

Chapter 1 Introduction to Database Processing



DATABASE PROCESSING
Fundamentals, Design,
and Implementation, 9/e

Why Use A Database?

- The purpose of a database is to help people and organizations keep track of things
- Problems of using list to store data
 - Data inconsistencies
 - Data privacy: The departments want to share some, but not all, of their data
- Databases store data in single-theme tables
- Tables are related through primary and foreign keys

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Components of A Database System

Figure 1.6 Components of a Database System



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Application Programs

- Functions:
 - Create and process forms
 - Create and transmit queries
 - Create and process reports
 - Execute application logic
 - Control application

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DBMS

- DBMS: Database Management System
- Functions:
 - Create database, tables, and supporting structures
 - Read and update database data
 - Maintain database structures
 - Enforce rules
 - Control concurrency
 - Provide security
 - Perform backup and recovery
- Example: Oracle, DB2, Microsoft Access, SQL Server

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Database

- Database is a self-describing collection of related records or tables
- Components:
 - User Data
 - Metadata: data about the structure of a database
 - Indexes and related structures
 - Stored procedures: program modules stored within the database
 - Triggers: a procedure that is executed when a particular data activity occurs
 - Application metadata: data describing application elements such as forms and reports

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Types of Database

- Personal database
 - 1 user; < 10 MB
- Workgroup database
 - < 25 users; < 100 MB
- Organizational database
 - Hundreds to thousands users
 - >1 Trillion bytes, possibly several databases

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Example: Organizational Database

Figure 1.15 Organizational Database System

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Building a Database System

- 3 Phases
 - Requirements phase: a data model is developed
 - Data model is a logical representation of the database structure
 - Design phase: the data model is transformed into tables and relationships
 - Implementation phase:
 - Tables, relationships, and constraints are created
 - Stored procedures and triggers are written
 - The database is filled and systems are tested
- Database and its applications will be modified (through these same three phases) to meet new requirements

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Example: Data Model

Figure 1.18 Entity-Relationship Diagram for Lakeview Rentals

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Application Development

- Application development proceeds in parallel with database development

Figure 1.17 Summary of Database Development Phases

Development Phase	Database	Application
Requirements	Build data model Specify data items Define constraints and rules	Determine application requirements
Design	Tables Relationships Indexes Constraints Stored procedures and triggers	Forms Reports Queries Application code
Implementation	Create tables Create relationships Create constraints Write stored procedures and triggers Fill database Test	Create forms Create reports Create queries Write application code Test


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History of Database Processing

Figure 1.21 Summary of the History of Database Processing

Timeframe	Technology	Remarks
Pre-1968	File Processing	Predecessor of database processing. Data maintained in lists. Processing characteristics determined by common use of magnetic tape medium.
1968-1980	Hierarchical and network models	Era of non-relational database processing. Prominent hierarchical data model was DL/I, part of IBM's first DBMS called IMS. Prominent network data model was CODASYL DBTG model. IMS was most popular network DBMS.
1980 to present	Relational data model	Relational data model, first published in 1970; began to see commercial application in 1980. IBM endorsed it with DB2; other vendors followed by modifying their DBMS products or by creating new ones. Oracle achieved prominence. SQL became standard relational language.
1982	First microcomputer DBMS products	Ashton-Tate developed dBase products; Micromin created RBase, Borland followed with Paradox.
1985	Interest in object-oriented DBMS (OODBMS) develops	With advent of object-oriented programming, OODBMS were proposed. Little success commercially, primarily because advantages did not justify the cost of converting billions of bytes of organizations' data to new format. Under development today.
1991	Microsoft ships Access	Personal DBMS created as element of Windows. Gradually supplanted all other personal DBMS products.
1995	First Internet database applications	Databases become key component of Internet applications. Popularity of the Internet greatly increases need and demand for database expertise.
1997	XML applied to database processing	Use of XML solves long-standing database problems. Major vendors begin to integrate XML into DBMS products.

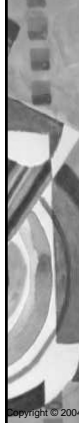
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Early Database Models

- Before mid-1960s, only sequential file processing using magnetic tape was possible
- In mid-1960s, disk storage enabled hierarchical and network database
 - IBM's DL/I (Data Language One)
 - CODASYL's DBTG (Data Base Task Group) model → the basis of current DBMSs


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The Relational Model

- E.F. Codd introduced the relational model in 1970
- DB2 from IBM is the first DBMS product based on the relational model
- Other DBMS based on the relational model were developed in the late 1980s
- Today, DB2, Oracle, and SQL Server are the most prominent commercial DBMS products based on the relational model

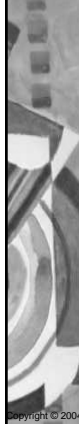
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Personal Computer DBMS

- The advent of microcomputer increases popularity of personal databases
- Graphical User Interface (GUI) make it easy to use
 - Examples of early DBMS products: dBase, R:base, and Paradox


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Object Oriented DBMS (OODBMS)

- Object-oriented programming started in the mid-1980s
- Goal of OODBMS is to store object-oriented programming objects in a database without having to transform them into relational format
- Object-relational DBMS products, such as Oracle 8i and 9i, allow both relational and object views of data on the same database
- Currently, OODBMS have not been a commercial success due to high cost of relational to object-oriented transformation

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Recent History

- Success story of the Microsoft Access
 - Microsoft Office suite and Windows integration
 - Easy-to-use and powerful personal DBMS
- Internet database
- XML and database integration

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