Smart Client, Data Store, Application and Enterprise Server Based Architecture

Lesson 09

Data Synchronization at Clients and Server

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Data synchronization Needs

- Required between the mobile device and service provider

- Between the device and personal area computer

- With nearby wireless access point (in WiFi connection)

- Another nearby device

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1. Two-way synchronization of partial or full copies of data

- Between mobile-device and personal-area computer

- For example, whenever the list of contacts and personal information manager data is modified at any of them, it is made consistent after synchronization

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2. Server-alerted synchronization

- The server alerts the client the data modification or additions

- The client synchronizes the modified or new data by pull request

- For example, alerting new e-mail and the device pulling that

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3. One-way server-initiated synchronization

- Server initiates synchronization of any new modification since communication of last modification

- Sends modified data copies to the client

- When a new email arrives at a server, it initiates the synchronization as and when the device connects to the server and pushes the mail

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4. Client initiated refresh synchronization

- The client initiates synchronization with the server for refreshing its existing data copies

- For refreshing the configuration parameters saved at the server for it

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4. Client initiated refresh synchronization— Example

- For example, a computer or mobile device initiates refreshing of the hoarded contacts and personal information data either at periodic intervals or as and when it connects

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4. Client initiated refresh synchronization – Example

- if the device configuration changes or a new device connects to a server, then the configuration parameters sent earlier refresh at the server

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5. Client-initiated synchronization

- With the server for sending its modifications, for example, device configuration for the services

- For example, a client mobile device initiates synchronization of the mails or new ring tones or music files available at the server either at periodic intervals or as and when it connects to it

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6. Refresh from client for backup and update synchronization

- The client initiates synchronization

- Sends backup to the server for updating its data

- For example, a computer or mobile device initiates refreshing of the hoarded contacts and personal information data either at periodic intervals or as and when it connects to the server

7. Slow (full data copy and thorough) synchronization

- Client and server data compared for each data field and are synchronized as per conflict resolution rules

- Full copy synchronization usually takes place in idle state of the device

- Not immediately on connecting to the server, that's why called <u>slow</u>

Formats of Synchronized Data Copies

- Can be different from each other at client and server

- When the data at a source synchronizes with the data at other end, it does so as per the format specified at that end

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Formats of Database records

- The records indexed enabling search by querying using the indexes, for example, the relational database records

- The database record retrieved by sending a query specifying the entries in these indexes

- Format DB2 at server and DB2e Every place at the mobile device

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Flat file Synchronization

- Data can be interpreted only if the file is read from beginning to end and that data cannot be picked from anywhere within the file

- For example, an XML or html file at the server synchronizes with the file at the device which is in text format or is a binary file depending upon the information format

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Flat file Synchronization— Example

- Information format in mobile computing XML document format

- For transmission it is WBXML (WAP Binary XML) content format

- Address book data at a mobile device with the data transmitted in WBXML format

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Usage Models for Synchronization in Mobile Applications

- Four usage models employed for synchronization in mobile computing systems

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1. Synchronization between two APIs within a mobile computing system
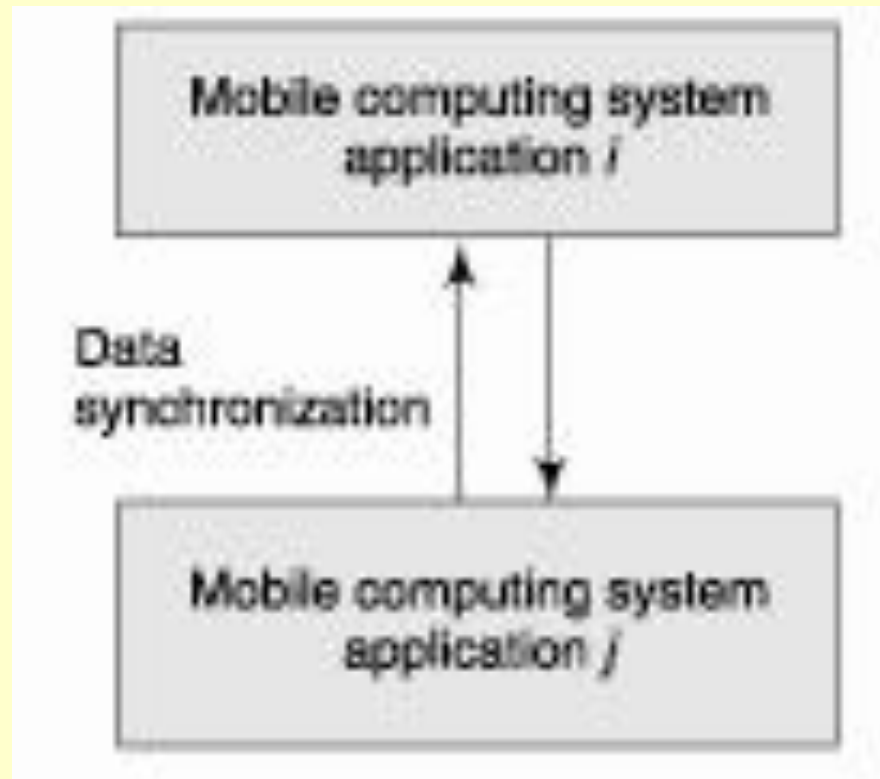
Synchronization between two APIs

- The data generated by an application synchronized and used in another application

- An API running at the device synchronizes data with another application on the same or another device or computer
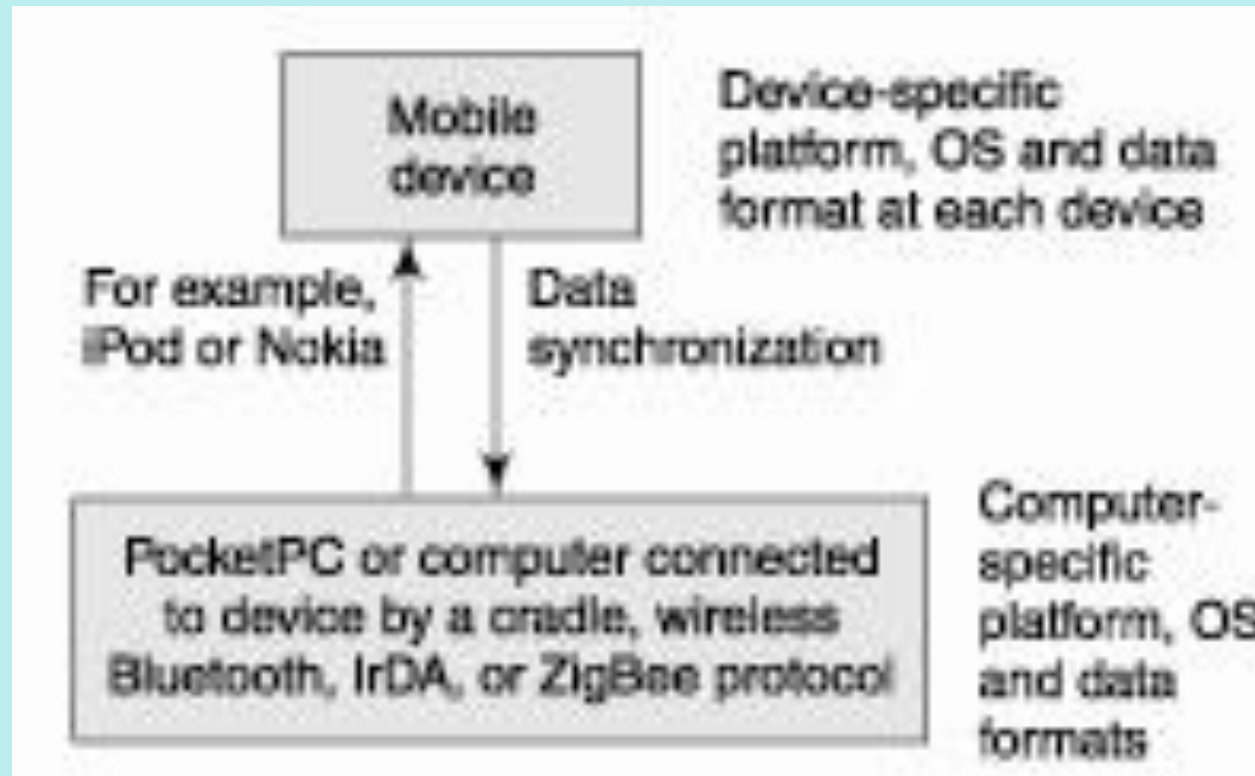
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Example of synchronization between APIs

- Data records at personal information manager (PIM) API synchronized with the email API

- When email from a new source retrieves at the email API in the device, the name and email address data fields at the application saved as new data record at PIM API

Example of synchronization between APIs

- When an email is to be sent to the same person, the email API uses the same data record from the PIM API
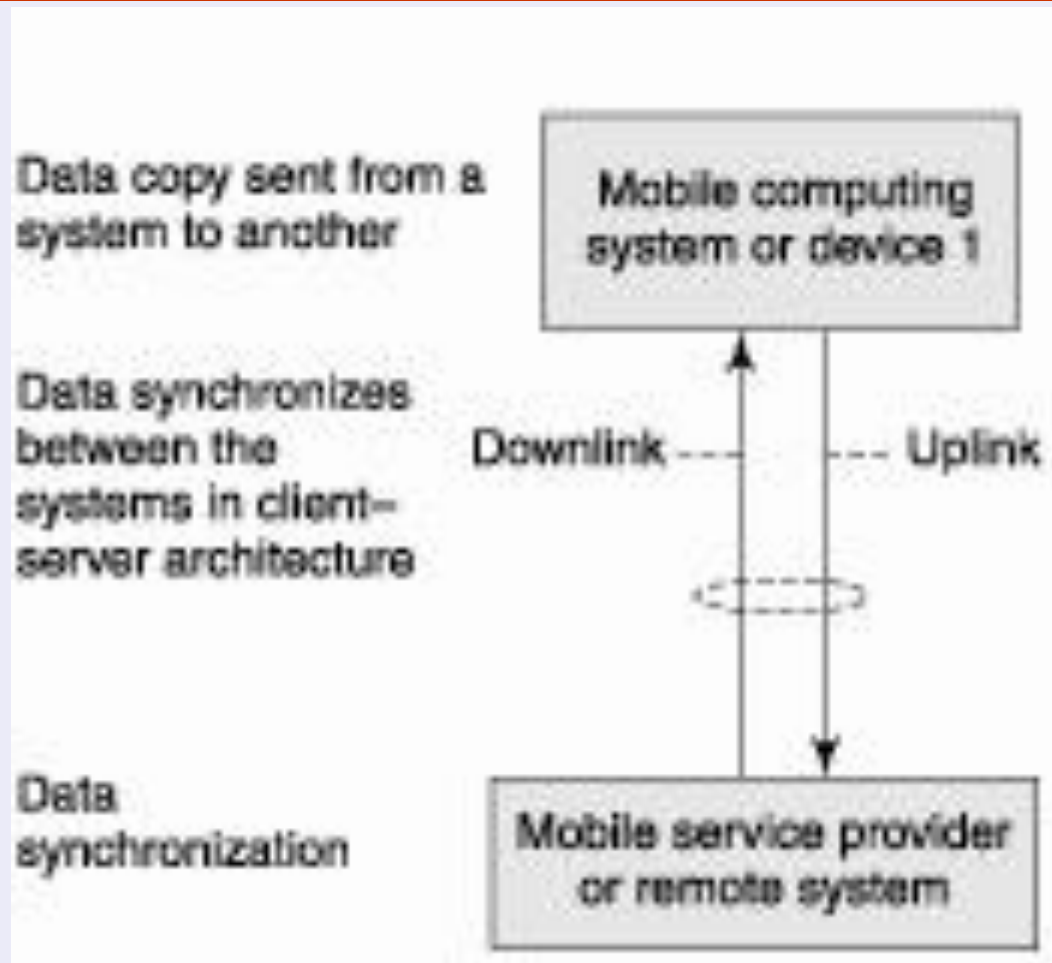
Synchronization between the device and nearby device

- Device and computer synchronize their data

- Also called personal area synchronization (PAS)

- Using PAS software, for example, HotSync or ActiveSync

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Examples of PAS

- Synchronization with nearby PC through a serial port using a cradle and wired connection to PC through the cradle

- Synchronization with the nearby computer through a wireless personal area network (WPAN) using ZigBee or Bluetooth

3. Synchronization between remote systems and device

Data copy sent from a system to another

Data synchronizes between the systems in client–server architecture

Data synchronization

Mobile computing system or device 1

Downlink ---   --- Uplink

Mobile service provider or remote system

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Synchronization between remote systems and device

- The device data records synchronize with the mobile service provider server records

- The remote server or systems synchronize their data with the mobile device

- The device connects to remote systems on Internet through the wired, wireless mobile service provider, or WiFi network

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Example of Synchronization between remote systems and device

- Wireless email synchronization using Intellisync between the device and remote server using SyncML language

4. Synchronization through a local pass-through system

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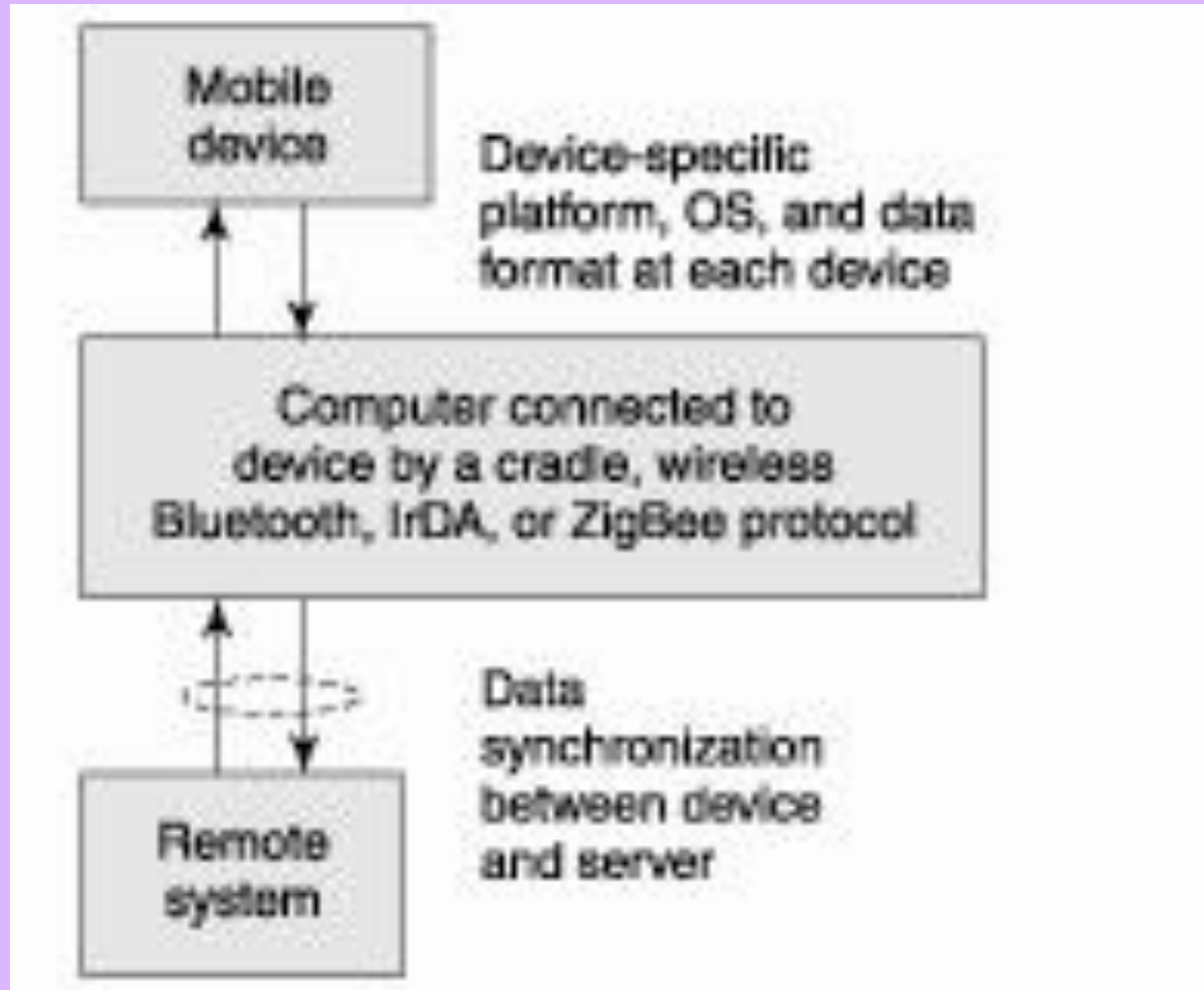
Using local pass through computer or system

- Device data records synchronize with the records of remote system, for example, an enterprise server, through a local computer system

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Synchronizer (synchronization engine)

- Software tool for synchronization

- Resides at a host

- Called 'Synchronization server' synchronizer at the server

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Synchronizer Functions

- Configuring as per the specified domain-dependent and conflict resolution rules

- Finds the data item or record appended at the data set(s)

- Discovers modifications with respect to the last action of synchronization of the specified data copies which have been deleted, added, or modified

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Synchronizer Functions

- Makes changes in the copies accordingly

- In case of conflict, it resolves it as per resolution rule(s)

- Disseminates (propagates) the changes to other devices or systems so that others devices also incorporate the changes in their data copies
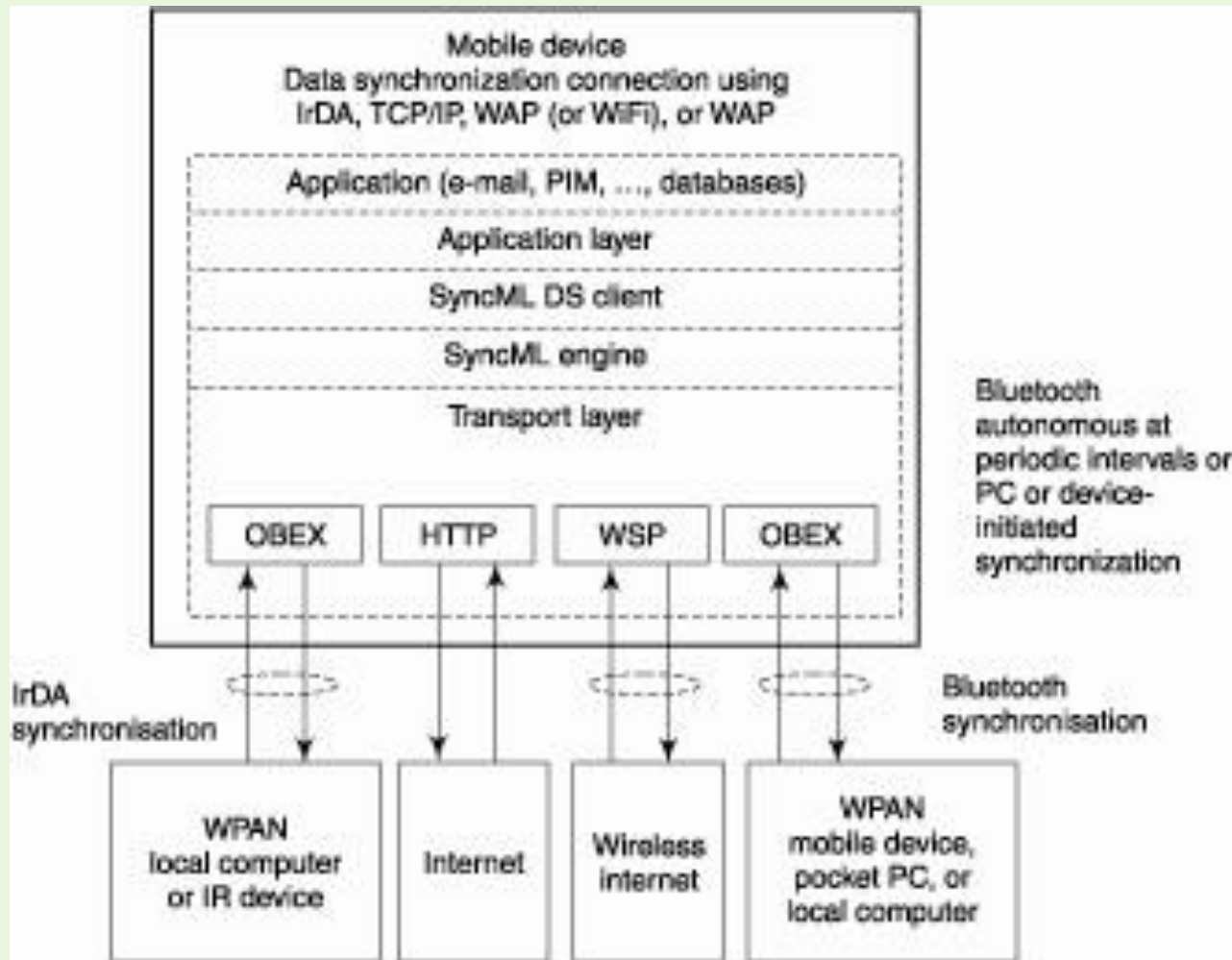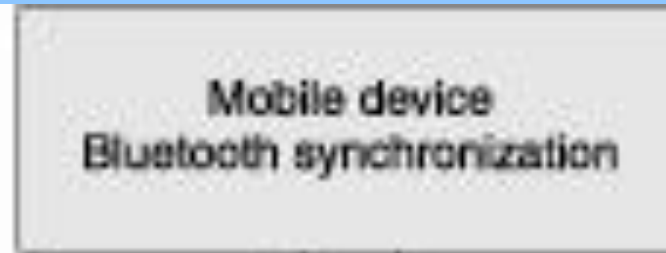
Bluetooth protocol

- Used for synchronization among mobile devices and Bluetooth-enabled PCs in a wireless personal area network

Bluetooth autonomous at periodic intervals or PC or device-initiated synchronization
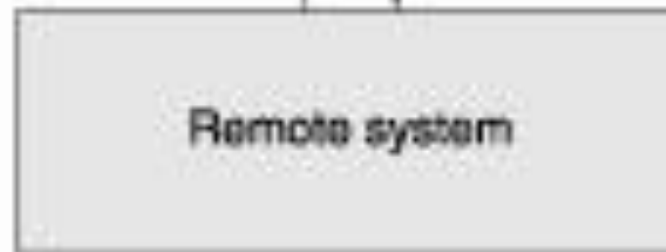
Mobile device Bluetooth synchronization

Synchronization SyncML codes binding over the Bluetooth object exchange OBEX
or
PC configured as a Bluetooth ActiveSync partner

Bluetooth synchronization computer
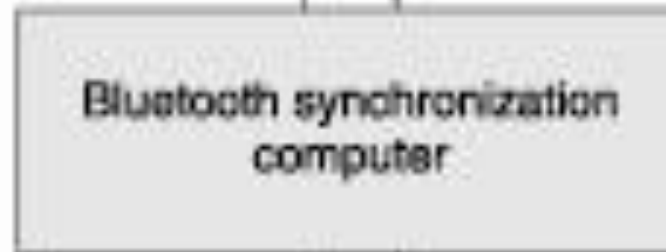
Data synchronization connection using WiFi or WAP or TCP/IP

Remote system

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Summary

- Data transfers between the synchronizers at the client application and the server in various formats, for example, as XML data stream

- Synchronization logic enables updates of DataStore

- Synchronization logic detects and resolves conflicts

End of Lesson 09

Data Synchronization at Clients and Server