

In the ANSI/SPARC three level database model, the external view is best described by which one of the following options:

- a. It is dependent on the underlying DBMS product used (e.g. Oracle, MySql).
- b. **It is the place where the users interface to the DBMS.** ANSWER
- c. It is the place where the storage structures link to the database.
- d. It is not part of the model.

3. When implementing a sorted file-based solution to storing and accessing data, which is the least efficient method to handling the addition of additional records

- a. Placing extra empty records throughout the file to hold insertions
- b. Using an overflow file for inserted records
- c. **Re-sorting the file after every insertion** ANSWER
- d. Appending inserted records to the end of the sorted records

Which is an advantage of the Three-Tier Client-Server Architecture

- a. Supports a 'fat' client that supports sophisticated GUI
- b. Creates a local copy of the database for efficient processing
- c. **Maps naturally to the web.** ANSWER
- d. Allows users to perform their own maintenance

Which is not a risk of the cloud computing service model?

- a. Network dependency
- b. System dependency
- c. **Lack of scalability** ANSWER
- d. Lack of control
- e. lack of information about processing transparency

π is the projection operator. σ is the selection operator. R is a relation. Select the relational expression that could possibly return the following result:

a	c
1	2
2	3

- a. $\sigma_{a < c} (\pi_{a, c} R)$ ANSWER

Identify the SQL command which will most likely **return the date** of all orders that have **completed** and are made of **Red or Blue** coloured materials.

Customer(Cust_no, Name, Address)
Order(Order_no, Cust_no, C_Date, Completed)
Make(Order_no, Maker_no, Dress_style, Colour)

SELECT **C_Date** ANSWER
FROM order, Make
WHERE Order.Order_no = Make.Order_no
AND completed = 'Y'
AND colour = 'Red'
OR colour = 'Blue'

18. Consider the schema in Question 17. Write the letter for the matching type on the lines provide beside each example. Use each letter exactly once.

- b** Name, Address in Customer
- d** Cust_No, Name in Customer
- c** Cust_No in Order
- a** Cust_No in Customer
- a. Primary Key
- b. Composite Key
- c. Foreign Key
- d. Superkey

In order for tables to be union compatible, they must

- a. Huh? What's union compatible?
- b. have the same number of attributes with the same names in any order
- c. have the same number of attributes with the same names in the same order
- d. have the same number of attributes with the same data types in any order
- e. **have the same number of attributes with the same data types in the same order** ANSWER

Which is not an advantage of a DBMS over file-based systems:

- a. Control of data redundancy
- b. Improved data consistency
- c. Easier data sharing.
- d. Improved security.
- e. **Improved performance.** ANSWER

a. **Logical** data independence refers to the immunity of the external schemas to changes in the conceptual schema.

b. **Physical** data independence refers to the immunity of the conceptual schema to changes in the internal schema.

c. **Conceptual** modeling is the process of constructing a detailed architecture for a database that is independent of implementation details.

d. The system **Catalogue** contains "data about the data" or metadata.

Which is not a cloud computing service model?

- a. DaaS Data as a Service
- b. SaaS Software as a Service
- c. PaaS Platform as a Service
- d. IaaS Infrastructure as a Service
- e. **They are all well-known models** ANSWER

Which is not a benefit of cloud computing?

- a. **Improved control** ANSWER
- b. Cost reduction
- c. Faster development
- d. Improved reliability
- e. Improved access to new technologies

15. In order to use a join two relations on attributes that have the **same values** but **different names** in the two tables (e.g., hotelID in relation1 and hotelNum in relation2), we need to use

- a. Theta Join
- b. **Equijoin** ANSWER
- c. Natural join
- d. Outer Join
- e. Inner Join

FOREIGN KEY Prog_Code REFERENCES P ON DELETE <constraint>

- a** CASCADE a. Delete any tuples with Prog_Code='0001' from S
- d** SET NULL b. Prevent the deletion of the tuple from P
- b** NO ACTION c. Set the Prog_Code attribute in S to a default value
- c** SET DEFAULT d. Set the Prog_Code attribute in S to NULL

19. Referential integrity, when enforced, ensures that

- a. every record in the referenced table is referred to by a record in another table
- b. **records in the referenced table can never contain a null value for the attribute that is used as a foreign key in a referring table** ANSWER
- c. records in the referenced table may not contain a null value for any attribute
- d. records in the referencing table may never be deleted
- e. records in the referenced table may never be deleted

In order for a view to be updatable, the view must be

- a. **based on just one table** ANSWER
- b. based on no more than two tables
- c. union compatible
- d. Huh? Views are never updatable
- e. Huh? Views are always updatable

In relational algebra, $R \bowtie_{(condition)} S$ can be rewritten as:

$\sigma_{(condition)} (R \times S)$

THETA JOIN = a. The most general type of join.

EQUIJOIN = b. Joins attributes with the same values

NATURAL JOIN = c. Joins attributes with the same name and same values.

OUTER JOIN = d. Displays tuples in result with no matching values in other table.

ANSI-SPARC Three-Level Architecture

- **External Level**
 - Users' view of the database.
 - Describes that part of database that is relevant to a particular user.
- **Conceptual Level**
 - Community view of the database.
 - Describes what data is stored in database and relationships among the data.
- **Internal Level**
 - Physical representation of the database on the computer.
 - Describes how the data is stored in the database.

Logical Data Independence

- Refers to immunity of external schemas to changes in conceptual schema.
- Conceptual schema changes (e.g. addition/removal of entities).
- Should not require changes to external schema or rewrites of application programs.

Conceptual schema is the core of a system supporting all user views.

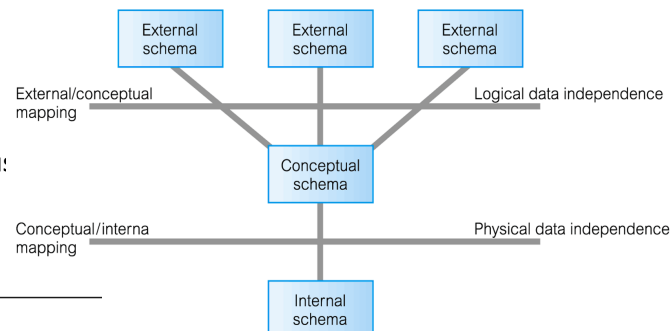
Should be complete and accurate representation of an organization's data requirements.

Conceptual modeling is process of developing a model of information u: that is independent of implementation details.

Result is a conceptual data model.

Physical Data Independence

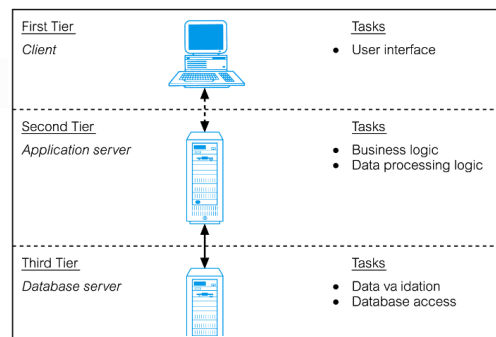
- Refers to immunity of conceptual schema to changes in the internal schema.
- Internal schema changes (e.g. using different file organizations, storage structures/devices).
- Should not require change to conceptual or external schemas.



Three-Tier Client-Server

Advantages:

- 'Thin' client, requiring less expensive hardware.
- Application maintenance centralized.
- Easier to modify or replace one tier without affecting others.
- Separating business logic from database functions makes it easier to implement load balancing.
- Maps quite naturally to Web environment.



Benefits of Cloud Computing

Cost-Reduction: Avoid up-front capital expenditure.

Scalability/Agility: Organisations set up resources on an as-needs basis.

Improved Security: Providers can devote expertise & resources to security; not affordable by customer.

Improved Reliability: Providers can devote expertise & resources on reliability of systems; not affordable by customer.

Access to new technologies: Through use of provider's systems, customers may access latest technology.

Superkey Relational Keys

- An attribute, or set of attributes, that uniquely identifies a tuple within a relation.

Candidate Key

- Superkey (K) such that no proper subset is a superkey within the relation.
- In each tuple of R, values of K unique identify that tuple (uniqueness).
- No proper subset of K has the uniqueness property (irreducibility).

Primary Key

- Candidate key selected to identify tuples uniquely within the relation.

Alternate Keys

- Candidate keys that are not selected to be a primary key.

Foreign Key

- Attribute, or set of attributes, within one relation that matches the candidate key of some (possibly same) relation.

Entity Integrity

- In a base relation, no primary key attribute can be null.

Referential Integrity

If a foreign key exists in a relation, either the foreign key value must match a candidate key value of some tuple in its home relation or the foreign key value must be wholly null.

General Constraints

- Additional rules specified by users or database administrators that define or constrain some aspect of the enterprise

SELECT Statement - Grouping

All column names in SELECT list must appear in GROUP BY clause unless name is used only in an aggregate function.

If WHERE is used with GROUP BY, WHERE is applied first, then groups are formed from remaining rows satisfying predicate.

```
CREATE TABLE Staff (
    staffNo char(4),
    fName varchar(10) NOT NULL,
    lName varchar(15) NOT NULL,
    position varchar(10) NOT NULL,
    sex char(1) NOT NULL,
    DOB datetime NOT NULL,
    salary decimal(8,2) NOT NULL,
    PRIMARY KEY (staffNo),
    branchNo char(4) REFERENCES Branch(branchNo),
    CHECK (sex IN ('M','F')),
    CHECK (staffNo >= 'S[A-Z]0' AND staffNo <= 'S[A-Z]999'),
    CHECK (DOB BETWEEN '1900-01-01' AND CURDATE())
)
```

Branch			
Attributes			
branchNo	street	city	postcode
B005	22 Deer Rd	London	SW1 4EH
B007	16 Argyll St	Aberdeen	AB2 3SU
B003	163 Main St	Glasgow	G11 9QX
B004	32 Manse Rd	Bristol	BS99 1NZ
B002	56 Clover Dr	London	NW10 6EU

Staff							
staffNo	fName	lName	position	sex	DOB	salary	branchNo
SL21	John	White	Manager	M	1-Oct-45	30000	B005
SG37	Ann	Beech	Assistant	F	10-Nov-60	12000	B003
SG14	David	Ford	Supervisor	M	24-Mar-58	18000	B003
SA9	Mary	Howe	Assistant	F	19-Feb-70	9000	B007
SG5	Susan	Brand	Manager	F	3-Jun-40	24000	B003
SL41	Julie	Lee	Assistant	F	13-Jun-65	9000	B005

- Theta Join – Join on predicate
- Equijoin – Theta with predicate is = (equality)
- Natural – Equijoin but same name col., common cols deleted
- Outer – Natural but keep rows from one that don't match, set null val
- Semi – Join on predicate, but keep only attributes of one relation

- RequiredData – NOT NULL
- Domain Constraint – CHECK (student_type in ('u','g'))
- Entity – Primary key must be unique/non-null
- Referential – Foreign key, if R's foreign key(of A) is not null, then A must hold that value somewhere
- General Constraints – CHECK SOME OTHER ASSERTION (num rows < 30)

HAVING clause

HAVING clause is designed for use with GROUP BY to restrict groups that appear in final result table.

Similar to WHERE, but WHERE filters individual rows whereas HAVING filters groups.

Column names in HAVING clause must also appear in the GROUP BY list or be contained within an aggregate function.

```
SELECT branchNo,
COUNT(staffNo)
AS myCount,
```

```
SUM(salary) AS mySum
FROM Staff
GROUP BY branchNo
HAVING COUNT(staffNo) > 1
ORDER BY branchNo;
```