

DATABASE ARCHITECTURE

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Database Architecture

- Architecture is depending on its design and can be of the following types:
 - Centralized
 - Decentralized
 - Distributed
- It can be seen as either a single-tier or multi-tier.
- N-tier splits the entire system into related but independent n modules that can be independently customized, changed, altered, or replaced.
- It can be centralized, or client-server, where one server machine executes work on behalf of multiple client machines.
- It can also be designed to exploit parallel computer architectures.

Table compares the features of several well-known database management systems

TABLE
1.1

Types of Databases

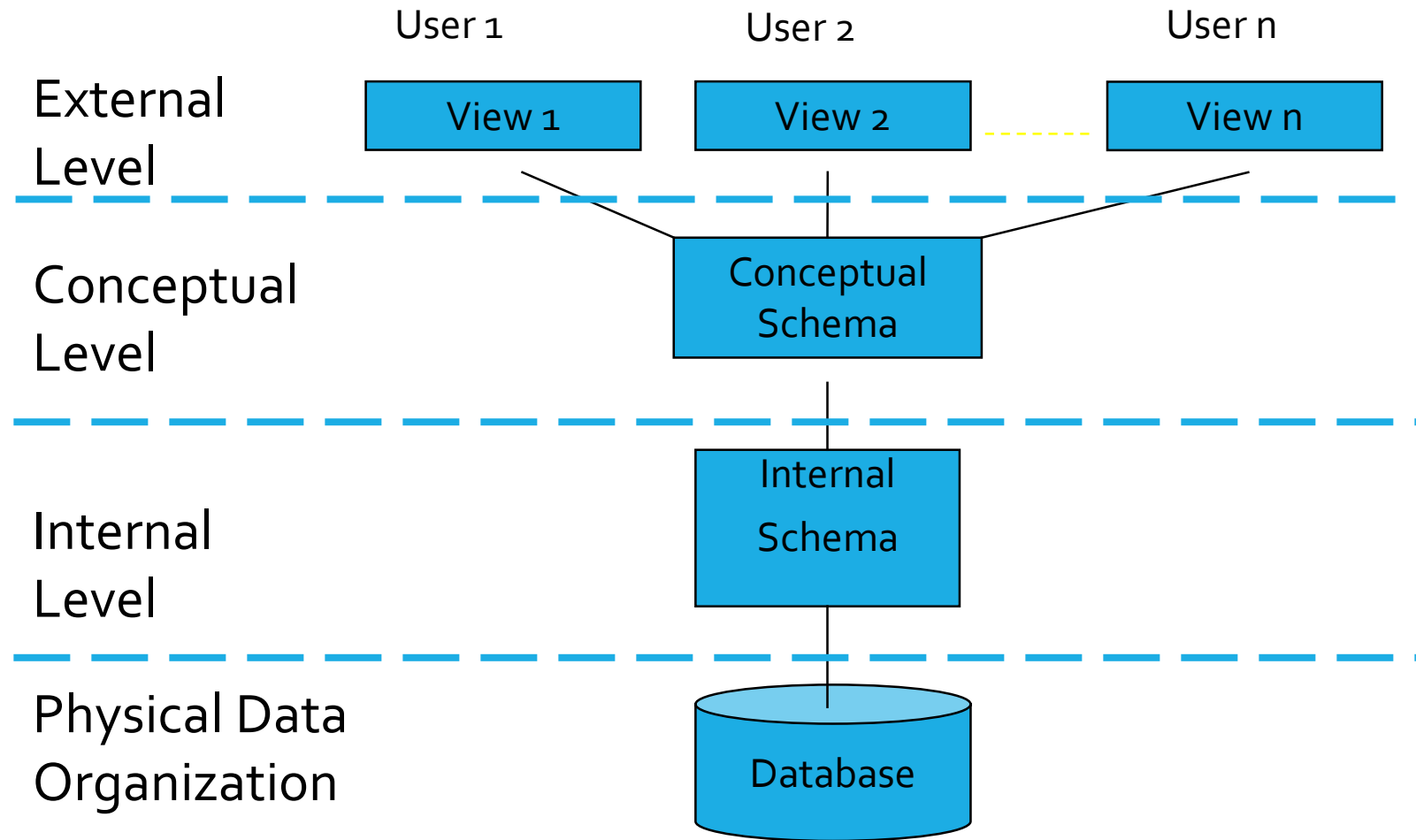
PRODUCT	NUMBER OF USERS			DATA LOCATION		DATA USAGE		XML
	SINGLE USER	MULTIUSER		CENTRALIZED	DISTRIBUTED	OPERATIONAL	DATA WAREHOUSE	
		WORKGROUP	ENTERPRISE					
MS Access	X	X		X		X		
MS SQL Server	X ³	X	X	X	X	X	X	X
IBM DB2	X ³	X	X	X	X	X	X	X
MySQL	X	X	X	X	X	X	X	X*
Oracle RDBMS	X ³	X	X	X	X	X	X	X
* Supports XML functions only. XML data are stored in large text objects.								

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³ Vendor offers single-user/personal DBMS version

Source: Carlos Coronel, Steven Morris and Peter Rob. *Database Systems: Design, Implementation, and Management*, 2016 (12th edition).

Three Level Architecture



Level 1 -External View

- It is also called view level.
- Each user has a view of the database limited to the appropriate portion of the user's perspective of reality.
- Virtual/calculated data: that is not actually stored in the database but is created when needed e.g. age, statistical data etc.
- DBMS uses external views to create user interface for different users which is both the facility and barrier
- User's external view is created after considering data access, reports, and the transactions needs.
- External schema evolves as user needs are modified over time

Level 2 - Logical or Conceptual View

- A complete description of the information content of the database.
- The entire information structure of the database, as seen by the DBA.
- All entities, attributes and their relationships are represented here
- Contains record types representing entities, data item types with their attributes, relationships and constraints on data.
- Contains Semantic information about the data meaning, security and integrity information

Supplier



SupplierId
Name
Phone
Current Order

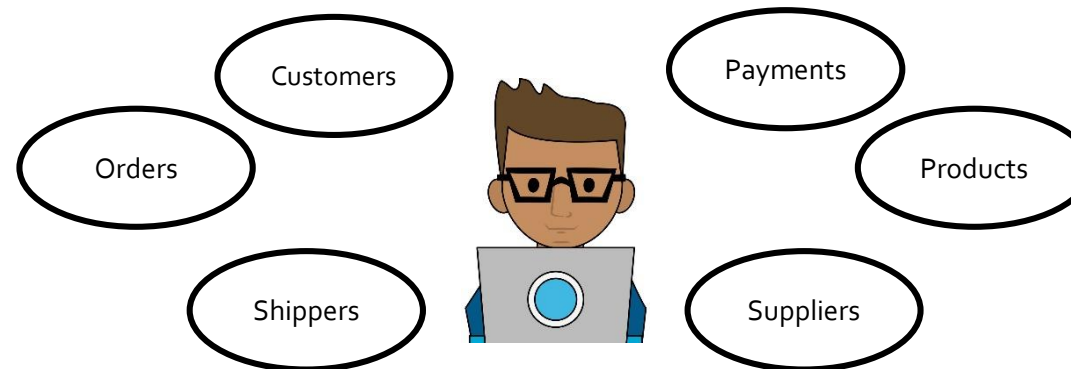
CustomerId
Name
Address
ContactNo

Customer



External Layer

Conceptual Layer

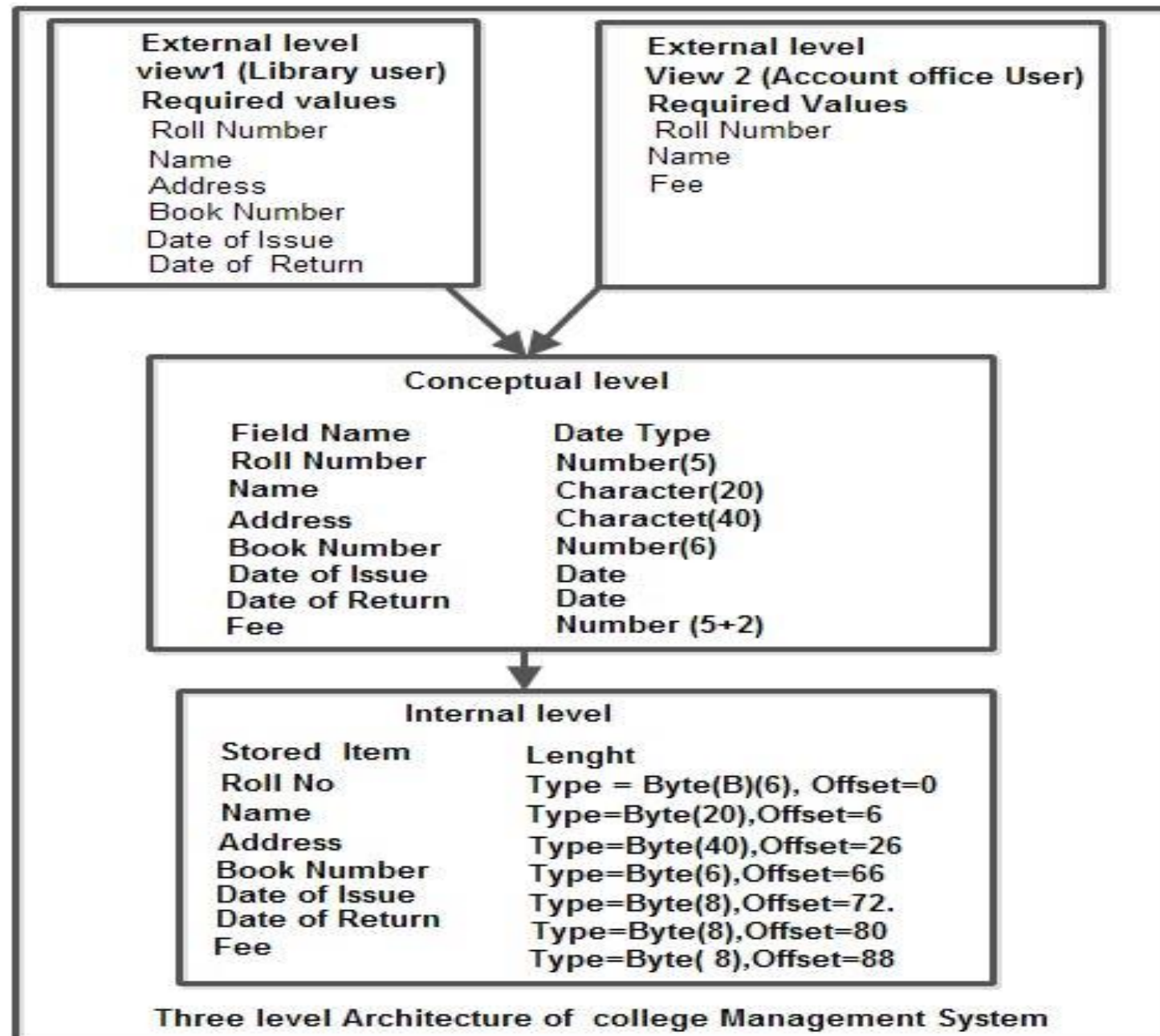


Level 3 - Internal or Physical View

- Concerns about the physical implementation of the database.
- DBMS chooses type of data structures
- lays out data on storage devices with operating system access methods
- Internal record: a single stored record

Physical Level

- Generally same as Internal
- Actual representation of data on the storage device
- In the binary format
- OS responsibility



Data Independence

Changes of data at one level should not affect another level.

Types

- Logical Data Independence
- Physical Data Independence

Logical Data Independence

- Changes in conceptual model do not affect the external views
- Immunity of external level from changes at conceptual level

Types of changing

- Adding a new file/index etc.
- Adding a new field in a file
- Changing type/size
- Deleting an attribute

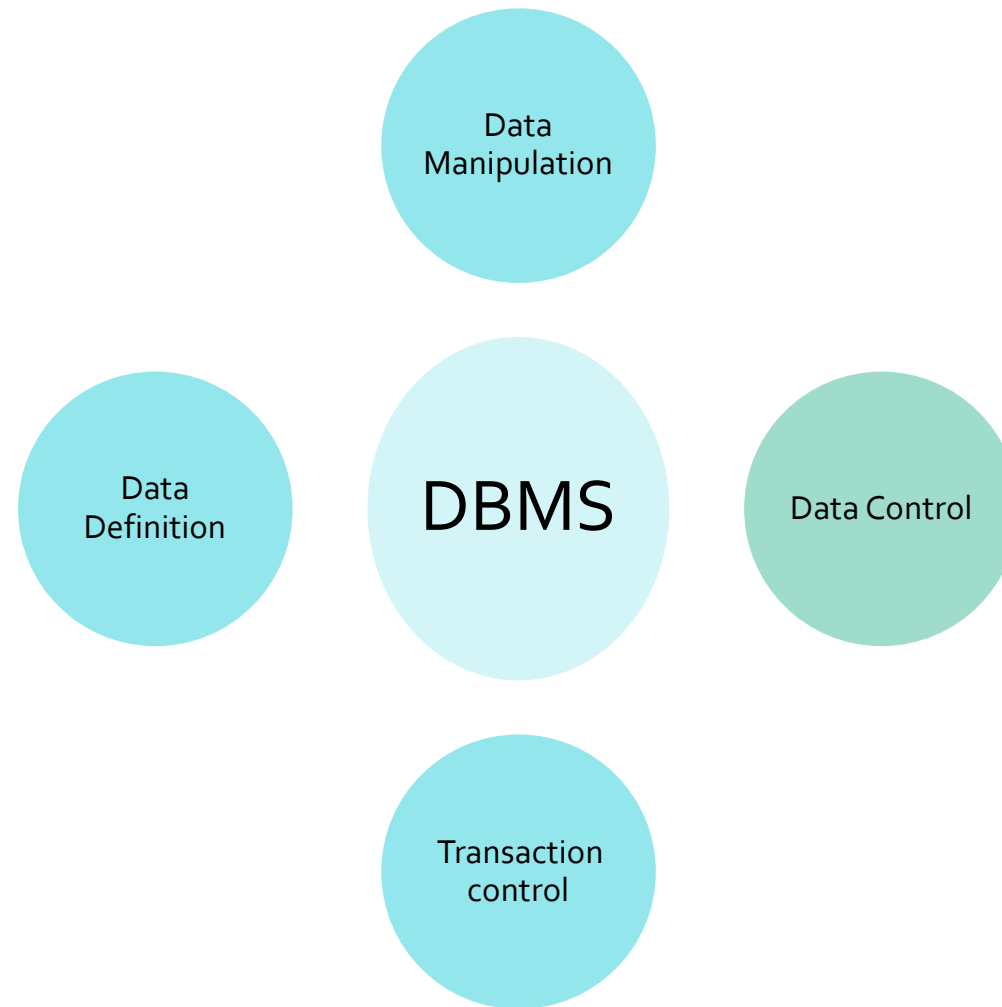
Physical Data Independence

- Changes in the internal model do not affect the conceptual model
- Immunity of Conceptual level from changes at Internal level

Types of changing

- Changing file organization
- Index implementation, hash, tree etc.
- Changing storage medium

Database offers



Database languages

Data Definition Language (DDL)

Used for specifying the database schema including create tables, schema, indexes, constraints etc. in database.

Data Manipulation Language (DML)

Used for accessing and manipulating data in a database.

Data Control language (DCL)

Used for granting and revoking user access on a database.

Transaction Control Language(TCL)

The changes in the database that we made using DML commands are either performed or rollback using TCL.