object models: relationships

Daniel Jackson

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relationship

kinds of relation
› property
› containment
› association
› naming

a ‘homogeneous’ or ‘recursive’ relation
does arrow direction matter?

some relations are symmetric
› a->b in friend iff b->a in friend

but for non-symmetric relation
› a->b in r not same as b->a in r

must define & implement direction consistently
› a->b in invites : “a send an invitation to b”

and graphical notation may express constraint
› that depends on relation direction

```
Director ⊃ appoints ⊃ CEO
```
relations on subsets

when you place a relation
› pick the smallest set

Message

sentAt, readAt

Time

Unread

Read

Message

sentAt

Time

Unread

Read

OK

better
**multiplicity**

**how many?**

› colors per shape?
› machines per IP?

- **Shape** \(\rightarrow\) **Color**
- **Machine** \(\rightarrow\) **IPAddress**
- **Directory** \(\rightarrow\) **FSObject**
- **Course** \(\rightarrow\) **Student**

\[ A \rightarrow^m R \rightarrow^n B \]

- R maps **m** A's to each B
- R maps each A to **n** B's

+ one or more
* zero or more
! exactly one
? at most one
omitted = *

- **User** \(\rightarrow^*\) **Student**
function properties

easily expressed with multiplicities

R is a function

R is a total function

R is an injection

R is a surjection

R is a bijection
common mistakes

#1. not a stateful relation
   arrivesAt: Elevator -> Floor

#2. should be split into multiple relations
   lines: Address -> AddressLine

#3. relates >2 atoms
   lecturer: Student -> Faculty