Databases

Lecture 5 - Constraints & Notations

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Contents

1. Introduction

1.1 Where are we right now?

- Last time, we looked at how we can use relationships in the database design stages
- Today, we'll be discussing
  - how we can expand on that knowledge
  - what multivalued and derived attributes are
  - the syntax for creating constraints more in-depth.

1.1 Where are we right now?

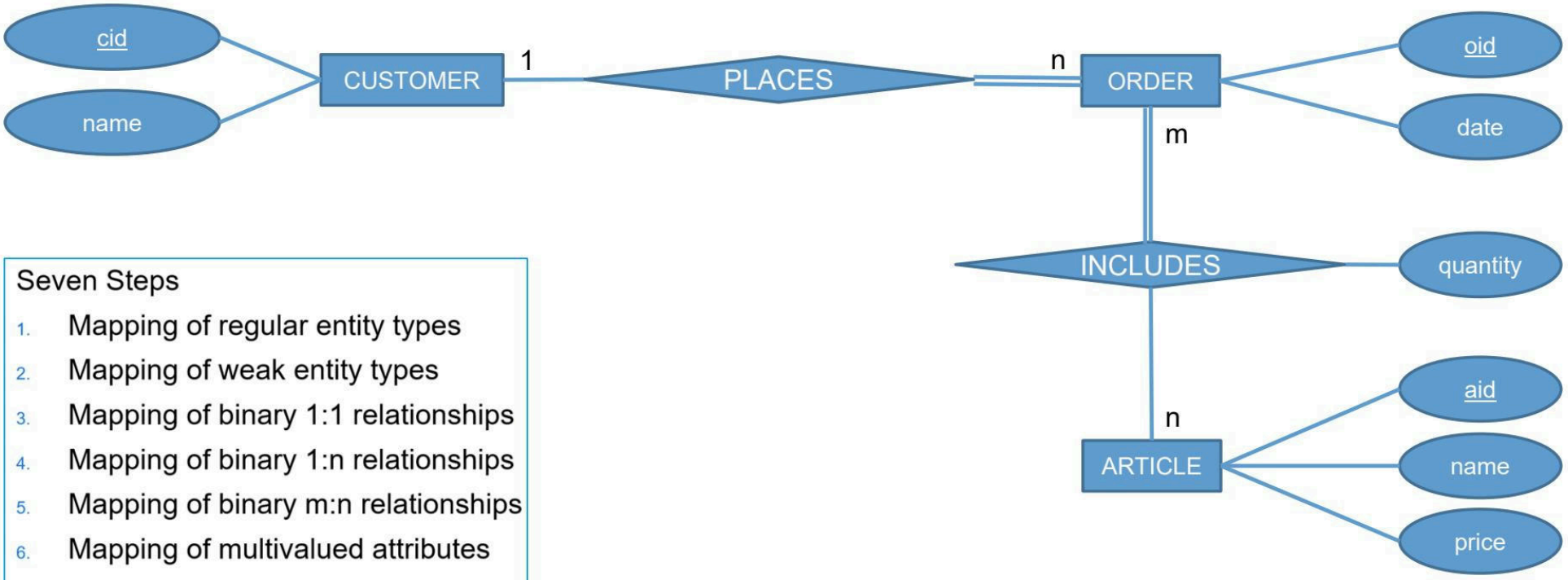
1. Introduction
2. Basics
3. SQL
4. Entity-Relationship-Model
5. Relationships
6. Constraints
7. More SQL
8. Subqueries & Views
9. Transactions
10. Database Applications
11. Integrity, Trigger & Security

1.2 What is the goal of this chapter?

- At the end of this lesson, you should be able to
  - create constraints based on your logical and conceptual design
  - use domains
  - and pivot the type of constraints to fit your need.

2. Relationships

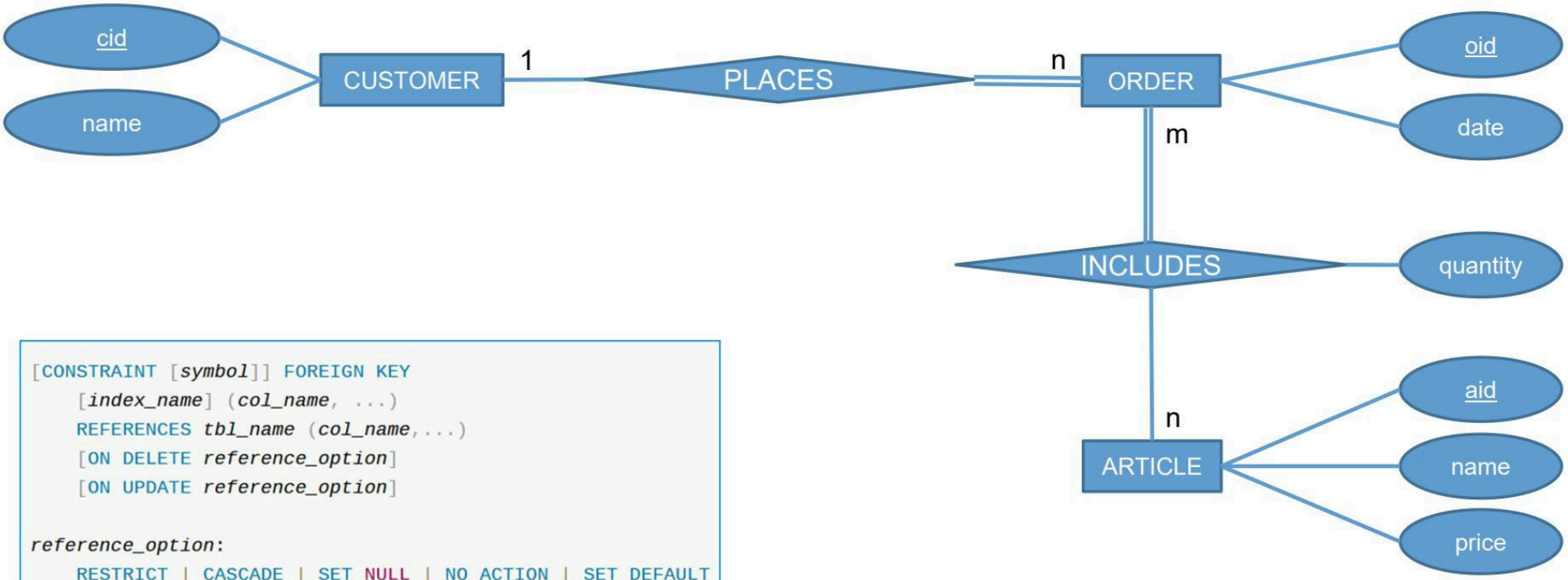
Convert ERD to RM



Seven Steps

1. Mapping of regular entity types
2. Mapping of weak entity types
3. Mapping of binary 1:1 relationships
4. Mapping of binary 1:n relationships
5. Mapping of binary m:n relationships
6. Mapping of multivalued attributes
7. Mapping of n-ary relationships

Convert ERD to RM: SQL




```
[CONSTRAINT [symbol]] FOREIGN KEY
    [index_name] (col_name, ...)
    REFERENCES tbl_name (col_name,...)
    [ON DELETE reference_option]
    [ON UPDATE reference_option]

reference_option:
    RESTRICT | CASCADE | SET NULL | NO ACTION | SET DEFAULT
```

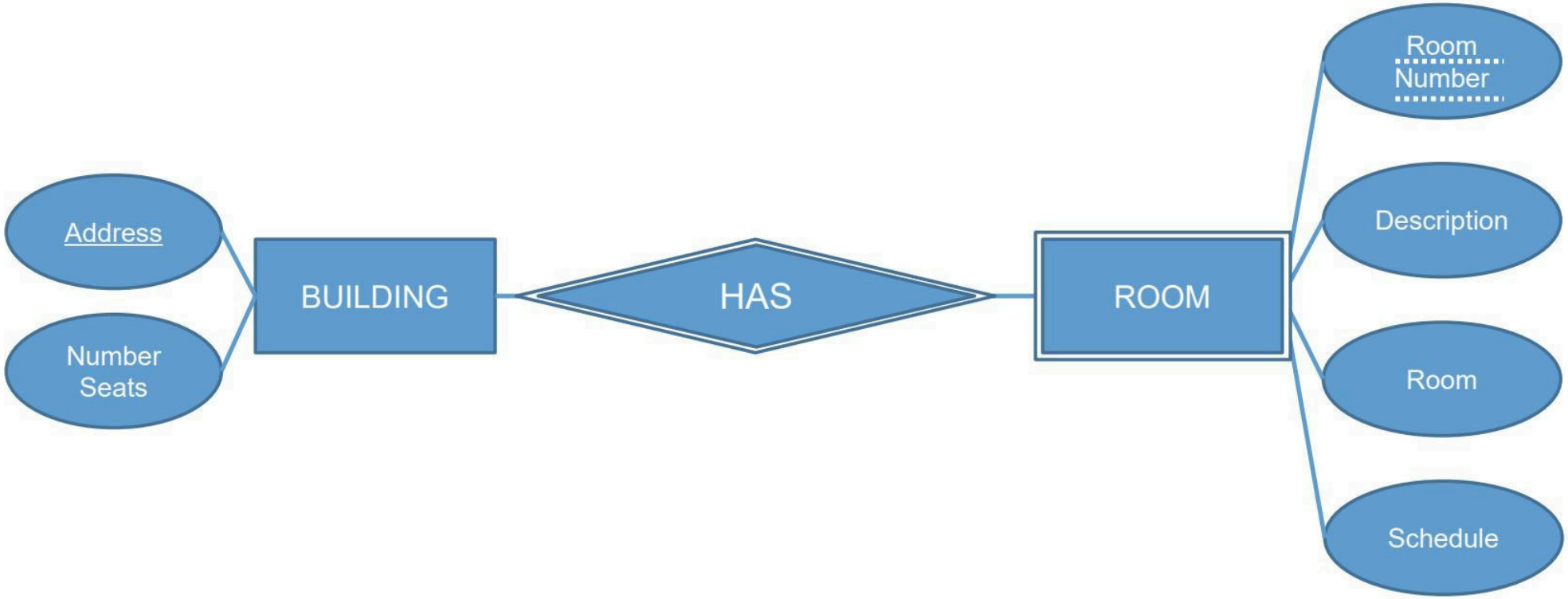
Weak Entity Types

- An entity type without a key attribute is called a weak entity type
- Weak entities are identified by being related to specific entities from another entity type in combination with one of their attribute values;
- This other entity type is called the identifying or owner entity type, and the relationship type that relates a weak entity type to its owner the identifying relationship
- A weak entity type always has a total participation constraint (existence dependency) with respect to its identifying relationship
- Represented by double rectangles and by having their identifying relationship placed in double diamonds
  - The partial key attribute is underlined with a dashed or dotted line

Example: Room vs. Building

Need for identify room: Room number and Building number!

Weak Entity Types



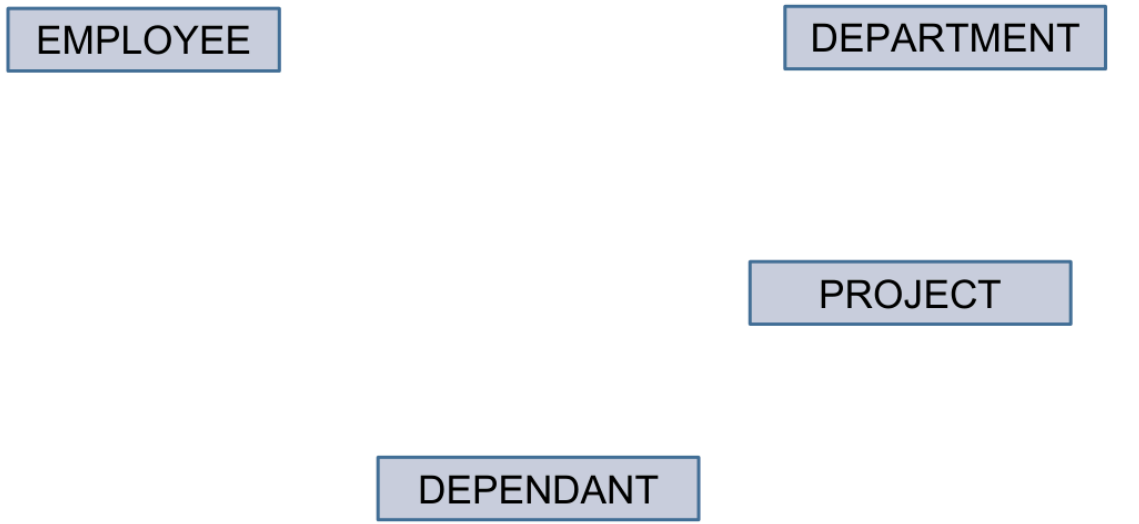
Weak Entity Types

- The company is organized into departments
- Each department has a unique name, a unique number, a manager (employee) with start date, and several locations
- A department controls a number of projects, each with unique name, unique number, single location
- We store each employee's name, ssn, address, salary, sex, birthdate
- An employee is assigned to one department, but may work on several projects, also from other departments
- We keep track of the hours per week per project
- We also keep track of the supervisor
- We want to keep track of each employee's dependents for insurance purposes, namely first name, sex, birth date, and relationship to employee. Source: Elmasri, Fundamentals

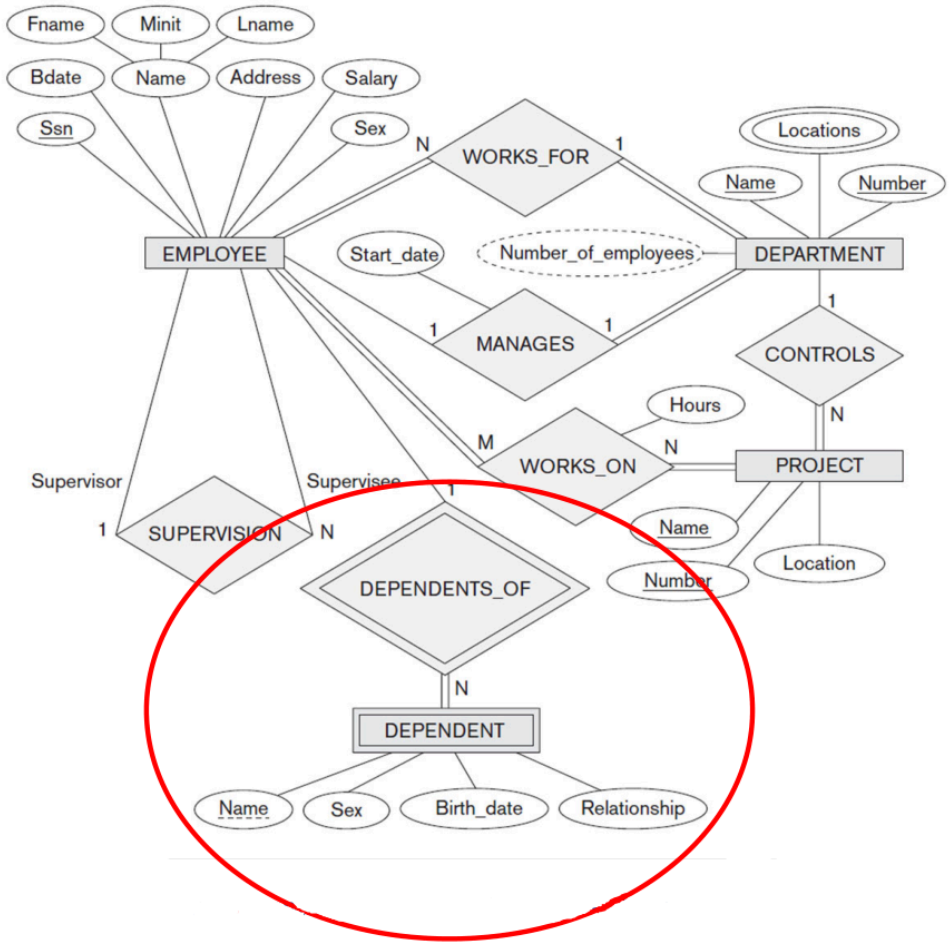
Weak Entity Types

? Question

What could be a weak entity type?



Weak Entity Types



Multivalued Attributes

- Single-valued vs multivalued attributes
  - Single-valued: Most attributes have a single value for a particular entity
  - Multivalued: In some cases, an attribute can have a set of values for the same entity
  - Multivalued attributes are displayed in double ovals

Multivalued Attributes

? Question

What could be a multivalued attribute?

- The company is organized into departments.
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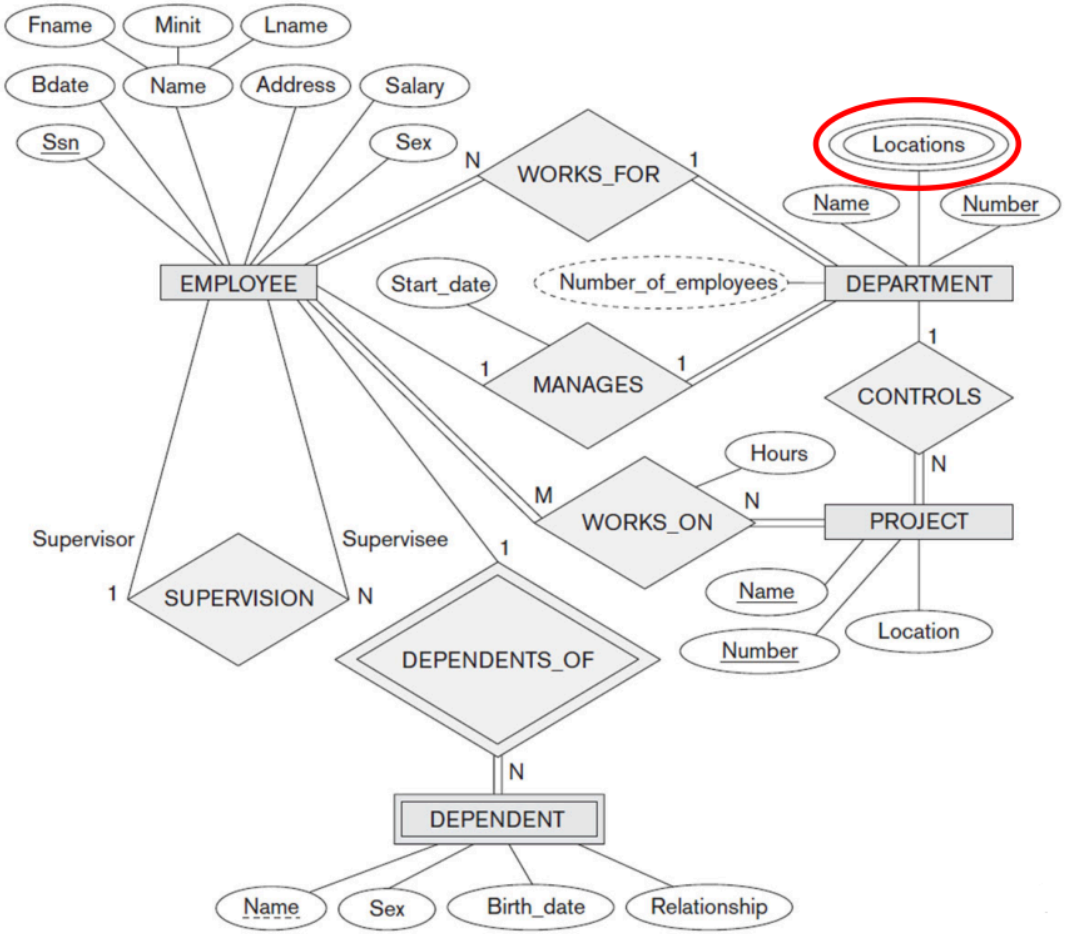
Multivalued Attributes



Complex Attributes

- Composite and multivalued attributes can be nested arbitrarily
- The combination of composite and multivalued attributes is called **Complex Attribute**

Example

Person can have more than one residence and each residence can have a single address and multiple phones

Derived Attributes

- Stored vs. derived attributes
  - Some attribute values can be derived from related entities
  - For example: Age can by derived from birthdate

Derived Attributes

? Question

Can you think of a derived attribute?

- The company is organized into departments.
- Each department has a unique name, a unique number, a manager (employee) with start date, and several locations.
- A department controls a number of projects, each with unique name, unique number, single location.
- We store each employee's name, ssn, address, salary, sex, birthdate.
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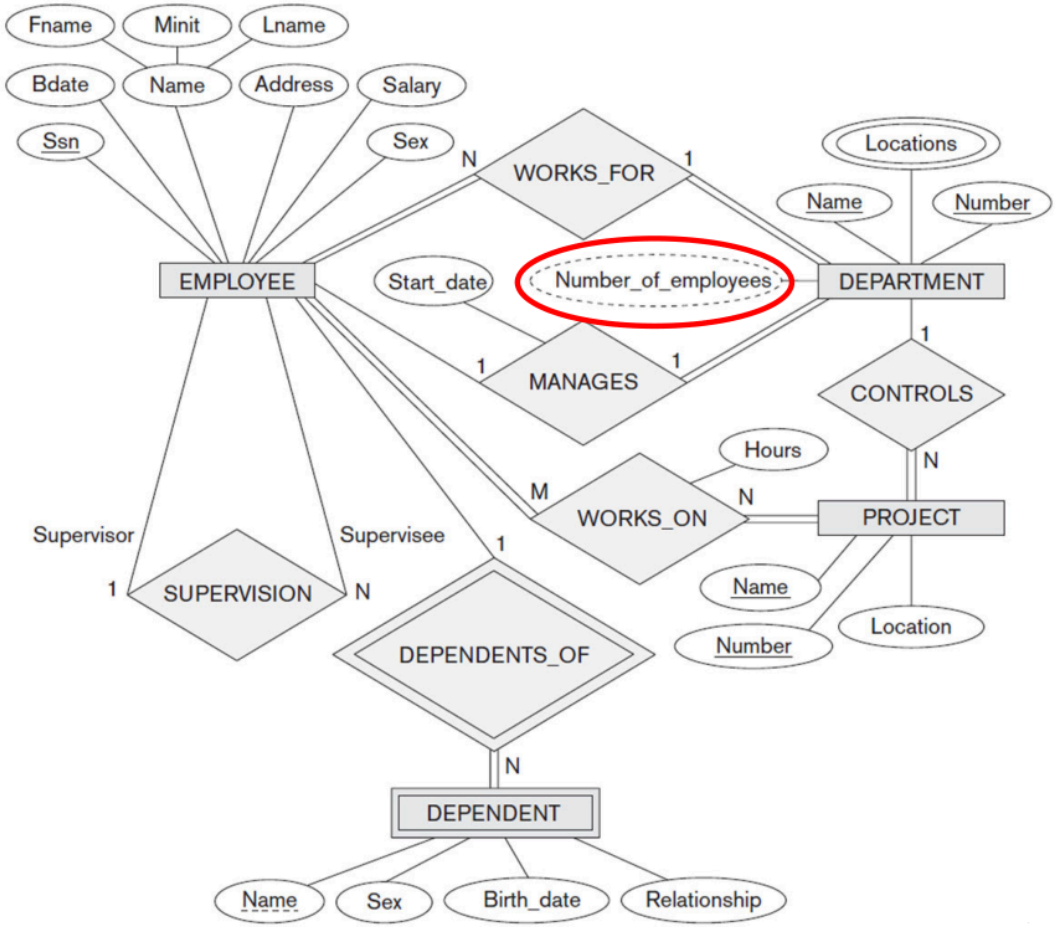
Derived Attributes



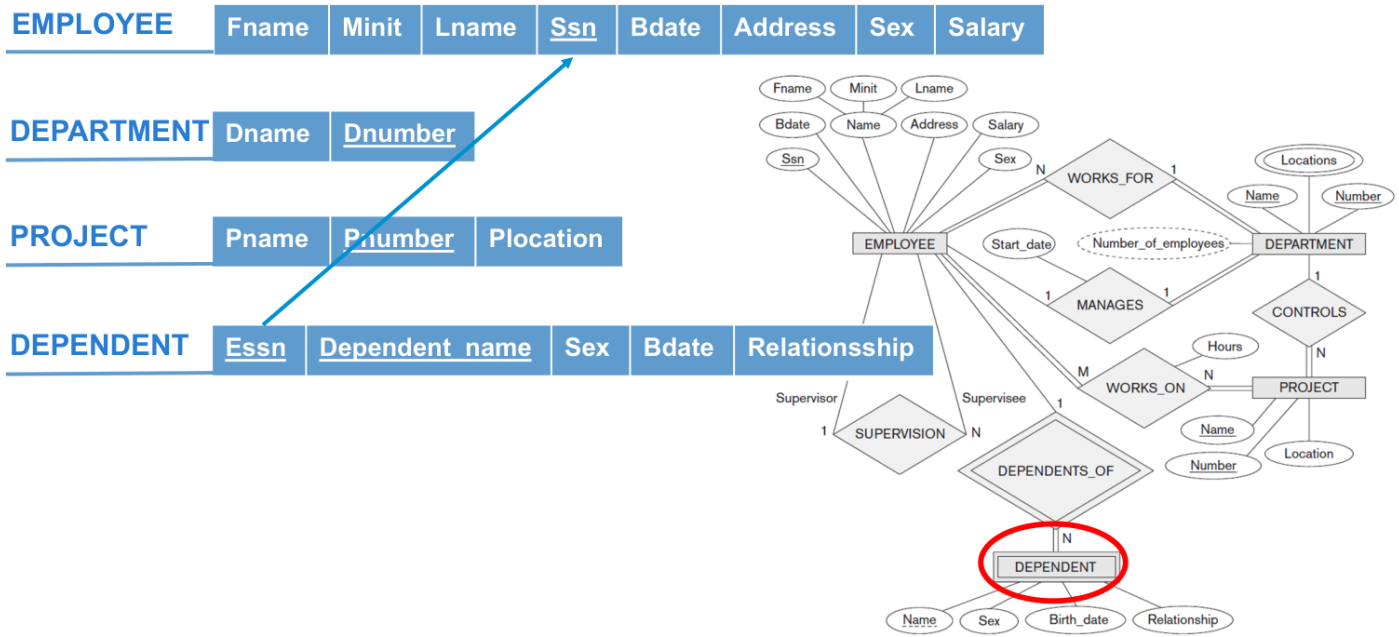
Mapping of ERM

- Seven Steps
  1. Mapping of regular entity types ✓
  2. Mapping of weak entity types
  3. Mapping of binary 1:1 relationships ✓
  4. Mapping of binary 1:n relationships ✓
  5. Mapping of binary m:n relationships ✓
  6. Mapping of multivalued attributes
  7. Mapping of n-ary relationships

Mapping of ERM: Weak Entity Types

- For each weak entity type W in the ER schema with owner entity type E, create a relation R and include all simple attributes (or simple components of composite attributes) of W as attributes of R
- In addition, include as foreign key attributes of R, the primary key attribute(s) of the relation(s) that correspond to the owner entity type(s); this takes care of mapping the identifying relationship type of W
- The primary key of R is the combination of the primary key(s) of the owner(s) and the partial key of the weak entity type W, if any

Mapping of ERM: Weak Entity Types



Info

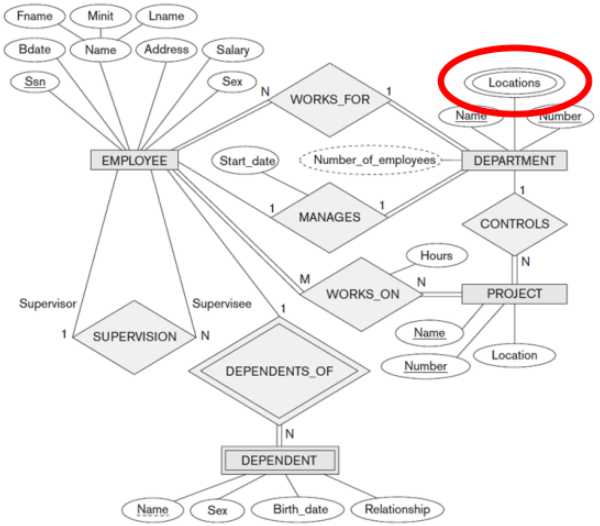
- The attribute `SSN` is renamed to `ESSN`, although this is not necessary.
- The primary key is the combination `{ESSN, DEPENDENT_NAME}`

Mapping of ERM: Multivalued Attributes

- For each multivalued attribute A, create a new relation R
- This relation R will include an attribute corresponding to A, plus the primary key attribute K - as a foreign key in R - of the relation that represents the entity type or relationship type that has A as a multivalued attribute
- The primary key of R is the combination of A and K
- If the multivalued attribute is composite, we include its simple components

Mapping of ERM: Multivalued Attributes

DEPT_LOCATIONS	Dnumber	Dlocation



- Attribute `Dlocation` represents the multivalued attribute `LOCATIONS` of `DEPARTMENT`
- Attribute `Dnumber` represents the primary key of `DEPARTMENT`
- The primary key of `DEPT_LOCATIONS` is the combination of `{Dnumber, Dlocation}`
- A separate tuple will exist in `DEPT_LOCATIONS` for each location that a department has

Mapping of ERM

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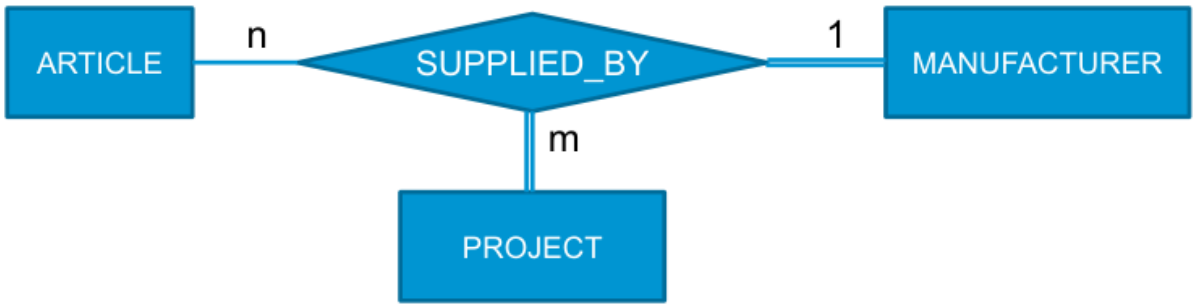
  7. Mapping of n-ary relationships

Ternary Relationship Types

Example

- Manufacturers supply items for projects.
- A manufacturer must supply at least one item.
- An article from in-house production does not have to be supplied for a project but can be supplied for many projects.
- A project uses at least one item.
- An item is supplied by only one manufacturer for a project.



Ternary Relationship Types

? Question

Cardinality: Can an entity of entity type A and an entity of entity type B be related to multiple entities of entity type C?

? Question

Participation: Must an entity type A be related to at least one entity type B and one entity type C?

Ternary Relationship Types

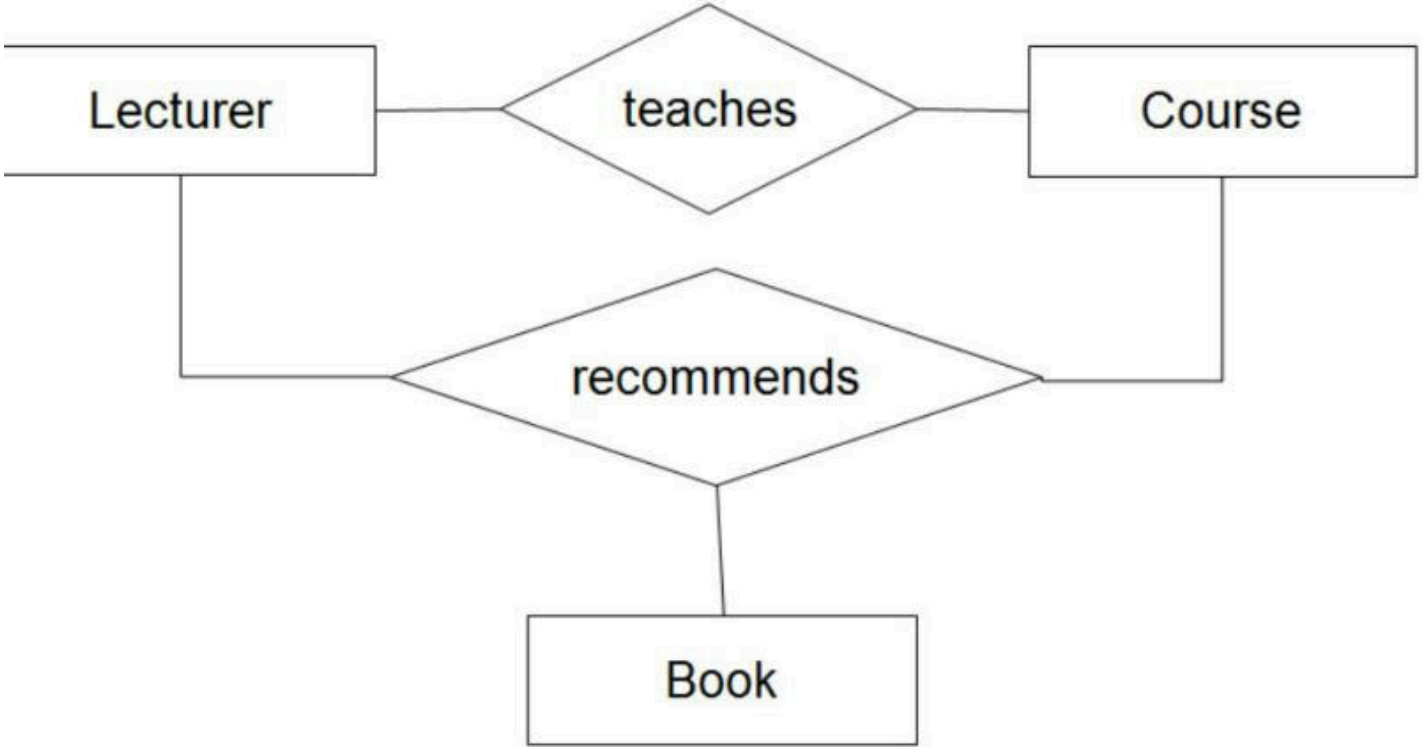
Example

- To prevent students from concentrating on one professor, they may only work with one professor on one seminar topic.
- In addition, a student can only work on a seminar topic with one professor.
- However, a professor may assign a seminar topic more than once.
- Students must attend seminars, but seminar topics do not have to be chosen.

Ternary Relationship Types

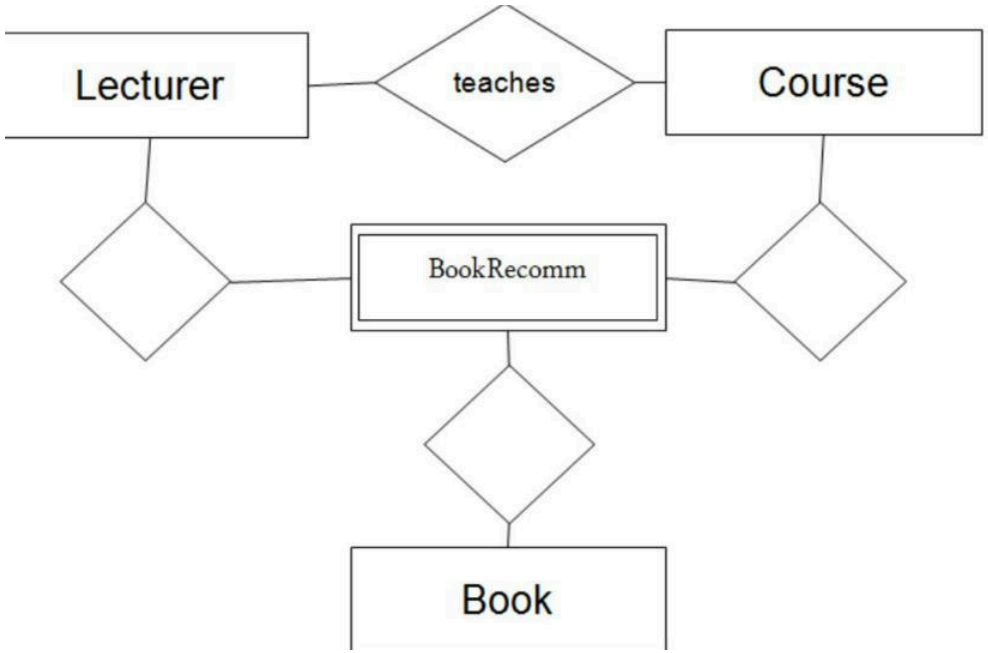
Ternary Relationship Types

- Higher degree relationship type: Literature recommendations for specific courses



Ternary Relationship Types

- In many CASE tools, only binary relationship types can be represented
- Ternary relationship type is replaced by (weak) entity type + relationship types



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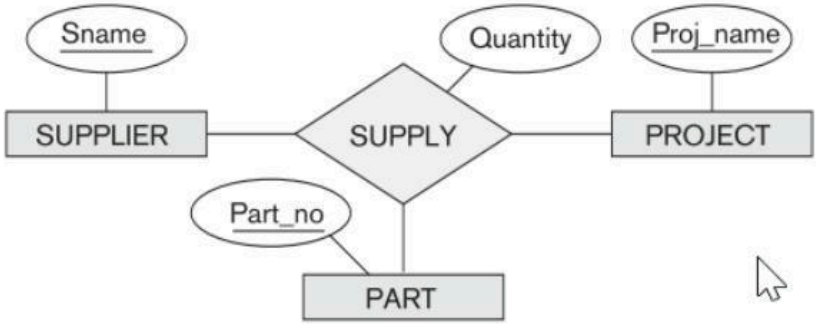
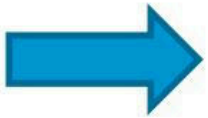
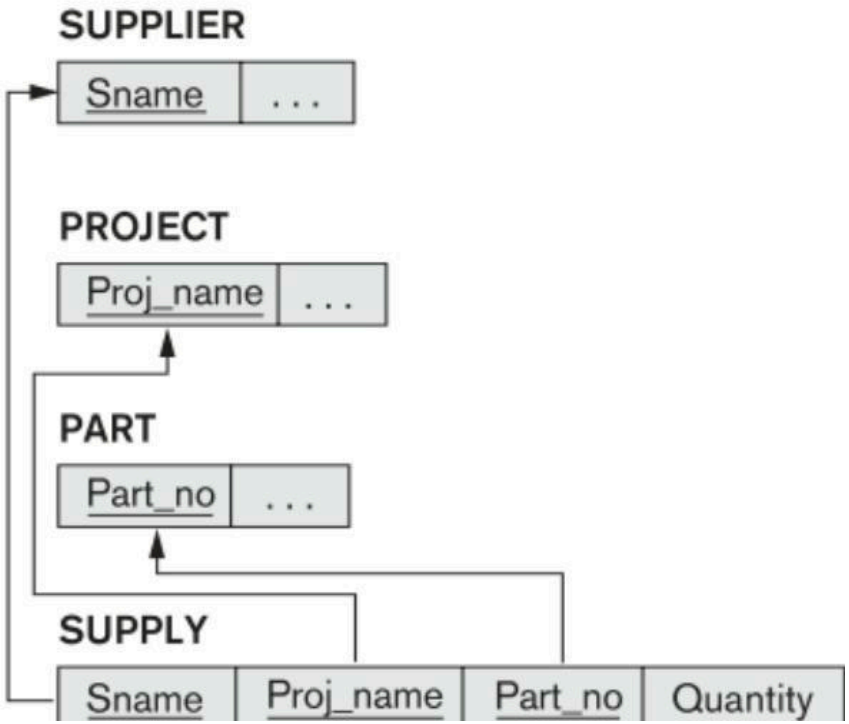
Mapping of ERM: Mapping of n-ary relationships

- For each n-ary relationship type R, where $n > 2$, create a new relation S to represent R
- Include as foreign key attributes in S the primary keys of the relations that represent the participating entity types
- Also include any simple attributes of the n-ary relationship type (or simple components of composite attributes) as attributes of S
- The primary key of S is usually a combination of all the foreign keys that reference the relations representing the participating entity types

Mapping of ERM: Mapping of n-ary relationships







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Mapping of ERM: Summary

ER Model	Relational Model
Entity type	Relation
1:1 or 1:N relationship type	Foreign key (or relationship relation)
M:N relationship type	Relationship relation and two foreign keys
N-ary relationship type	Relationship relation and n foreign keys
Simple attribute	Attribute
Composite attribute	Set of simple attributes
Multivalued attribute	Relation and foreign key
Value set	Domain
Key attribute	Primary key

3. Constraints

Basics

- Three categories
  1. Constraints that are inherent in the data model inherent model-based constraints or implicit constraints Example: no duplicate tuples in a relation
  2. Constraints that can be directly expressed in schemas of the data model schema-based constraints or explicit constraints Example: Domain constraints, key constraints, constraints on NULL, entity integrity constraints and referential integrity constraints
  3. Constraints that cannot be directly expressed in the schemas of the data model, and hence must be expressed and enforced by the application programs application-based or semantic constraints or business rules

Basics

- Syntax for creating an empty table

```
CREATE TABLE < relationname >
        (<column> <type> [ DEFAULT expr ]
                [ [NOT] NULL ] [ colconstraint ] *
        [,{<column> <type> [ DEFAULT expr ]
                [ [NOT] NULL ] [ colconstraint ] *
         | <tableconstraint> } ] *
        );
```

SQL

- Some constraints (e.g., `UNIQUE`, `NOT NULL`) can be defined as column constraints or as table constraints

Key Attributes

- How can we identify an actual entity within an entity set?
- Attributes must be used
  - Key Attributes (also called identifying attributes)
- Sometimes several attributes together form a key attribute (identifying attribute), meaning that the combination of the attribute values must be distinct for each entity
  - If a set of attributes possesses this property, the proper way to represent this in the ER model that is to define a composite attribute and designate it as a key attribute of the entity type
  - Notice that such a composite key attributes must be minimal; that is, all component attributes must be included in the composite attribute to have the uniqueness property
- Key attributes are underlined
- If two attributes are underlined separately, then each is an identifying attribute on its own

Primary Key

- Primary Key
  - Also called Entity Integrity Constraint
  - PK values must be unique and cannot be NULL!
  - Notation: <u>underlined</u>

ISBN	Title	Author	Publisher	Year	Price
978-1-292-09761-9	Fundamentals of Database Systems	Ramez Elmasri	Prentice Hall	2016	59.99
978-0-321-19784-9	An Introduction to Database Systems	C. J. Date	Pearson	2003	69.92

3.5 Domains

Basics

- A domain D is a set of atomic values
- Atomic means that each value is indivisible
- A common method of specifying a domain is to specify a data type from which the data values forming the domain are drawn
- It is also useful to specify a name for the domain, to help in interpreting its values

Example

- `Names`: The set of character strings that represent names of persons
- `Employee_age`: Possible ages of employees in a company; each must be an integer value between 16 and 70

3.5 Domains

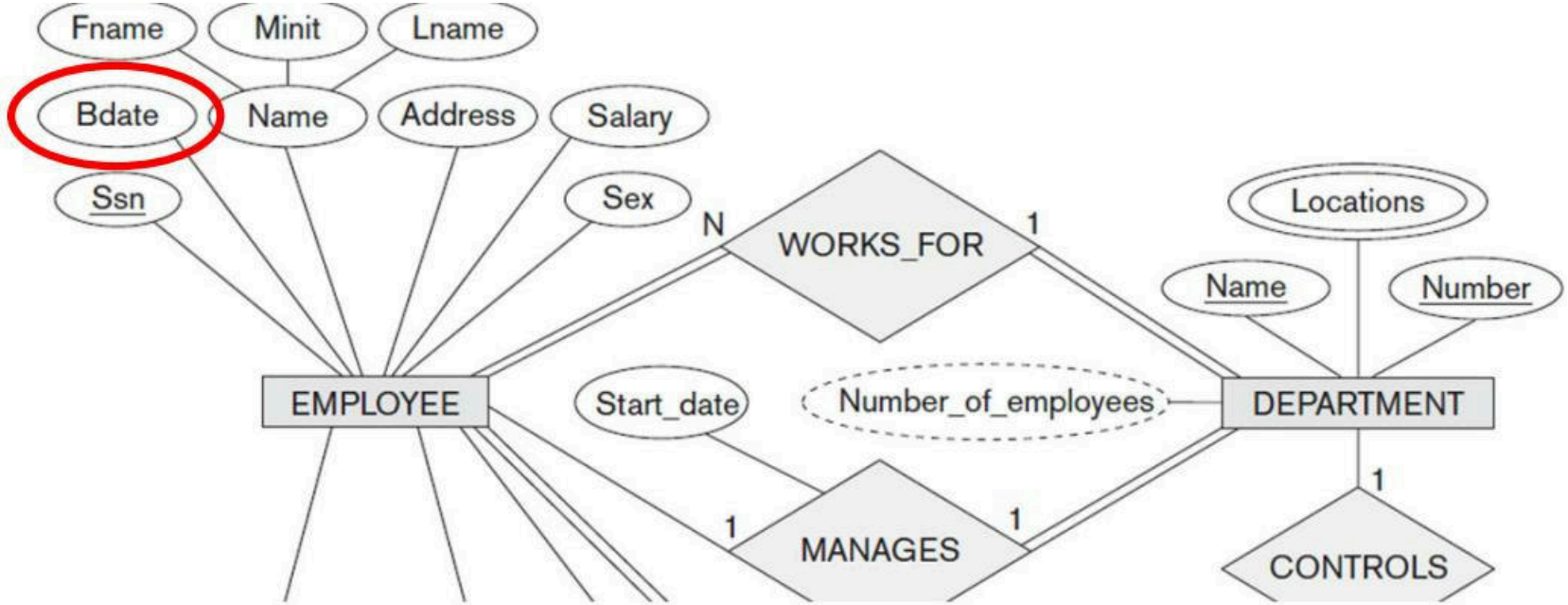
Basics

- Domain constraints specify that within each tuple, the value of each attribute A must be an atomic value from the domain $\mathrm{dom}(A)$
- Data types
  - Numeric data types: short integer, integer, long integer
  - Real numbers: float, double
  - Characters
  - Booleans
  - Fixed-length or variable-length strings
  - Date
- Also, possible subrange of values from a data types and enumerated data types

3.5 Domains

Basics

- For example: Employee must be between 16 and 70 years old
- Value sets are not displayed in ER diagrams, and are typically specified using the basic data types available in most programming languages



3.5 Domains

Basics

- Example:
  - `Employee_age`: integer number between 16 and 70
  - `Mobile_Number`: (dd)ddd-ddddddd d is a decimal digit
- A domain is thus given a name, data type, and format

3.5 Domains

Basics

- `CREATE DOMAIN` is part of the ANSI Standard But almost all RDBMS ignore this command
- A domain is simply a self-defined data type More precise it is a limitation of the values range of a data type

Example

- You want to save the age of a person, you could use `INTEGER`
- Now you could save a value from −2,147,483,648 to 2,147,483,647
- No person will reach an age of 2,147,483,647 years, neither can someone be younger than 0

- By creating a domain, you could design a useful value range (e.g., 0 => column =< 100).
- For using a domain, you just type the domain-name instead of a data type

3.5 Domains

Basics

- Based on base data type … with additional constraints

```
CREATE DOMAIN <name> [ AS ] datatype [ DEFAULT expression]
[ constraint [ . . . ] ] ; [ CONSTRAINT constraint\_name] { NOT
NULL | NULL | CHECK ( expression )
```

SQL

Example

```sql
CREATE DOMAIN nnint AS INT NOT NULL ;
CREATE DOMAIN posint AS INT CHECK ( VALUE >= 0 ) ;
CREATE DOMAIN dayofweek AS VARCHAR CHECK ( VALUE IN ( 'Monday' ,
'Tuesday' , ...)) ;
CREATE DOMAIN SSN TYPE AS CHAR(9);
```

SQL

3.5 Domains

SQL - Check

- One option to implement domains in mySQL
- `colconstraint` = Column constraint
  - `CHECK`
    - Constraint can restrict attribute or domain values using the `CHECK` clause following an attribute or domain definition

Example

```sql
Dnumber INT NOT NULL CHECK (Dnumber > 0 AND Dnumber < 21);
```

3.5 Domains

SQL - Check

- Tuple-based constraints
  - Semantical Integrity
  - Apply to each tuple individually and are checked whenever a tuple is inserted or modified
- Makes sure that condition is met … or `NULL`!
- Typical use case: Range checking

Example

```sql
CONSTRAINT chk\_age CHECK (age ≥ 18)
```

- Also, complex conditions possible (verify relationships with other rows and/or tables)

Example

```sql
  CHECK (Dept_create_date <= Mgr_start_date);
```

3.5 Domains

SQL - Check

- The `CHECK` clause can also be used in conjunction with the `CREATE DOMAIN` statement if supported by the DBMS
- For example, we can write the following statement:

```SQL
CREATE DOMAIN D_NUM AS INTEGER CHECK (D_NUM > 0 AND D\_NUM < 21 );
```

Constraints on `NULL`

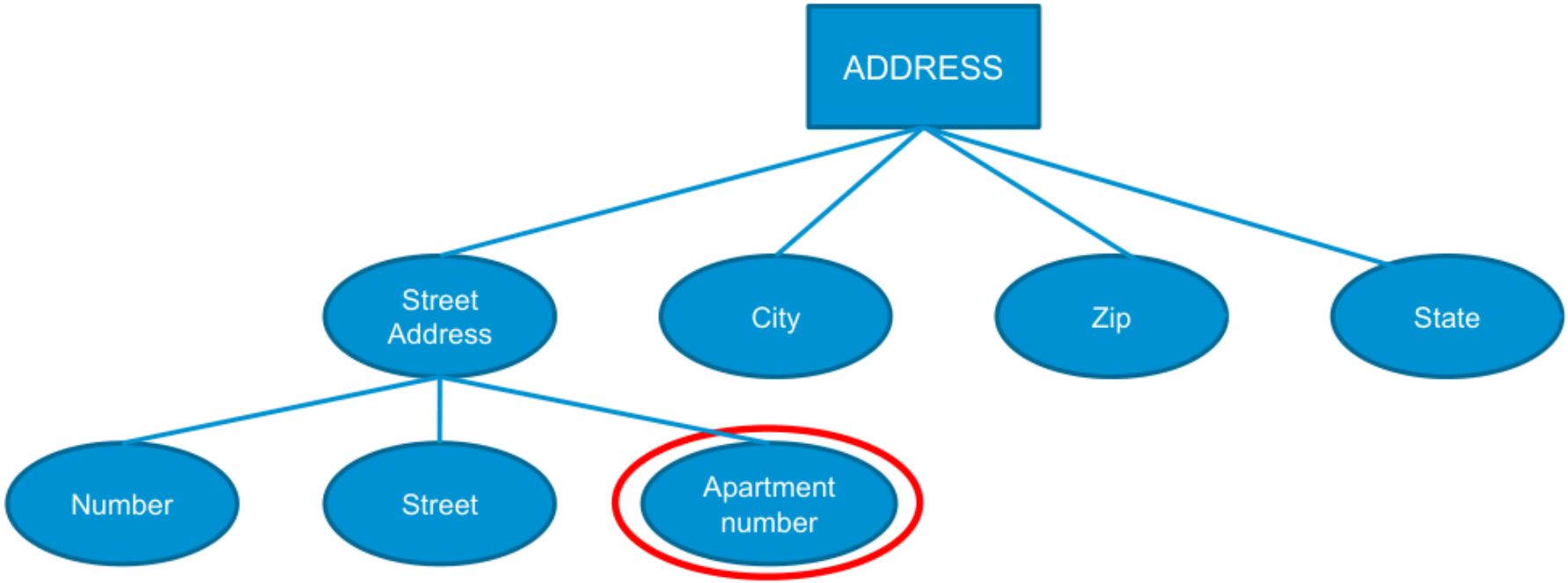
- Constraint on attributes specifies whether NULL values are or are not permitted
- `NULL`: special attribute value
  - Value unknown (exists but is intentionally withheld)
    - A person's date of birth is not known, so it is represented by NULL in the data base
  - Unavailable or withheld value (exists but is not known)
    - A person has a home phone but does not want it to be listed, so it is withheld and represented as `NULL` in the database.
  - Not applicable (the attribute is undefined for this tupel)
    - Student's name has no middle initials, student has no academic degree, …

3.5 Domains

Constraints on `NULL`

- `NULL` values
  - A particular entity may not have an applicable value for an attribute, e.g. apartment number in address

3.5 Domains



- `NULL` can also be used if we do not know the value of an attribute for a particular entity

Constraints on `NULL`

- Syntax for creating an empty table:

```
1  CREATE TABLE < relationname >                                    SQL
2           (<column> <type> [ DEFAULT expr ]
3                    [ [NOT] NULL ] [ colconstraint ] *
4           [,{<column> <type> [ DEFAULT expr ]
5                    [ [NOT] NULL ] [ colconstraint ] *
6            | <tableconstraint> } ] *
7           ) ;
```

3.5 Domains

Constraints on `NULL`

- `NULL`:
  - “no information available”
  - “no information available yet”
  - “unknown”
  - “not applicable”
- Examples:
  - Birthdate
  - Apartment Number
  - Minit

3.5 Domains

Constraints on `NULL`

- `NOT NULL` mandatory field, a value is needed
- Default: `NULL` optional field, `NULL` is allowed
- This is always implicitly specified for the attributes of the primary key of each relation

! Memorize

Attention: Most attributes should be `NOT NULL`!

`UNIQUE`

- UNIQUE constraint prevents duplicates in a column, i.e., a duplicate entry is not valid in a unique column
- A unique key is a candidate key
- All the candidate keys of a relation can uniquely identify the records of the relation, but only one of them is used as the primary key of the relation
- Example: primary key

`UNIQUE`

- Additional identifying attributes: alternate (secondary) keys
- In SQL: `UNIQUE`
- Unique elements can be `NULL`
  - … in some implementations
  - Thinking of key: should not be nullable
    - Unique: could be null (several nulls allowed!)

3.5 Domains

- As column constraint

```sql
Dname VARCHAR(15) UNIQUE;
```

- As table constraint

```sql
CREATE TABLE Department
( Dname VARCHAR(15) NOT NULL Dnumber INT NOT NULL …
PRIMARY KEY ( Dnumber ) ,
UNIQUE ( Dname ),
...);
```

Relationship Types

- Cardinality
  - Specifies the maximum number of relationship instances that an entity can participate in
  - Cardinality ratios
    - 1:1
    - 1:N
    - M:N
  - Cardinality ratios for binary relationships are represented on ER diagrams by displaying 1, M, and N on the diamonds
  - Notice that in this notation, we can either specify no maximum (N) or a maximum of one (1) on participation

3.5 Domains

Relationship Types

- Participation
  - Specifies whether the existence of an entity depends on its being related to another entity via the relationship type
  - Also called minimum cardinality constraint
  - Two types
    - Total: every entity in the total set of all entities of an entity type A must be related to an entity of entity type B via a relationship
      - Total participation is also called existence dependency
      - Is displayed as a double line connecting the participating entity type to the relationship
    - Partial: some or part of the entities of an entity type A are related to some entities of an entity type B via a relationship
      - Is displayed by a single line connecting the participating entity type to the relationship

3.5 Domains

Relationship Types

- Cardinality
  - specifies the maximum number of relationship instances that an entity can participate in
- Participation
  - specifies if the existence of an entity depends on its being related to another entity via the relationship type
  - minimum cardinality constraint

Referential Integrity Constraint

- Is defined between two relations
- Is used to maintain the consistency among tuples in the two relations: a tuple in one relation that refers to another relation must refer to an existing tuple in that relation
- Foreign key: a set of attributes FK in relation schema R_1 is a foreign key of R_1 that references relation R_2 if it satisfies the following rules:
  1. The attributes in FK have the same domain(s) as the primary key attributes PK of R_2; the attributes FK are said to reference or refer to the relation R_2.
  2. A value of FK in a tuple t_1 of the current state $r_1(R_1)$ either occurs as a value of PK for some tuple t_2 in the current state $r_2(R_2)$ or is `NULL`. In the former case, we have $t_1[\mathrm{FK}] = t_2[\mathrm{FK}]$, and we say that the tuple t_1 references or refers to the tuple t_2.

3.5 Domains

Foreign Key - Syntax

- As Column Constraint
  - Only if the foreign key is one single attribute (and not combined)

```SQL
[CONSTRAINT < constraintname > ]
    REFERENCES < tablename >[( column )] [< action >]
```

- As Table Constraint

```SQL
[CONSTRAINT < constraintname >]
    FOREIGN KEY (< column list >)
    REFERENCES < tablename >[(< column list >)]
            [< action >]
```

Foreign Key - Syntax

```sql
CREATE TABLE Department
( Dname VARCHAR(15) NOT NULL,
Dnumber INT NOT NULL,
Mgr_ssn CHAR(9) REFERENCES Employee(Ssn),
Mgr_start_date DATE,
PRIMARY KEY (Dnumber),
UNIQUE (Dname));
```

Foreign Key - Syntax

SQL

```sql
CREATE TABLE Department
( Dname VARCHAR(15) NOT NULL,
Dnumber INT NOT NULL,
Mgr_ssn CHAR(9) NOT NULL,
Mgr_start_date DATE,
PRIMARY KEY(Dnumber),
UNIQUE(Dname),
FOREIGN KEY (Mgr_ssn) REFERENCES Employee (Ssn));
```

3.5 Domains

Foreign Key - Syntax

- `< action >`:
  - How to react on changes to the referenced table
- The default action: reject the update operation (`RESTRICT` option)

```sql
action ::= ON {UPDATE | DELETE}
{NO ACTION | SET NULL | SET DEFAULT | CASCADE}
```

3.5 Domains

Foreign Key

- Options:
  - `SET NULL` Value of foreign key is set to `NULL`
  - `SET DEFAULT` Value of foreign key is set to a default value
  - `CASCADE` Value of foreign key is updated
- For example:
  - `ON DELETE CASCADE` Delete all referencing tuples
  - `ON UPDATE CASCADE` Change Value of the foreign key attribute(s)
- General Rule for using `CASCADE`:
  - For “relationship” relations
  - For multivalued attributes
  - For relations that represent weak entity types

3.5 Domains

Foreign Key

- All constraints get an identifier … if not by you, then by the system
- Problems with system generated identifiers Bad error messages
- Maybe we want to alter or drop the constraint later? Then we need its name!
- Exception: `NOT NULL` constraints no need for identifier
- The names of all constraints within a particular schema must be unique

3.5 Domains

Foreign Key

SQL

```sql
CREATE TABLE Employee
(...,
  Dno INT NOT NULL DEFAULT 1,
  CONSTRAINT EMPPK PRIMARY KEY (Ssn),
  CONSTRAINT EMPSUPERFK FOREIGN KEY (Super_ssn) REFERENCES
EMPLOYEE(Ssn)
    ON DELETE SET NULL
    ON UPDATE CASCADE,
  CONSTRAINT EMPDEPTFK FOREIGN KEY(Dno) REFERENCES
Department(Dnumber)
    ON DELETE SET DEFAULT
    ON UPDATE CASCADE);
```

Other Constraints

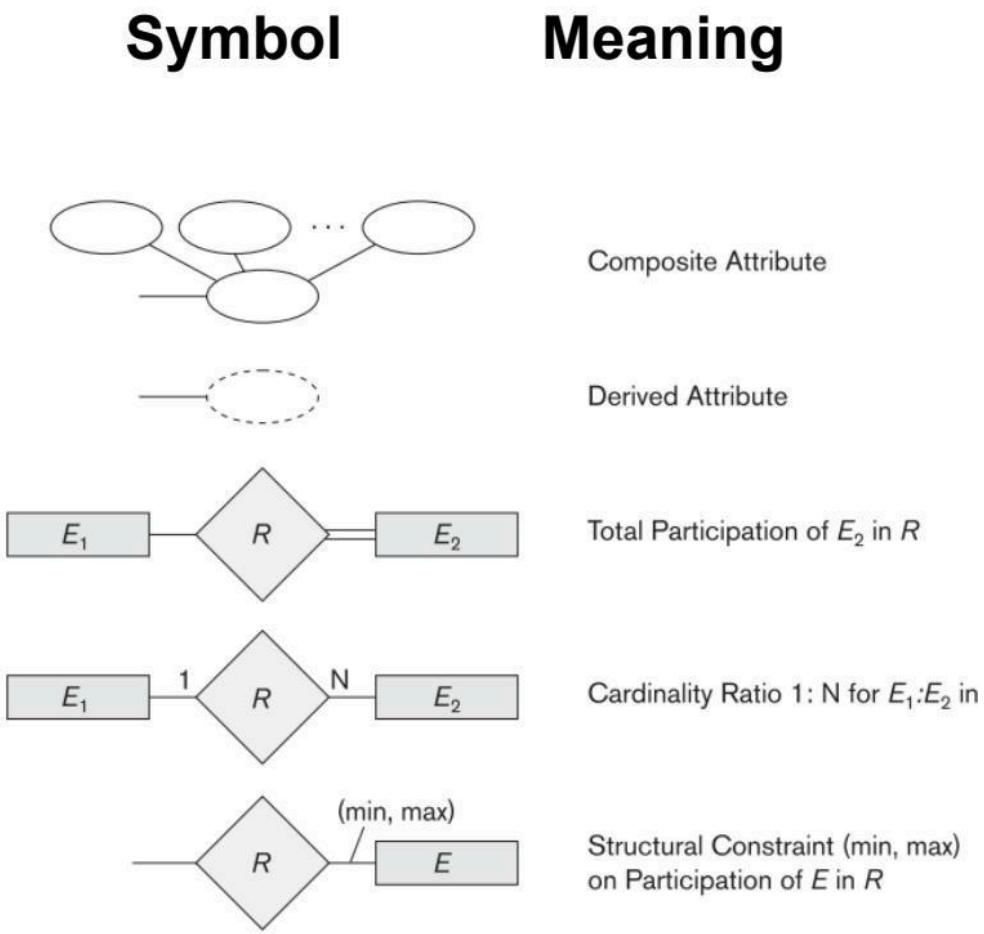
- Semantic integrity constraints
  - Example: The maximum number of hours an employee can work on all projects per week is 56
  - Realization:
    - Within the application programs or
    - Constraint specification language, e.g., trigger and assertions
- Functional dependencies constraint
  - It establishes a functional relationship among two sets of attributes X and Y
  - This constraint specifies that the value of X determines a unique value of Y in all states of a relation
  - It is denoted as a functional dependency $X \longrightarrow Y$

3.5 Domains

Overview

Constraint	Number of affected Relations
Domain constraints	1
Constraints on `NULL`	1
Entity integrity constraints (primary key)	1
Referential integrity constraints	$\geqslant 1$
Semantic integrity constraints	$\geqslant 1$
Functional dependencies constraint	$\geqslant 1$

4. Notation and Guidelines


Symbol
Meaning
Composite Attribute
Derived Attribute
E_1
R
E_2
Total Participation of E_2 in R
E_1
1
R
N
E_2
Cardinality Ratio 1: N for E_1:E_2 in
(min, max)
R
E
Structural Constraint (min, max)
on Participation of E in R

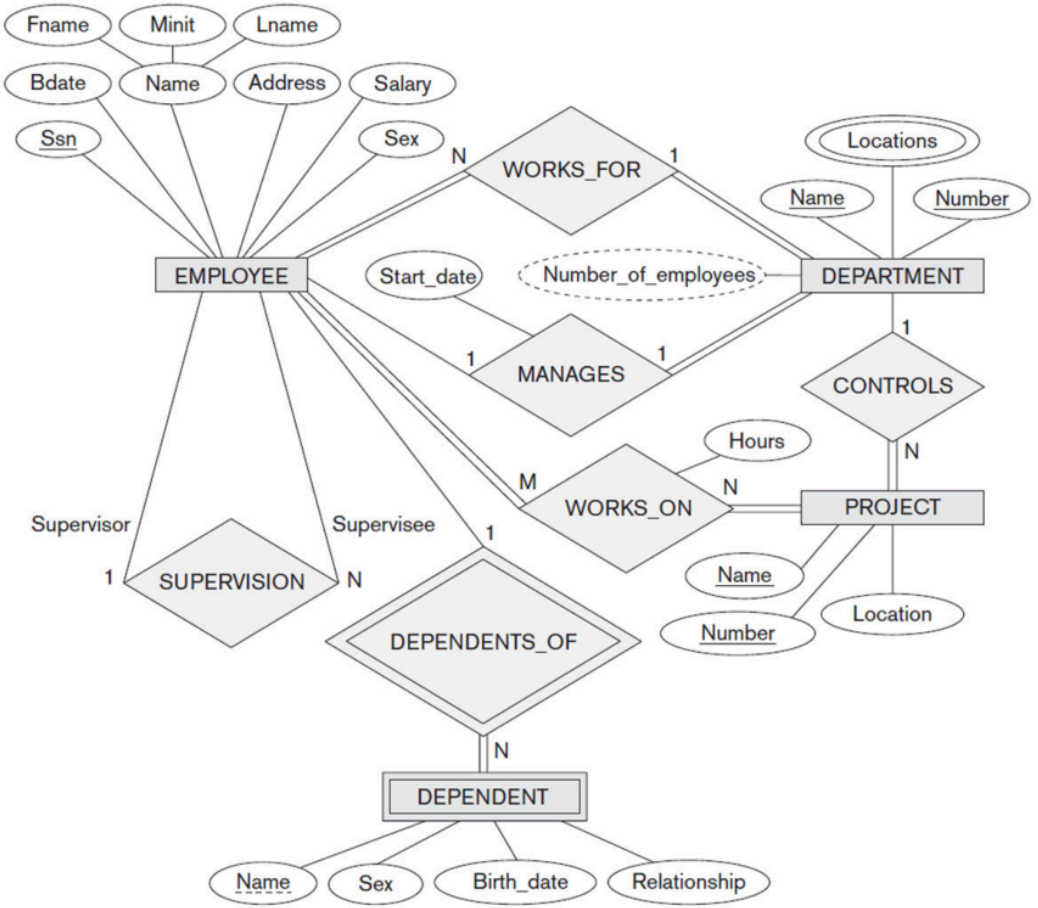
Symbol	Meaning
	Entity type
	Weak entity type
	Relationship type
	Identifying relationship type
	Attribute
	Key Attribute
	Multivalued Attribute

Basics

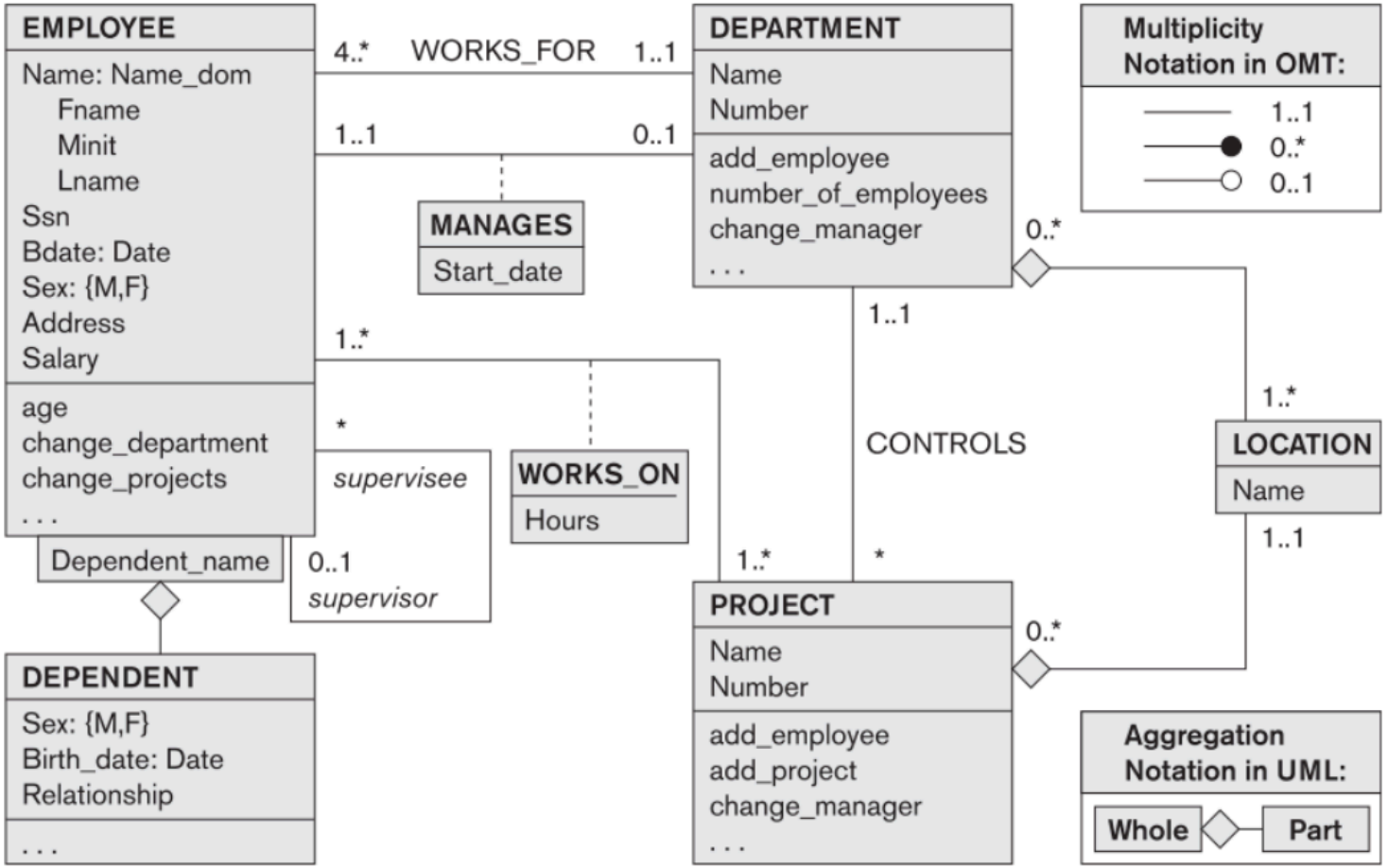
- Names
  - Entity type and relationship type names:
    - uppercase letters
  - Attribute names
    - initial letter capitalized
  - Role names
    - lowercase letters
- Binary relationship names to make the ER diagram of the schema readable from left to right and from top to bottom

Basics

- In general, the schema design process should be considered an iterative refinement process
- An attribute may be refined to a relationship if it is a reference to another entity type
- If an attribute exists in several entity types, it may be promoted to an independent entity type
- If an entity type A exists in the initial design with a single attribute and is related to only one other entity type B, the entity type A may be reduced or demoted to an attribute of entity type B


Fname
Minit
Lname
Name
Bdate
Address
Salary
Ssn
Sex
EMPLOYEE
WORKS_FOR
N
1
Locations
Name
Number
DEPARTMENT
Start_date
Number_of_employees
MANAGES
1
1
1
CONTROLS
N
Hours
M
WORKS_ON
N
PROJECT
Supervisor
Supervisee
1
1
SUPERVISION
N
DEPENDENTS_OF
Name
Location
Number
N
DEPENDENT
Name
Sex
Birth_date
Relationship

UML Notation



MC Notation

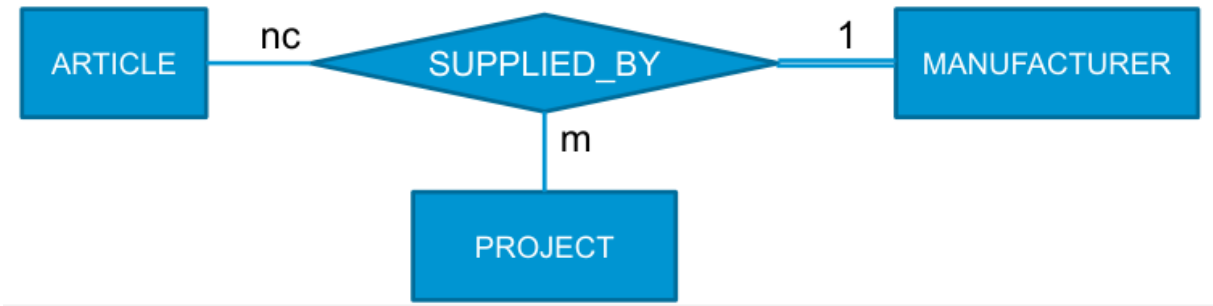
- Participation constraints
- Relationships can be mandatory or optional
- Types
  - Exactly one element: 1
  - One or no element: c (or 1c)
  - No or many elements: mc (or nc)
  - One or many elements: m (or n)

> **Info**
>
> Also called must-can notation!

MC Notation - Tenary Relationship

Example

- Manufacturers supply items for projects.
- A manufacturer must supply at least one item.
- An article from in-house production does not have to be supplied for a project but can be supplied for many projects.
- A project uses at least one item.
- An item is supplied by only one manufacturer for a project.



MC Notation - Tenary Relationship

? Question

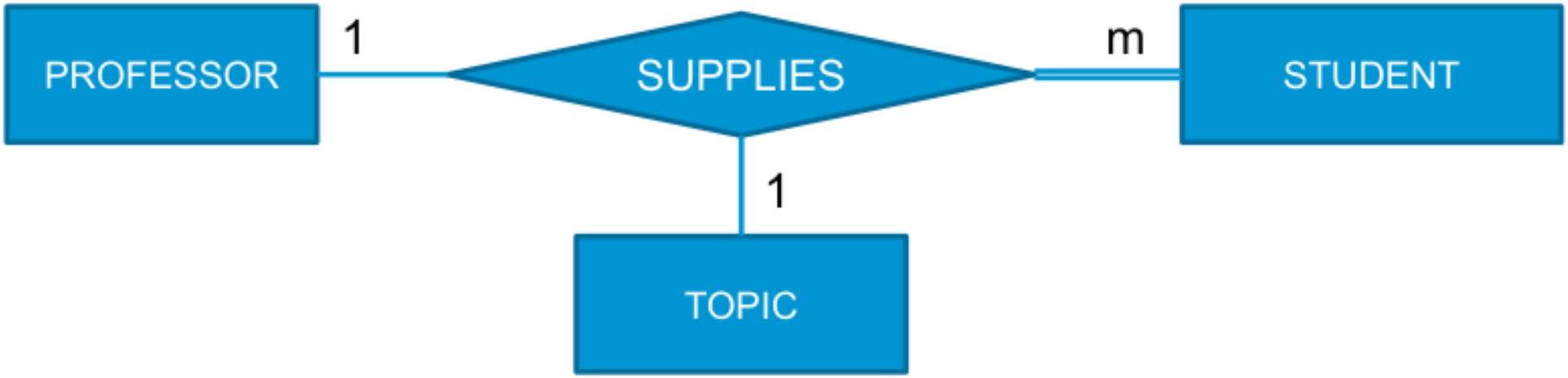
Cardinality: Can an entity of entity type A and an entity of entity type B be related to multiple entities of entity type C?

? Question

Participation: Must an entity type A be related to at least one entity type B and one entity type C?

MC Notation

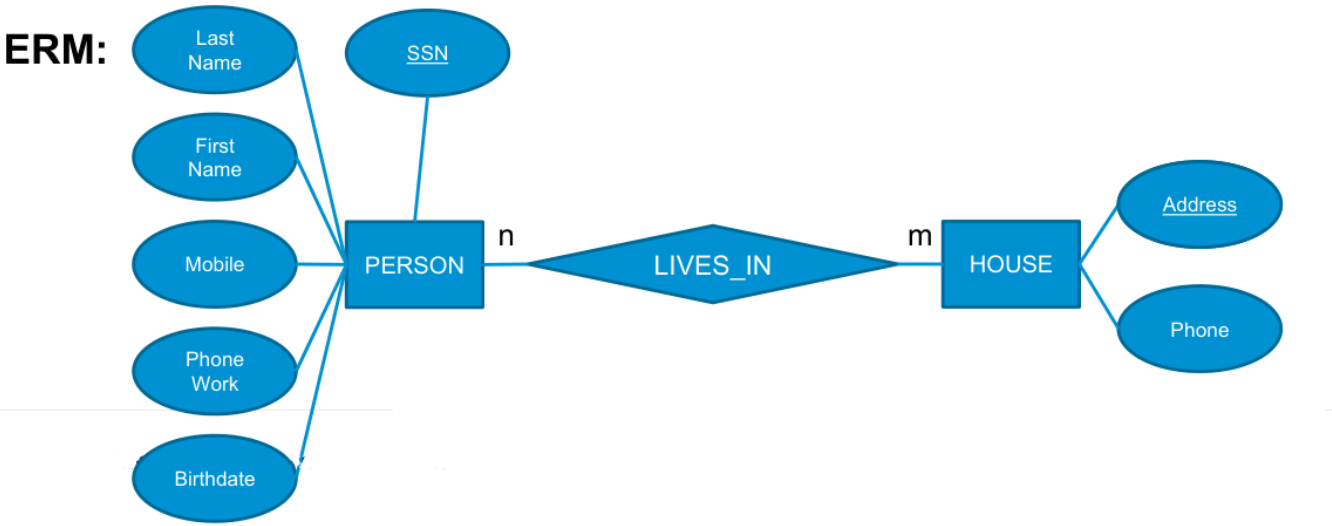
- To prevent students from concentrating on one professor, they may only work with one professor on one seminar topic.
- In addition, a student can only work on a seminar topic with one professor.
- However, a professor may assign a seminar topic more than once.
- Students must attend seminars, but seminar topics do not have to be chosen.



MC Notation - Tenary Relationship

Comparison ERM and RM

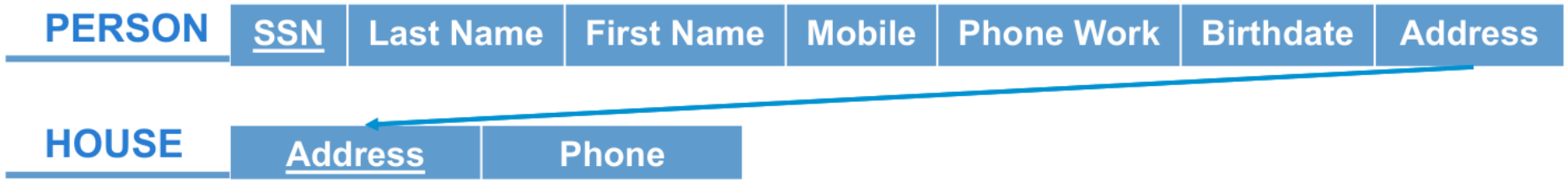
- ERM:
  - Conceptual Database Design
  - Describes a collection of entities, also called as real-world objects and relations between those entities
  - Basic elements: entity type, relationship type and attributes
  - Constraints like Cardinality, Participation ratio and Keys



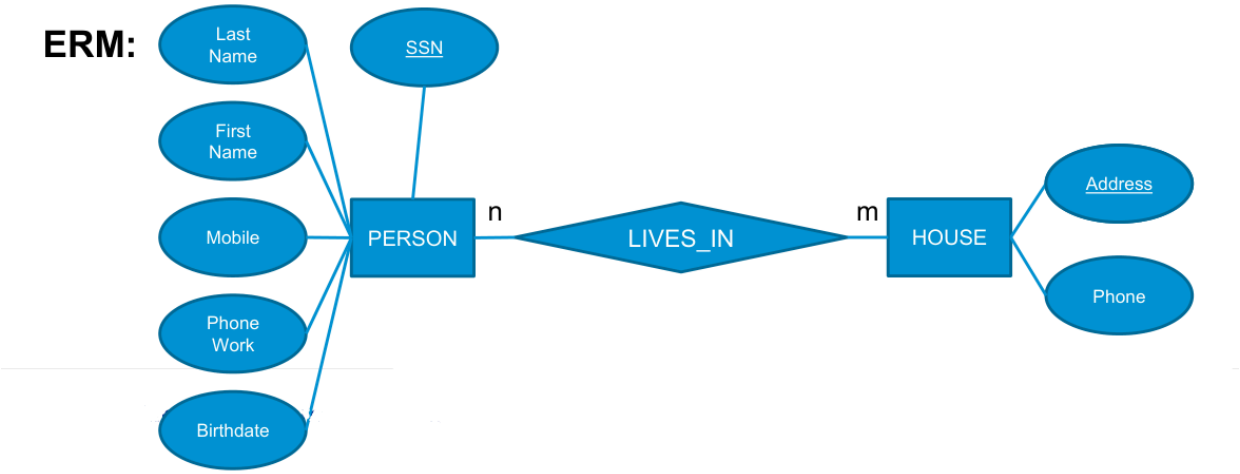
Comparison ERM and RM

- Relational Model:
  - Logical Database Design
  - Describes data and relation among those data by tables
  - Basic elements: Relations and Attributes
  - Constraints: Domain constraints, key constraints, constraints on `NULL`, entity integrity constraints and referential integrity constraints

Relational Model



Comparison ERM and RM



Relational Model

PERSON	SSN	Last Name	First Name	Mobile	Phone Work	Birthdate	Address

HOUSE	Address	Phone

Comparison ERM and RM

Aspect	ERM	RM
Basic	It represents the collection of objects called entities and relation between those entities	It represents the collection of tables and the relation between those tables
Describe	ERMs describe data as entity set, relationship set and attributes	Relational model describes data in a table as domains, attributes, tuples
Relationship	In an ERM, it is easier to understand the relationships between entities	Comparatively, it is less easy to derive a relation between tables in relational model
Mapping	ERM describes mapping cardinalities	Relational model does not describe mapping cardinalities

Mapping of ERM to RM

Main rules

- Entity types
  - Mapped to relations
  - Relations contain the attributes
  - Composite attributes: set of simple attributes
- Relationship Types
  - Foreign keys or
    - Relations plus Foreign keys

Mapping of ERM to RM

- Seven Steps
  1. Mapping of regular entity types
  2. Mapping of weak entity types
  3. Mapping of binary 1:1 relationships
  4. Mapping of binary 1:n relationships
  5. Mapping of binary m:n relationships
  6. Mapping of multivalued attributes
  7. Mapping of n-ary relationships

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