Databases

Lesson 04

Client–Server Computing and Adaptation

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Two Network Based Computing Architectures

- Distributed Peer-to-Peer— designed each node distributed computing node of the system, each node on the network similar resources and the various nodes can depend on each other resources

- Client-Server— designed such that a node is either a client or a server

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Client-Server Architecture in Mobile Environment

- Client node has much less resources than server
- Client nodes depend on server resources

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Client-Server Architecture in Mobile Environment

- A client requests the server for data or responses

- The client can either access the data records at the server or cache these records through broadcasts or distribution from the server

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Client-server Computing

- An *N*-tier architecture (*N* = 1, 2, …)
- On the same computing system (not on a network), then the number of tiers, *N* = 1
- When the client and the server are on different computing systems on the network, then *N* = 2
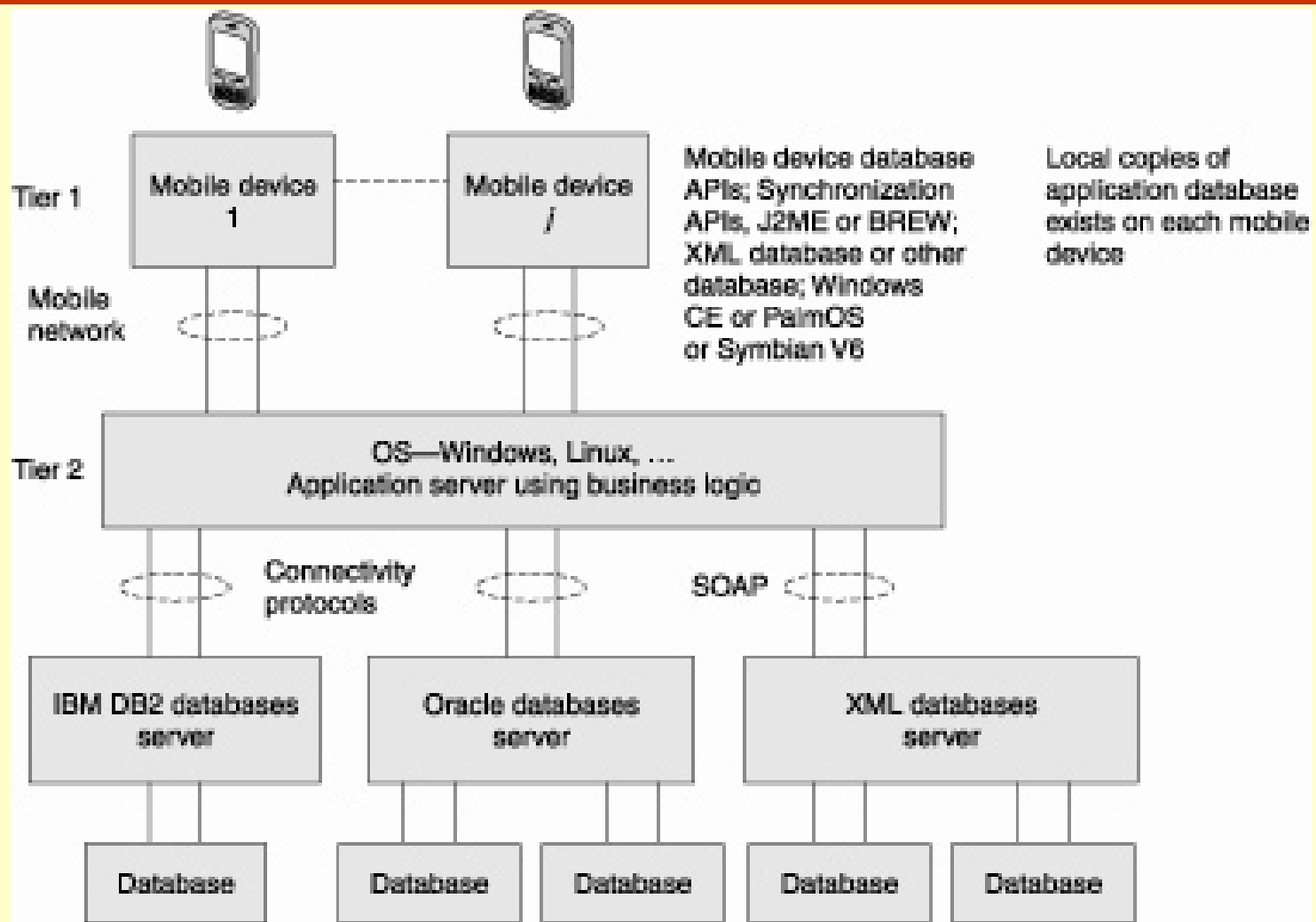
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Server networks or connecting to other computing systems

- Connecting to other systems provide additional resources to the server for the client

- Then $N > 2$

- $N > 1$ means that the client device at tier 1 connects to the server at tier 2 which, in turn, may connect to other tiers, 3, 4, and so on

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Application server in two-tier client–server computing architecture

- Local copies 1 to j of database hoarding at the mobile devices) on client request

- Synchronization API enables running of the application independently on the devices without the need for a run-time retrieval
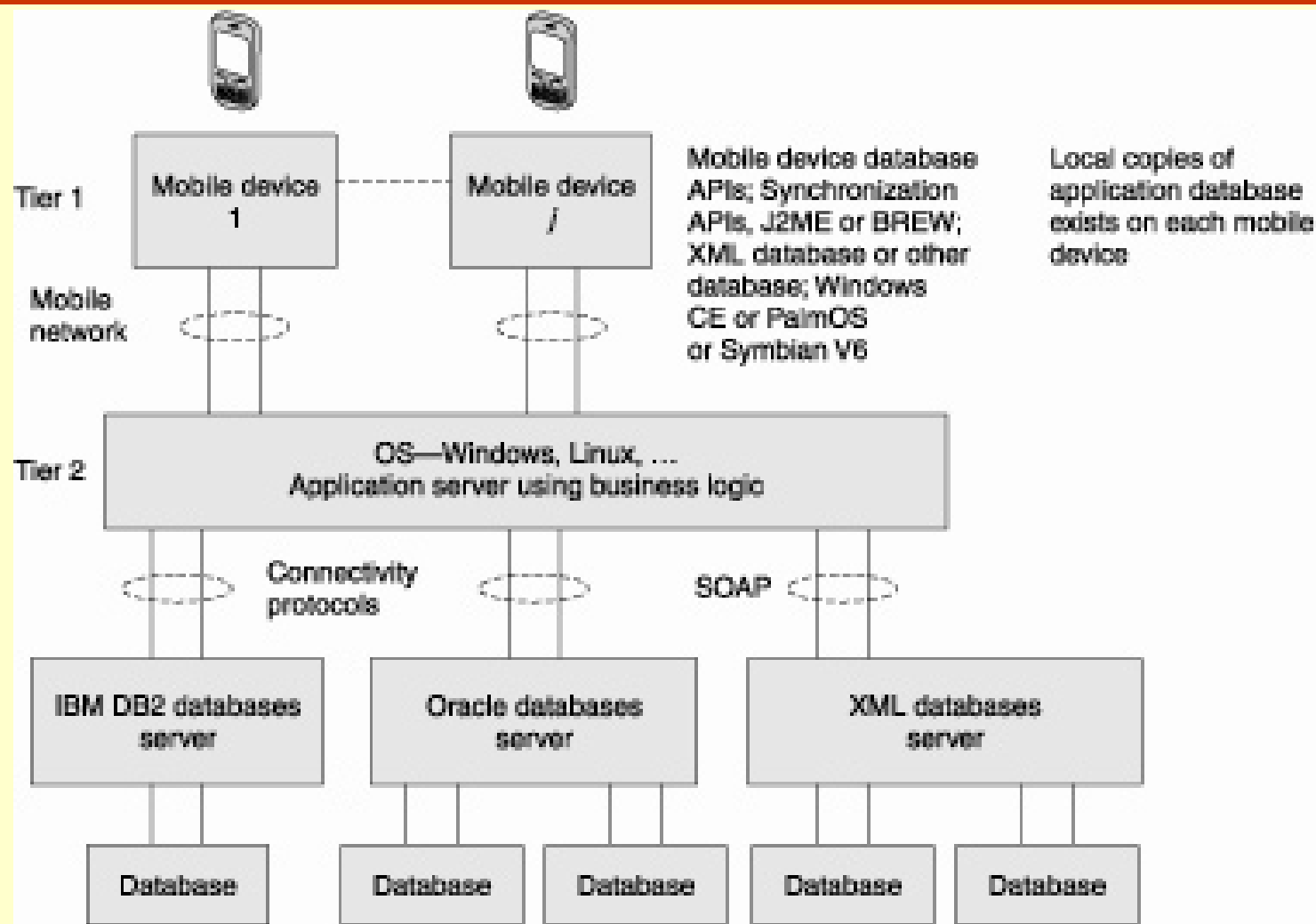
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Two-tier Client–Server Architecture

Tier 1

Mobile device 1

Mobile device j

Mobile device database APIs; Synchronization APIs, J2ME or BREW; XML database or other database; Windows CE or PalmOS or Symbian V6

Local copies of application database exists on each mobile device

Mobile network

Tier 2

OS—Windows, Linux, ...
Application server using business logic

Connectivity protocols

SOAP

IBM DB2 databases server

Oracle databases server

XML databases server

Database

Database

Database

Database

Database

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APIs and Synchronization API

- Various APIs synchronization with each other

- Synchronization─ means that when copies at the server-end modifies, the cached copies accordingly modified

- The APIs designed independent of hardware and software platforms as far as possible as different devices may have different platforms

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# Two-tier client–server architecture using a multimedia files server

Tier 1 — Mobile device 1 — Mobile device j

Mobile network

Mobile device database APIs; Synchronization APIs, J2ME or BREW; XML database or other database; Windows CE or PalmOS or Symbian V6

Local copies of application database exists on each mobile device

Tier 2 — OS—Windows, Linux, ...
Application server using business logic

Connectivity protocols   SOAP

IBM DB2 databases server   Oracle databases server   XML databases server

Database   Database   Database   Database   Database

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Three-tier Client–Server Architecture

- The application interface, the functional logic, and the database are maintained at three different layers

- The database is associated with the enterprise server tier (tier 3)

- Only local copies of the database exist at mobile devices

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Three-tier Client–Server Architecture

- Database at the backend system of an enterprise (company) that holds IBM DB2, Oracle, and other databases

- Server at Tier 2 connects to the enterprise server through a connecting protocol. The enterprise server connects the complete databases on different platforms, for example, Oracle, XML, and IBM DB2

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Database record Copies of database at the mobile devices using three tier architecture

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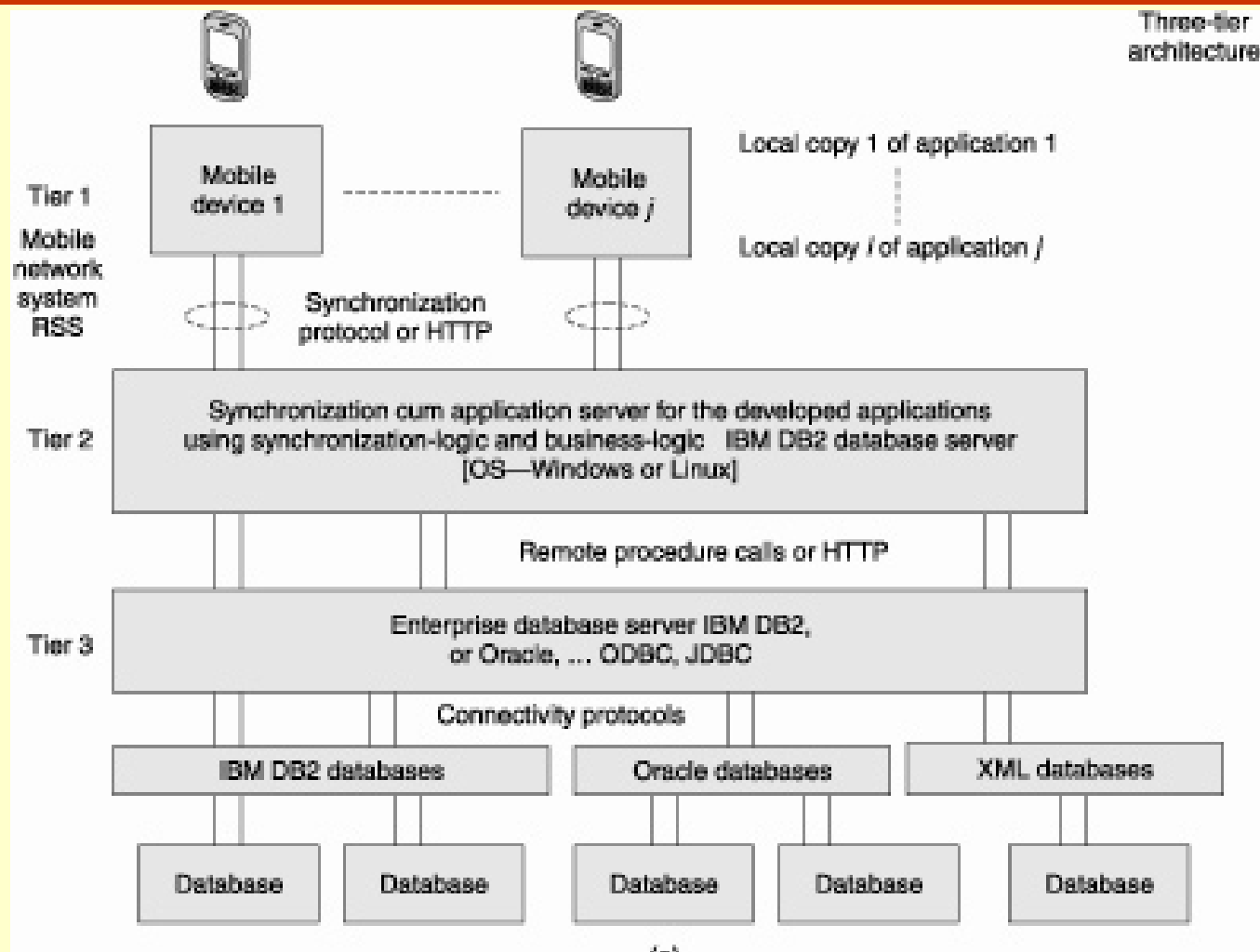
Mobile Device with J2ME or BREW platform, an OS and database having local copies

Mobile device 1	Mobile device APIs, Synchronization APIs, J2ME, BREW; DB2e or XML database or other database APIs and an OS (Windows CE or PalmOS or Symbian V6…)	Local copy 1 of application 1
Tier 1		Local copy *i* of application *i*

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Connectivity of the synchronization-cum-application server

- To the enterprise server is by RPC, RMI, JNDI, or IIOP protocols

- In case the application client at tier 1 connects to tier 2 using the Internet, the connectivity using HTTP or HTTPS

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N-tier Client–Server Architecture

- When N is greater than 3, then the database is presented at the client through in-between layers

- Four-tier architecture in which a client device connects to a data-presentation server at tier 2

- The presentation server then connects to the application server tier 3

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N-tier Client–Server Architecture

- The application server can connect to the database using the connectivity protocol and to the multimedia server using Java or XML API at tier 4

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4-tier architecture in which a client device connects to a data-presentation server
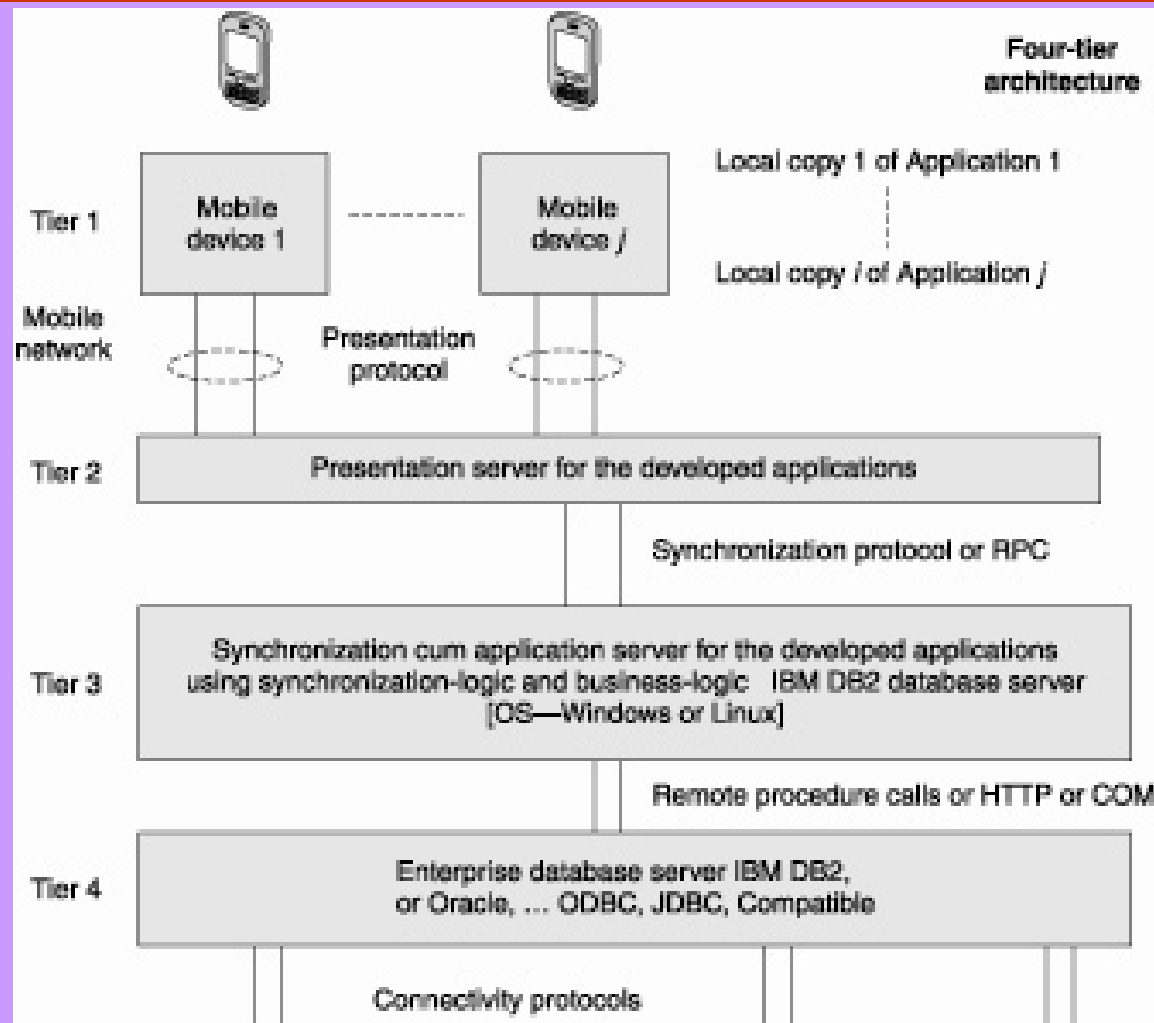
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Mobile-device number of interfaces (APIs)

- PIM (personal information manager) interfaces for the **calendar, contacts**

- Microsoft Outlook or Intellisync Wireless e-mail

- Lotus Notes (5x and 6x)

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Mobile-device number of interfaces (APIs)

- Lotus Organizer (5x and 6x)

- APIs for IBM WebSphere Everyplace Access, BlackBerry Connect, Oracle Collaboration Suite, Secure Mobile Connections via VPN Client and Symantec Client Security 3.0, Fujitsu mProcess Business Process Mobilizer. report

Necessity for Client Server Computing with Adaptation

- The data format differences in different cases for data transmitted from the synchronization server and those required for the device database and device APIs

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Client Server Computing with Adaptation

- Two adapters (adaptation software) at a mobile device

- An adapter for standard data format for synchronization at the mobile-device

- Another adapter for the backend database copy, which is in a different data format for the API at the mobile-device

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Adapter

- Software to get data in one format or data governed by one protocol and covert it to another format or to data governed by another protocol

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APIs, database and adapters at a mobile device and the Adapters for the server

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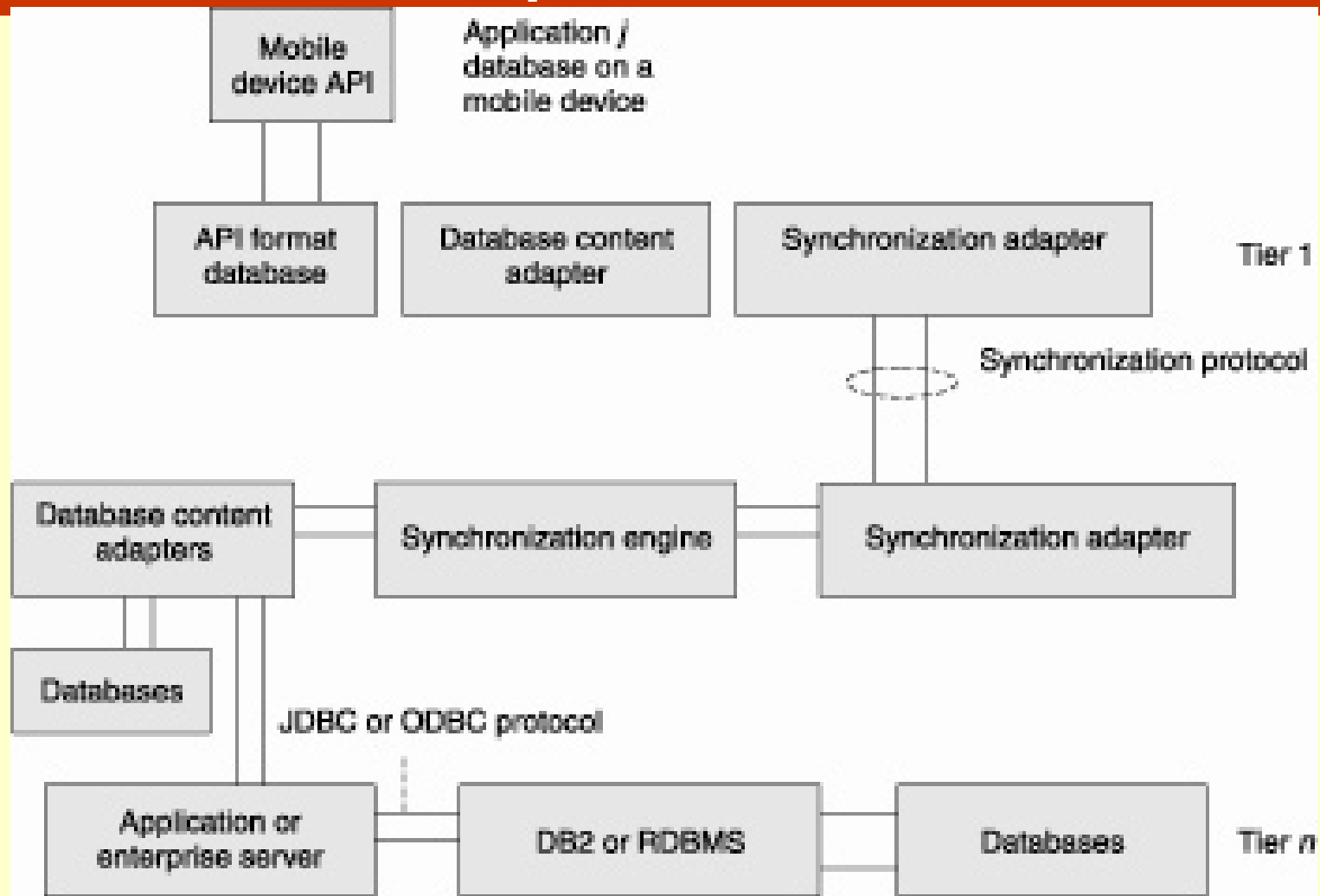
Adapters

- Used for interchange between standard data formats and data formats for the API

- IBM WebSphere Everyplace Access (WEA) provides adapters for synchronization objects (for example, XML format synchronization objects) and the objects of API databases (for example, for the PIM APIs)

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Summary

- Two methods in Network Architecture for computing

- Peer-to-Peer and Client Server

- 1 Tier in which server and API at the mobile device itself

- Two, three, four or N tier architecture

- Use of presentation, synchronization, enterprise database servers

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Summary

- Client-server computing with Adapters for interchange between standard data formats and data formats for the API

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End of Lesson 04

Client–Server Computing and Adaptation

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