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Data Models

- Data Modelling
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- Quality of Designs

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❖ Data Modelling

Aims of data modelling:

- describe what information is contained in the database
  (e.g., entities: students, courses, accounts, branches, patients, ...)
- describe relationships between data items
  (e.g., John is enrolled in COMP3311, Tom's account is held at Coogee)
- describe constraints on data
  (e.g., 7-digit IDs, students can enrol in no more than 3 courses per term)

Data modelling is a design process

- converts requirements into a data model

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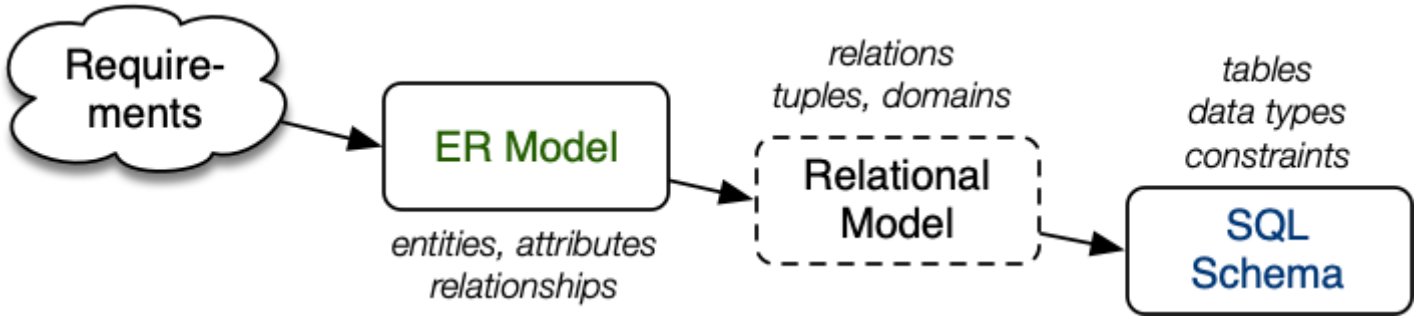
❖ Data Modelling (cont)

Kinds of data models:

- logical: abstract, for conceptual design, e.g., ER, ODL, UML
- physical: record-based, for implementation, e.g., relational, SQL

Strategy: design using abstract model; map to physical model



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❖ Some Design Ideas

Consider the following while working through exercises:

- start simple ... evolve design as problem better understood
- identify objects (and their properties), then relationships
- most designs involve kinds (classes) of people
- keywords in requirements suggest data/relationships
  (rule-of-thumb: nouns → data, verbs → relationships)
- don't confuse operations with relationships
  (operation: he **buys** a book; relationship: the book **is owned** by him)
- consider all possible data, not just what is available

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❖ Exercise: GMail Data Model

Consider the GMail system (or any other modern mail client)

Develop an informal data model for it by identifying:

- the data items involved (objects and their attributes)
- relationships between these data items
- constraints on the data and relationships

❖ Exercise: GMail Data Model (cont)

Objects in GMail data model:

```
users
        gmail-address, name, password, ...

messages
        timestamp, sender*, title, content, ...

tags
        owner, name, colour parent*

settings
        name, value, user*
```

Relationships in GMail data model:

```
recipients
        user - message
```

```
sent
        user - message

tag-hierarchy
        child-tag - parent-tag

settings
        user - setting
```

Constraints in GMail data model:

```
gmail-address values are unique

users must have a password (strong?)

every message has a sender

every message has a non-empty title and content

values for each setting are valid for that setting
```

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❖ Quality of Designs

There is no single "best" design for a given application.

Most important aspects of a design (data model):

- correctness (satisfies requirements accurately)
- completeness (all reqs covered, all assumptions explicit)
- consistency (no contradictory statements)

Potential inadequacies in a design:

- omits information that needs to be included
- contains redundant information (⇒ inconsistency)
- leads to an inefficient implementation
- violates syntactic or semantic rules of data model

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