

Final concepts and summary:

Entity-relationship (ER) model

Review and continue:  
Richness of ER model

### Richness of ER model

1. Inheritance for entities:

- An entity type can be further refined



2. Tuples can be composed of tuples –  
hierarchy:

- Relationship tuples composed of entity tuples
- By aggregation, relationship tuples can contain relationship tuples

### Aggregation

- last time:

$tutorial\ offering = \text{Tutorials X Conferences X Contacts}$

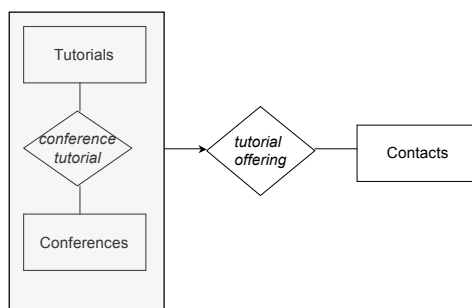


$tutorial\ offering = [\text{Tutorials X Conferences}] \text{ X Contacts}$

because wanted Tutorials X Conferences as key


**express constraint**

### Diagram

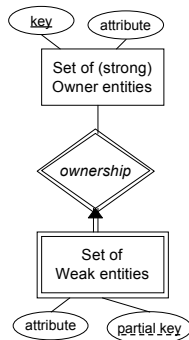


### Aggregation

Examples when need for semantics?

to board 

## Weak entity



Weak entity only completely identified when related to owner entity

- Weak entity set has no key
- Weak entity has partial key (aka discriminator)
- Owner key + partial key = key for weak entity
- Weak entity fully participates in ownership relationship
- Weak entity is key for *ownership* relationship
  - key constraint on weak entity in ownership relationship

## Summary

- ER model is rich model for describing objects and their relationships
- Can capture:
  - constraints
  - Aggregations of objects into more complex objects
  - Different decompositions of entity types
  - Deep hierarchy of decomposition
- Model used as first effort to organize information and make precise what is needed