

Lab 2: ER Model

CS460 Fall 2021

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Database Design

Requirements Analysis

user needs; what must database do?

Conceptual Design

high level description (often done w/ ER model)

Logical Design

translate ER into DBMS data model

Schema Refinement

consistency, normalization

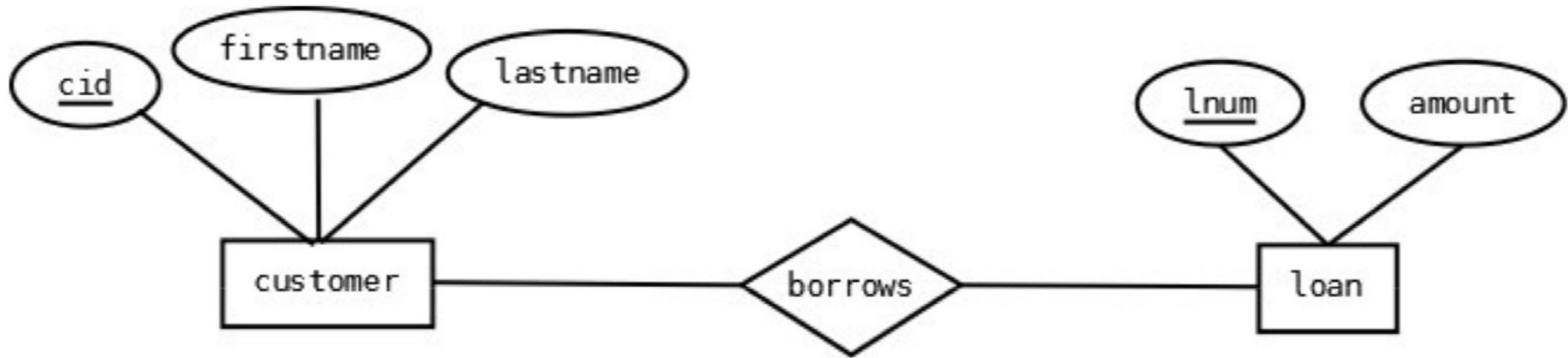
Physical Design

indexes, disk layout

Security Design

who accesses what

ERD Basics



Entity (Rectangle): An Entity is an object in real world that is distinguishable from surrounding environment. They have a primary key, distinguishing each occurrence of the entity.

Relationships (Diamond): Relationships are associations between or among entities.

Attributes (Oval): Attributes are characteristics of an entity or a relationship. Underlined attributes indicate primary keys. Dashed oval indicates derived attributes.

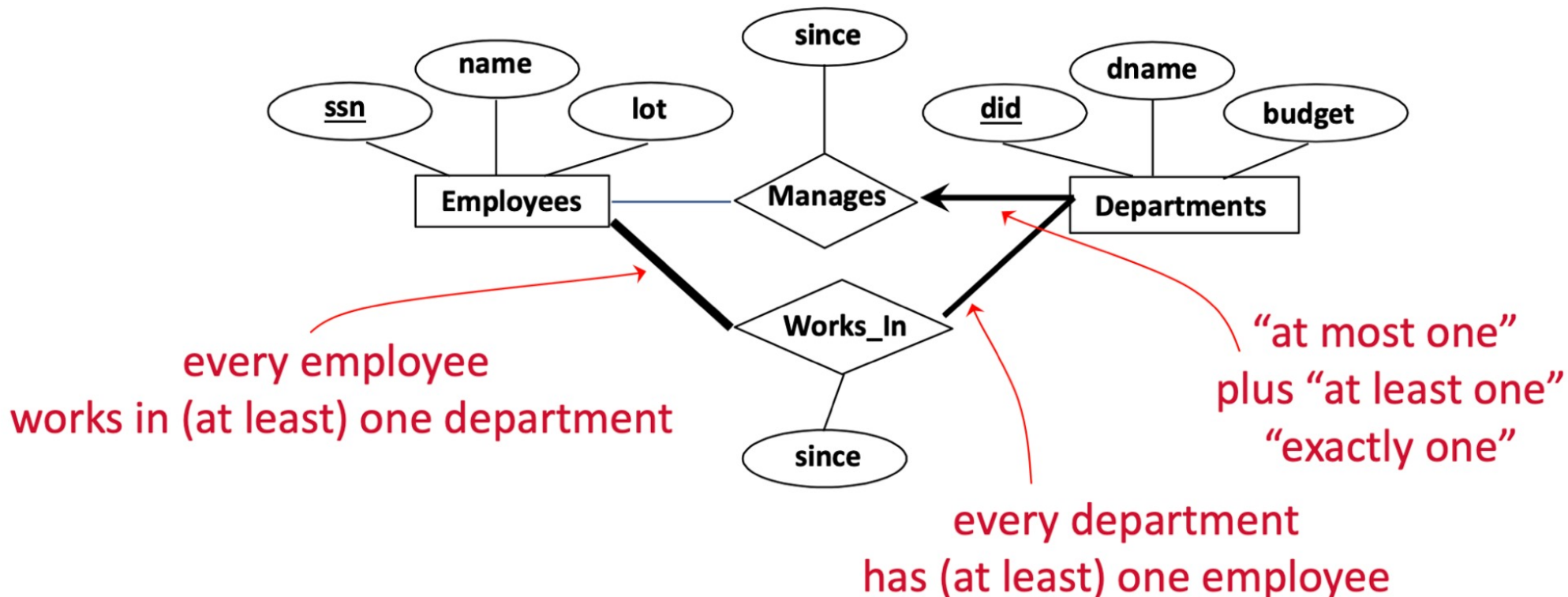
Participation Constraints

does every employee work in a department?

If so, this is a participation constraint

the participation is said to be **total** (vs. *partial*)

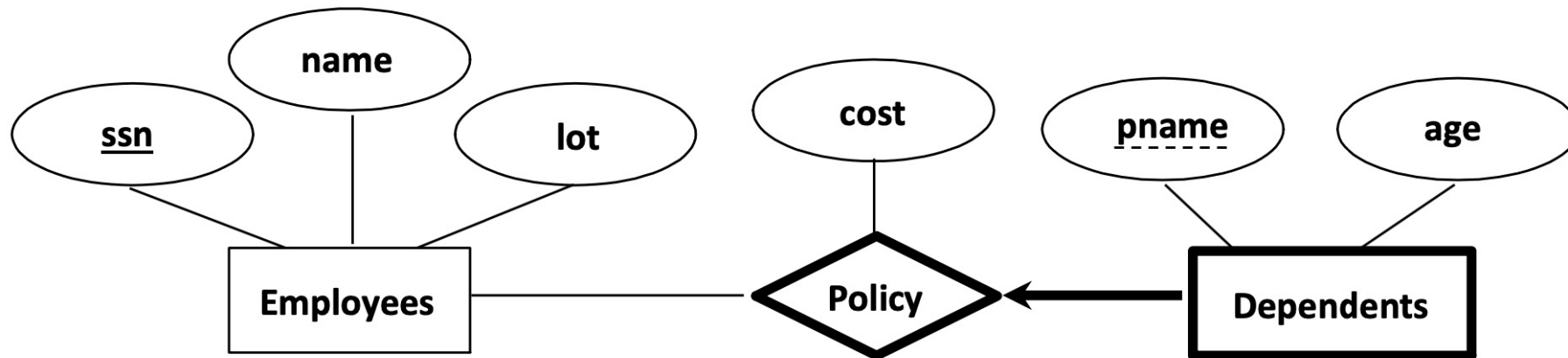
Basically means “at least one”



Weak Entities

A *weak entity* can be identified uniquely by the primary key of another (*owner*) entity (+ some of its attributes)

- Owner entity set and weak entity set must participate in a one-to-many relationship set (one owner, many weak entities)
- Weak entity set must have total participation in this *identifying* relationship set



Weak entities have only a “partial key” (dashed underline)

Exercise

go to <https://www.draw.io>

Transform ERD to Table

- Convert all the Entities in the diagram to tables.
- All single valued attributes of an entity is converted to a column of the table
- Key attribute in the ER diagram becomes the Primary key of the table.
- Declare the foreign key column, if applicable.
- Any multi-valued attributes are converted into new table.
- One can ignore derived attribute, since it can be calculated at any time.
- Weak entity is also represented as table. Add a foreign key column, which would be the primary key of its strong entity. This foreign key column along with its key attribute column forms the primary key of the table.
- All many-to-many relations will be a table

SQL Example

```
CREATE TABLE Persons (  
    PersonID int,  
    LastName varchar(255),  
    FirstName varchar(255),  
    Address varchar(255),  
    City varchar(255)  
);
```

```
INSERT INTO Persons  
VALUES (1, 'Hopkins', 'Anthony', '111 Cummington Mall', 'Boston');
```

```
INSERT INTO Persons  
VALUES (2, 'Bale', 'Christian', '730 Comm Ave', 'Boston');
```

```
SELECT * FROM Persons;
```

```
SELECT * FROM Persons WHERE LastName LIKE 'Bale';
```