

What is Database Management System?
It's just a piece of software / collection of software or programs designed to assist in maintaining & utilizing large collection of data.

Software VS data

Something that the computer executes & processed by its system
It is what the software process.

DBMS these days maintain large volume of data.

- Structured
- Multimedia (text, images, audios)
- it doesn't forget things.

Future of DBMS will most likely be biological

RNA & DNA are nature's databases.

Using CRISPR, one can edit DNA strands, & then

store our data

DBMS is a middleware between application programs & storage devices; assuring their data is stored without loss.

DBMS introduced SQL: Structured Query language.

DBMS Advantages:
- Data independence
- Data integrity & consistency
- Data sharing (less redundancy)
- Centralized control
- Reduce application development time

Data Models

conceptual
High-level description of data;
Designed to facilitate a conversation; a dialog.
eg: SDM, ER

logical
Everything is an excel table
eg: relational data model; SQL, relational calculus
Mathematical description of data;

physical
logical data model is implemented in some physical system: eg: MySQL, Oracle, Teradata

SDM (Semantic Data Model)

SDM is a conceptual level. (can be at the intersection of conceptual & logical)

It is a concept; to facilitate the meaning of data.

facilitate conversation between non-techie & techie.

Transaction: is a sequence of instructions that constitute a logical operation.

Properties of transaction:

- Atomicity: Collection of instructions; that are executed atomically either all of them or none of them. (execute all or nothing)

- Consistency: means transaction must transition the database from one valid state to another. (preserve correct state)

- Isolation: It can come up with a serial schedule to describe its behavior. (serialize concurrent operations)

- Durability: once a transaction commits; the system will not forget it. (retain results permanently)

SDM schema is a collection of classes

Concrete: Specific
Abstract: Generalization
Aggregate: A collection of another type of entity

Events

Points, Incidents

Duration: begin-end

Names

Primitives such as

STRINGS

Class Attributes

- Member attributes: link the member to one or more entities in the same or another class.

- Class determined attribute: Associated with the whole class & has the same value for all the members of that class.

- Class attribute: A property of a class taken as a whole.

Base class is independent of other classes. In SDM it may be concrete object class, a point event class, a duration event, a name class.

It is specified as either containing duplicates or not containing duplicates. The latter model is a multi-set/bag of entities; (as they are duplicates) ∵ it doesn't have any unique identifier.

Non-base class is defined in terms of the class(es) to which it is connected.

Main types:

Subclass of a parent class; members of subclass are also members of the parent class. Members inherit all the attribute of the parent class. Subclass may add new member attributes.

Attribute values

SHIPS.name = "Bounty"

Attribute

Attribute value

Attribute is either an entity or class of entities.

If the attribute value is unknown:

Think of true as 1; False as 0 & Unknown as 0.5

X Y Value

0 1 False

1 0 False

0.5 0 Unknown

1 0.5 Unknown

1 1 True

Attribute type specifies the kind of relationship the attribute value have with the entity.

component

Physical part of an object

participant

entity that plays a role in an event

property of an Attribute

attribute that provides further information

SDM & Relational data model are 2 different things

deals with meaning of data

deals with the representation of data

ER Model is based on real world that consists of entities & relationships.

Entities: objects that exists & are distinguishable from one another; a set of attributes.

Relationship: 2 or more entities may participate in a relationship

There are times when one may want to specify that all members of an entity set MUST participate in a relationship.

= representation of

First Normal Form: All occurrences of record (row) must contain the same no. of fields.

e.g. employee table with 5 columns & 1000 rows; each row must have 5 attributes.

Second & third Normal Form:

→ it is violated when a non-key attribute is a fact about a subset of the key

→ it is violated when a non-key attribute is a fact about another non-key attribute.

Five Normal Forms reduce a conceptual model to a logical model (SDM, ER → RDM)

It is important because information might be duplicate & you don't want data inconsistencies & anomalies & to prevent loss of information.

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