object models: relations

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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
› \( a \rightarrow b \) in friend iff \( b \rightarrow a \) in friend

but for non-symmetric relation
› \( a \rightarrow b \) in \( r \) not same as \( b \rightarrow a \) in \( r \)

must define & implement direction consistently
› \( a \rightarrow b \) in invites : “a send an invitation to b”

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

when you place a relation
› pick the smallest set

OK

better
multiplicity

how many?
› colors per shape?
› machines per IP?

\[ A \xrightarrow{R} B \]

• \( R \) 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 = *

- Shape \( \xrightarrow{\text{color}} \) Color
- Machine \( \xrightarrow{\text{ip}} \) IPAddress
- Directory \( \xrightarrow{\text{contains}} \) FSObject
- Course \( \xrightarrow{\text{enrolled}} \) Student
- User \( \xrightarrow{\text{friends}} \)
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