
بسم الله الرحمن الرحيم

Database Systems
Lecture 6

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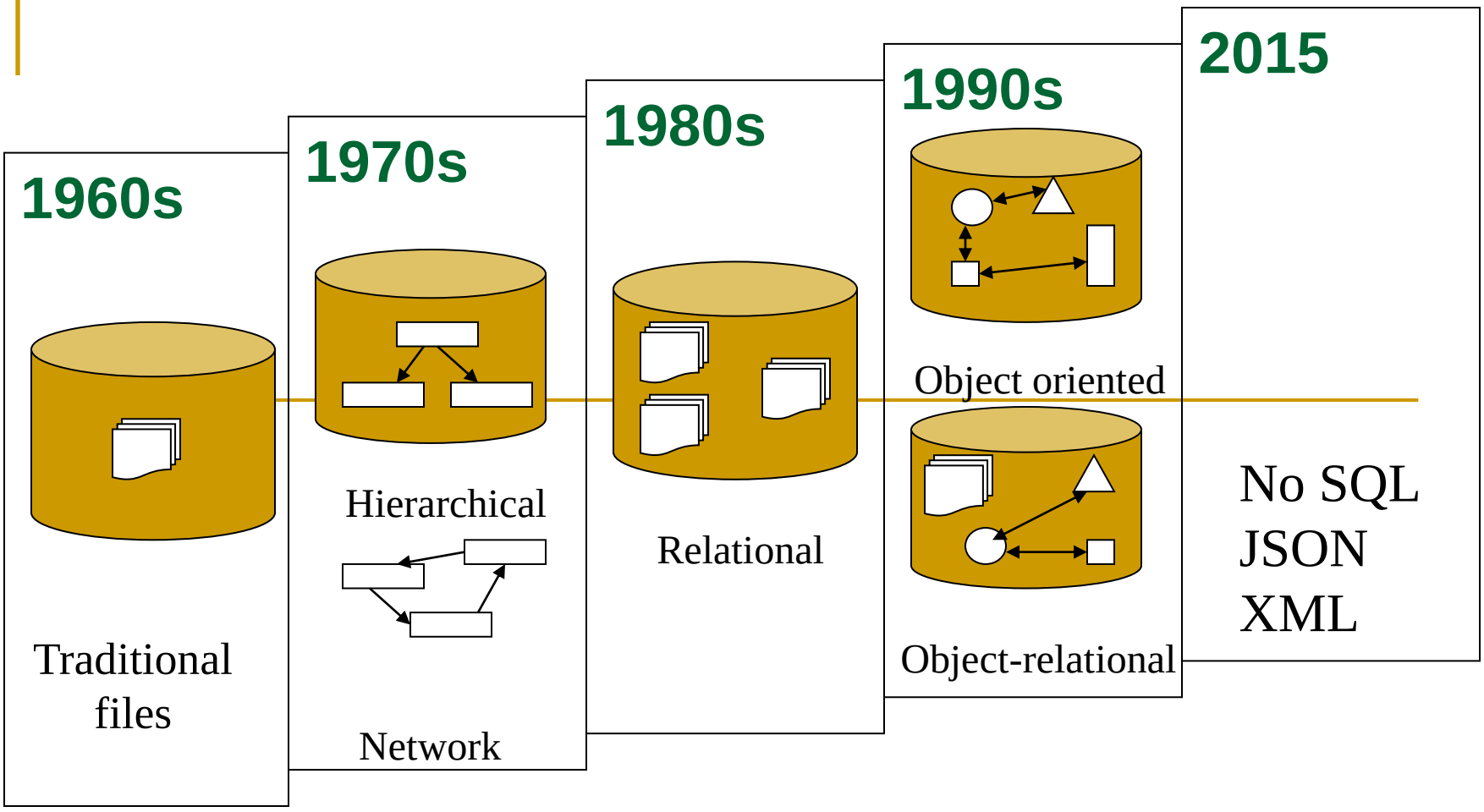
Lecture 6
Implementation Database Models
Hierarchical ,Network and Relational Data Model

Evolution of Database Modals



Implementation Database Models

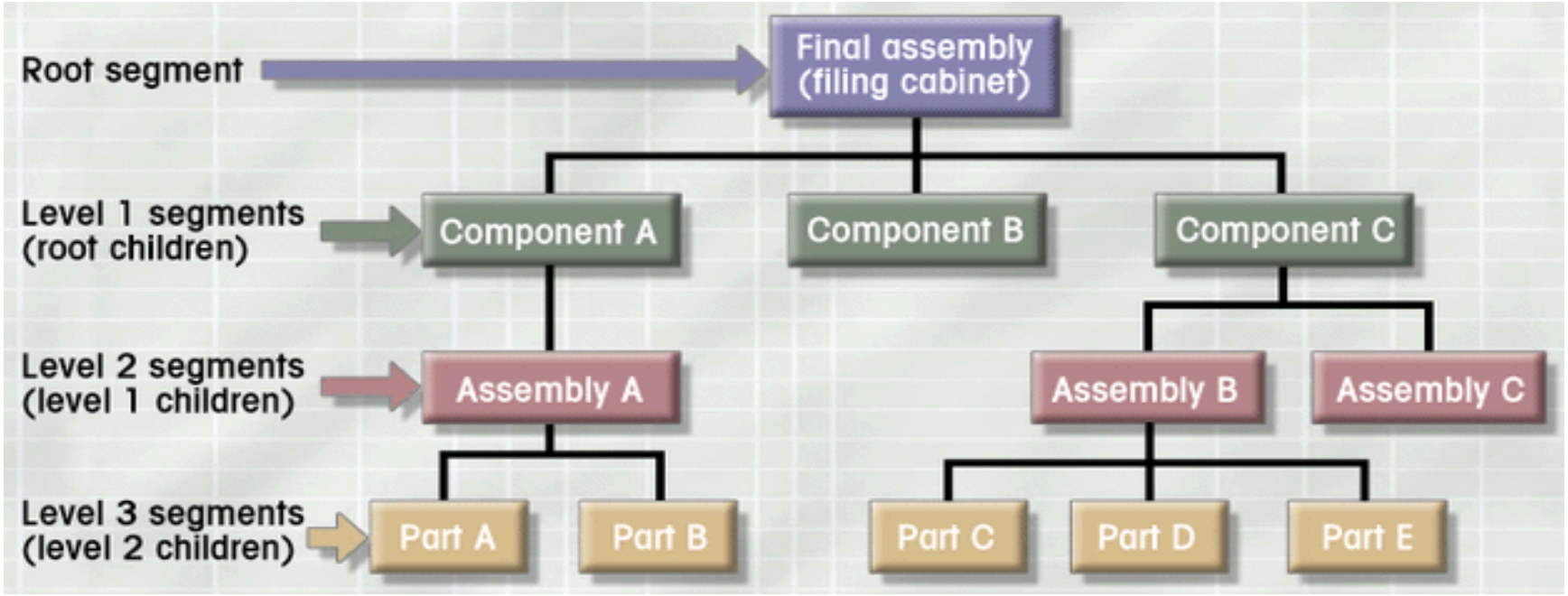
- **Implementation Database Models**
  - Hierarchical
  - Network
  - Relational
  - Object-Oriented

Hierarchical Database Model (HDBM)

- Logically represented by an upside down tree
  - Each parent can have many children (segment linkage)
  - Each child has only one parent
  - A single table acts as the **"root"** of the database from which other tables **"branch"** out.
  - **Relationships** in such a system are **children and parents.**
  - Parents and children are tied together by **links** called **"pointers**

Hierarchical Database Model

- Logically represented by an upside down tree
  - 1:M relationship



Hierarchical Database Model

- Hierarchical path (beginning from left)
- Left-list hierarchical path, or preorder traversal, or hierarchical sequence

Final assembly->Component A->Assembly A-> -> Part A ->Part B -> Component B -> Component C – Assembly B -> Part C ->Part D

- Re-list sequence, if the segment is frequently accessed
- Bank systems commonly use HD model

Hierarchical Database Model

- Bank systems commonly use the HDBM
  - customer account can be subject to many transactions (1:M relationship)
  - Relationship is fixed (debiting and crediting)
  - Frequently access large amount of transactions

Hierarchical Database Model

- Advantages
  - Conceptual simplicity: relationship between layers is logically simple; design process is simple
  - Database security: enforced uniformly through the system
  - Data integrity
  - Data independence
  - Efficiency in 1:M relationships and when uses require large numbers of transactions
  - Dominant in 1970s , when we used mainframe system with large databases

Hierarchical Database Model

- Disadvantages
  - Complex implementation: physical data storage characteristics; database design is complicated
  - Difficult to manage and lack of standards
  - Lacks structural independence
  - Applications programming and use complexity (pointer based)
  - Implementation limitations, i.e. especially it only handle 1:M type of model

Network Database Model (NDBM)

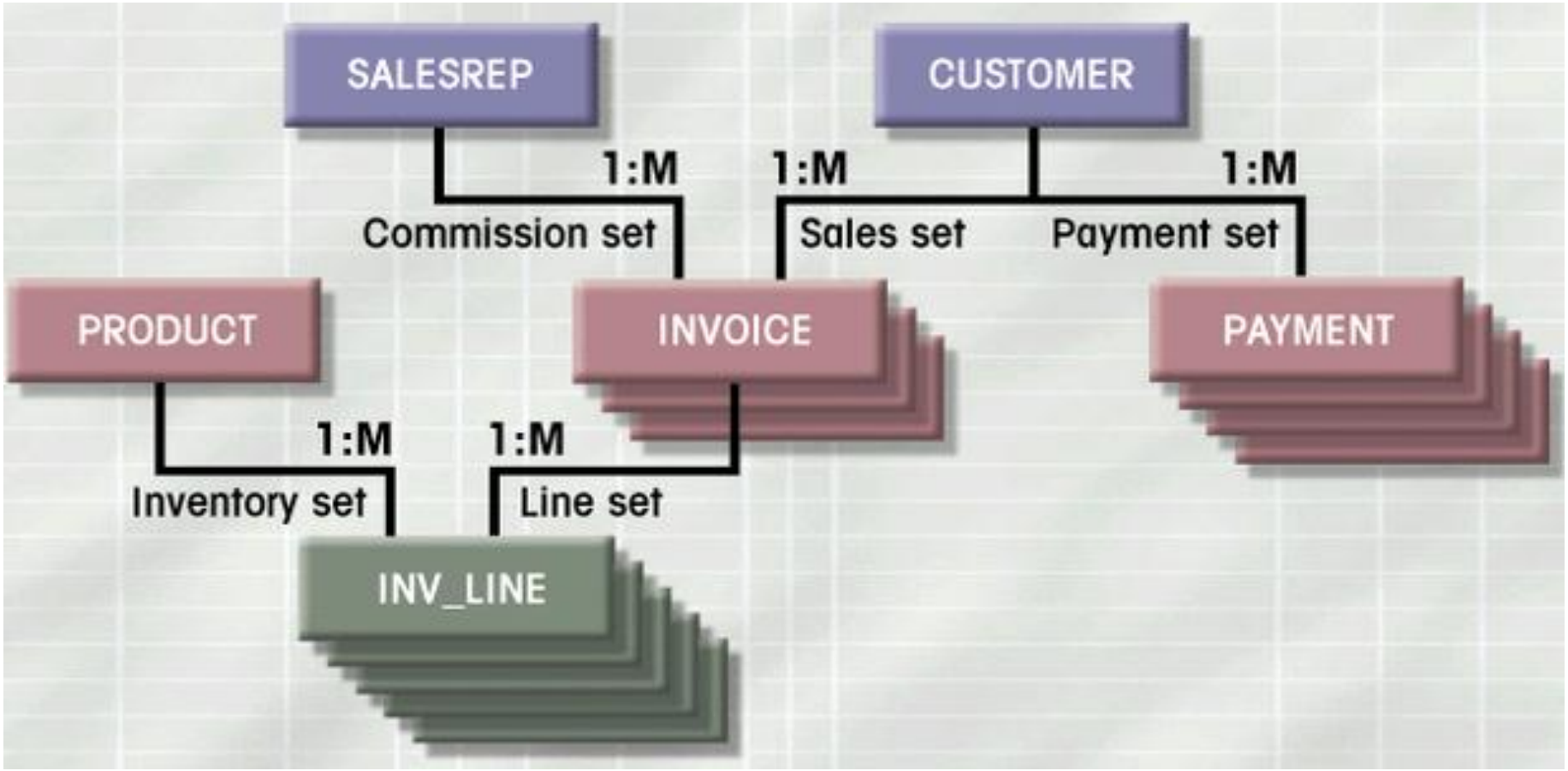
- Each record can have multiple parents
  - Called by Database Task Group (DBTG) to define standards
  - Three crucial database components
    - Network schema: conceptual organization of the entire database
    - Subschema: portion of database as information for application programs
    - Database management language: defining data characteristics and data structure
      - Schema Data definition language (DDL): define schema components
      - Subschema Data definition language
      - Data manipulating language: manipulate data content

Network Database Model

- Each record can have multiple parents
- Introduce set to describe relationship
- Each set has owner record and member record, parallel to parent and child in HDM
  - Member may have several owners
  - One-ownership
- Hierarchical model is a subset of the network model.
- The network model uses **set theory** to provide a **tree-like hierarchy.**

Network Database Model

- Member may have several owners



Network Database Model

- Advantages
  - Conceptual simplicity, just lime HDM
  - Handles more relationship types (but all 1:M relationship)
  - Data access flexibility
  - Promotes database integrity
  - Data independence
  - Conformance to standards

Network Database Model

- Disadvantages
  - System complexity

    (Develop by the Computer programmers for the Computer Programmers rather than user)
  - Lack of structural independence