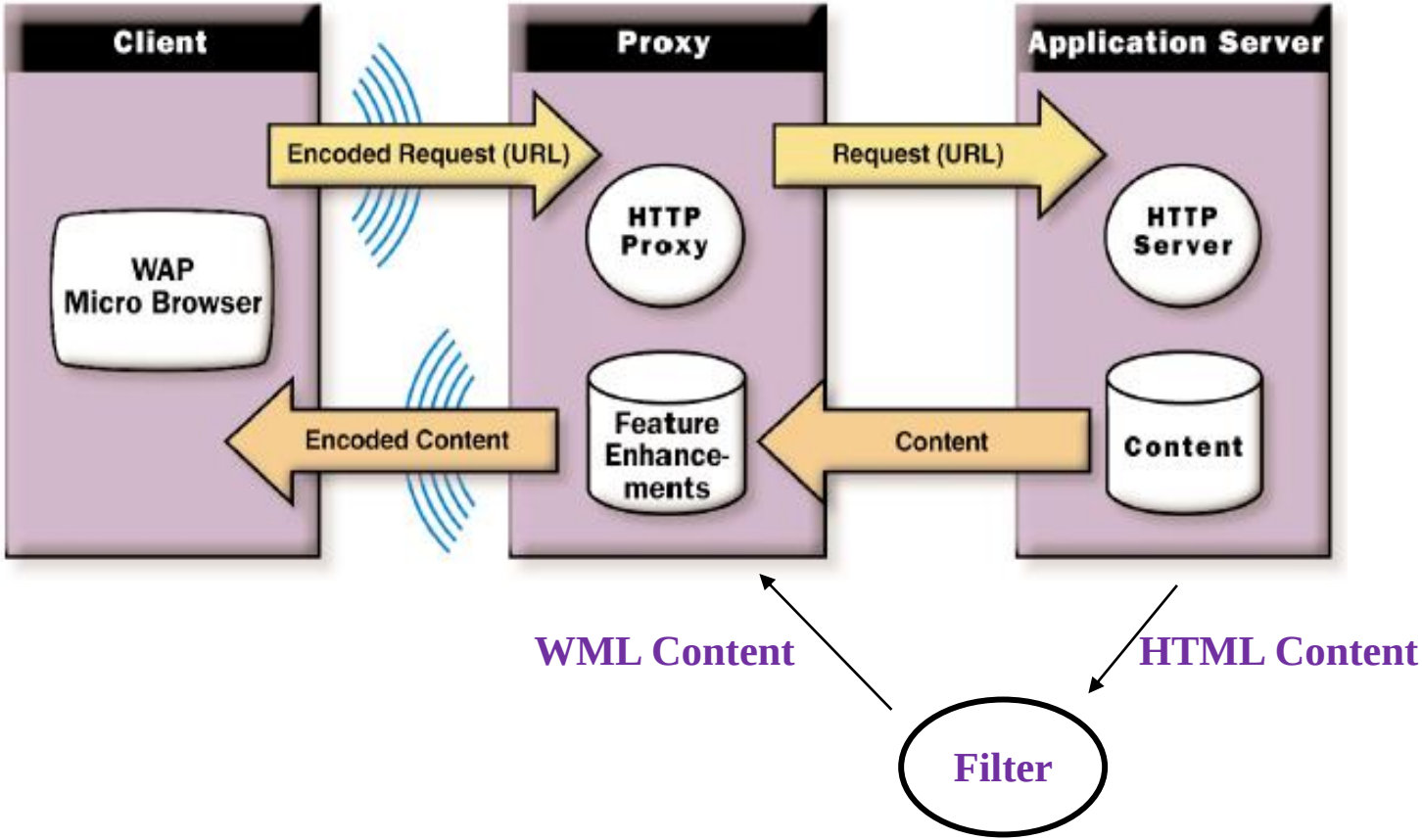
Acts both as a client and as a server in the network. Typically has

- Protocol gateway : translates requests from the WAP protocol stack to WWW protocol stack
- Content encoders and decoders : translate WAP content into compact encoded formats to reduce the size of data over the network

It allows content and applications to be hosted on standard WWW servers and developed using proven WWW technologies such as CGI scripting

Note: **WAP Gateway** is also known as **WAP Proxy**

WAP Proxy Model



WAP 1.0 and WAP 2.0

	WAP 1.0	WAP 2.0	Conventional Web
Display	Assumes black-and-white, limited screen display	Limited screen display with limited color	Web browsers capable of rendering HTML in full color.
Content	WML.	XHTML Basic	HTML
Server	WAP server	WAP server or Web Server with a WAP Proxy	Web server
Protocols	WAP Protocols including WSP, WTP WTLS and WDP	WAP Protocols or WP-HTTP (Wireless Profiled HTTP), TLS (Transport Layer Security), and WP-TCP (Wireless Profiled TCP)	HTTP over TCP/IP
Architecture	WAP gateway connecting devices to web servers.	WAP gateway connecting devices to web servers.	Web servers connected to browsers.

i-Mode

- **i-Mode**, stands for Internet Mode
  - A micro browser technology that supports text, graphics, audio, and video for Web access
  - Used with Japanese cellular networks.
  - It was introduced in 1999 at NTT DoCoMo, in Japan

WAP 2.0 and i-Mode

- i-mode
  - Packet switched network built on circuit switched mobile phone networks
  - Billed by the packet
  - Uses cHTML (compact HTML)
- WAP 2.0
  - Packet switched network
  - Compatible with WAP 1.0
  - Billed by connection time
  - Pull and Push models

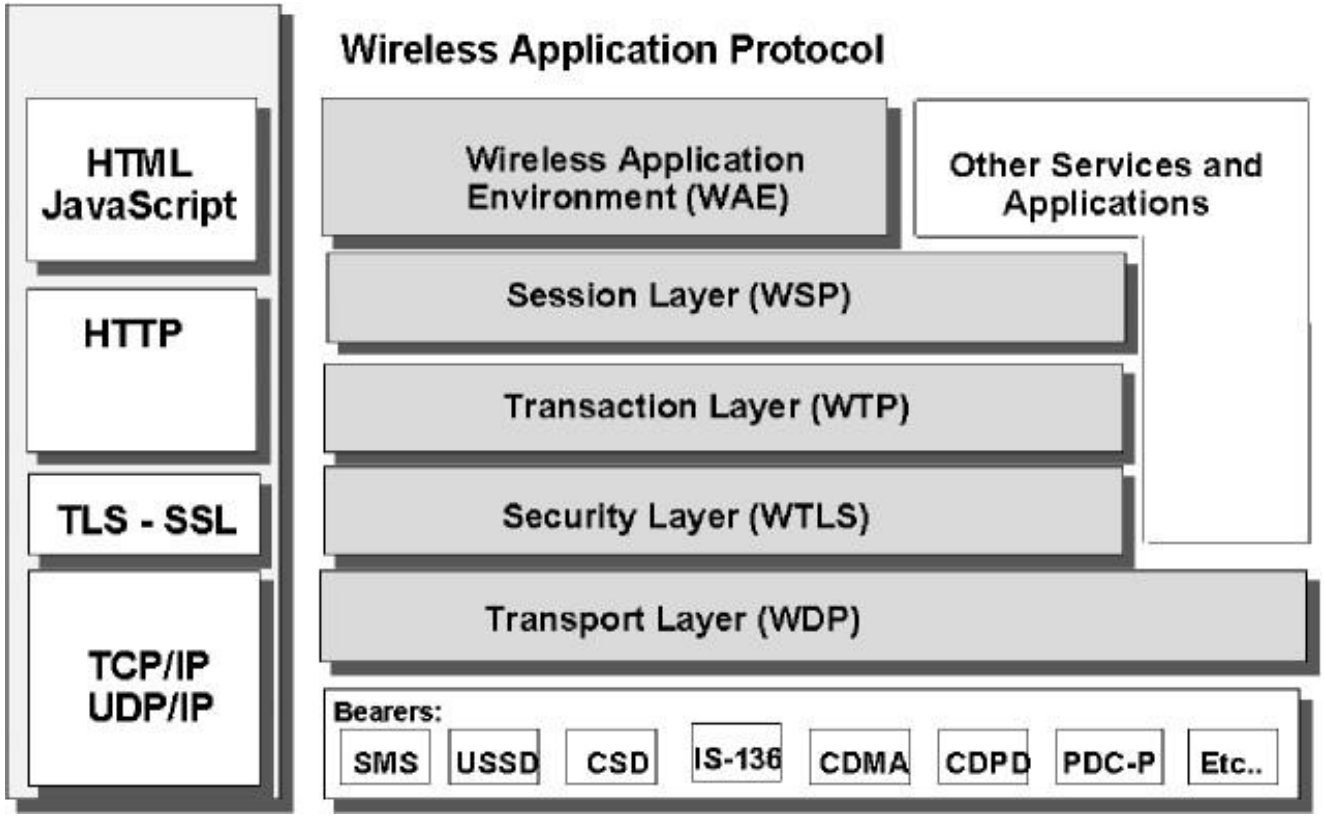
WAP 2.0 and i-Mode

- retrieving Web content on the i-Mode is easier.
  - Before accessing a site, WAP users must agree to pay extra charges and type in URLs to browse through sites other than the service provider's portal.
  - i-Mode phones have a one-button browsing method, eliminating the need to type in Web addresses

WAP 2.0 and i-Mode

- 500 companies the WAP standard rather than the i-mode standard
  - ➢ despite i-Mode being easier to use, more people used WAP because it was supported in many countries and by many companies

WAP Protocol Stack



WAP Protocol Stack

- Wireless Application Environment (WAE)
  - ➢ includes an addressing model
    - an addressing model used for naming resources stored on servers
    - the same addressing model as the **Uniform Resource Locators** (which is used by the Internet)
  - ➢ Includes WML standard mark-up language,
    - an efficient binary encoded form of HTML
  - ➢ Provides a scripting language similar to JavaScript

WAP Protocol Stack

- Wireless Application Environment (WAE) (cont.)
  - ➢ Includes Wireless Telephony Application (WTA)
    - A framework with methods for creating telephony services on the WAP network
      - whereby telephony services include:
      - phone calls
      - video calls
      - voicemail
      - text messages

WAP Protocol Stack

- Wireless Session Protocol (WSP)
- Also known as the **Session Layer**
  - provides session management:
    - such that sessions that can be established from a client to a server
  - Includes a **Push** mechanism
    - such that Push messages can be sent to all/multiple registered clients, useful in multicast or broadcast applications
  - The WSP is equivalent to HTTP (used on the Internet)
    - WSP is based on HTTP 1.1
    - whereby HTTP (Hypertext Transfer Protocol) is the set of rules for transferring files, like text, images, sound, video etc. over the web
  - Sessions can be suspended and re-established to save power and avoid overhead

WAP Protocol Stack

- Wireless Transaction Protocol (WTP)
- Also known as the **Transaction Layer**
  - ➢ Lightweight version of TCP
    - with Low overhead:
    - whereby TCP is a standard used for establishing and maintaining communication between applications on network hosts using the TCP/IP based network
    - WTP is a standard that allowed WAP devices to access the Internet, it works like TCP but with less information required for the data communication

WAP Protocol Stack

- Wireless Transaction Protocol (WTP) (cont.)

  - 3 classes of service included in WTP:
    - **Class 0:** unreliable encoded message sent with no ACK (no acknowledgment from the recipient device)
    - **Class 1:** reliable encoded message sent
    - **Class 2:** reliable encoded message sent with exactly one acknowledgement message sent back to the original sender

WAP Protocol Stack

- Wireless Transport Layer Security (WTLS)
- Also known as the **Security Layer**
  - Provides security between WAP client and WAP server
    - by providing data integrity, privacy, authentication, and DoS protection
    - this layer includes optimized handshake and dynamic key refreshing (which allows encryption keys to be updated during a secure session)

WAP Protocol Stack

- Wireless Datagram Protocol (WDP)
- Also known as the **Transport Layer**
  - Contains bearer-specific layer that optimizes data transfer to SMS, USSD, CSD, or CDMA
  - includes wireless control message protocol (WCMP) which is responsible for error-handling

WAP Protocol Stack

- Wireless Protocol Stack (Summary)

➢ Wireless Session Protocol (WSP)	Session Layer
➢ Wireless Transaction Protocol (WTP)	Transaction Layer
➢ Wireless Transport Layer Security (WTLS)	Security Layer
➢ Wireless Datagram Protocol (WDP)	Transport Layer

Uses of WAP

- Location-based services
  - Real-time traffic reporting, Event/restaurant recommendation
- Enterprise solutions
  - Email access, Database access, “global” intranet access
  - Information updates “pushed” to WAP devices
- Financial services
  - Banking, Bill-paying, Stock trading, Funds transfers
- Travel services
  - Schedules and rescheduling, Reservations

Uses of WAP

- Gaming and Entertainment
  - Online, real-time, multi-player games
  - Downloadable horoscopes, cartoons, quotes, advice
- M-Commerce
  - Shopping on the go
  - Instant comparison shopping
  - Location-based special offers and sales

Outdated WAP

- The WAP protocol has become obsolete as newer cell phones can access the Internet no differently than your desktop or laptop computer:
  - No longer limited by lower device resources (such as RAM and processor capabilities
  - Most modern cell phones process HTML data directly without the need for WML / WAP encoding