CS 331
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Terminology

Database
- A structured collection of logically related data that pertains to an organization

Entity
- A “real world” object, represents as table in database

Attribute
- The field of the table, column

Record
- Tuple, an instance of the entity, row

Database Schema
- Structure of the database (intension)

Database Instance
- A snapshot of the database at some point (extension)

View
- Subset of a database

Sub-schema
- User view
ANSI-SPARC Architecture

- Three Level architecture

- implementation-independent layer to isolate programs from underlying representation

- External, conceptual and internal level

Diagram:

- External Level
- Conceptual Level
- Internal Level
- Physical Data

Department 1

Department 2

Department 3

Conceptual Schema

Internal Schema

Database
Three Level Architecture

- Separate each user’s view of the database

- Exertal level
  - users’ view (how data is viewed)

- Conceptual Level
  - mapping and independence between external and internal levels
  - Logical structure of the entire database (what data is stored and their relationships)

- Internal level
  - Physical representation (how data is physically stored)
Schema and Mapping

- Based on the levels of abstraction of the three-level architecture

- External schemas, conceptual schema, internal schema

- Conceptual-internal mapping
  - Find actual record in physical storage from a logical record

- External-conceptual mapping
External-Conceptual Mapping

Car rental Company

**Reservation**
- Car Type
- Rental Dates
- Customer Name
- Customer Phone #
- Rental Fee

**Contract**
- Customer Name, Customer Phone #
- Rental Car Type
- Rental Car Model
- Rental Dates
- Rental Fee

**Finance**
- Customer Name
- Customer Phone #
- Payment Method
- Rental Fee
- Deposit
- Balance

**Conceptual**
- Customer Name
- Customer Phone #
- Rental Car Type
- Rental Car Model
- Rental Dates
- Payment Method
- Rental Fee
- Deposit
- Balance
Conceptual-Internal Mapping

Car rental Company

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**Conceptual**

- Customer Name
- Customer Phone #
- Rental Car Type
- Rental Car Model
- Rental Dates
- Payment Method
- Rental Fee
- Deposit
- Balance

**Structural**

```c
struct Rental {
    char cname[20];
    char phone[10];
    double fee; ....
} ; index cname;
```
Data Independence

- Logical data Independence
- Physical data Independence

forms data abstraction
Data Independence

Diagram:
- External-conceptual mapping
- Conceptual-internal mapping
- Department 1 connected to Conceptual Schema
- Department 2 connected to Conceptual Schema
- Department 3 connected to Internal Schema