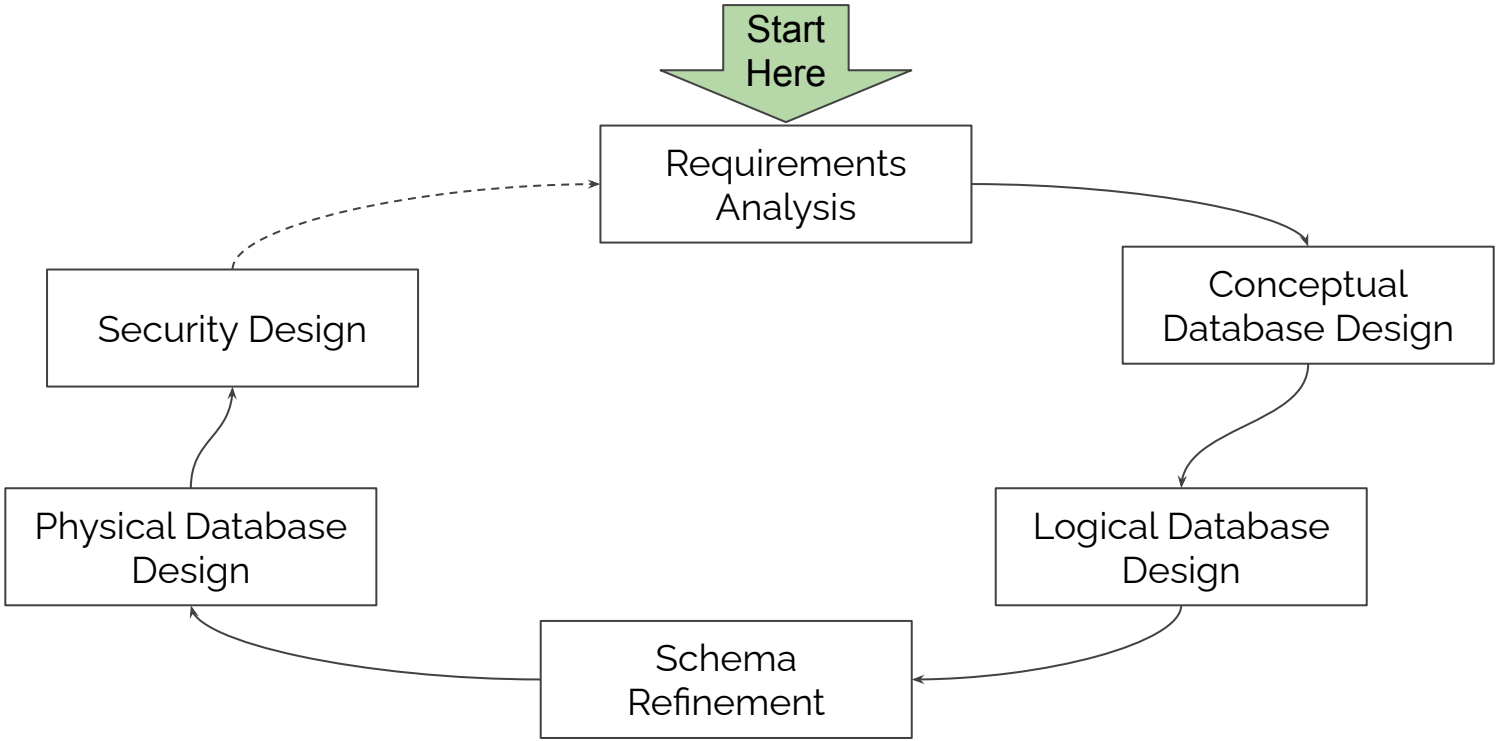
CSC 365

Introduction to Database Systems

Database Design Process

CAL POLY



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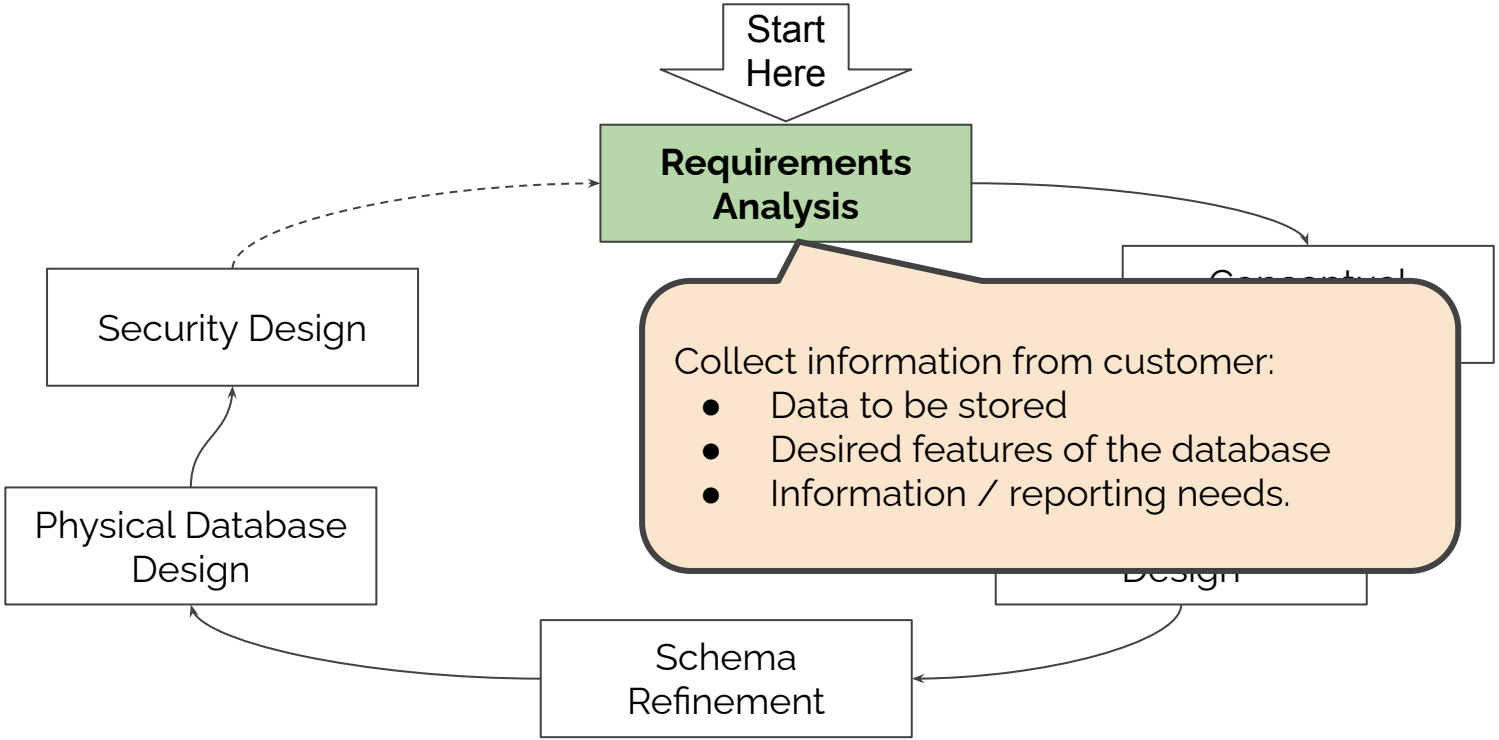

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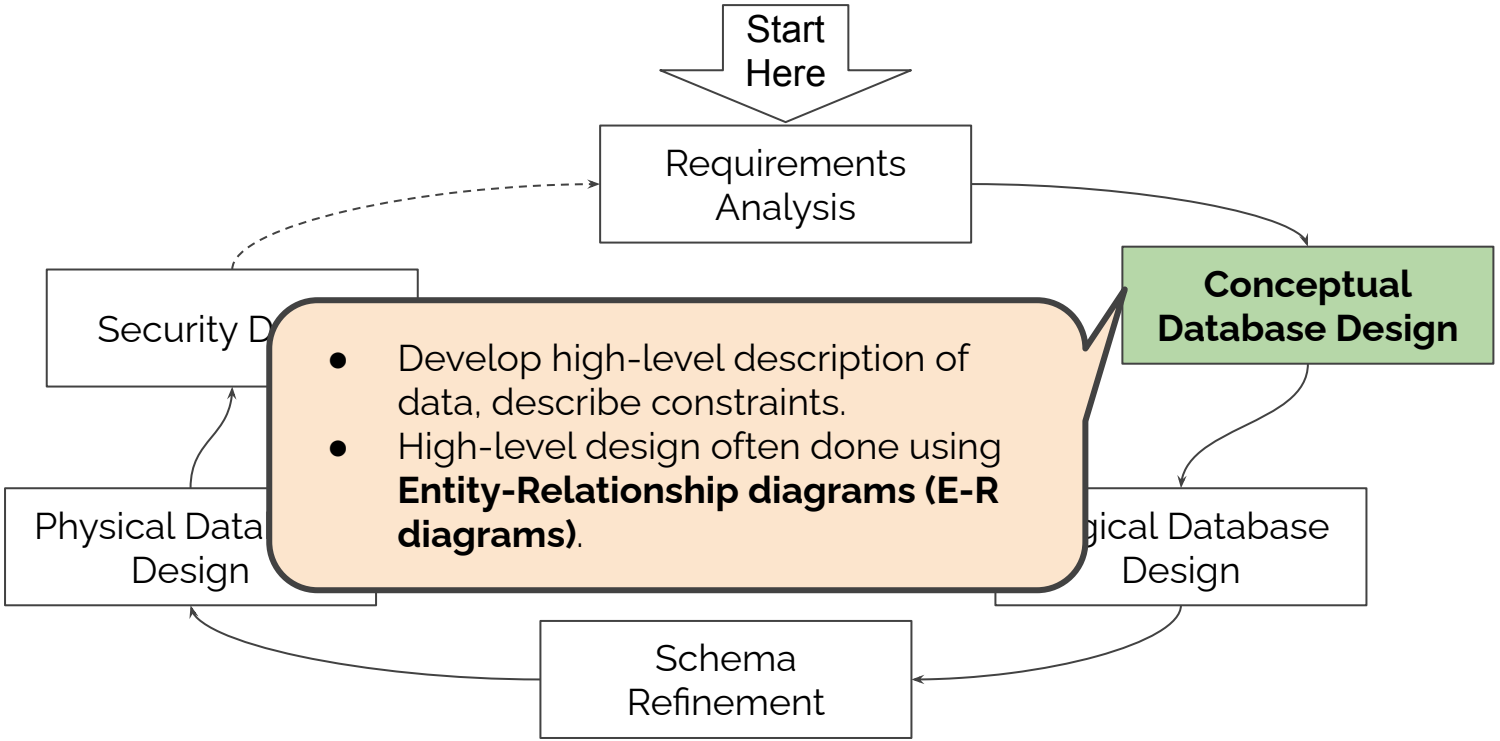

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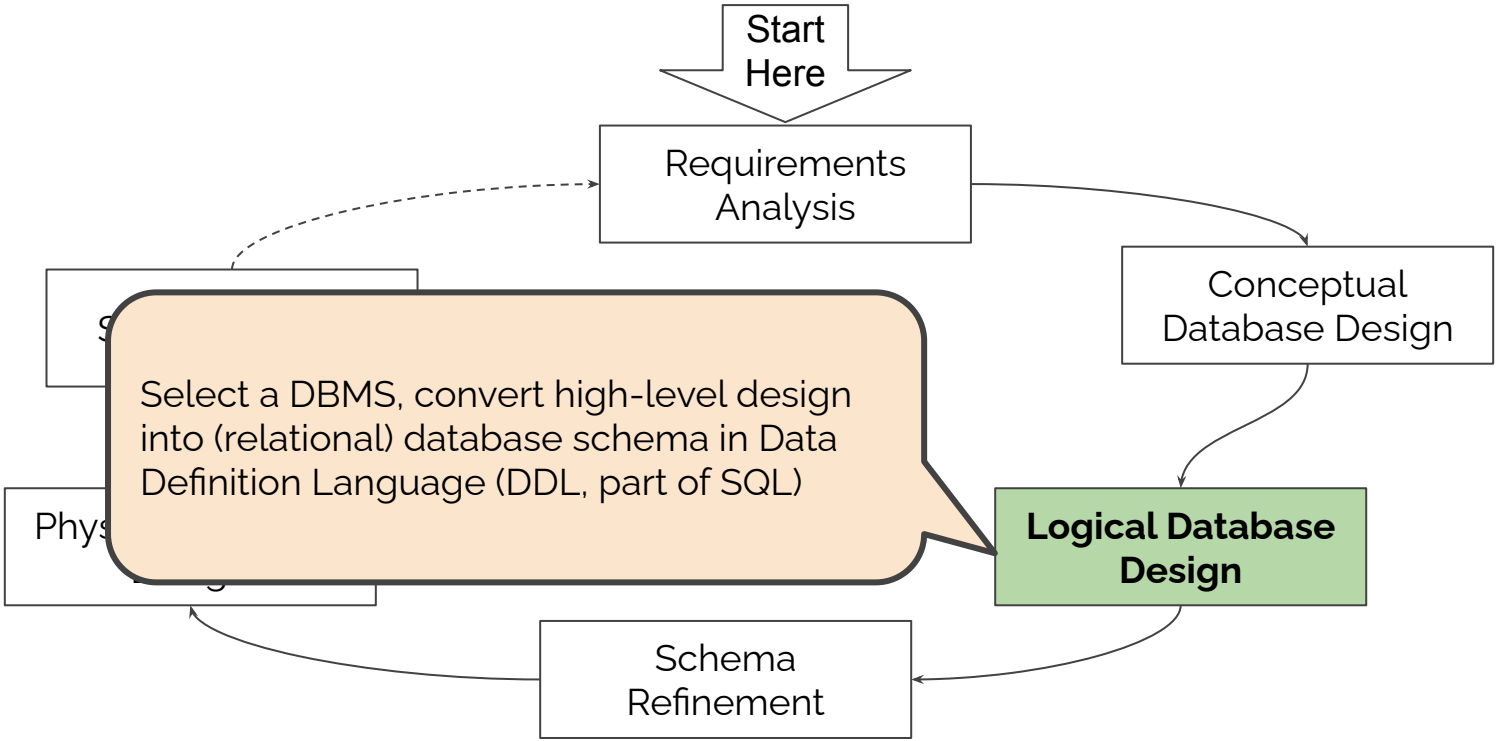

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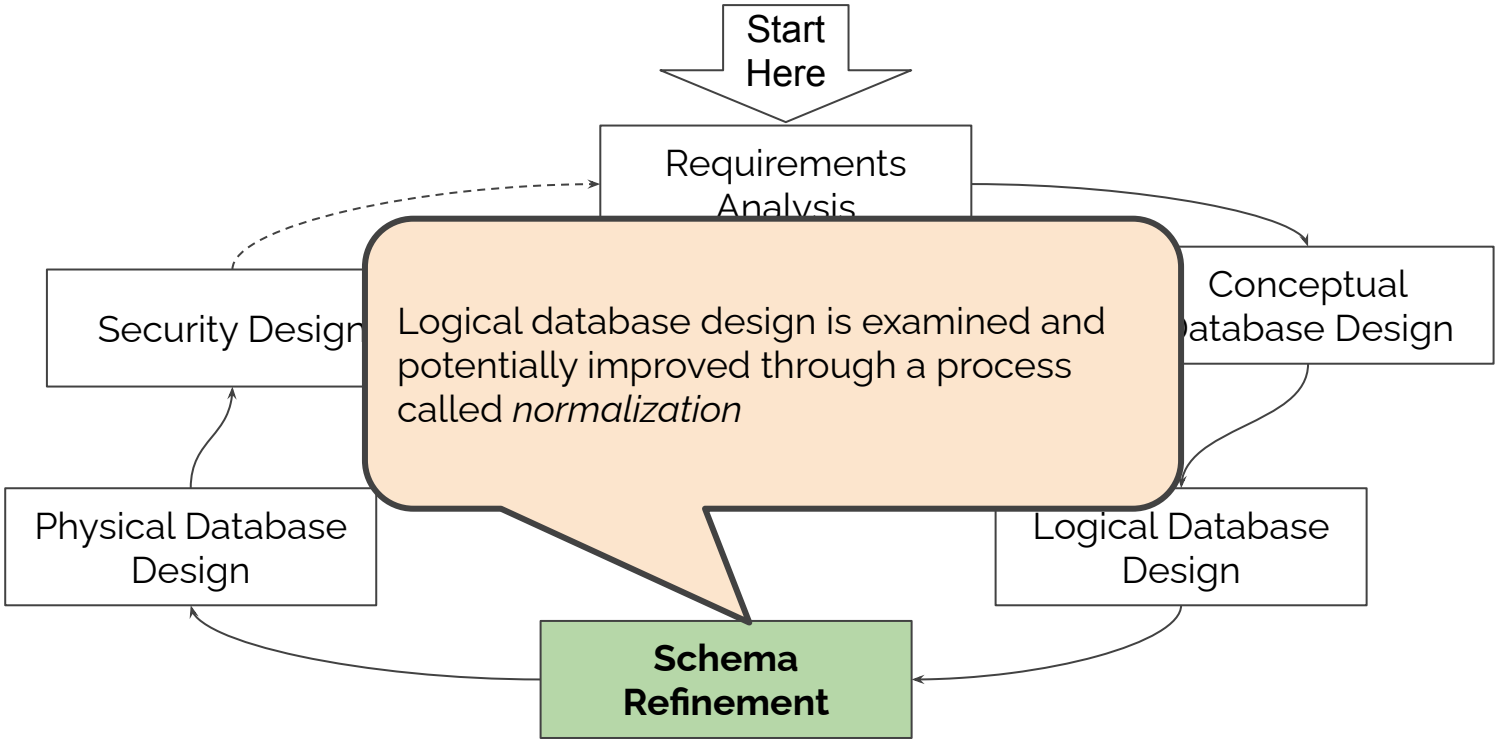

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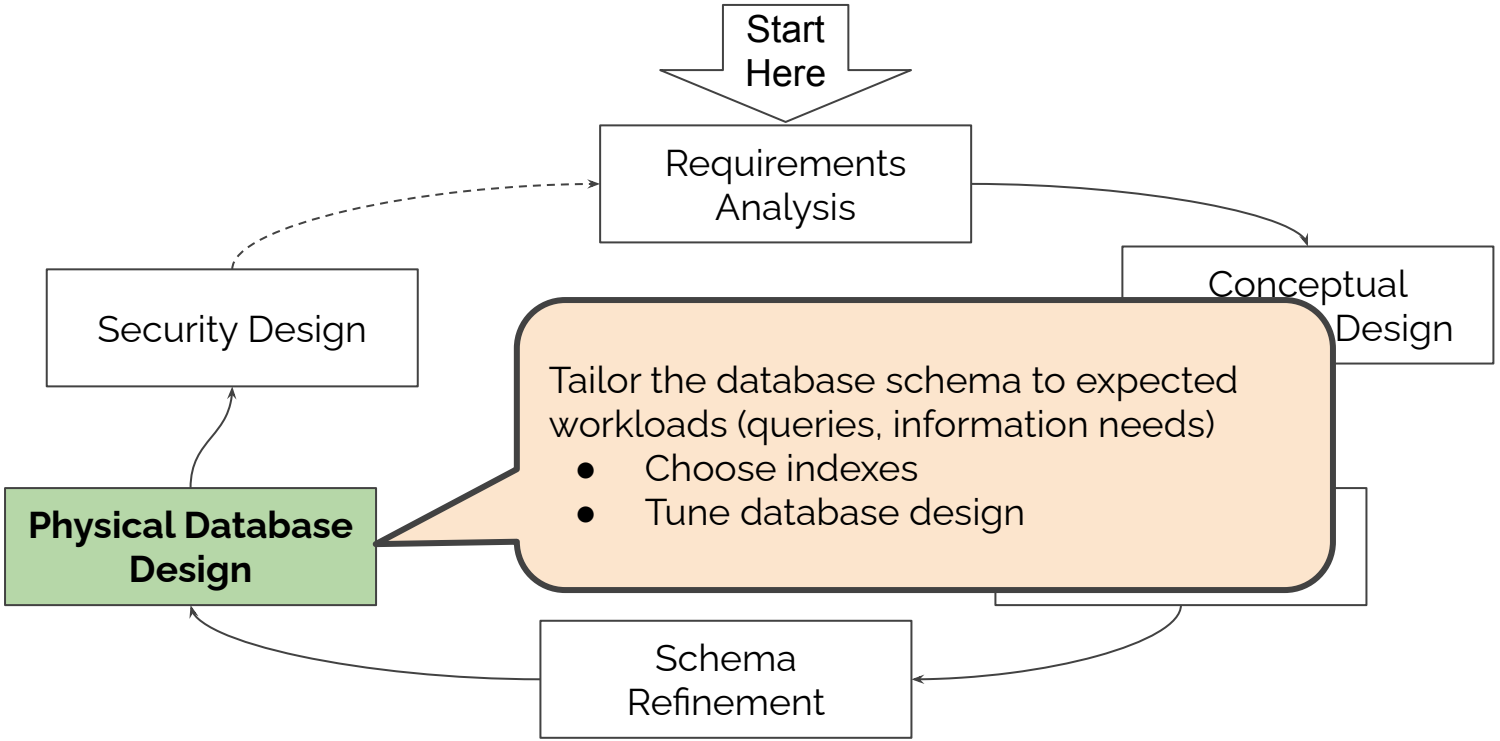

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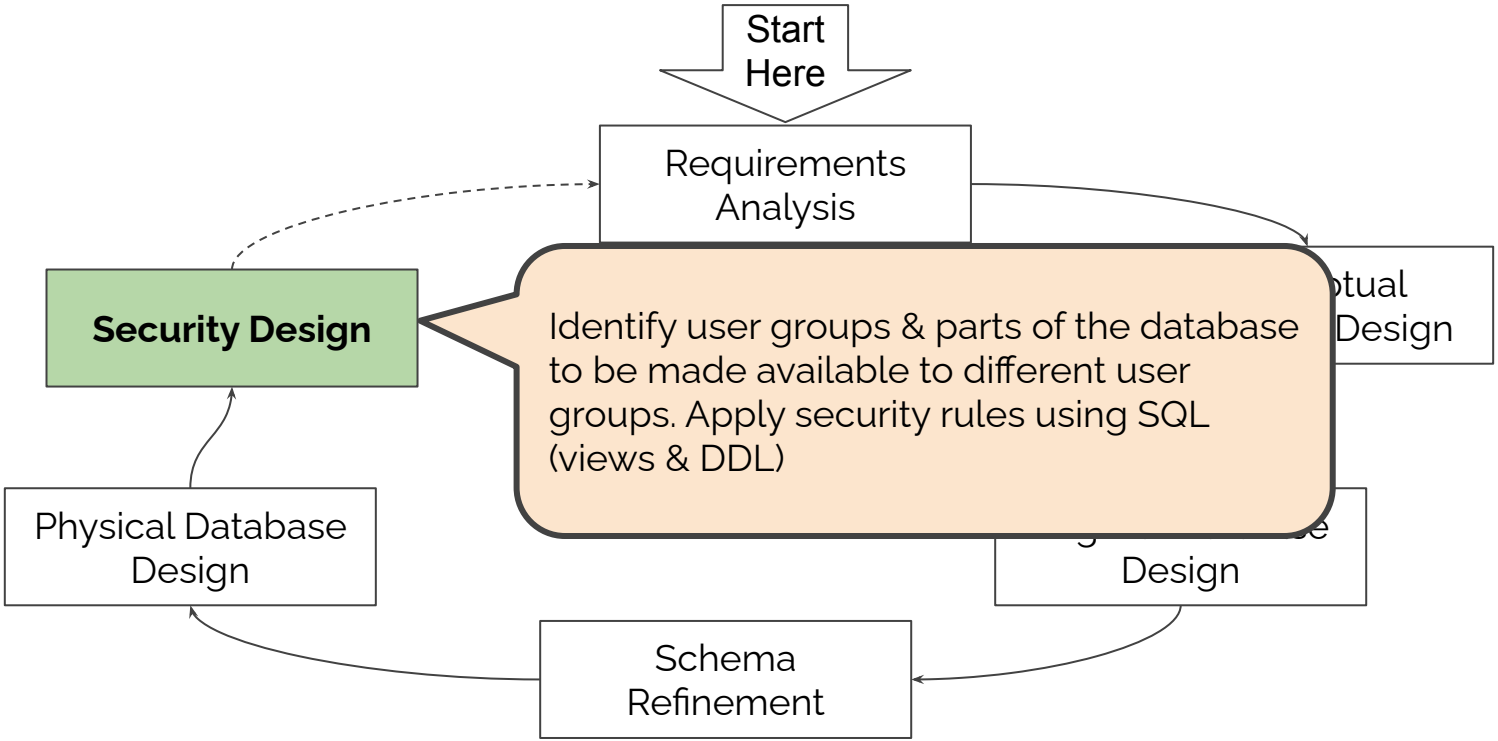


- **Conceptual**: captures relationships in data
- **Logical**: captures the format of the data as understood by the Database Management System (DBMS)
- **Physical**: represents the exact way in which data is stored and accessed by the DBMS

Entity-Relationship (ER) Model

ER Model: A representation of the data for an organization, business area, etc. Expressed in terms of entities, relationships and attributes.

ER Diagram: A graphical representation of an entity-relationship model. Sometimes abbreviated as ERD.

Entity-Relationship (ER) Model - Definitions

Entity: Principal data object about which information is to be collected. Usually a person, place, thing, or event.

Relationship: Real-world association among one or more entities

Attribute: Provides descriptive information about an entity or relationship

ER Diagramming - Notes on Notation

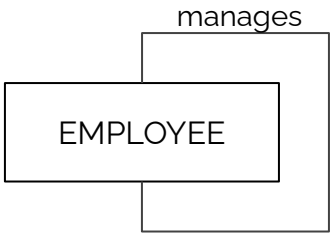
There are a few styles of ER diagrams: Chen, Crow's Foot, IDEF1X, Bachman, etc. Textbooks and tools often introduce their own slight variations.

We will briefly introduce **Crow's Foot** and **Chen** notation.

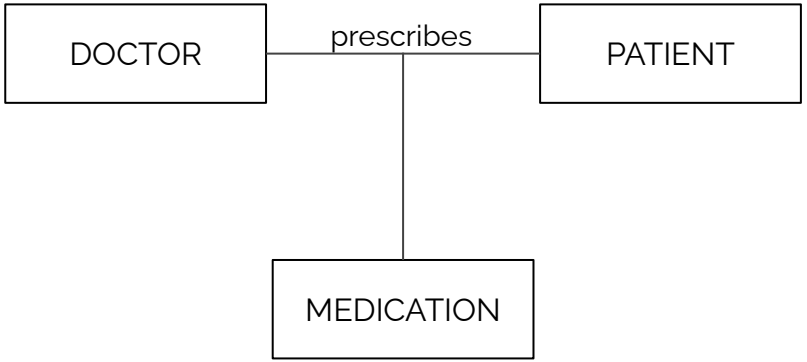
Degree: Number of entities that participate in a relationship

Entity Count	Degree of Relationship
1	Unary
2	Binary
3	Ternary
4 or more	n-ary

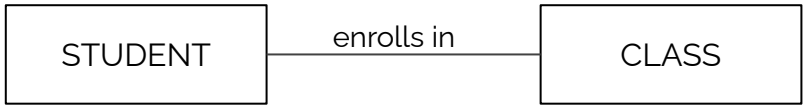
ER Diagram - Relationship Degree



Unary (Recursive)



Ternary



Binary

ER Diagrams - Cardinality / Existence

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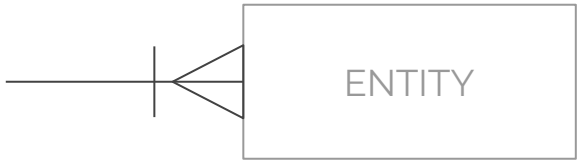
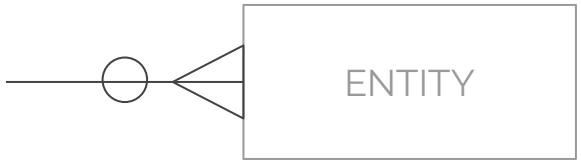
Mandatory One



Mandatory Many

Optional One



Optional Many

ER Diagram - One-to-Many Mandatory

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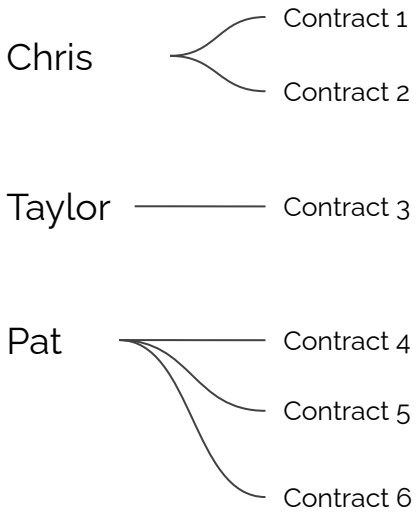
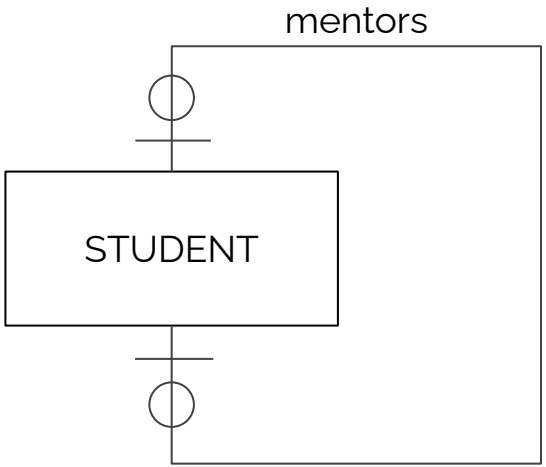
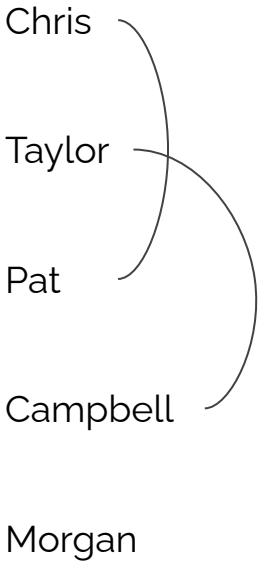


Degree? Binary
Cardinality? One to many (mandatory on both sides)

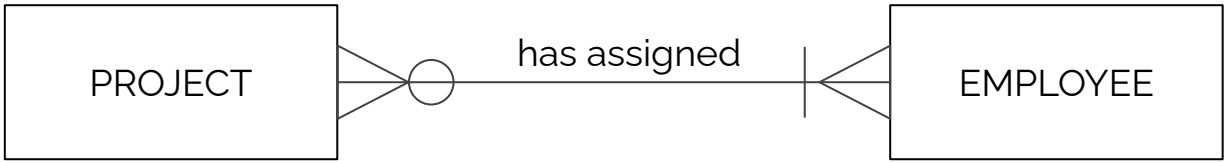
ER Diagram - Unary One-to-One Optional

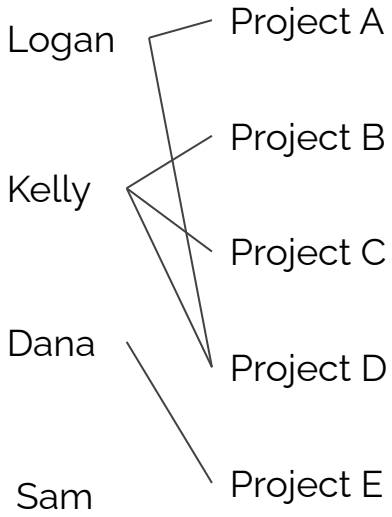




Degree? Unary
Cardinality? One to one (optional on both sides)

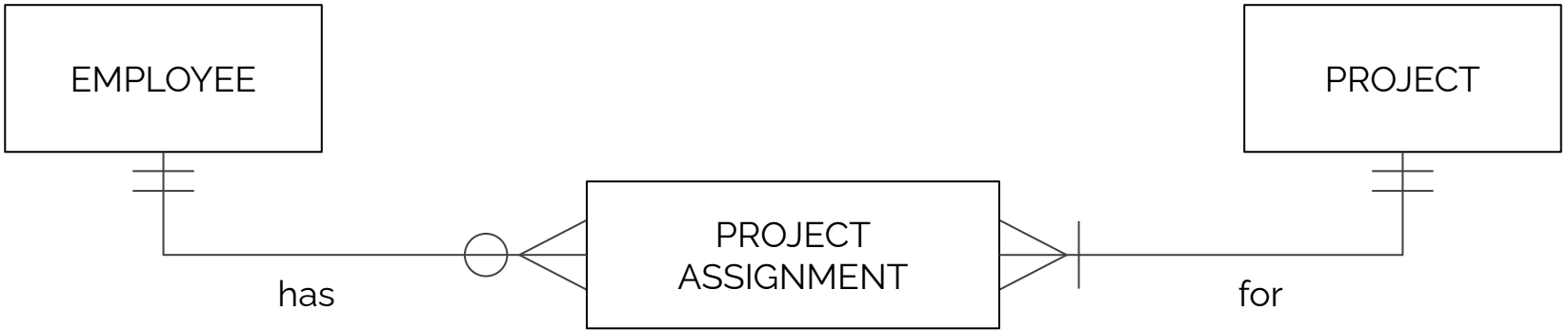
ER Diagram - Many-to-Many



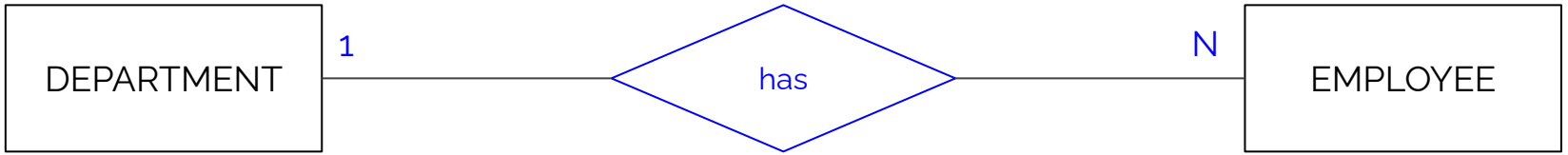


Degree? Binary
Cardinality? Many (mandatory) to many (optional)

Any Difference?



One to Many:



Many to Many:

Chen Notation - Attributes

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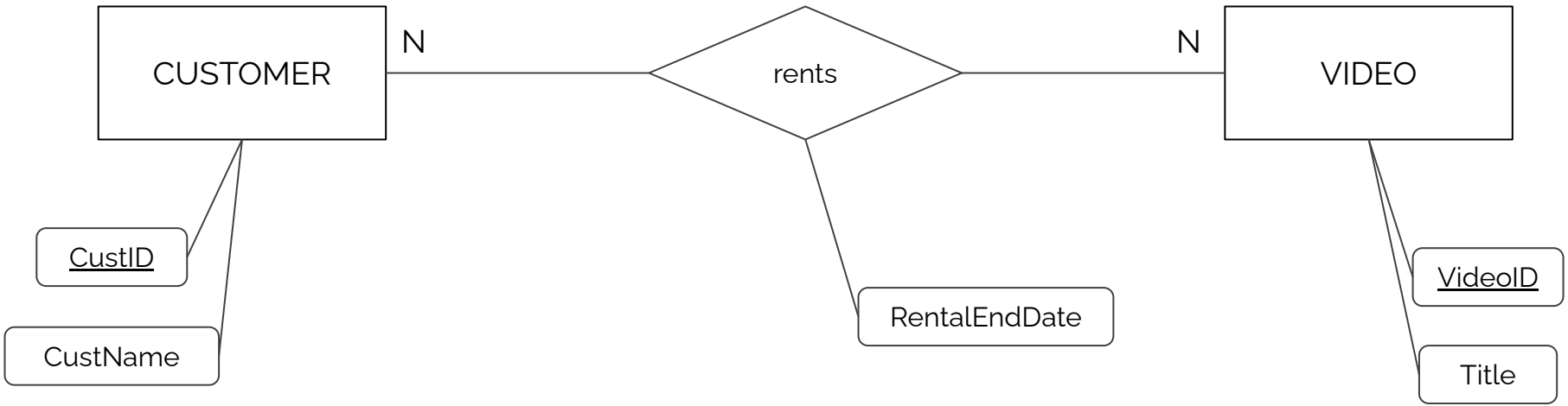

ER Diagram Example 1

Customers submit orders for products. A customer may submit any number of orders, but need not submit any orders. Each order is submitted by exactly one customer. Each customer must have a single shipping address.

ER Diagram Example 1

Customers submit orders for **products**. A customer may submit any number of **orders**, but need not submit any orders. Each order is submitted by exactly one customer. Each customer must have a single **shipping address**.

Entity-Relationship Model

- Standard visual representation (ER Diagram or ERD)
- Entities, relationships, attributes
- Facilitates conversations between users and developers, allows for verification of assumptions during the data modeling process