Database Management Issues in Mobile Computing

Lesson 01

Data Organization Methods

Data Organization

- Computations require data

  Data Organization Methods

1. MemoPad

2. File

3. File in a folder

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Data Organization

4. Folder in a subdirectory

5. Database

6. Relational Database

Structuring The Data

- Data structure
- Object
- Database
- Relational Database

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Database

- A collection of systematically stored records or information

- Is not just arbitrarily stored data without any logic

- Stores data in a particular logical manner, for example, as lookup tables

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ORGANISATION DATA IN A DATABASE

- Enables raising queries
- Perform Data transactions- Insertion, Deletion, Modify, Append
- Retrieve the required section of data during a computation

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Lookup table

- A database which stores information in tabular form

- Table structure—the first column a reference for looking into the data

- Subsequent column or columns contain the data

- The reference—key to the data-values

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Database Contacts

Consider a database 'Contacts'. Consider a master table, which is used as reference or foundation table. First nine Columns from 1 onwards are 1: Contact entry Serial, 2: Title:, 3: First Name:, 4. Last Name:, 5: Nickname:, 6: Picture:, 7: Company:, 8: Job Title: and 9: Custom Ringtone/Alerts *Phone*:.

Contact Entry Serial	Title Mr./Dr./Ms.	First Name	Last Name	Nick_name	Picture	Company	Job Title	Custom Ring-tone/Alerts Phone
1	2	3	4	5	6	7	8	9

Columns 10 onwards are 10: Custom Ring-tone/Alerts *Messages*, 11: Email:, 12: Email 2:, 13:Work:, 14: Work 2:, 15: Home:, 16: Home 2:, 17: Mobile:, 18: Mobile 2:, 19: Work address *Address 1*:, 20: Work address *Address 2*:, 21: Work address *City*: 22: Work address State/Prov/Region: 23: Work address Zip/Postal Code: 24: Work address Country: 25: Birthday and so on.

Contacts as database

- Enables raising queries such as find contacts of Professors,

- Enables Data transactions- Change Work address_1 of Contact entry serial 10,

- Delete Contact with last name John,

- Retrieval of the required section of data during a computation- for example, retrieve picture of P. John

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Tags based database

- Another logical structure

- A tag is also the key to the data-values

- For example, "*contact*: 1 John, 2 Lucy." and "*address*: 1 ABC Street, 2 DEF Street."

- *contact* and *address*— tags in the database

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Business (Transactions) between the application software and database

- Computational actions─ connecting to a database

- Using the database for querying for a record

- Deleting a specific set of records

- Modifications of records

- insertions into the records and

- Appending of the records

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Transaction command

- A command which is sent for retrieving the data from the database

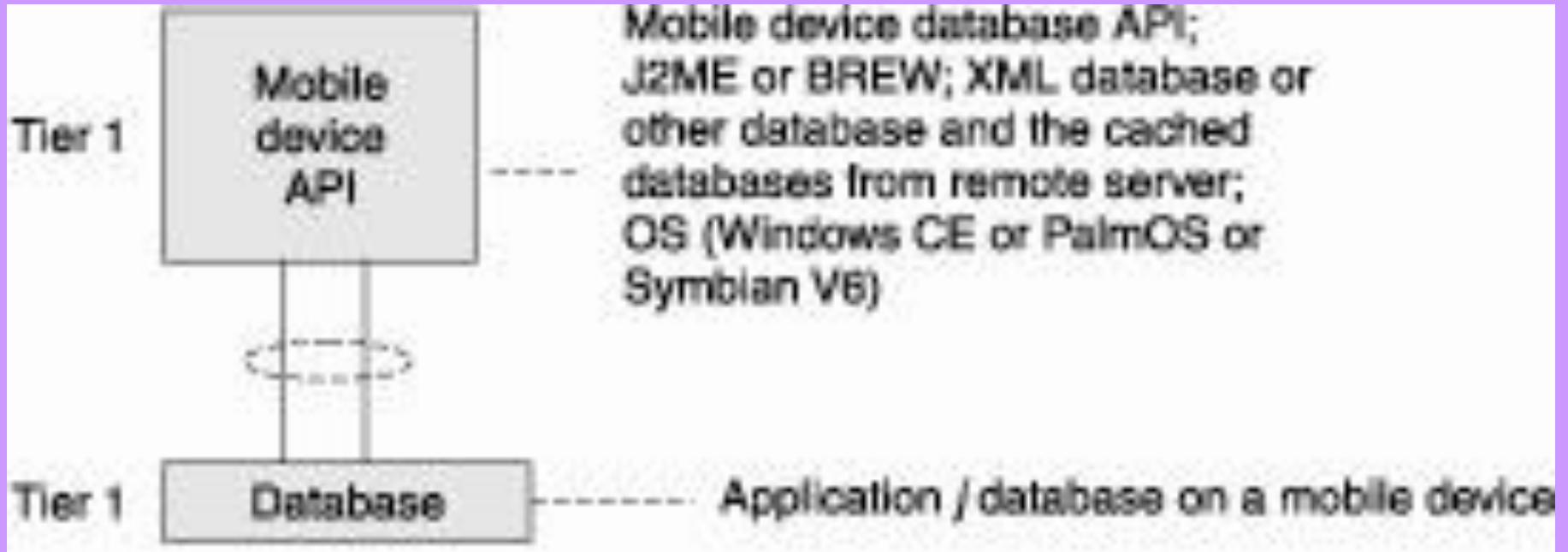- Embodies the logic used for obtaining (and storing) the data

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Data stored in databases

- Follows a logic

- Business logic indicates the logical way in which transactions (business) carried out

- Between two ends, for example, between database-client (application) and database-server or between an API and a database

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API (APPLICATION PROGRAM INTERFACE)

- A section of a program used to run an application (software)

- API may run instructions to retrieve a queried record from a database

- The API may also issue outputs or queries, commands to another program, and receive the inputs from another program during a program-run

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API AT MOBILE DEVICE SENDING QUERIES AND RETRIEVING DATA FROM LOCAL DATABASE

Tier 1 — Mobile device API

Mobile device database API; J2ME or BREW; XML database or other database and the cached databases from remote server; OS (Windows CE or PalmOS or Symbian V6)

Tier 1 — Database

Application / database on a mobile device

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Transactions involving databases

- Establishing connection between API and database

- Updating data records by inserting, adding, replacing, or deleting

- Querying for records

- Terminating the connection between the API and the database

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Implicit Business Logic

- 'Business logic' indicates the logical manner, flow, or pattern, in which business (or transactions) may be carried out with a database

- Implicit business logic─ The structure and components of the database itself define, which is used in retrieving (or modifying) data from the database

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Implicit Business Logic

- The logic of transactions (business logic) implicit when it comes from within the database

- No external definition required for the business logic to function

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Example of Implicit Business Logic

- Telephone Directory in which the first word of each line is structured alphabetically

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The telephone directory

- Names and telephone numbers arranged alphabetically shows implicit business logic
- Names and telephone numbers structured in rows with each row having a name and the corresponding address and telephone number

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Search directory in an XML database

- Arranged alphabetically
- Database designed using XML uses a tag as a key
- The key enables business (transaction for retrieving, deleting, inserting, or modifying data)

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Search directory in an XML database

- <search>

- <Allnames first_character = "R">

- <name_record>

- Raj Kamal

- <address> ABC Street, …. </address>

- <telnumber> 9876543210 </telnumber>

- </name_record>

Search directory in an XML database

- </Allnames>

- <Allnames first_character = "S">

- .

- .

- </search>

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Explicit business logic

- Stored queries and procedures define the logic

- A transaction (business) between the API and the database uses an explicitly defined query

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Example of Explicit business logic

- If Structure = most recently added entry list Content_Type = English English_Records, flight origin = Frankfurt, airline = Lufthansa, present time = 0800 hrs and status = Not arrived then Get_Records

Example of Explicit business logic

- Another query for business can be
- If flight origin = Frankfurt, airline = Lufthansa, present time = 0800 hrs and status = arrived then Delete_Records
- English_Records─ a section of the database having English contents
- Get_Records and Delete_Records ─ two procedures that carry the transaction*s*

Connectivity Protocol

- An API that has predefined methods to handle the various data access functions
- Defines ways to connect to and access a database and methods for sending queries and updating or retrieving database records
- Connects a client or server to the database

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Connectivity Protocol

- Describes the set of permitted commands, transaction methods, and the order in which commands are interchanged between the API and the database at the server or the client

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Connectivity Protocols

- Describes the set of permitted commands, transaction methods, and the order in which commands are interchanged between the API and the database at the server or the client

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Connectivity Protocols

- Using the connectivity protocol API, a program issues commands

- Access a database and query in order to select and retrieve queried record(s) from the database

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Examples of connectivity protocols

- Java database connectivity (JDBC)
- Open database connectivity (ODBC)
- Simple object access protocol (SOAP)
- Connect the server to the database

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POPULARLY USED SYSTEMS FOR MOBILE DATABASES

- IBM's DB2 Everyplace (relational database which connects to enterprise synchronization server)

- SQLAnywhere mobile-database

- Oracle 9iLite

- Microsoft SQLCompact

- SQL stands for Structured Query Language

IBM DB2 Everyplace (DB2e)

- A relational database engine
- Needs a memory of about 100 kB
- Designed to reside at the device
- Supports databases of sizes up to 120 MB
- An enterprise server employing DB2e delivers and synchronizes the local copies of data contents at mobile devices

DB2e based Synchronization

- DB2e synchronizes with DB2 databases at the synchronization, application, or enterprise server

- Means that if a data record is modified at the server then the copy of that record at the client device also changes accordingly

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API AT MOBILE DEVICE RETRIEVING DATA FROM DATABASE USING DB2e

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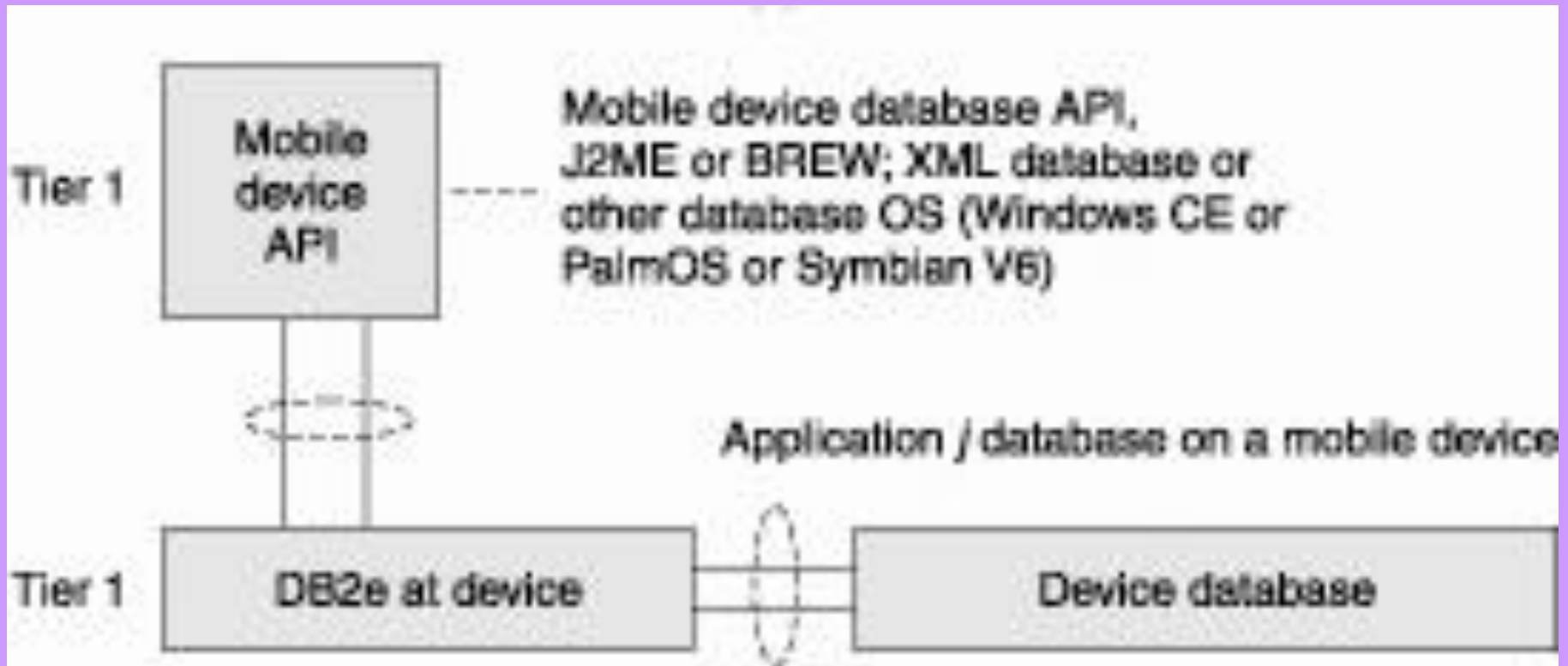
Summary

- Database– a collection of systematically stored records or information
- Business logic' indicates the logical way in which transactions (business) carried out between two ends
- XML database
- Implicit Business Logic
- Explicit business logic for Stored queries and procedures   …

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... Summary

- Transactions involving databases are—(a) establishing connection (b) updating data records by inserting, adding, replacing, or deleting, (c) querying and (d) terminating the connection

- Connectivity protocol

- IBM DB2e EveryPlace for retrieving database records and querying from DB2e server

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End of Lesson 01

Data Organization Methods