Chapter 1

Introduction

Ch1. Introduction

- what we will learn in this course?
  - concepts & Skills you need to make a database work
  - not how to build one, but how to set one up

Terminology

- DataBase Management System
  - 数据库管理系统，简称 DBMS
  - http://en.wikipedia.org/wiki/Database_management_system
- DataBase (数据库)
  - http://en.wikipedia.org/wiki/Database
- DataBase User (数据库用户)

Ch1. Introduction

- **DataBase Management System**

  (数据库管理系统，简称 DBMS)

  - **is a program product for keeping computerized records (on disk) about an enterprise.**

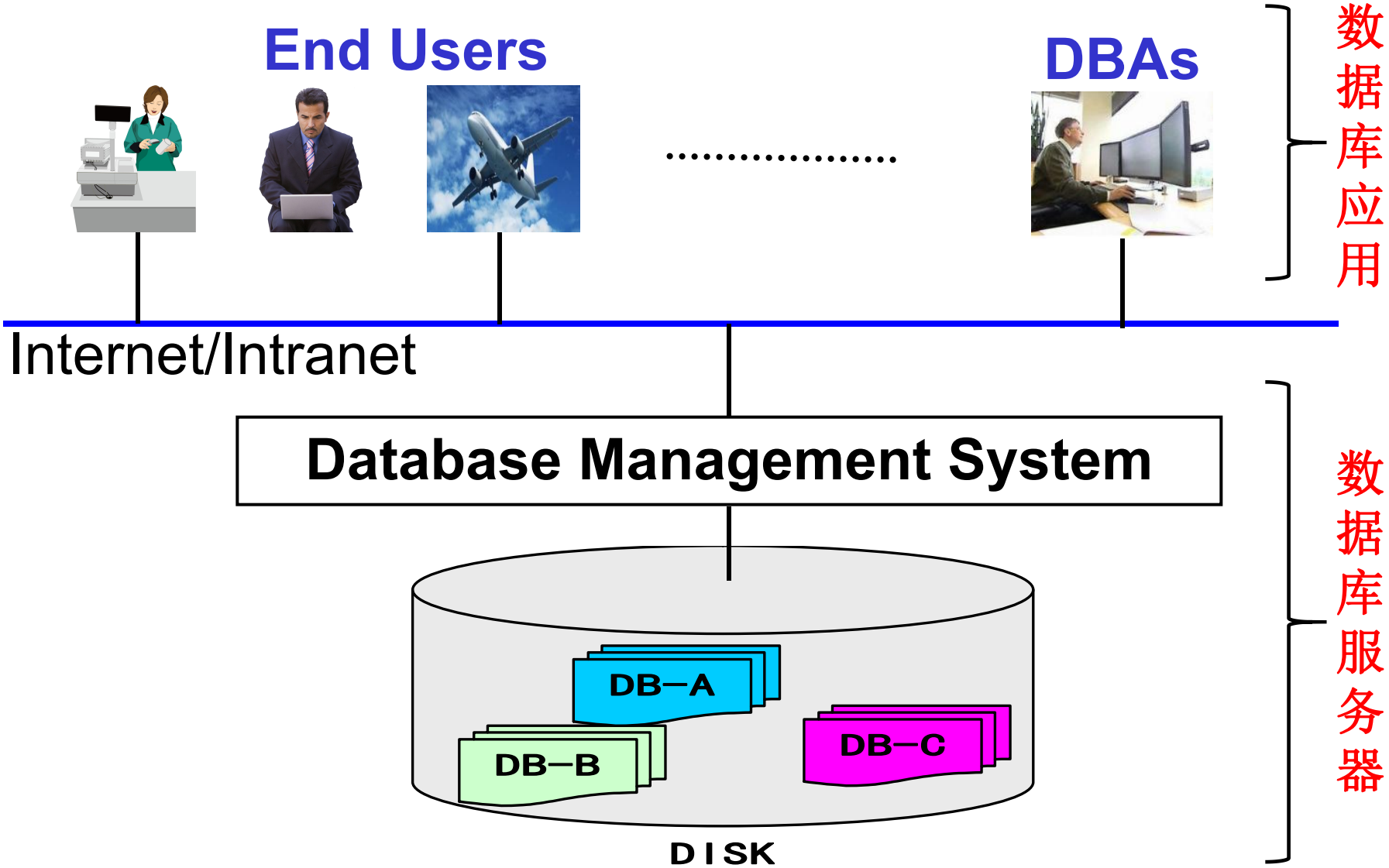
  - **Example of records**
    - **Records about sales**
    - **Records about students**
    - **Records about library inventory and loans**
    - **……**

Database

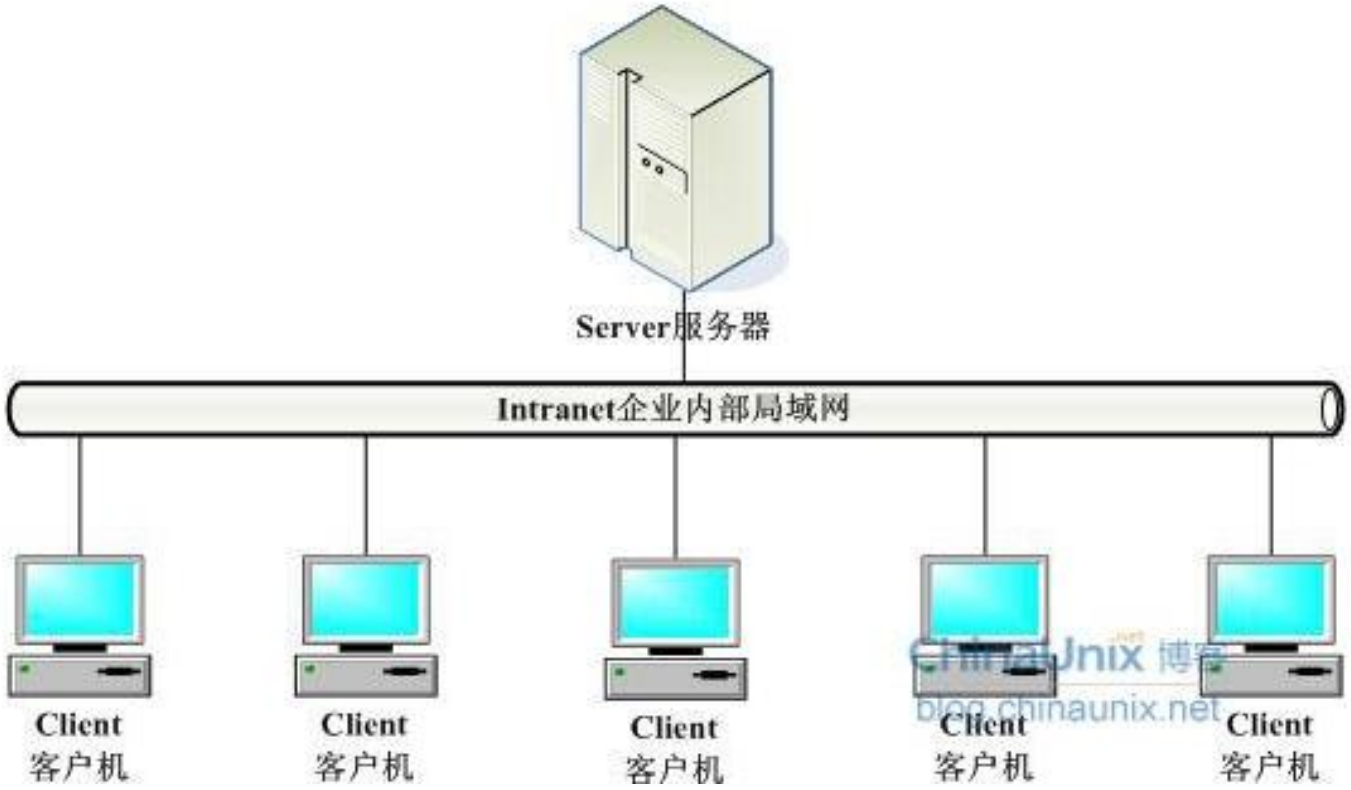
Ch1. Introduction

- Database Users
  - End users
    - Casual users √
    - Naive users
  - Application programmers √
  - DataBase Administrators (DBA) √

Architecture of Database System



Two-tier Architechture vs. Three-tier Architechture



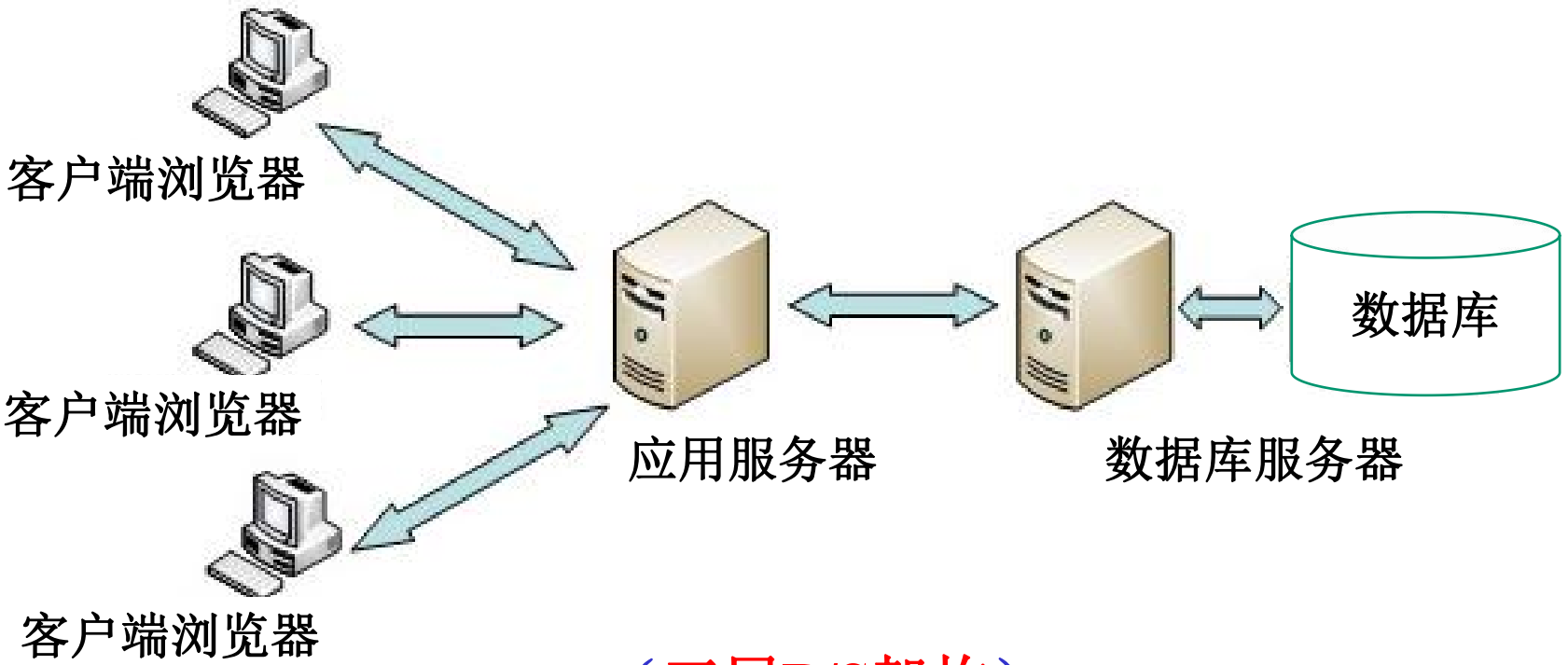
（两层C/S架构）

- 在两层C/S架构中，数据库和DBMS运行在数据库服务器中，数据库应用程序运行在客户机中，两者之间通过局域网实现数据访问。

Two-tier Architechture vs. Three-tier Architechture

- 但更多的时候，数据库服务器及其应用程序可能分布在距离遥远的不同地方（如下图所以），他们相互之间无法通过企业内部的局域网相连，只能通过更广阔的互联网来实现数据访问和数据传输。

Two-tier Architechture vs. Three-tier Architechture



（三层B/S架构）

- 在三层B/S架构中，数据库和DBMS运行在数据库服务器中，数据库应用程序运行在应用服务器（也称“Web服务器”）中，用户客户端只需要安装常用的浏览器，负责接收用户输入和结果展示。

Ch1. Introduction

- **DataBase Management System**

  (数据库管理系统，简称 DBMS)

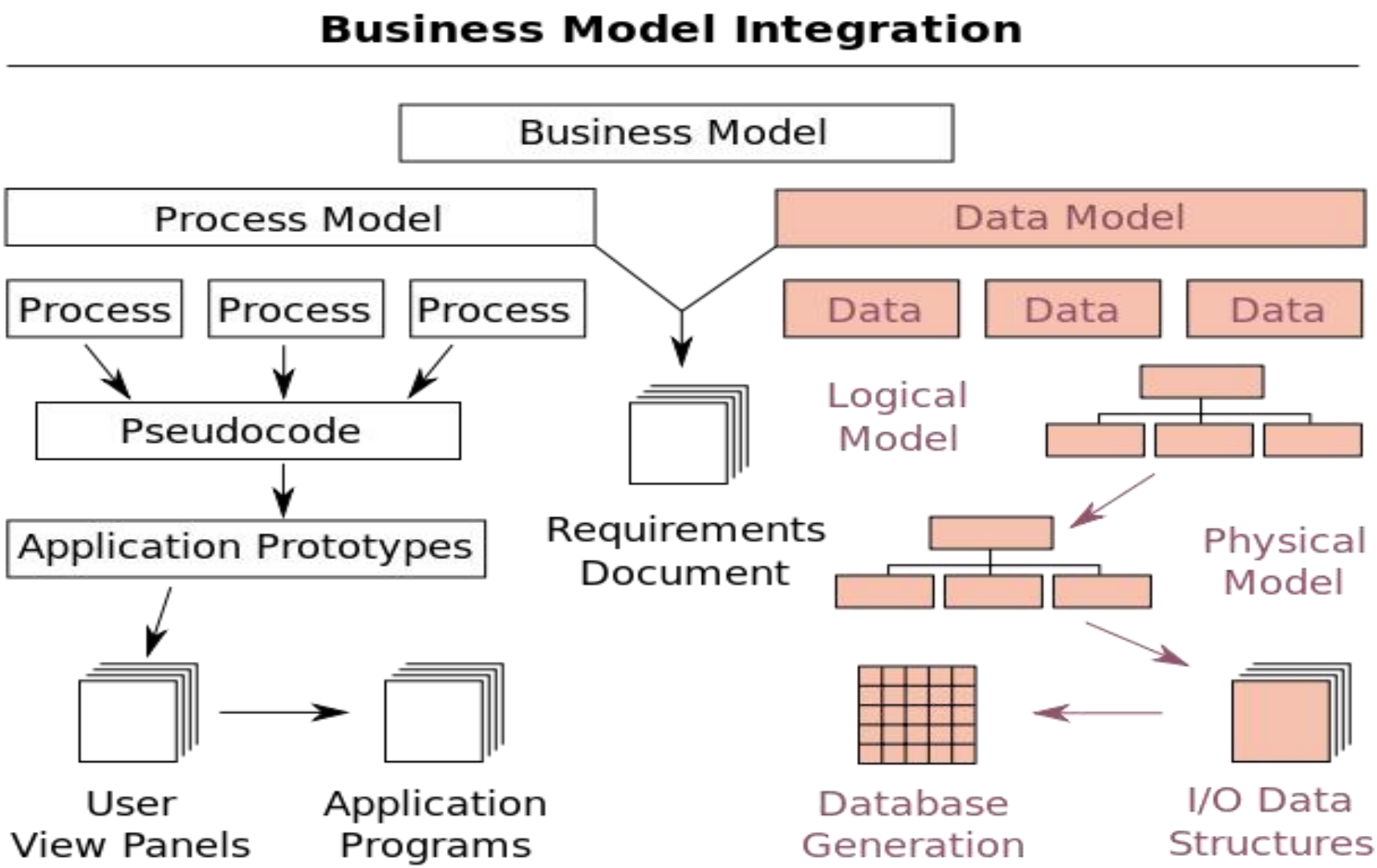
  - **is a program product for keeping computerized records (on disk) about an enterprise.**

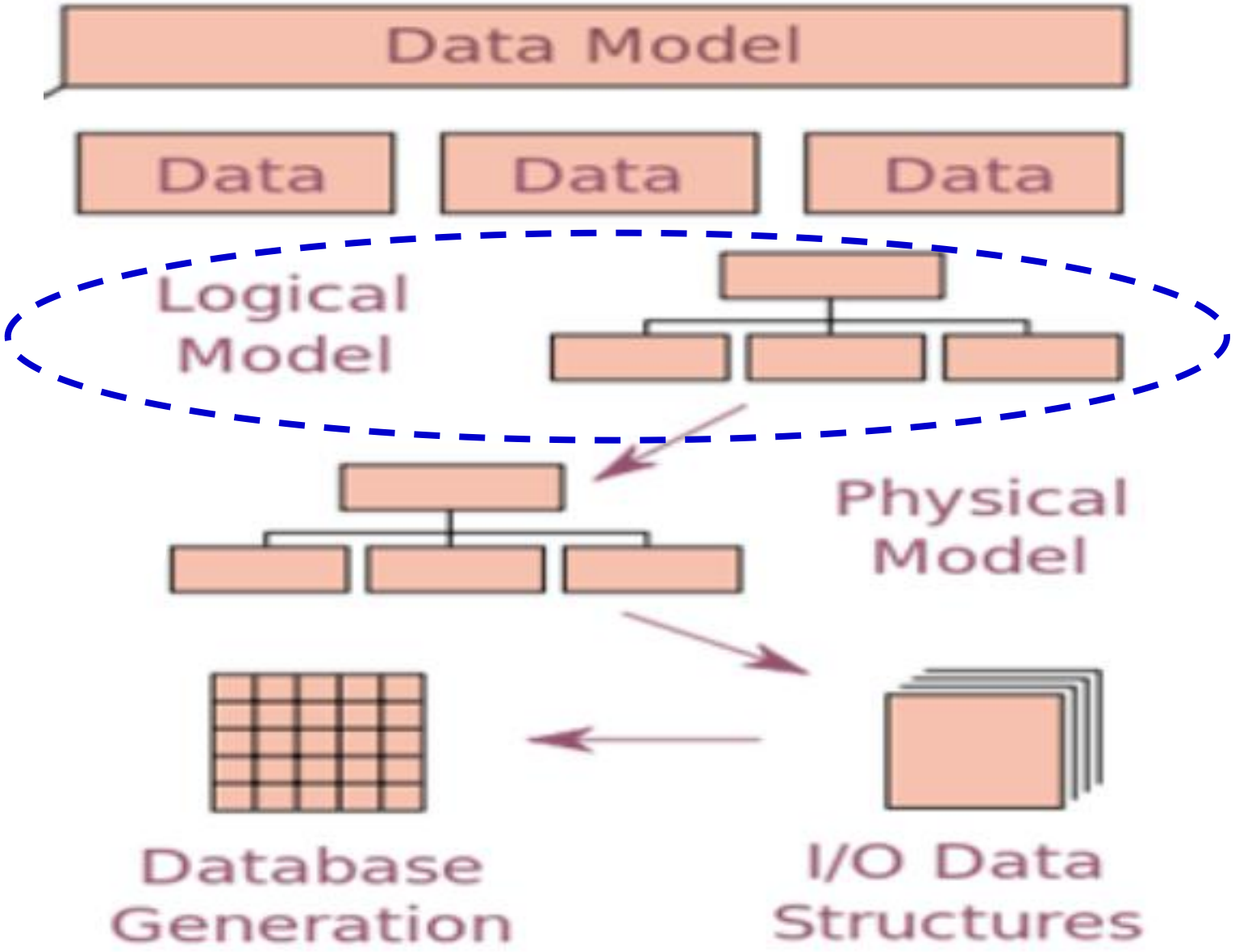
  - **Example of records**
    - **Records about sales**
    - **Records about students**
    - **Records about library inventory and loans**
    - **……**

Data Model

Database

Data Model


Business Model Integration
Business Model
Process Model
Data Model
Process
Process
Process
Data
Data
Data
Logical Model
Pseudocode
Application Prototypes
Requirements Document
Physical Model
User View Panels
Application Programs
Database Generation
I/O Data Structures


Data Model
Data
Data
Data
Logical
Model
Physical
Model
Database
Generation
I/O Data
Structures

Terminology

- **Data Model (数据模型)**
  - http://en.wikipedia.org/wiki/Data_model
  - **Hierarchical Data Model (层次数据模型)**
  - **Network Data Model (网状数据模型)**
  - **Relational Model (关系模型)**
  - **Object-Oriented Model (面向对象模型)**

Terminology

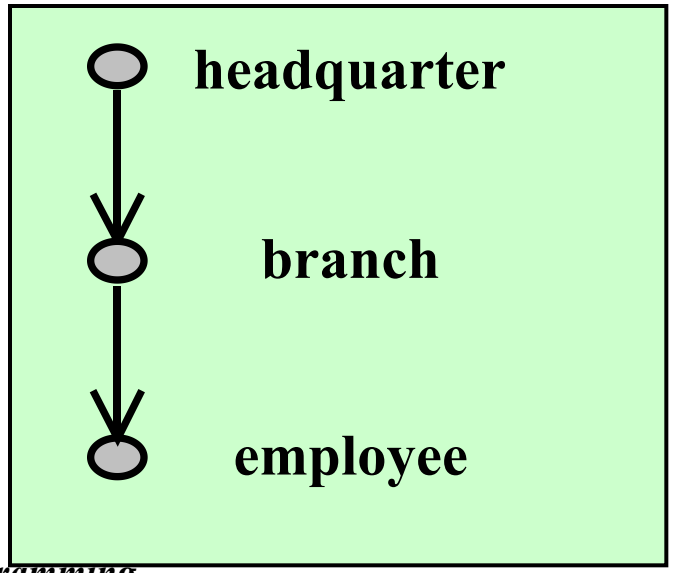
- **Data Model**

  - Hierarchical Data Model
  - Network Data Model
  - Relational Model
  - Object-Oriented Model

} **Object-Relational Model (对象关系模型)**

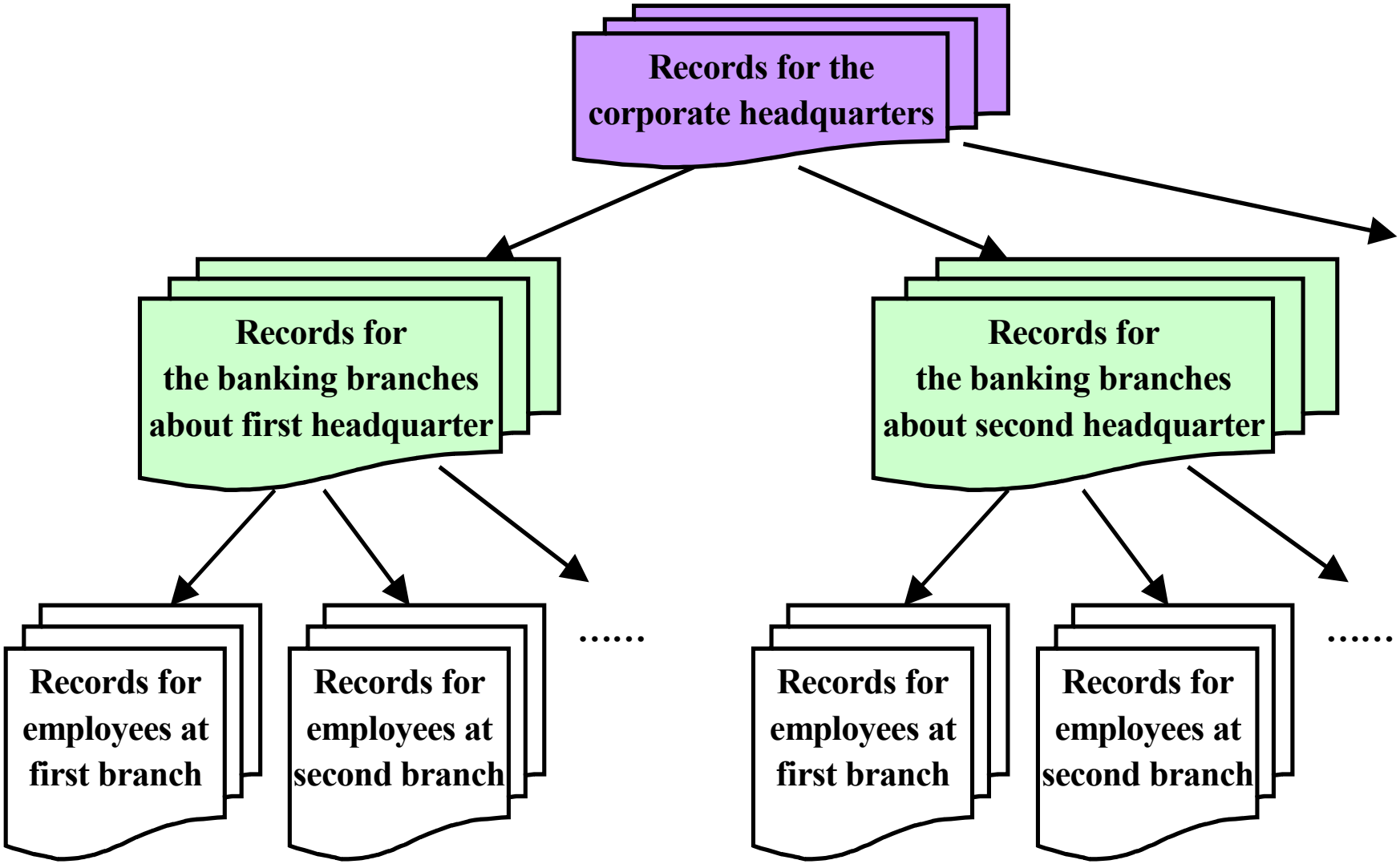
Ch1. Introduction

- History of Database Systems
  - Hierarchical Data Model (层次数据模型)
    - 1968, IMS (Information Management System)
    - Different kinds of records relate to one another in a hierarchical from.
      - A directed tree (有向树)

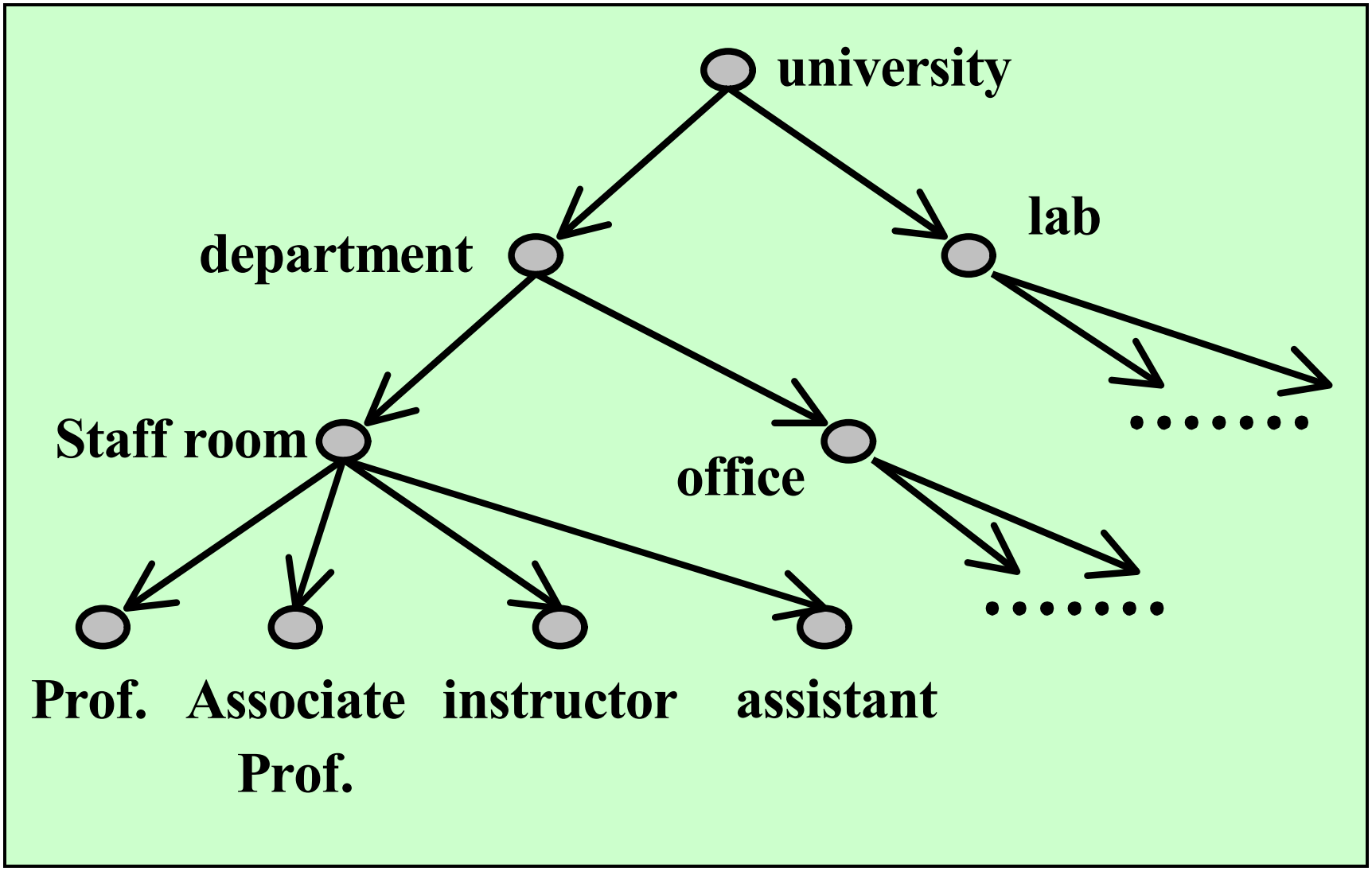


- Example: a hierarchical datamodel for a bank

a database for a bank

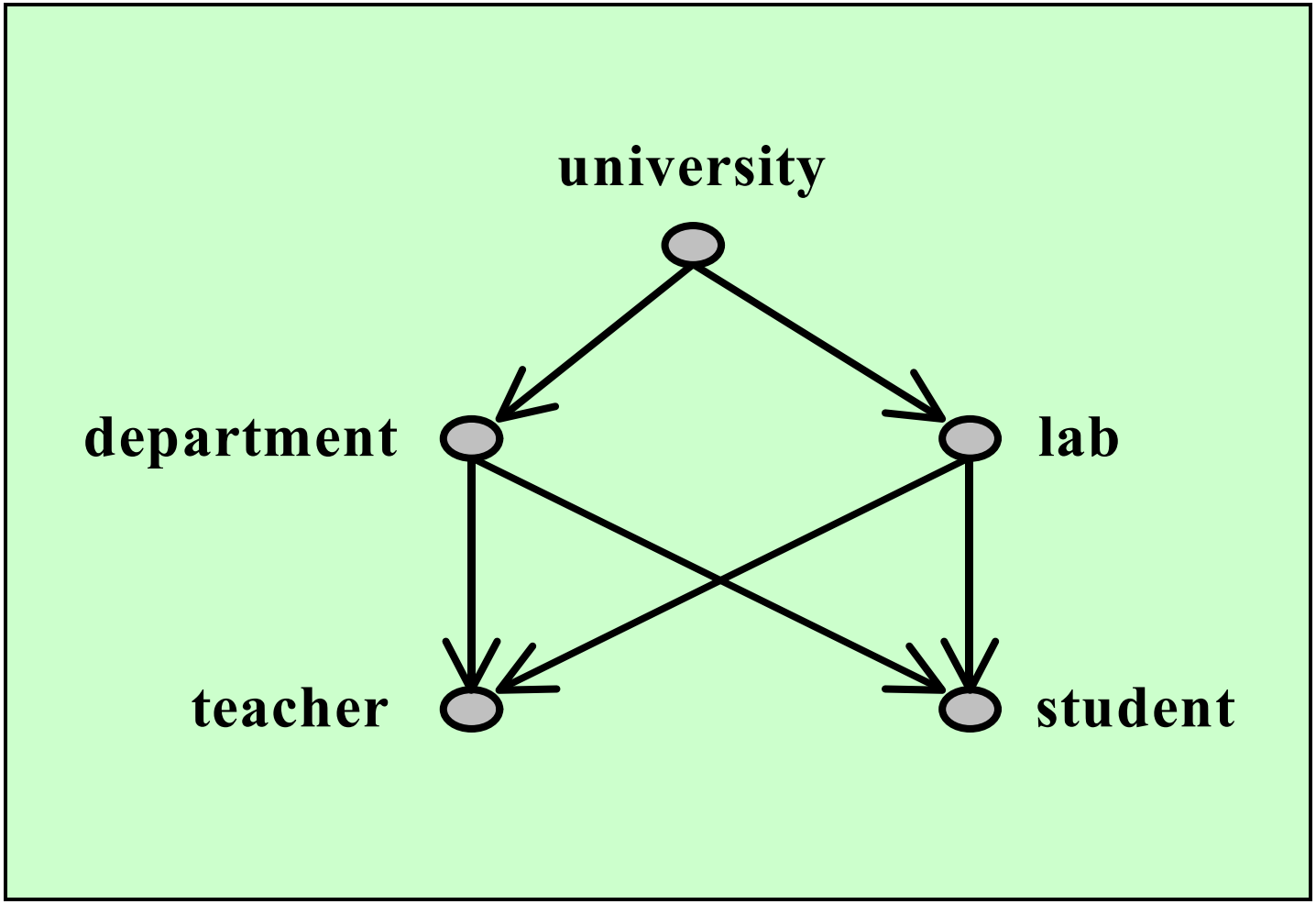


Another example of hierarchical data model

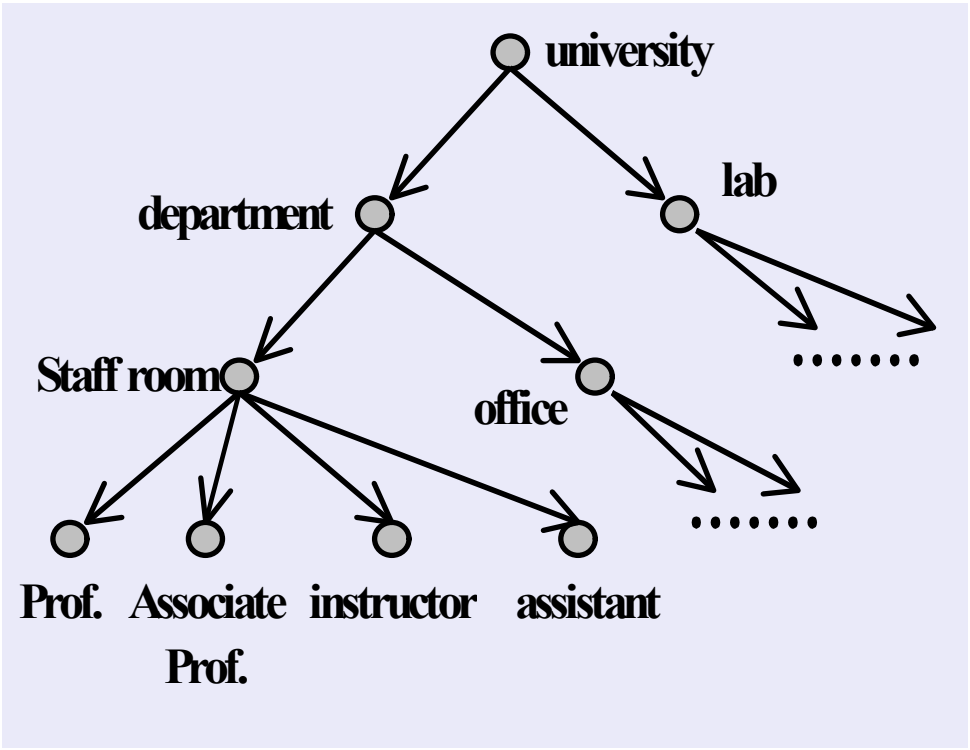


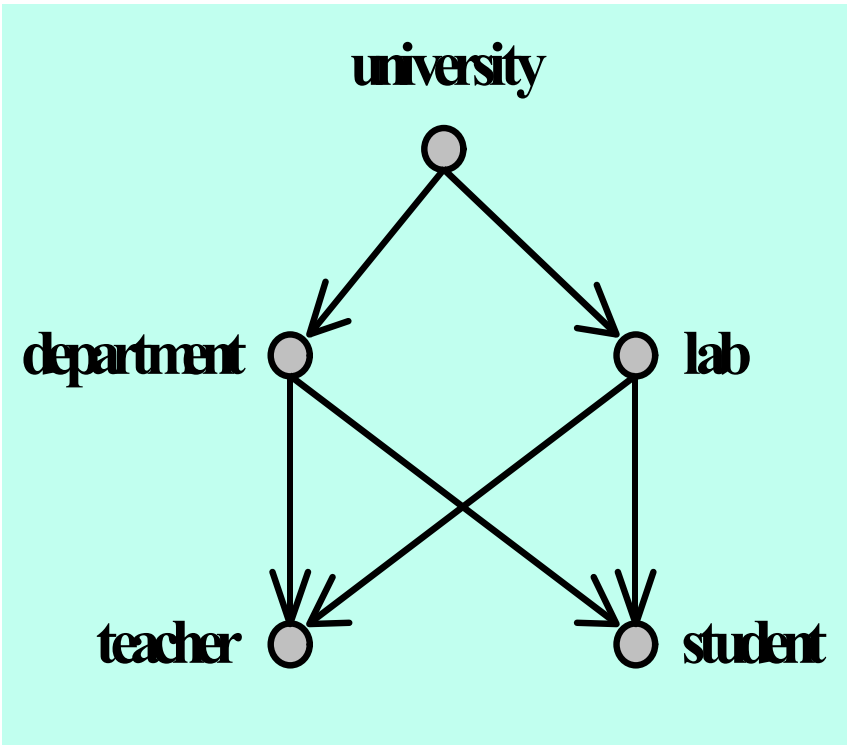
- History of Database Systems (cont.)
  - Network Data Model (网状数据模型)
    - 1970, IDMS
      - was conceived as a result of the 1971 CODASYL report
    - A generalization of the hierarchical model where a set of records in one layer might have two different containing hierarchies at the next layer up.
      - A directed graph without circuits (有向无环图)

- Example of network data model



Hierarchical Data Model vs. Network Data Model





- 第一代数据库系统

- 查理士·巴赫曼 （Charles William Bachman，73年图灵奖）
  - 数据库之父：第一个数据库系统IDS（64年）
  - 《DBTG报告》

Ch1. Introduction

- History of Database Systems (cont.)
  - Relational Model (关系模型)
    - our data will look like tables.
  - Relational Database (关系数据库)
    - All Information is represented in the form of named *table*s with labeled *column*s.
  - Relational DBMS (关系数据库管理系统)

students

sid	lname	fname	class	telephone
1	Jones	Allan	2	555-1234
2	Smith	John	3	555-4321
3	Brown	Harry	2	555-1122
5	White	Edward	3	555-3344

Figure 1.1a Relational Student Enrollment Database

students

sid	lname	fname	class	telephone
1	Jones	Allan	2	555-1234
2				
3				
5				

courses

cno	cname	croom	time
101	French I	2-104	MW2
102	French II	2-113	MW3
105	Algebra	3-105	MW2
108	Calculus	2-113	MW4

Figure 1.1a Relational Student Enrollment Database

Ch1. Introduction

students

sid	lname	fnam
1	Jones	Alla
2	Smith	Joh
3	Brown	Harr
5	White	Edwa

courses

cno	cname	cr
101	French I	2-
102	French II	2-
105	Algebra	3-
108	Calculus	2-

enrollment

sid	cno	major
1	101	No
1	108	Yes
2	105	No
3	101	Yes
3	108	No
5	102	No
5	105	No

Figure 1.1a Relational Student Enrollment Database

Ch1. Introduction

students

sid	lname	fname	class	telephone
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enrollment

sid	cno	major
1	101	No
1	108	Yes
2	105	No
3	101	Yes
3	108	No
5	102	No
5	105	No

Figure 1.1a Relational Student Enrollment Database

Ch1. Introduction

- History of Database Systems (cont.)
  - Object-Relational Model (对象关系模型)
  - Object-Relational Database
  - Object-Relational DBMS

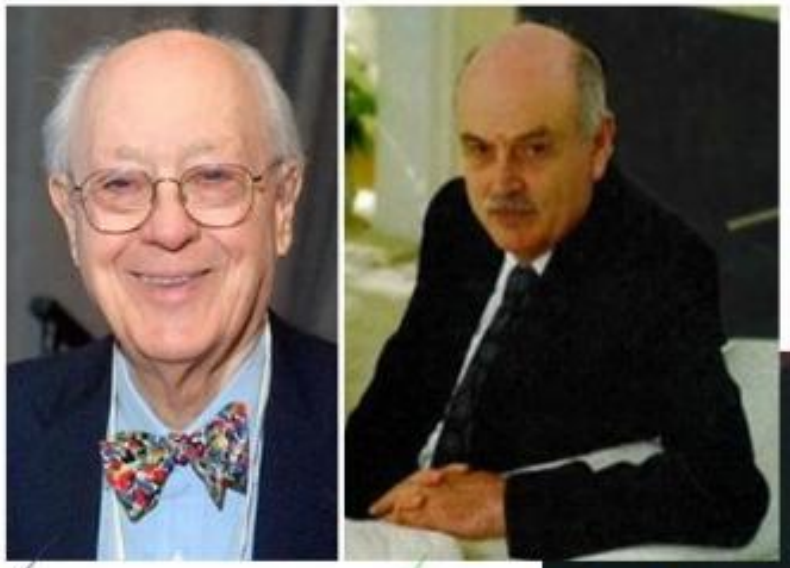
Ch1. Introduction

students

sid	name		class	telephone	enrollment	
	lname	fname			cno	major
1	Jones	Allan	2	555-1234	101	No
					108	Yes
2	Smith	John	3	555-4321	105	No
3	Brown	Harry	2	555-1122	101	Yes
					108	No
5	White	Edward	3	555-3344	102	No
					105	No

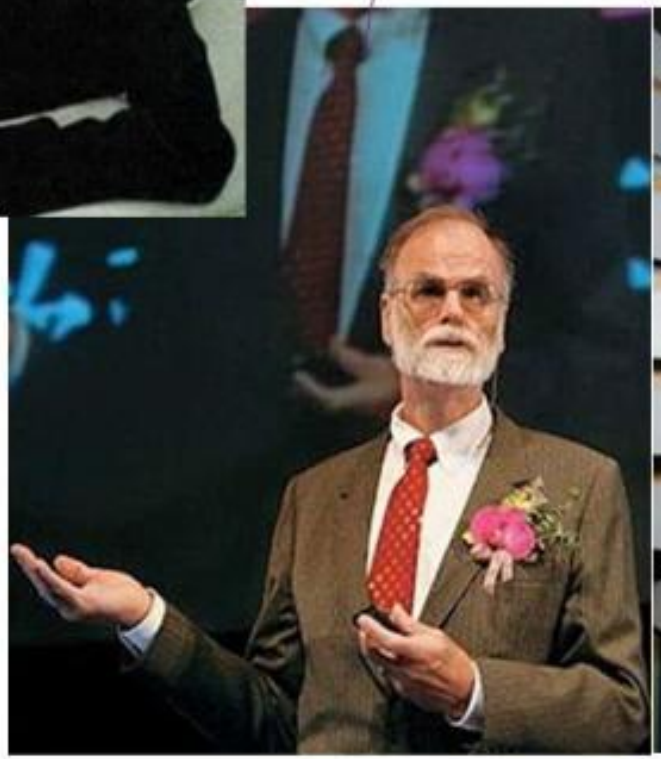
Figure 1.1b Object-Relational Student Enrollment Database

数据库界的图灵奖获得者



Jim Gray
事务处理，数据库系统实现

Michael Stonebraker
现代数据库概念与实践



Charles W. Bachman
网状数据库，奠基者兼实践者

E . F. Codd
关系数据库

数据库界的四位图灵奖 得主