

DISCIPLINE SPECIFIC 4: WIRELESS APPLICATION PROTOCOL

Semester : VI

Course Code : 16UCS504

Syllabus

UNIT I:

The Rise of Mobile Data: Market Convergence Enabling Convergence – Key Services for the Mobile Internet. Overview of the Wireless Application Protocol: The Origins of WAP – Overview of the WAP Architecture – Components of the WAP Standard – Network Infrastructure Services Supporting WAP Clients – WAP Architecture Design Principles – Relationship to Other Standards.

UNIT - I

1. Wireless Application Protocol (WAP)

- ✓ WAP application is enable to access WAP sites using WAP browser (Micro-browser)
- ✓ WAP sites (Mobile internet sites) are websites written in, or dynamically converted to, WML
- ✓ XHTML MP(Mobile Profile) is defined as a standard WML in WAP 2.0
- ✓ The basic aim of WAP is to provide a web like experience on small portable devices like mobile phones and PDAs
- ✓ The wireless industry came up with the idea of WAP. The point of this standard was to show internet contents on wireless clients like mobile phones
- ✓ WAP is used to enable the access of internet in the mobile phones or PDAs
- ✓ WAP stands for Wireless Application Protocol
- ✓ WAP is used to access services and information
- ✓ WAP is for handheld devices such as mobile phones
- ✓ WAP enables the creating of Web Applications for mobile devices
- ✓ WAP uses markup language WML(not HTML) .
- ✓ WAP is a communication protocol and an application environment
- ✓ WAP is independent of OS that means WAP can be implemented on any OS
- ✓ WML is defined as an XML 1.0 application

Examples of WAP application

- ✓ Email by mobile phone
- ✓ Tracking of stock market prices
- ✓ Sports results
- ✓ News headlines
- ✓ Music downloads

Objectives of WAP

- ✓ Supporting the standard Internet protocols
- ✓ Interoperability among service providers
- ✓ Overcoming shortfalls of the wireless medium
- ✓ Overcoming drawbacks of handheld devices
- ✓ Increasing efficiency and reliability
- ✓ Providing security, scalability and extensibility

WAP: Main Features

- ✓ Browser
 - “Micro browser”, similar to existing web browsers
- ✓ Markup language
 - Similar to HTML, adapted to mobile devices
- ✓ Script language
 - Similar to Javascript, adapted to mobile devices
- ✓ Gateway
 - Transition from wireless to wired world
- ✓ Server
 - “Wap/Origin server”, similar to existing web servers
- ✓ Protocol layers
 - Transport layer, security layer, session layer etc.
- ✓ Telephony application interface
 - Access to telephony functions

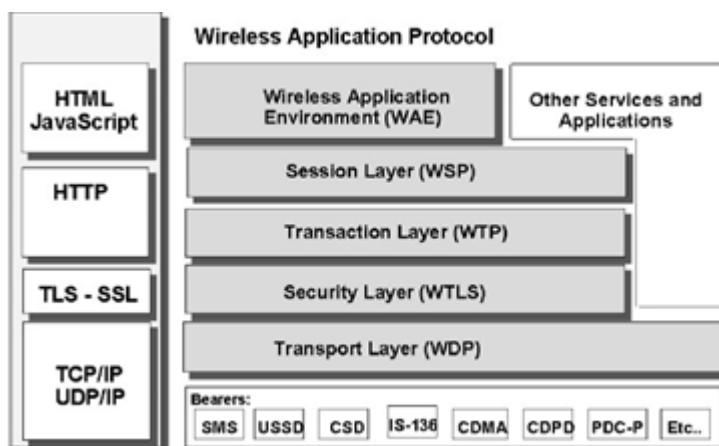
Purpose of WAP

To enable easy , fast delivery of relevant information and services to mobile users

Types of Devices that use

Mobile Phones , Pagers, two way radio , smart phones , communicators

2.WAP ARCHITECTURE



- ✓ WAP Architecture consists of set of standard services encompassing network protocols , Security and the application Environment

- ✓ WAP works with most wireless networks such as CDD, SMS, USSD, CDMA, FLEX, DECT, WAE
- ✓ Wireless Application Environment (WAE)
 - Provides model for accessing WWW URLs
 - Uses uniform resource identifiers (URIs)
 - Uses WML standard markup language, an efficient binary encoded form of HTML
 - Provides a scripting language analogous to JavaScript
 - Provides a set of telephony applications
 - WAE Components
- ✓ Architecture
 - Application model, Microbrowser, Gateway, Server
- ✓ User Agents
 - WML/WTA/Others
 - content formats: vCard, vCalendar, Wireless Bitmap, WML, ...
- ✓ WML
 - XML-Syntax, based on card stacks, variables, ...
- ✓ WMLScript
 - procedural, loops, conditions, ... (similar to JavaScript)
- ✓ WTA
 - telephone services, such as call control, text messages, phone book, ... (accessible from WML/WMLScript)
- ✓ Wireless Session Protocol (WSP)
 - Push mechanism reduces number of requests made by client
 - Push to all registered clients useful in multicast or broadcast applications
 - Binary equivalent to HTTP
 - Sessions can be suspended and re-established to save power and avoid overhead
 - Provides HTTP 1.1 functionality
 - Supports session management, security, etc.
- ✓ Wireless Transaction Protocol (WTP)
 - Lightweight version of TCP
 - Low overhead: no setup or teardown

- 3 classes of service:
 - Class 0: unreliable send with no ACK
 - Class 1: reliable push
 - Class 2: classical request-data-ACK cycle
- Provides reliable message transfer mechanisms
- Based on ideas from TCP/RPC
- ✓ Wireless Transport Layer Security (WTLS)
 - Security between WAP client and WAP server
 - Features: datagram support, optimized handshake, dynamic key refreshing
 - Provides data integrity, privacy, authentication functions
 - Based on ideas from TLS/SSL
- ✓ Wireless Datagram Protocol (WDP)
 - Defines transport layer
 - Contains bearer-specific layer that optimizes data transfer to SMS, USSD, CSD, or CDMA
 - Wireless control message protocol (WCMP) is responsible for error-handling
 - Provides transport layer functions
 - Based on ideas from UDP

3. Components of WAP Standard

Layers of WAP Divided into three groups

Bearer Adaptation

- ✓ Hides the differences in the signaling and channel protocols used among various wireless networks

Service Protocols

- ✓ Higher level protocols for moving application data thro wireless network .
Service include - reliability, Security and caching

Application Environment

- ✓ Powerful, browser based Supports content and application portability across various device types, independent of manufacturer

Bearer Adaption:

- Network (Bearer) protocols for exchanging info to and from the client device

- Each Bearer protocol- particular type of n/w infrastructure - which in turn is – particular set of suppliers or regions.
- Most common wireless network infrastructures

AMPS - The Advanced Mobile Phone System

- Analogs
- Most widely used ,North American
- Uses Geographic cells to separate conversation taking place on the same frequency.

CDPD- Cellular Digital Packet Data.

- 19.2 kbps Digital packet service.
- Uses free space in a voice network to transmit Data , FDM .
- Used in US , Canada.

IS -54/IS-136 / ANSI -136(North American TDMA)

- Used in US , Canada
- Uses TDM and Divides the radio frequency into time slots and allocating them to various calls .

IS -95, CDMA

- Developed by **Qualcomm** for US military during ww II
- Used in US , Canada and some parts of Asia
- Spread – spectrum technology – tags each conversation with its own digital sequence .

GSM- Global System for Mobil Communications:

- Runs in the 800 MHz band
- Used in Australia , Europe and most of Asia .
- Combines TDM and FDM to Similar to CDMA .
- In US , it operates in different frequencies and are called DCS 1800, PCS 1900.

PDC- Personal Digital Cellular:

- Both Telephony and Data Services .
- Used in Japan.
- Combines TDM and FDM.

PHS – Personal Handy Phone System:

- Evolution of Digital Cordless Phone technology.
- Used in Japan.

The Flex Protocol:

- By Motorola
- Supports one – way paging
- Reflex – adds Two – way paging capabilities
- New stds : EDGE, GPRS, UMTS- Greater capacity.

SERVICE PROTOCOLS (SP):

WDP- limiting

- SPs – provides reliability, Security, ordering and Timeliness – in a layered Fashion – to be used by the application environment.
- SPs – are protocols – i.e , Define a set of packet formats and a protocol state machine.
- Designed and implemented independent of bearer n/w.
- Gateway – bridge SPs between two bearers simply by changing the type of WDP adaptation.

Three SPs layers:

- Wireless transport layer security ,
- Wireless transaction protocol,
- Wireless session protocol.

Wireless Transport Layer Security (WTLS):

- Modeled after the Transport later security (SSL)
- Provides authentication
- Using specially optimized c/s certificates- uses less bandwidth.
- Includes Data encryption
- Defends against various security attacks including replay attacks
- Defends against denial of- service attacks
- Since it is placed just about the WDB all the attacks are identified and eliminated quickly, thereby reducing the computational resources usage.
- Optional layer.

Wireless Session Protocol (WSP):

- Supports efficient, long – term “ conversations”
- i.e, supports a WAP micro – browser on a client device to efficiently communicate over the low- bandwidth, high – latency wireless network.
- Modeled on the HTTP 1.1 – both are semantically same

1. WSP request => WAP gateway => HTTP request
2. HTTP response => WAP gateway => WSP response
3. WAP – enabled web server – directly speak WSP .

Features that's are limitations in HTTP but not in WSP,

1. Sessions
2. Modularity
3. Binary encoding.

4. NETWORK INFRASTRUCTURE SERVICE SUPPORTING WAP CLIENTS:

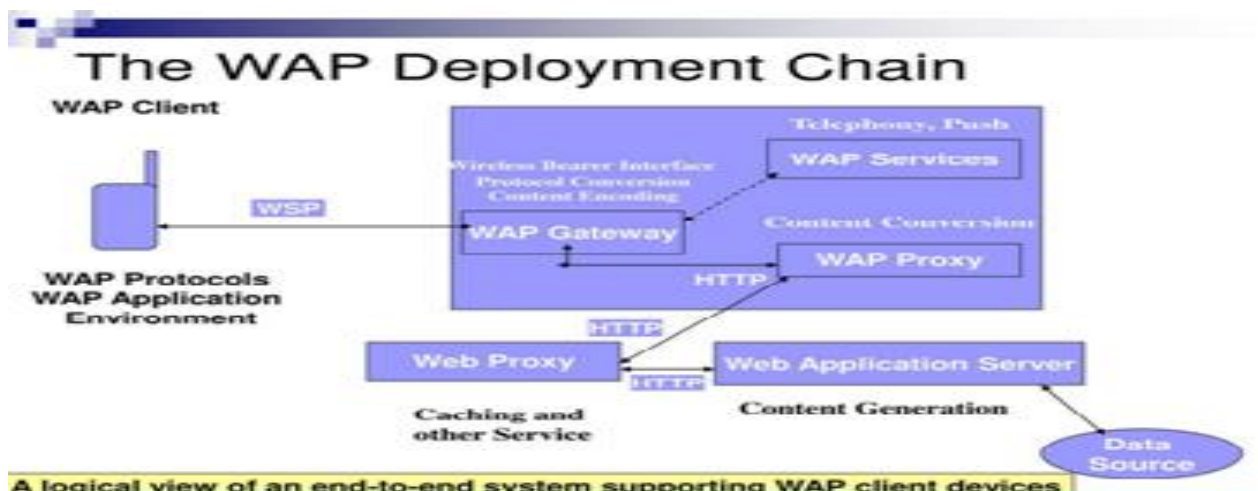
To support the delivery of info to WAP clients, n/w infrastructure perform services like:

- Generate content in std forms
- Convert that contents into formats (WML,WML Script etc) that are recognized by the WAP application environment
- Compile and access encode the content into binary form using WBXML, WML script byte codes
- Bridge protocols between the WAP suite and the internet suite
- Bridge the physical wireless n/w with the wire line n/w
- Other service like content catching , filtering and access control, telephony and server- initiated content push

THE WAP DEPLOYMENT CHAIN:

WAP CLIENT:

- Executes WAP.appl.env
- WML browser,WML Script engine ,push client , telephony, Appl.Env are located
- Mobile,PDA



WAP GATEWAY:

- WSP-HTTP and back binary encoding
- IBM secure way wireless gateway , phone.com up link server , ericsson, nokia

WAP PROXY:

- Necessary manipulates to WAP content on behalf of the WAP client- content conversion, filtering, customization

WAP SERVICES:

- Provide capabilities not provided by web infrastructure like WAP push telephony server

WEB PROXY:

- Standard proxy providing services like content catching, inserting and site based content filtering IBMs web traffic express

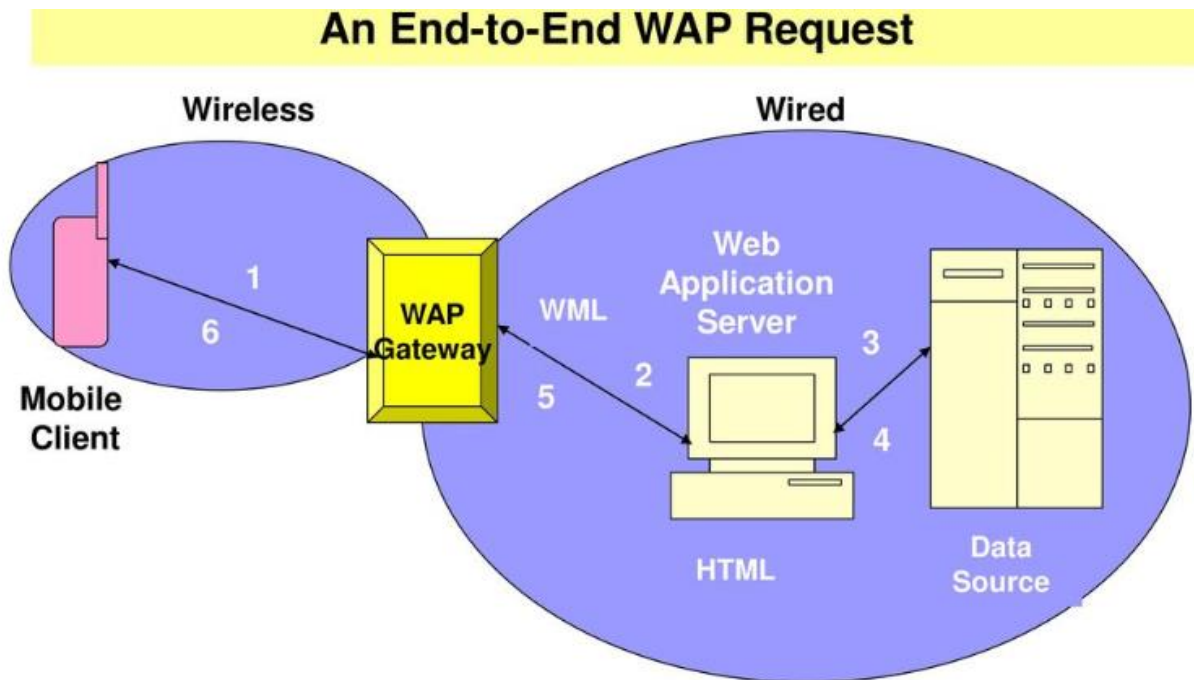
WEB SERVER OR WEB APPLICATION SERVER:

- Generate content delivers to the claims in various formats like WML, html, XML, WML SCRIPT, card, vcalendar.
- IBM 's web sphere application server

DATA SOURCE

- Repository for data being sent to the user or the system that processes transaction requests.
- RDBMS, IBMs DB2 or Oracle 8i

AN END TO END WAP REQUEST:



REQUEST FLOW:

WAP CLIENT

- Obtain url thro' user input or via the WML card from which the user has selected the link
- Build a WSP request contain the URL
- Encode the WSP request into binary form.
- Deliver the WSP request to the WAP protocol stack
- Establish W AP protocol communication wit the WAP gateway and send thro', the wireless n/w

WAP GATEWAY

- Receives the binary encoded WSP request over the wireless n/w and deliver it to the WAP protocol stack within the WAP gateway
- Process the inbound request thro' the WAP protocol stack , decode the binary WSP request pass it to the WSP /HTTP bridge component .
- In the WSP/HTTP bride component, interpret the WSP request and construct corresponding HTTP request.
- Establish a TCP/IP connection to the destination web application server ; over this link, transmit the HTTP request toward its destination
- Sample request

WEB APPLICATION SERVER:

- The servlet RequestServlet extracts the parameter-value pairs “FORMAT=WML11” “REQ=CBALANCE”
- Indicates that a WML output stream is required and a function called Cbalance should be used at the server side to construct the WML response.
- Within the servlet , the request is converted to a request for balance from the data sources leads to a JDBC call- generates SQLquery

DATA SOURCE:

- Any RDBMS
- Can reside in the web appl. Server or in a separate database server.
- Receives the SQL query, returns back the result as a JDBC result set to the servlet.

RESPONSE FLOW:**WEB APPLICATION SERVER**

- Servlet receives data from DB-converts to intermediate XML format(which can be converted to multiple formats)
- Inspects the format parameter send with the request – datamines the format in which to generate output-selects an appropriate XSL style sheet-transforms the balance info from XML to desired format.
- For each Cbalance , separate XSL stylesheet – Cbalance WML,CbalanceHTML,etc
- Servlet invokes the XSL processor-passes the XML describing the account balance –selected XSL for the requested formats-resulting WML is return to the calling program over HTTP.

WAP GATEWAY:

- The gateway process is the response thro’ the TCP/IP protocol stack-passes the HTTP response to the WSP/HTTP bridge component.
- WSP/HTTP bridge component converts the HTTP response- WSP response- binary encodes the WSP response and WML content – delivers the binary encoded WSP response and content to WAP protocol stack.
- WAP gateway processes the WSP response thro’ WAP protocol stack- forwards the response thro the wireless n/w.

WAP CLIENT DEVICE:

- The client receives the binary encoded WSPresponse and WML content over the wireless n/w
- Processes the response thro' the WAP protocol stack and delivers the WML content to the WAP application environment
- WAP apl.Env decodes the binary WML content and renders it on the client device display

5.WAP ARCHITECTURE DESIGN PRINCIPLES:

- To ensure that the std remains internally consistent but also achieves its goal of enabling interoperability among mobile devices
- The principles are not formally written and adopted by the WAP forum architecture group but provide insight into the existing stds.

PRINCIPLE OF FLEXIBLE DEPLOYABILITY:

“THE WAP STD SHALL NOT MANDATE HOW IT IS IMPLEMENTED WITHIN THE NETWORK INFRASTRUCTURE “

- No mandatory physical n/w structure
- 2 design elements : layering and separability

PRINCIPLE OF SEPARABILITY:

“Different part of the WAP std may be logically and physically separated.

These parts should have minimal dependencies , and their interface should be well defined”

PRINCIPLE OF FLEXIBLE IMPLEMENTABILITY:

- “The WAP std shall grant maximum flexibility of implementation and support interoperability of those implementations”
- Language independence-abstract service primitives
- Optimizability
- Interoperability- static conformance requirements (SRCs) are published with each std.

PRINCIPLE OF GLOBAL USE:

“To the greatest extent possible , WAP content, applications,

And infrastructure should support all WAP-enabled clients worldwide”

- Bearer independence
- Support for worldwide languages

PRINCIPLE OF WAP WEB AND INTERNET CONSISTENCY:

“The WAP will adhere to the web and internet architectures and be designed to support evolution toward a unified content and application model for all web clients”

6. RELATIONSHIP TO OTHER STANDARDS

It emerged for two reasons

1) Most WAP forum members are already W3C members

2) a number of individuals participate in both groups

The areas of cooperation between the WAP Forum and W3C include the following

XHTML AND HTML-NG: XHTML is a general-purpose markup language designed to represent documents for a wide range of purposes across the World Wide Web

CC/PP

CC/PP (Composite Capabilities/Preference Profiles)

A CC/PP profile is a description of device capabilities and user preferences. This is often referred to as a device's delivery context and can be used to guide the adaptation of content presented to that device.