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Department of Information Technology

Mobile Transport Layer

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Mobile Transport Layer

UNIT V MOBILE TRANSPORT AND APPLICATION LAYER 9

Mobile TCP– WAP – Architecture – WDP – WTLS – WTP –WSP – WAE – WTA Architecture – WML

Mobile Transport Layer

Introduction

- Mobility support on only ***lower layer is not enough*** to provide mobility support for applications.
- As ***application is directly communicates with transport Layer only***.

Mobile Transport Layer

Traditional TCP

Congestion Control

- TCP ***designed for fixed n/w*** with fixed end-systems.
- Congestion may appear from time to time even in carefully designed networks.
- Sender notices the ***missing ACK for the lost packet*** and assumes a packet loss due to congestion.
- Retransmitting the missing packets , might only ***increase the congestion***.
- **Solution** – TCP show down the transmission rate dramatically.

Mobile Transport Layer

Traditional TCP

Slow start

- Sender always ***calculates a congestion window*** for a receiver.
- The ***start size*** of the congestion window is ***one segment***.
- ***Double the window size*** after receiving ACK.
- Maintain the ***congestion threshold***.

Mobile Transport Layer

Traditional TCP

Fast retransmit/fast recovery

- Two things lead to a reduction of the congestion threshold :-
  - **Fast retransmit** – continious receving of ACK for the same packet.
  - **Fast recovery** – receipt of ACK shows that there is no congestion to justify slow start. The sender perform fast recovery from the packet loss.

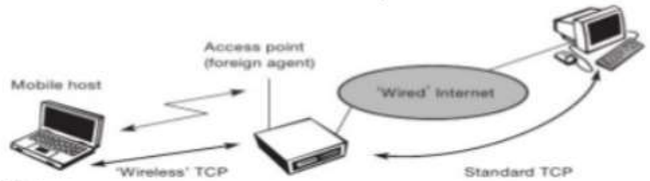
Mobile Transport Layer

Implication on mobility

- Slow start is not a solution in case of mobility
- The reason for this is of using wrong assumptions.
- ***Error rate on wireless links are higher*** as compare to wired links.
- Retransmittion may increase duplicates at layer 2 and more connection are end-to-end encryption.
- ***Mobility itself cause packet loss***.
- TCP detects missing ACK via time-outs and concluding packet loss due to congestion control only.

Mobile Transport Layer

Classical TCP improvements



Indirect TCP

- I-TCP segments a TCP connection into a ***fixed part and a wireless part***.
- Standard TCP is used between the fixed computer and the access point/FA.
- Now access point/FA terminates the standard TCP connection.
- It means access point/FA now seen as the mobile host for the fixed host.
- Access point/FA work as a proxy.
- If the packet is lost on the wireless link, the mobile hosts notice this much faster due to much lower RTT.
- In case of handover , AP/FA act as a proxy buffering packets for retransmission after the handover to the new AP/FA.

Mobile Transport Layer

Advantages of I-TCP

- Does not require any change in the TCP protocol.
- Due to strict partitioning into two connections, transmission error on wireless link cannot propogate into the fixed network.
- Short delay between mobile node and AP/FA, independent of other traffice streams.
- Partitioning of two connection allow us to use different TCP.

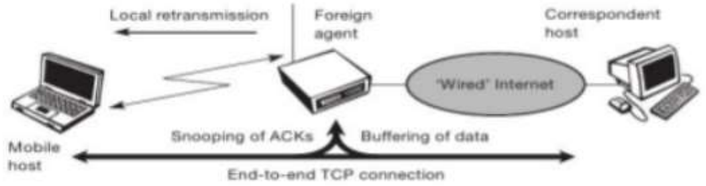
Mobile Transport Layer

Disadvantages of I-TCP

- Loss of end-to-end functionality of TCP.
- If sender receive the ACK it means AP/FA receive the packet.
- Foreign agent must be a trusted entity

Mobile Transport Layer

Snooping TCP



- This method based on end-to-end TCP semantic.
- **Objective** – is to buffer data close to the mobile host to perform fast local retransmission in cse of packet loss.
- FA/AP buffers all packets with ***destination mobile host*** and additionally '***snoop***' the packet flow in both directions.
- FA not ACK data to the corresponent host.
- FA/AP will retransmits the packet to mobile host directly form the buffer.

Mobile Transport Layer

Snooping TCP

- Data transfer from the mobile host with destination correspondent host
  - FA snoops into packet stream to detect gaps in the seq. no. of TCP.
  - If FA detect missing packet,
  - then , it return a NACK to the mobile host.
  - Now mobile host retransmit the missing packet immediately.

Mobile Transport Layer

Advantage/Disadvantage of Snooping TCP

- **Advantage**
  - End-to-End TCP semantic is preserved.
  - Need no modification on FA/AP and correspondent node
- **Disadvantage**
  - It takes some time until the FA/AP can successfully retransmit a packet from its buffer due to problem in wireless link.
  - Have to manage time-out at FA/AP and correspondent Node
  - If sender using end-to-end encryption scheme then TCP protocol header will be encrypted – ***this approach will not work***.

Mobile Transport Layer

Mobile TCP

- Dropping of packets due to a handover or higher bit error rate is not the only problem occurs.
- The occurence of lengthy and/or ***frequent disconnections*** in another problem.
- I-TCP when mobile disconnected:-
  - Has to buffer more and more data – need more buffer.
- Snooping TCP when mobile disconnected:-
  - Mobile will not able to send ACK.

Mobile Transport Layer

Working of Mobile TCP

- It splits the TCP connection into two parts as I-TCP
- An unchanged TCP is used between Host-Supervisory Host while an optimized TCP is used on the SH-MH connection.
- Assumption – M-TCP assumes low bit error rate on wireless link.
- M-TCP does not perform caching/retransmission of data.

Mobile Transport Layer

Working of Mobile TCP (Cont.)

- SH monitors all packets sent to the MH and ACKs returned from the MH.
- If the SH does not receive an ACK for some time , it assumes that the MH is disconnected.
- It chokes the sender by setting the sender's windows size 0.
- It means sender will not retrasmit data.

Wireless Application Protocol

HISTORY

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.

Wireless Application Protocol

WAP- Wireless Application Protocol

- Wireless Application Protocol commonly known as WAP is used to enable the access of internet in the mobile phones or PDAs.
- An open, global specification that empowers mobile users with wireless devices to easily access and interact with internet information and services instantly.

Wireless Application Protocol

WAP stands for Wireless Application Protocol

- WAP is an application communication 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 the mark-up language WML (not HTML) WML is defined as an XML 1.0 application

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Wireless Application Protocol

GOALS-

The basic ***AIM*** of WAP is to provide a web-like experience on small portable devices - like mobile phones and PDAs.

Wireless Application Protocol

PURPOSE OF WAP

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

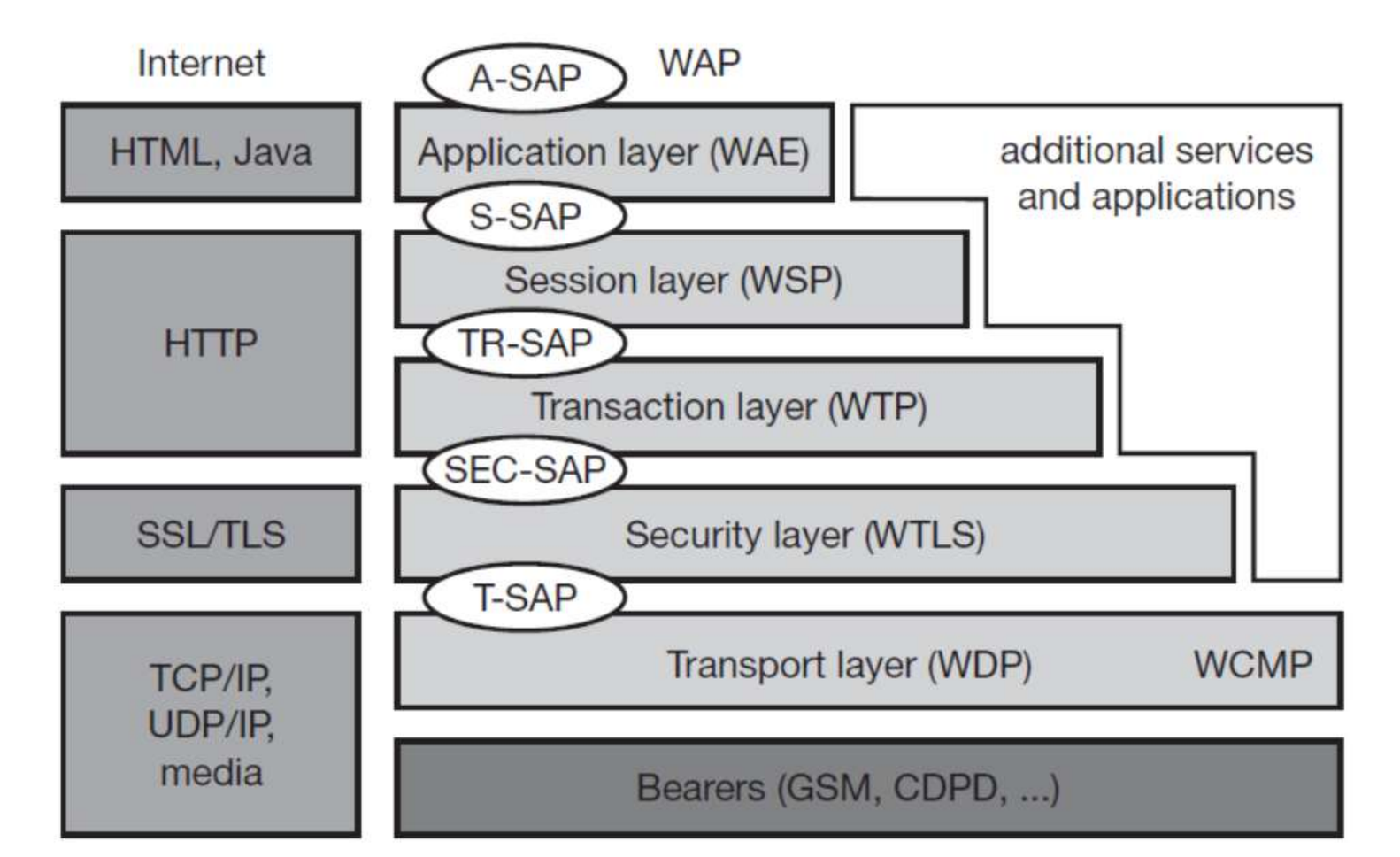
TYPE OF DEVICES THAT USE WAP

Handheld digital wireless devices such as mobile phones, pagers, two-way radios, smart phones and communicators .

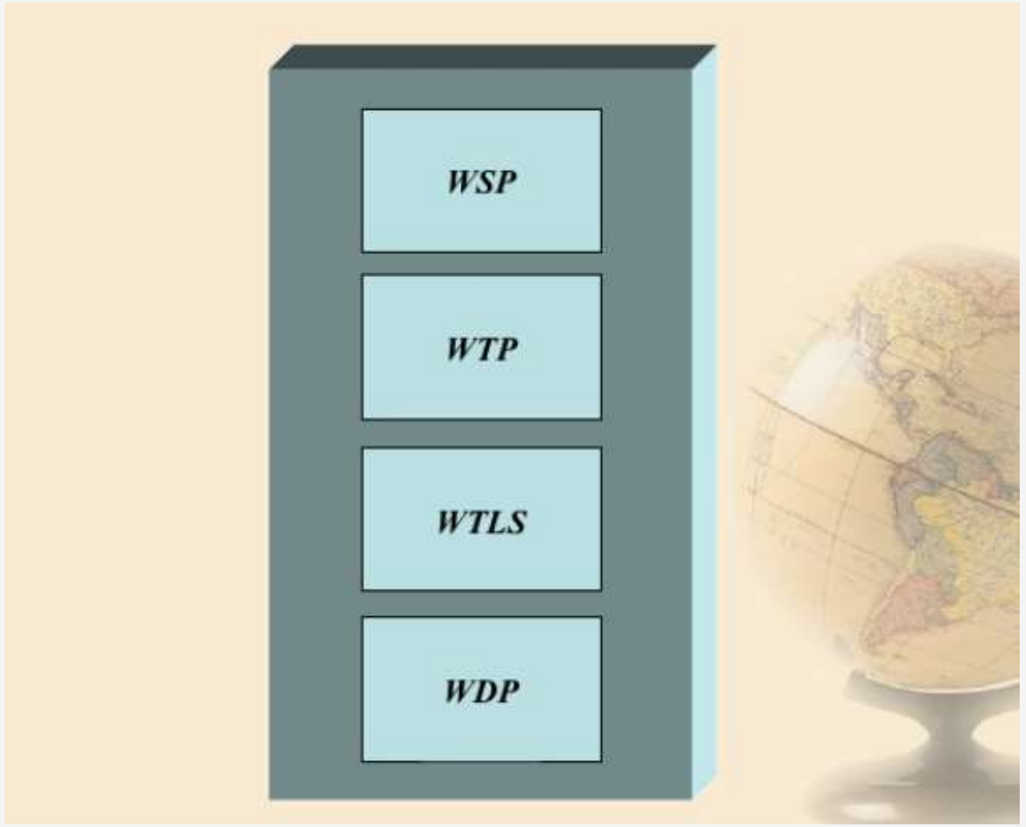
WAP WORKS WITH MOST WIRELESS NETWORKS SUCH AS:

CDPD, CDMA, GSM, PDC, PHS, TDMA, FLEX, TETRA, DECT.

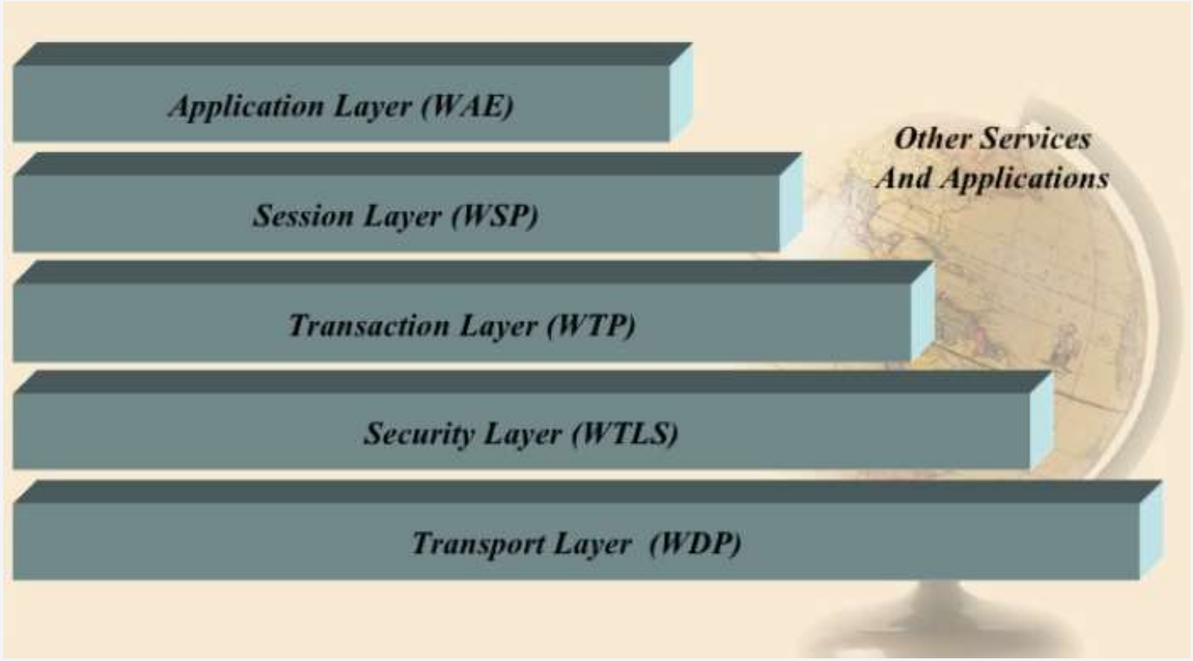
Wireless Application Protocol



Wireless Application Protocol



Wireless Application Protocol



Wireless Application Protocol

Wireless Datagram Protocol (WDP)

- The WAP datagram protocol (WDP) is the Transport layer that sends and receives messages via any available bearer network.
- It is the most bottom layer and responsible for moving WAP data from sender to receiver & back again.
- Provides a common interface to the upper layer protocols and hence they function independent of the underlying wireless network.

Wireless Application Protocol

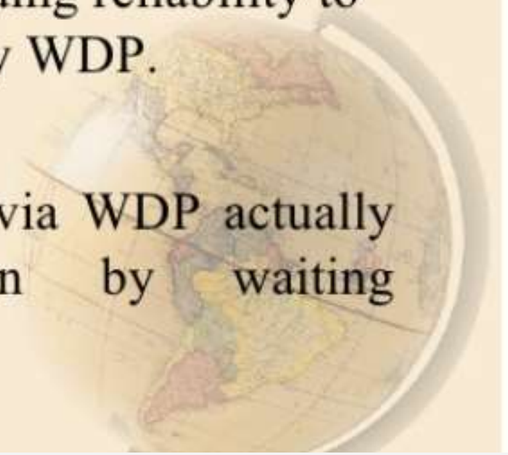
Wireless Session Protocol (WSP)

- The WAP session protocol (WSP) layer provides a lightweight session layer to allow efficient exchange of data between applications.
- It creates a session between the WAP client & the WAP Gateways. Each session has an unique id & must be started, stop, resume or disconnected.

Wireless Application Protocol

Wireless Transaction Protocol (WTP)

- The WAP transaction protocol (WTP) layer provides transaction support, adding reliability to the datagram service provided by WDP.
- It make sure that packets sent via WDP actually arrive at their destination by waiting acknowledgement.



Wireless Application Protocol

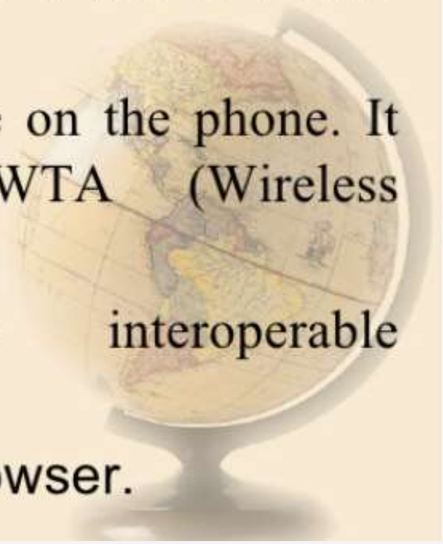
Wireless Transport Layer Security (WTLS)

- WTLS checks the security level of data which is sent through wireless.
- Features:
  - Data integrity
  - Privacy
  - Authentication

Wireless Application Protocol

WIRELESS APPLICATION ENVIRONMENT (WAE)

- General-purpose application environment based on a combination of WWW and mobile telephony technologies.
- It defines the user interface on the phone. It contains WML and WTA (Wireless Telephony Application).
- Primary objective – interoperable environment.
- WAE includes a micro-browser.



Wireless Application Protocol

ADVANTAGES-

- Simplicity of use.
- Mobility.
- Personalized.
- Easy to carry.
- Increased sales for devices ,infrastructure & gateway manufacturer.
- Time saving.

Wireless Application Protocol

DISADVANTAGES OF WAP

- Battery life
- Small display screens
- Speed of access
- Limited availability
- Price
- Lack of user habit
- Limited memory
- Limited bandwidth

Wireless Application Protocol

USAGE/APPLICATIONS

- **Corporate Applications:** Sales force automation where sales people use their WAP enabled handsets to get instant, direct access to the latest pricing, latest news, competitive information any time, anywhere.
- **Online Services:**

  -***Banking:*** Users can get their current balance, transfer funds between accounts and receive fax of a mini-statement.

  -***Electronic Commerce:*** Subscribers can use their handset just like their PC to purchase products and services over the Web.

Wireless Application Protocol

- **Tele services**

  -Prepaid Services: With a WAP-enabled phone, prepaid subscribers can see their current balance with the press of a button. By pressing another button, they can also recharge their account by entering a credit card or voucher number into the handset.

- **Personal Productivity**

  -Email: Using WAP users can keep track of their email right from their handset.

- **Others include:**
  - **Interactive Chat**
  - **Auctions**
  - **Games**

Wireless Application Protocol

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