L10: ER modeling 3

CS3200 Database design (sp18 s2)

https://course.ccs.neu.edu/cs3200sp18s2/

2/12/2018

Announcements!

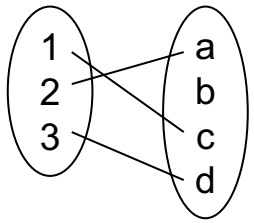
- On Thursday: mid-course feedback for instructor
  - Exam: Today gave you ¼ of the exam points in class (10% out of 40%). What worked well, what can we do to make it work better for you?
  - What is on the exams: everything from class: discussed in class, HWs, and piazza
  - Anything else you think we should keep or change in the next 2/3 of the class?

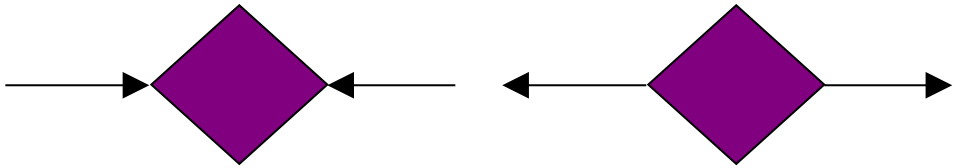
- Outline
  - We continue with ER modeling
  - Next Thursday starting with normalization
    - make sure to have Jupyter running

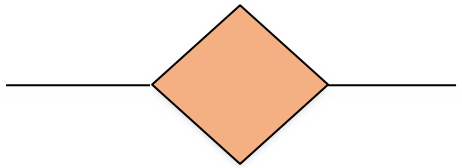
1. Cardinality (multiplicity) of E/R relationships

Stanford's Arrow notation **Crow's Feet**

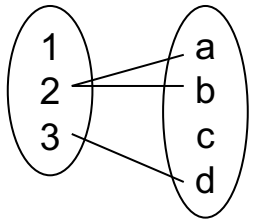
One-to-one:

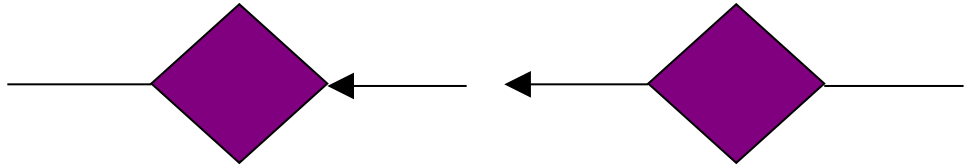


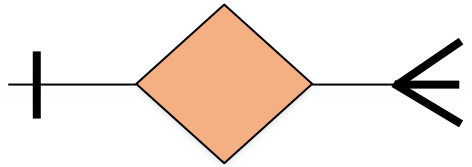




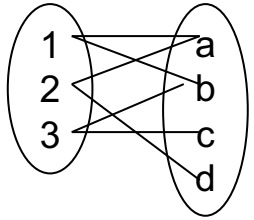
One-to-many:

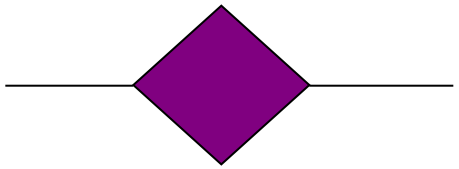


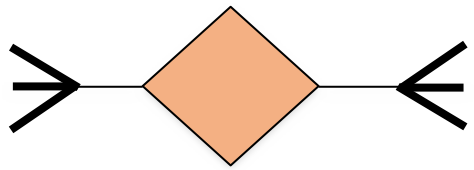




Many-to-many:



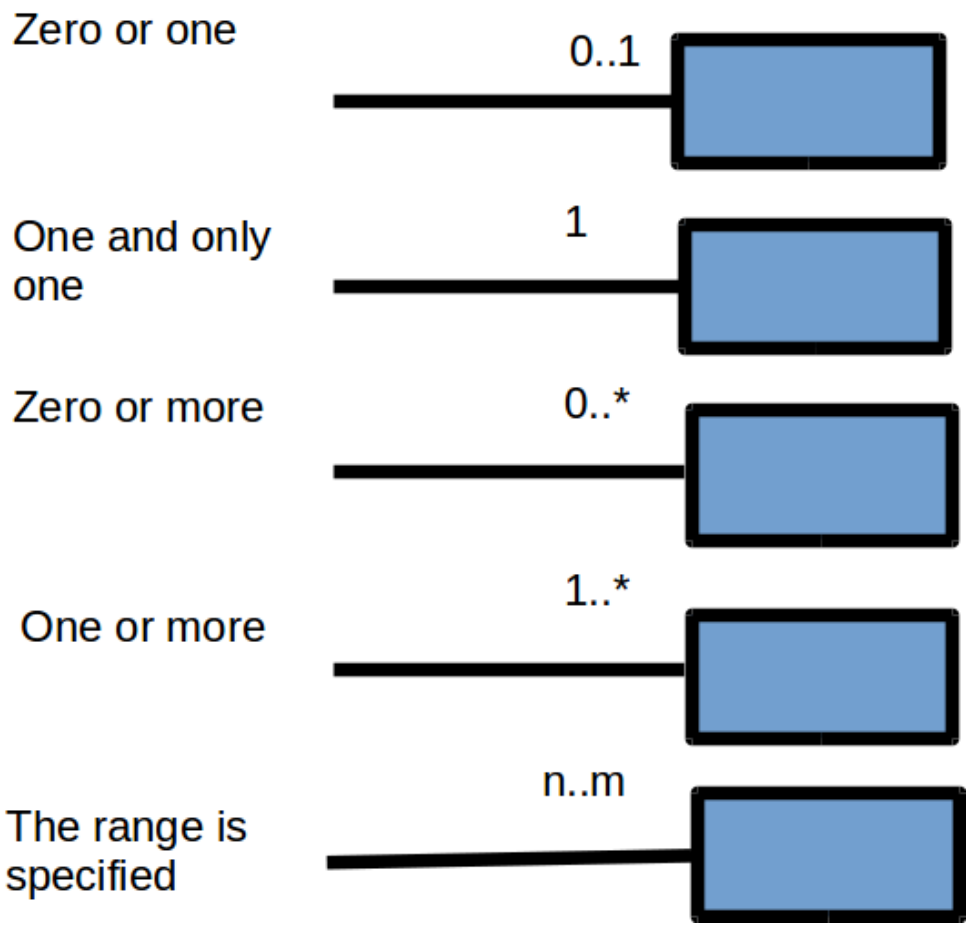




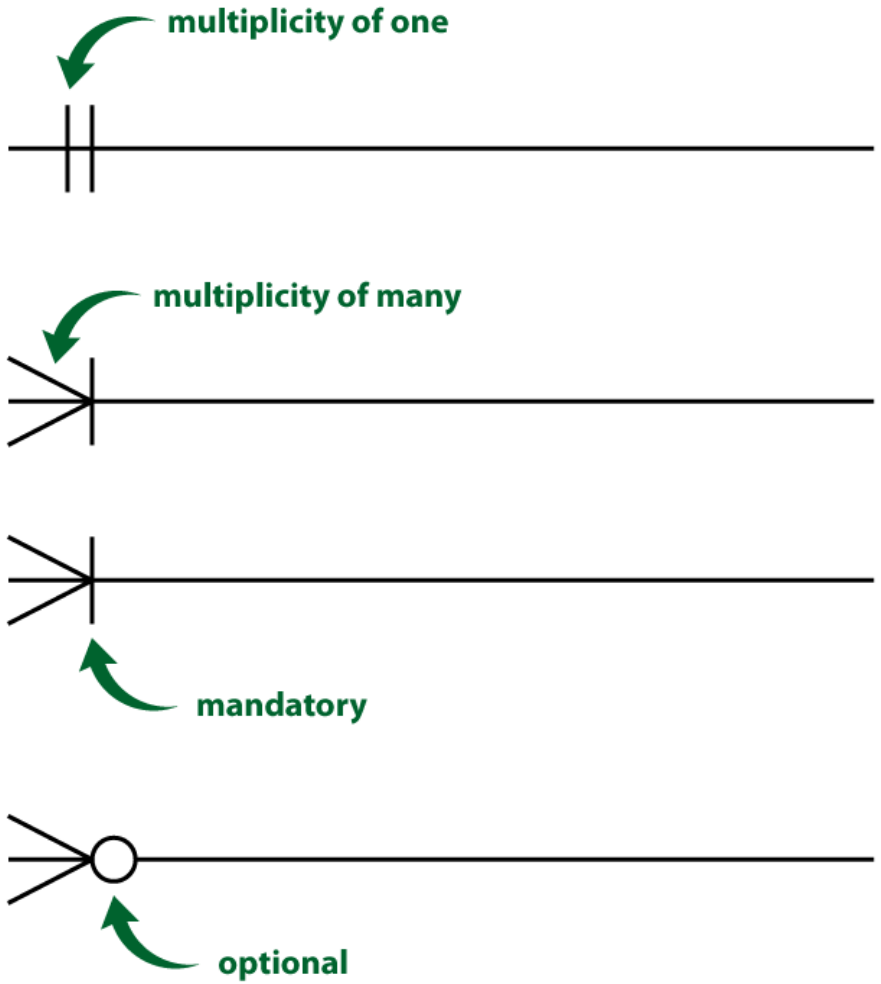
X -> Y means **there exists a function mapping from X to Y**
(*recall the definition of a function)*

Relationships with specified cardinalities

UML notation



Crow's Feet

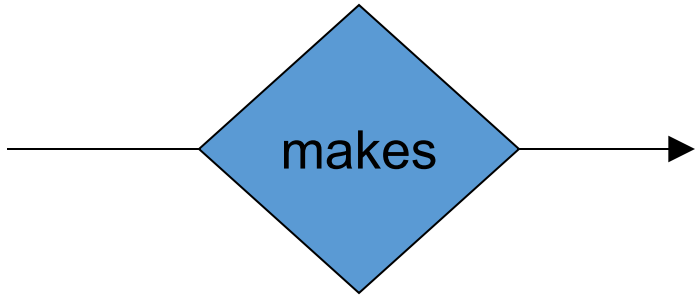


Constraints in E/R Diagrams

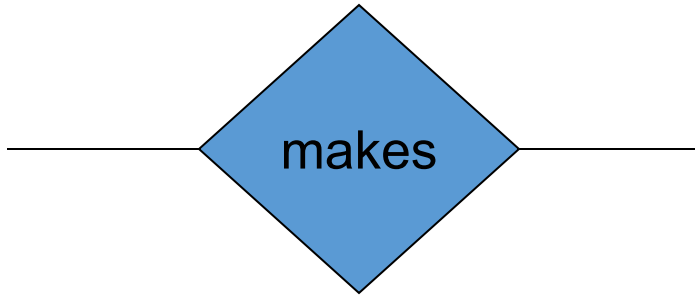
- Finding constraints is part of the modeling process.

- Commonly used constraints:
  - Keys: social security number uniquely identifies a person.
  - Single-value constraints: a person may have only one biological father (max value)
  - Referential integrity (participation) constraints: if you work for a company, it must exist in the database (min value)
  - Other constraints: peoples' ages are between 0 and 150.

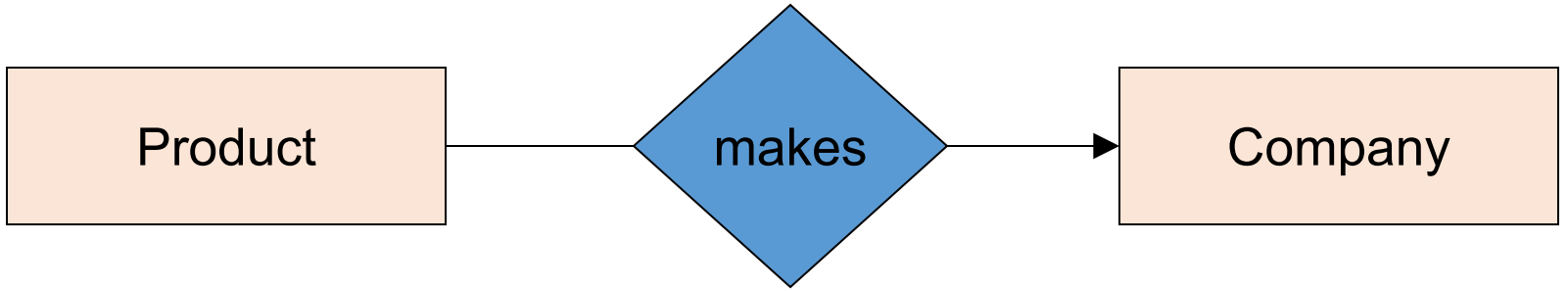
Single Value Constraints



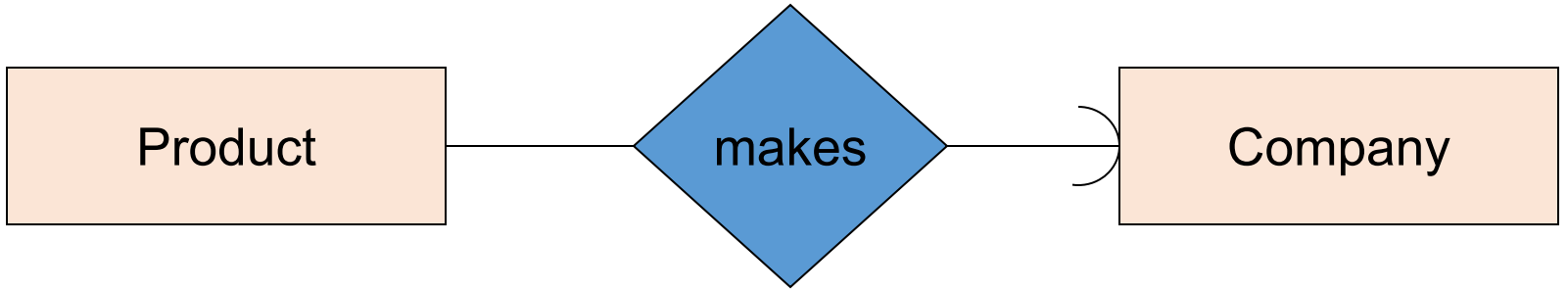
v. s.



Referential Integrity Constraints



Each product made by at most one company.
Some products made by no company



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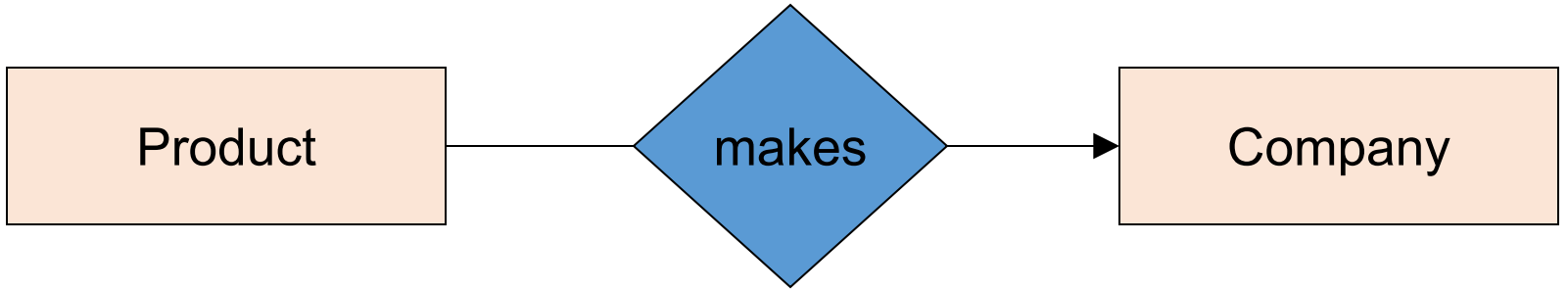

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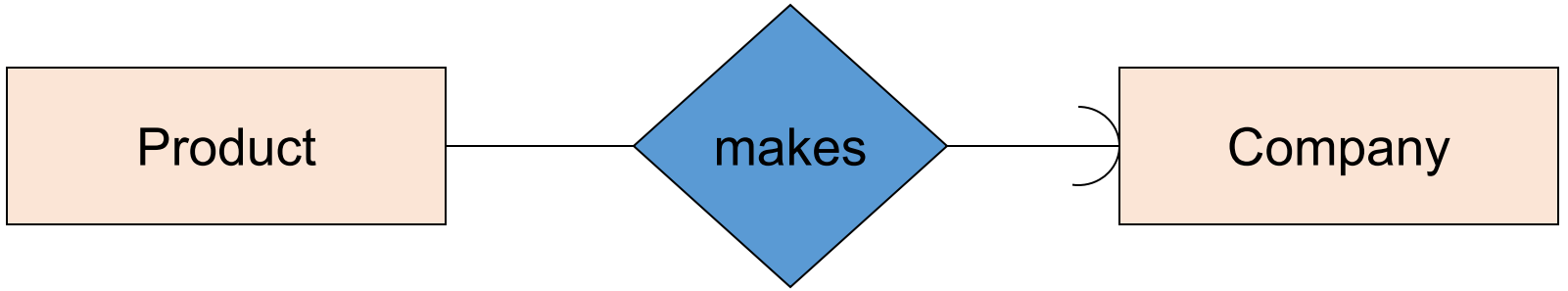
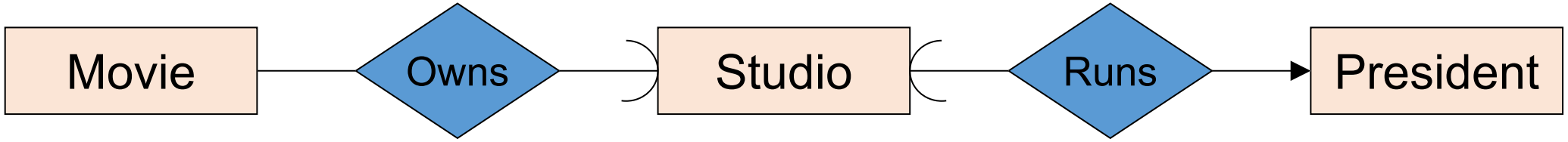


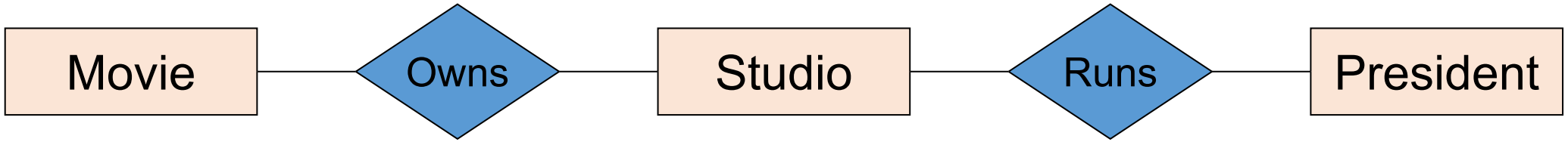
Each product made by exactly one company.

Participation constraints in Stanford arrow notation

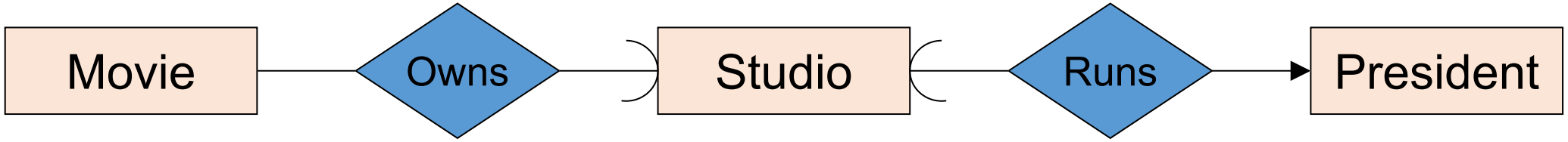


A studio can have at most one president

Each president must run exactly one studio (that exists in the studio entity set)



Participation constraints in Stanford arrow notation



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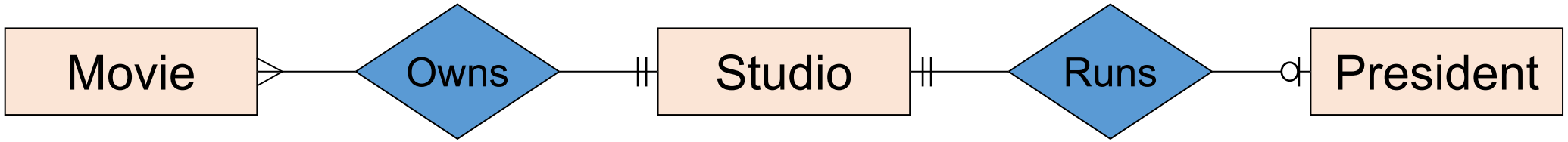
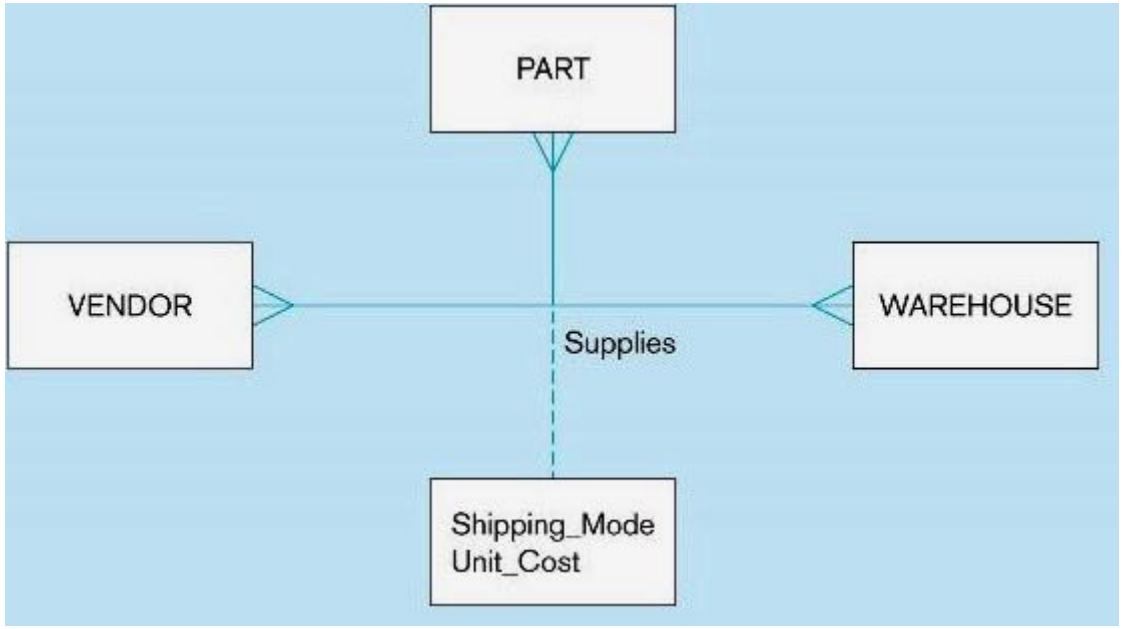
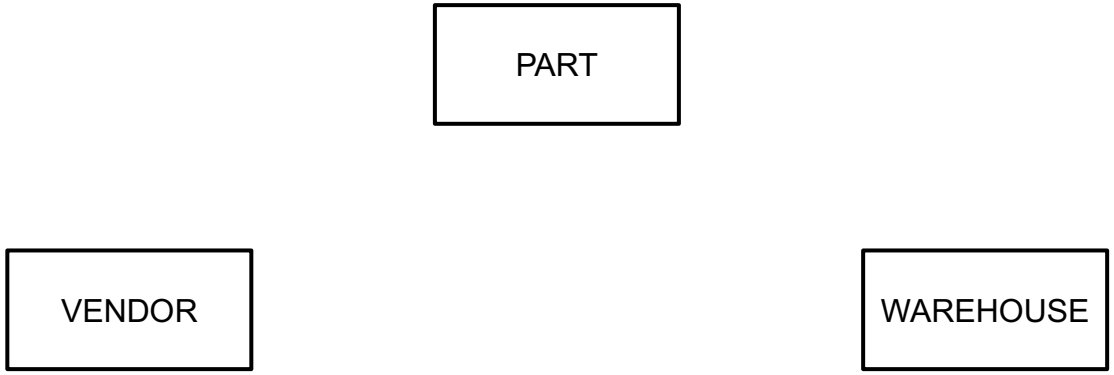


Ternary vs. binary relationships

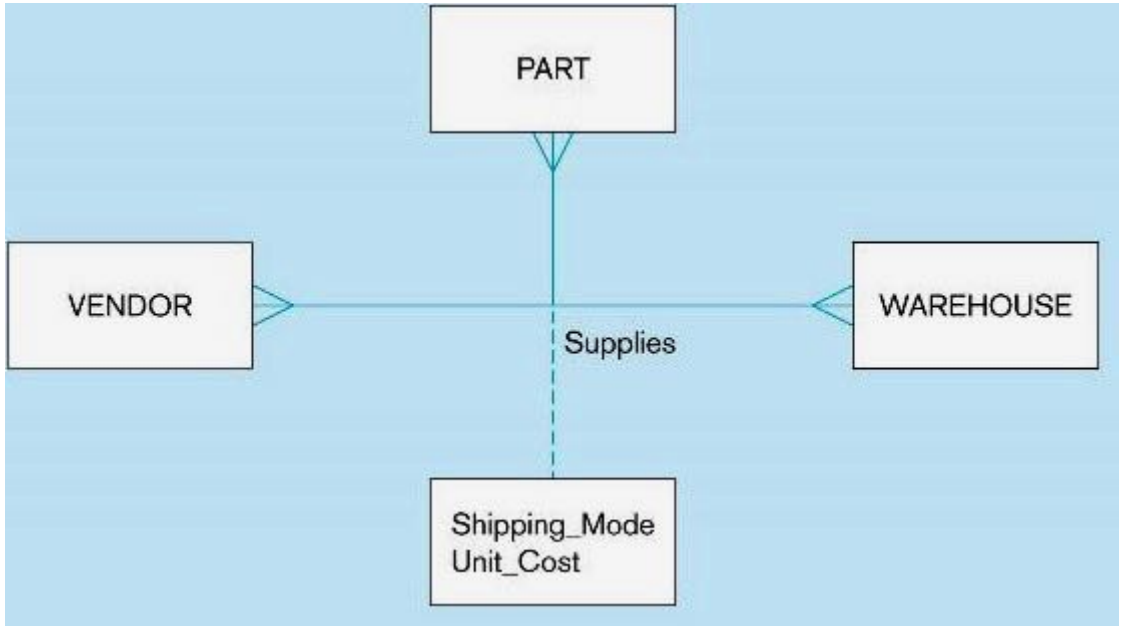


Can you transform the above tenary relationship into a number of binary relationships?



Source: Fig 2.18: Hoffer, Ramesh, Topi, "Modern database management," 10th ed, 2010.

Ternary vs. binary relationships



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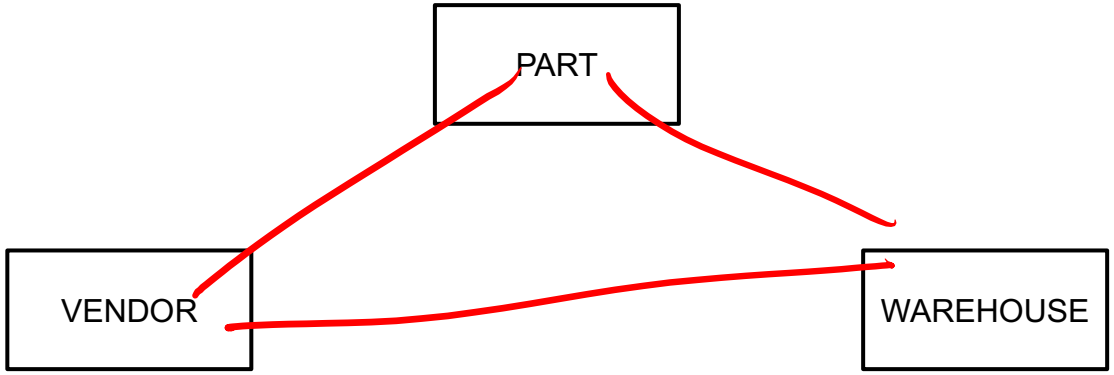
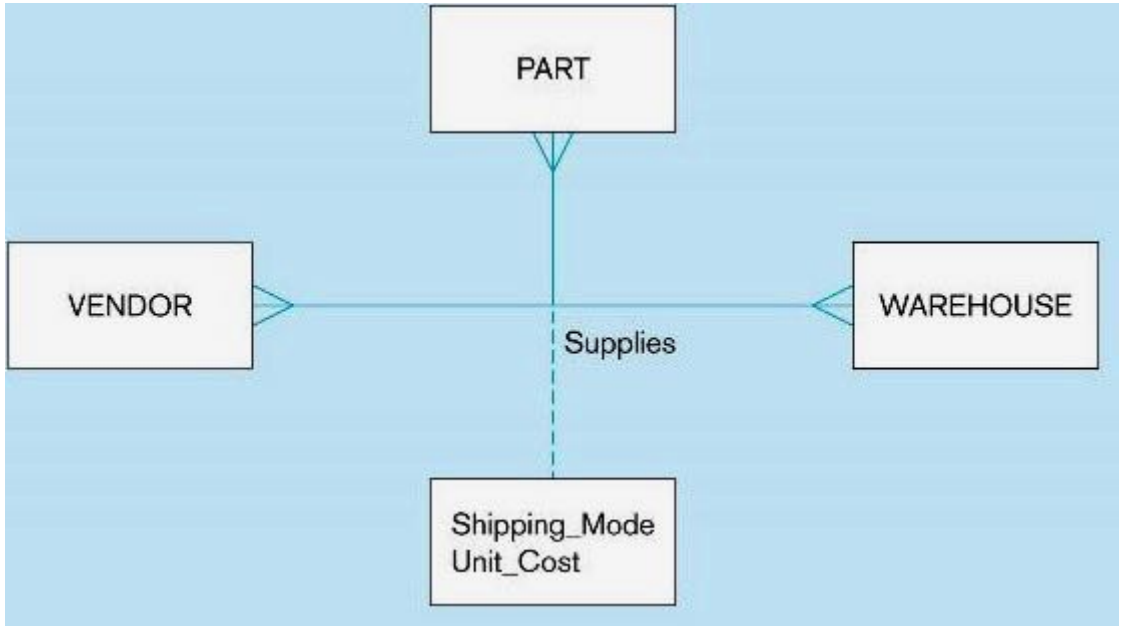


No! E.g., where to put the attribute shipping_mode?

Source: Fig 2.18: Hoffer, Ramesh, Topi, "Modern database management," 10th ed, 2010.

Cardinality + participation in a ternary relationship



Business Rules

1. Each vendor can supply many parts to any number of warehouses but need not supply any parts.
2. Each part can be supplied by any number of vendors to more than one warehouse, but each part must be supplied by at least one vendor to a warehouse.
3. Each warehouse can be supplied with any number of parts from more than one vendor, but each warehouse must be supplied with at least one part.

PART

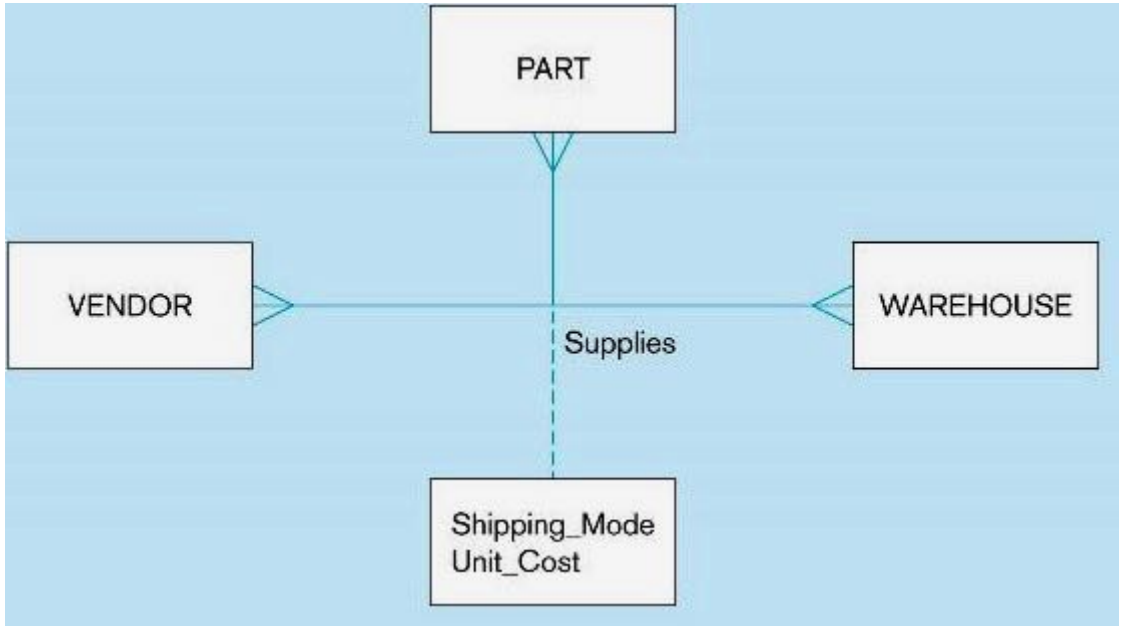
VENDOR

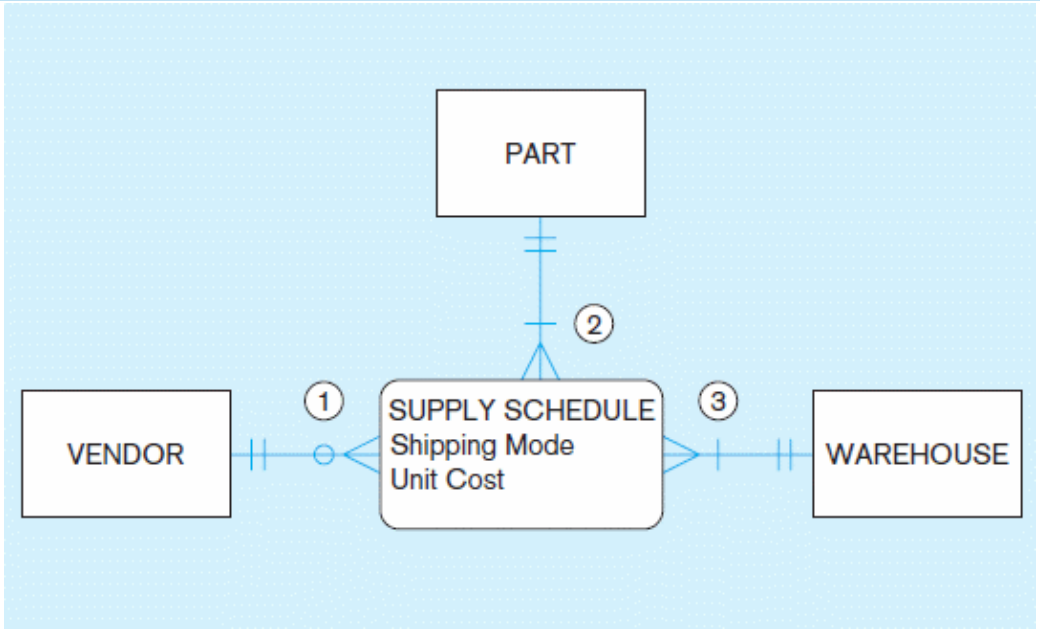
WAREHOUSE

Can you transform the ternary relationship to an associative entity?

Source: Fig 2.18: Hoffer, Ramesh, Topi, "Modern database management," 10th ed, 2010.

Cardinality + participation in a ternary relationship





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