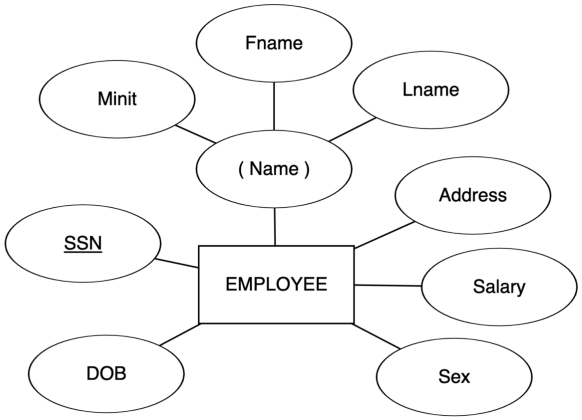
ER to Relational Database Design

Khalid Mahmood
Khalid.mahmood@it.uu.se

Regular Entity Mapping

- Map each Regular Entity to a Relation with all simple attributes
  - Unpack composite attribute
- Choose a primary key (only one if more than one key exists)
- A primary key can also be a composite key



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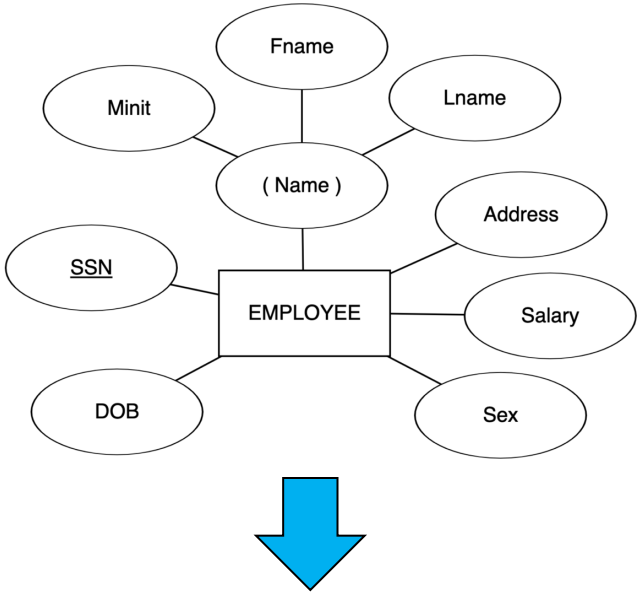
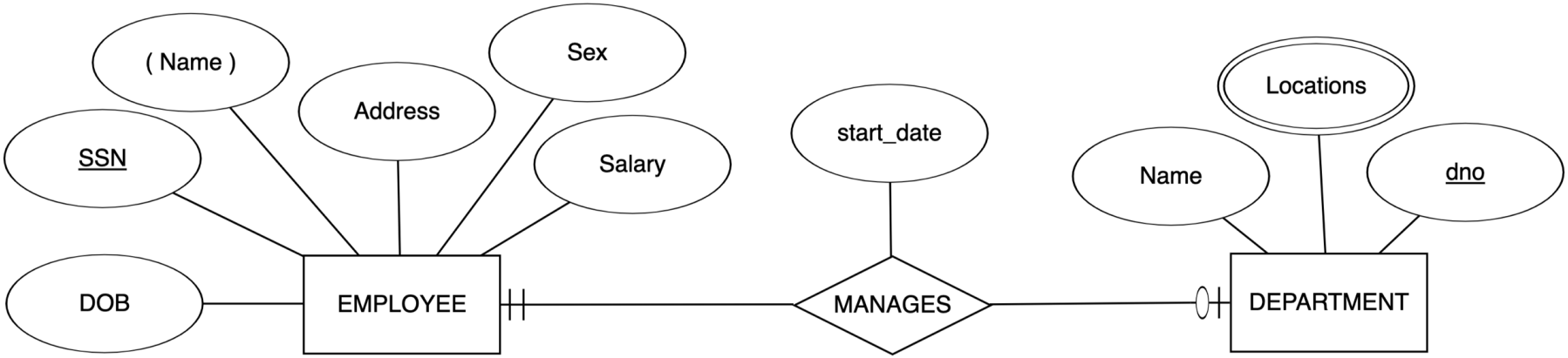


EMPLOYEE

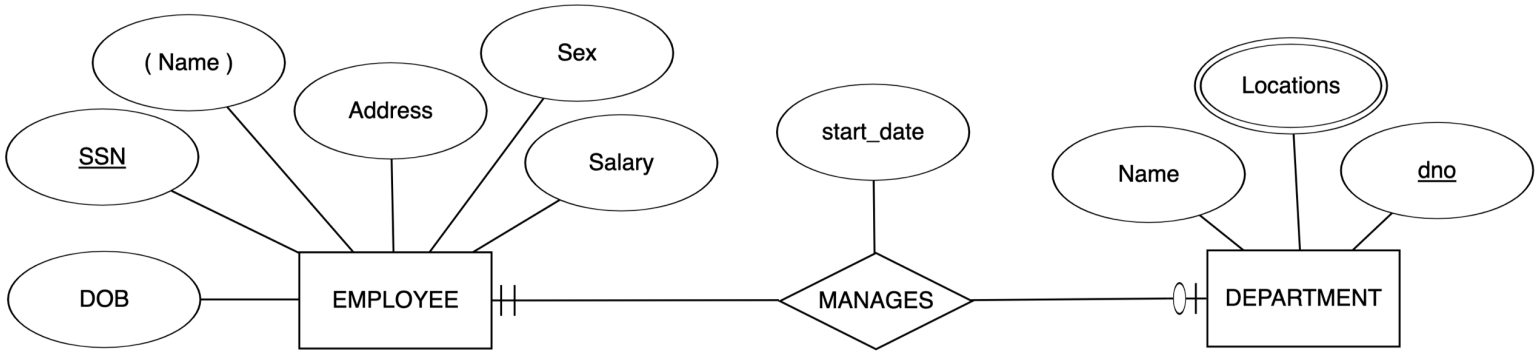
Fname	Minit	Lname	Ssn	Bdate	Address	Sex	Salary

Mapping of one-one Relation



Mapping of one-one Relation

- 3 possible ways:
  - **Foreign Key**: Better to choose an entity with total participation
  - **Merge relation**: May be appropriate if both participations are total. Might lose the context of an logical entity.
  - Build a **cross-reference table**: However, mostly FK approach is efficient.



EMPLOYEE

Pk

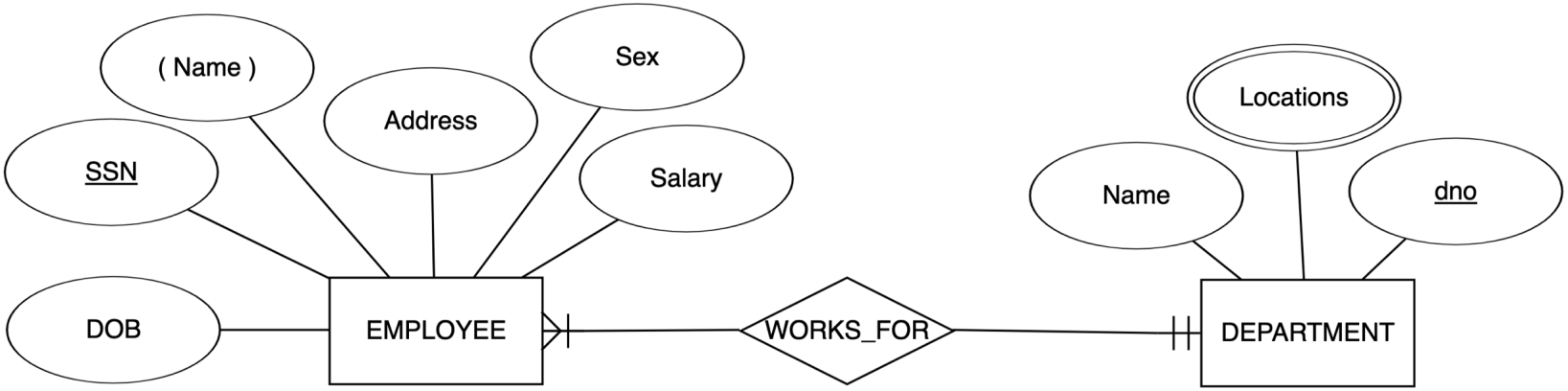
Fname	Minit	Lname	Ssn	Bdate	Address	Sex	Salary

DEPARTMENT

Dname	Dnumber	Mgr_ssn	Mgr_start_date

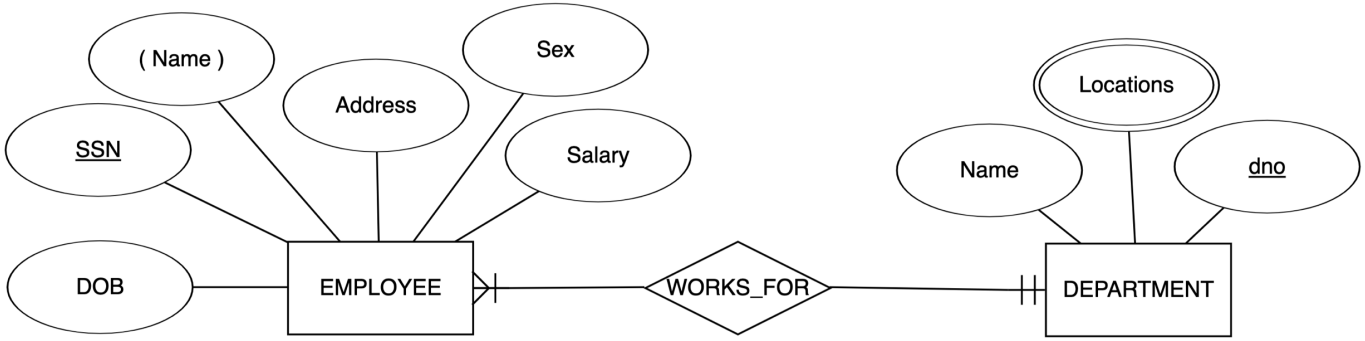
Fk

Mapping of one-many Relation



Mapping of one-many Relation

- 2 possible ways:
  - **Foreign Key**: Choose entity having the one-side of the relationship
  - Build a **cross reference table**: Rarely used



EMPLOYEE

Fname	Minit	Lname	Ssn	Bdate	Address	Sex	Salary	Super_ssn	Dno

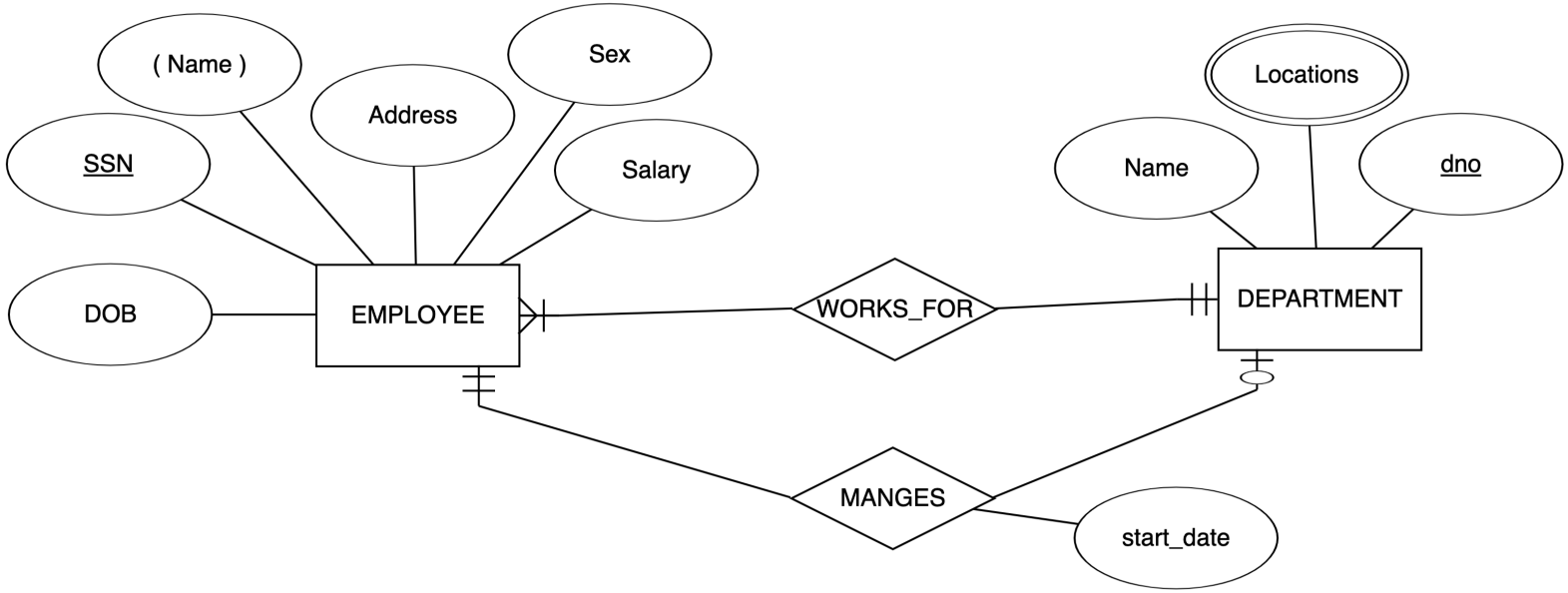
Fk

DEPARTMENT

Dname	Dnumber	Mgr_ssn	Mgr_start_date

Pk

Putting it together



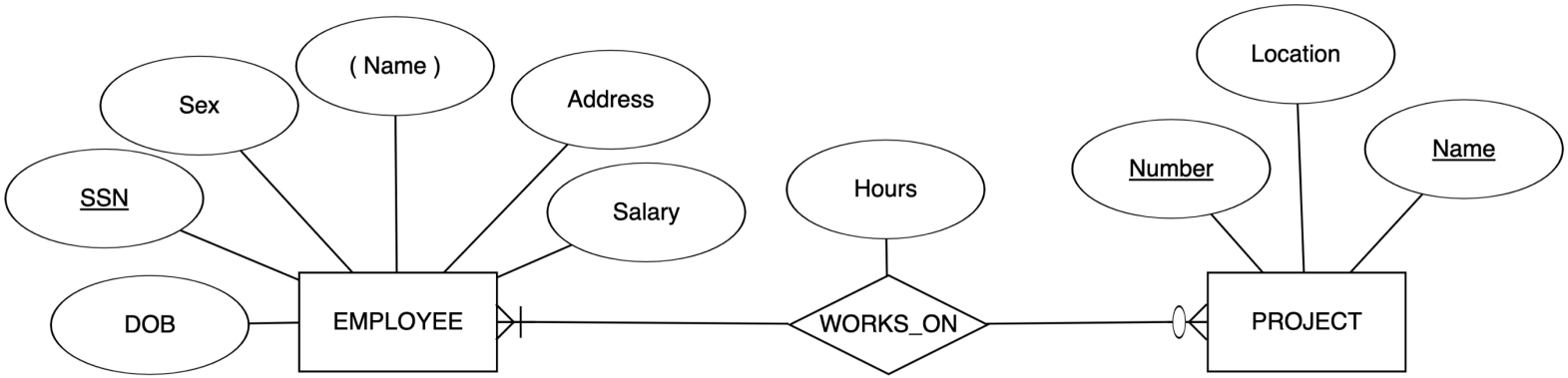
EMPLOYEE

Fname	Minit	Lname	Ssn (Pk)	Bdate	Address	Sex	Salary	Super_ssn	Dno (Fk)

DEPARTMENT

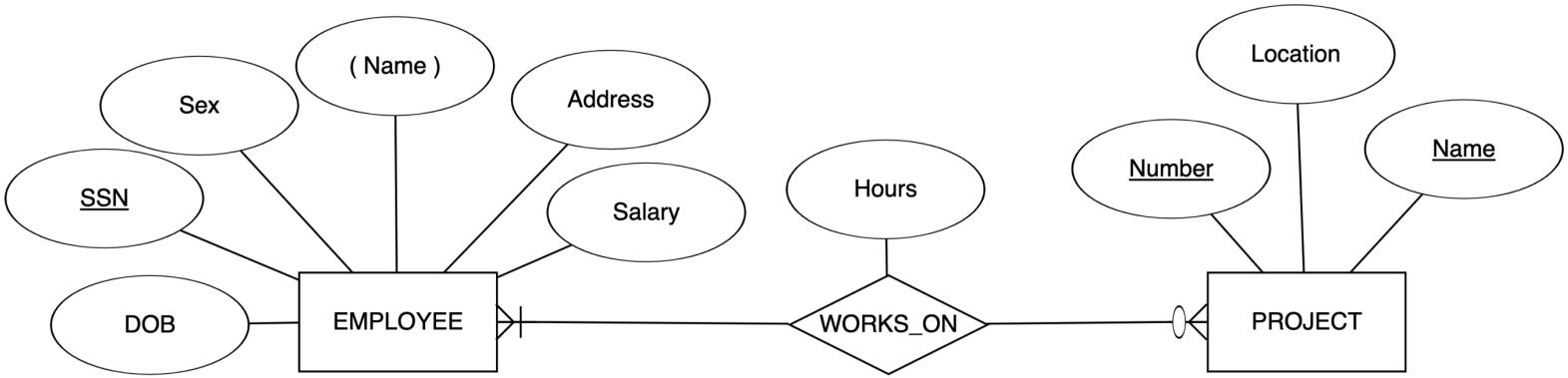
Dname	Dnumber (Pk)	Mgr_ssn (Fk)	Mgr_start_date

Mapping of many-many Relation



Mapping of many-many Relation

- Create a ***table*** having two ***foreign keys*** from both relations
  - add attribute (s) (if exists) from the ***relationship*** to the this table



EMPLOYEE

Fname	Minit	Lname	Ssn (Pk)	Bdate	Address	Sex	Salary

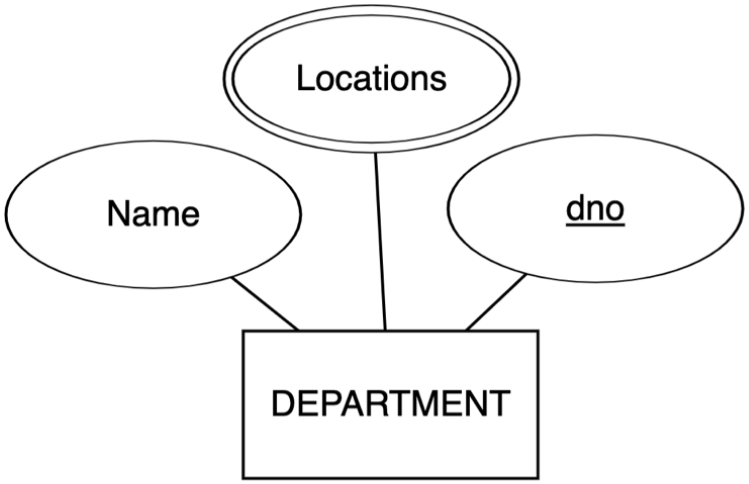
WORKS_ON

Essn (Fk)	Pno (Fk)	Hours

PROJECT

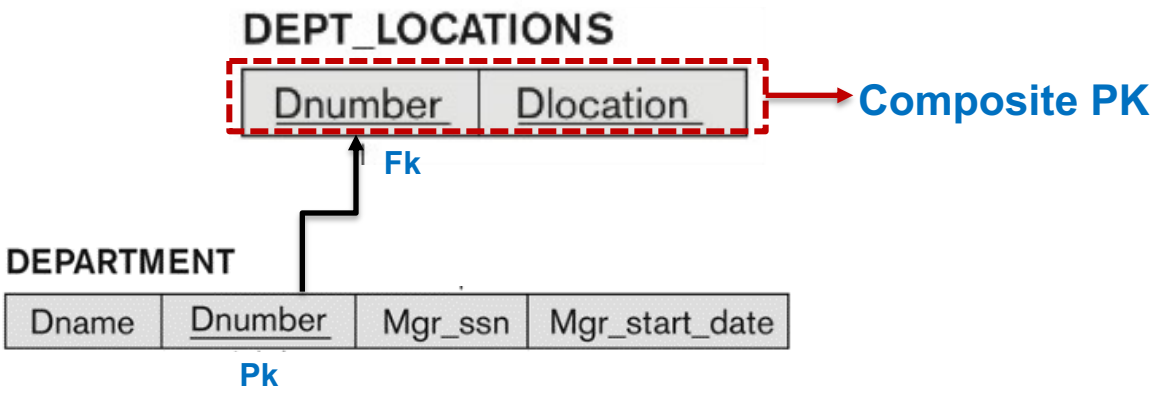
Pname	Pnumber (Pk)	Plocation	Dnum

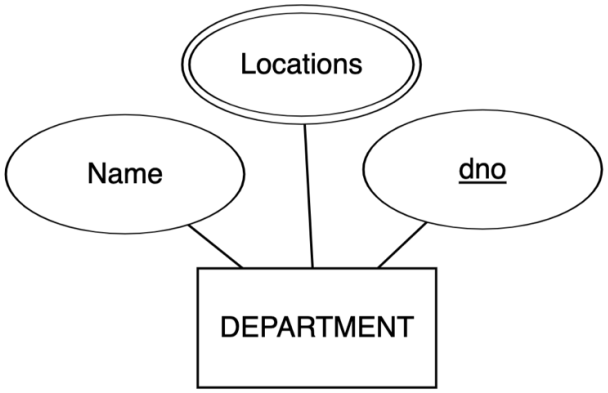
Mapping of Multivalued Attribute



Mapping of Multivalued Attribute

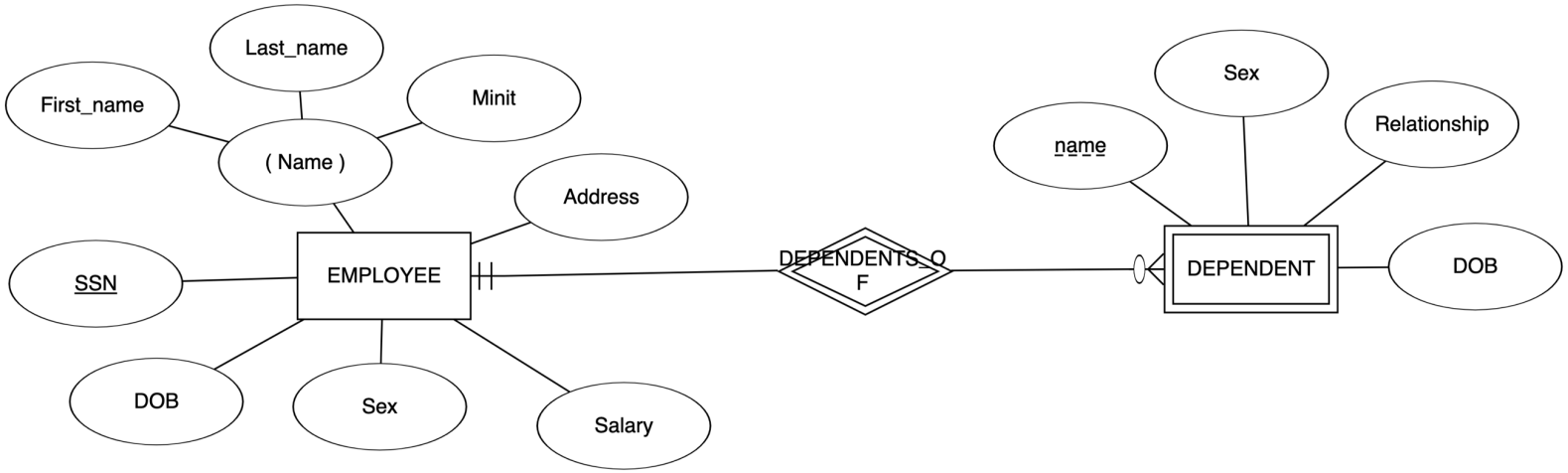
- For a ***multivalued*** attribute, create a **new *table***.
  - This table will have:
    (1) Attribute itself
    (2) *PK* of the **original table** as a *FK* in the **new table**
  - Composite PK of the new table: (PK of original + the Attribute itself)





Week Entity Mapping

- Create a **new *table*** having all the attributes
- Add a FK attribute of the PK of the owner entity to the new table
- The primary key of new table = (FK + Partial key of the week entity)



Week Entity Mapping

- Create a **new *table*** having all the attributes
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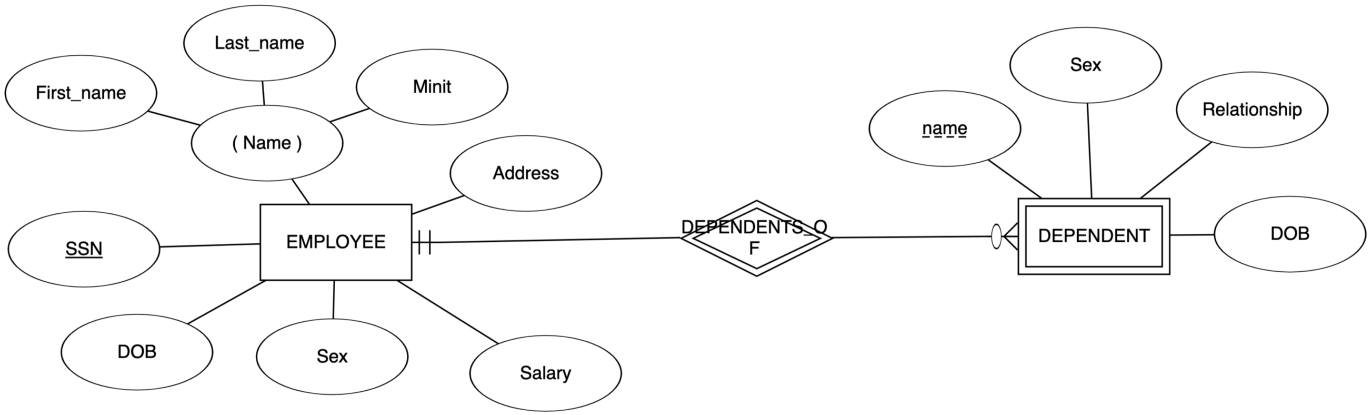


DEPENDENT

Essn	Dependent_name	Sex	Bdate	Relationship

Composite PK

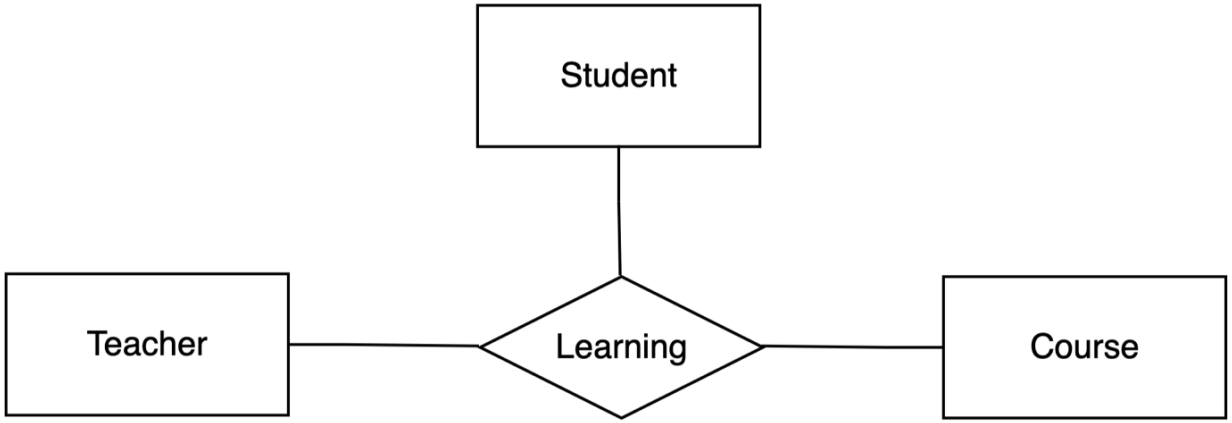
Fk

EMPLOYEE

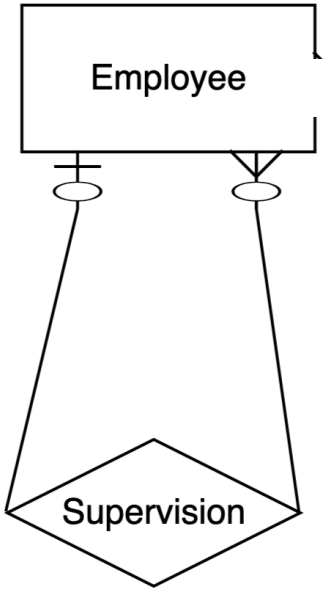
Fname	Minit	Lname	Ssn	Bdate	Address	Sex	Salary

Pk

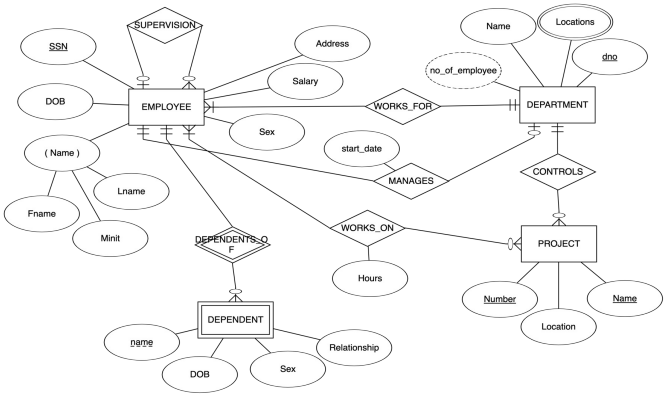
Task: How to Map N-ary Relationship?



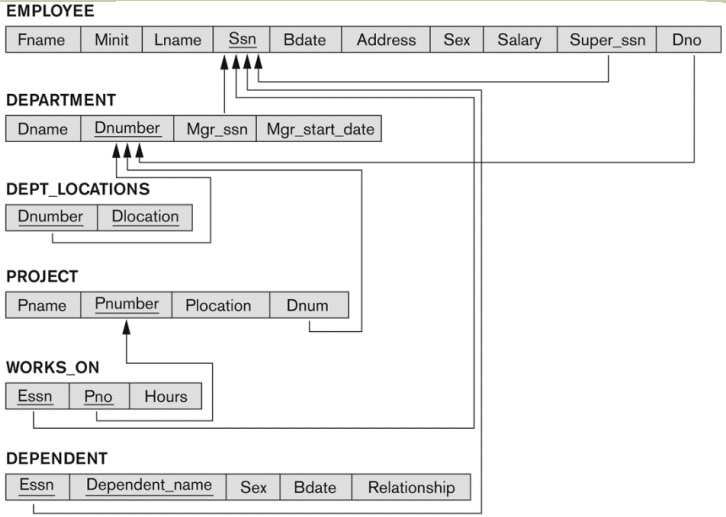
Task: Recursive Relationship Mapping



How to display a relational database schema and its constraints?



ER/EER
(Conceptual data models)



Relational Model
Close to DB Tables

Figure 5.6
One possible database state for the COMPANY relational database schema.

EMPLOYEE

Fname	Minit	Lname	Ssn	Bdate	Address	Sex	Salary	Super_ssn	Dno
John	B	Smith	123456789	1965-01-09	731 Fondren, Houston, TX	M	30000	333445555	5
Franklin	T	Wong	333445555	1955-12-08	638 Voss, Houston, TX	M	40000	888665555	5
Alicia	J	Zelaya	999887777	1968-01-19	3321 Castle, Spring, TX	F	25000	987654321	4
Jennifer	S	Wallace	987654321	1941-06-20	291 Berry, Bellaire, TX	F	43000	888665555	4
Ramesh	K	Narayan	666884444	1962-09-15	975 Fire Oak, Humble, TX	M	38000	333445555	5
Joyce	A	English	453453453	1972-07-31	5631 Rice, Houston, TX	F	25000	333445555	5
Ahmad	V	Jabbar	987987987	1969-03-29	980 Dallas, Houston, TX	M	25000	987654321	4
James	E	Borg	888665555	1937-11-10	450 Stone, Houston, TX	M	55000	NULL	1

DEPARTMENT

Dname	Dnumber	Mgr_ssn	Mgr_start_date
Research	5	333445555	1988-05-22
Administration	4	987654321	1995-01-01
Headquarters	1	888665555	1981-06-19

DEPT_LOCATIONS

Dnumber	Dlocation
1	Houston
4	Stafford
5	Bellaire
5	Sugarland
5	Houston

WORKS_ON

Essn	Pno	Hours
123456789	1	32.5
123456789	2	7.5
666884444	3	40.0
453453453	1	20.0
453453453	2	20.0
333445555	2	10.0
333445555	3	10.0
333445555	10	10.0
333445555	20	10.0
999887777	30	30.0
999887777	10	10.0
987987987	10	35.0
987987987	30	5.0
987654321	30	20.0
987654321	20	15.0
888665555	20	NULL

PROJECT

Pname	Pnumber	Plocation	Dnum
ProductX	1	Bellaire	5
ProductY	2	Sugarland	5
ProductZ	3	Houston	5
Computerization	10	Stafford	4
Reorganization	20	Houston	1
Newbenefits	30	Stafford	4

DEPENDENT

Essn	Dependent_name	Sex	Bdate	Relationship
333445555	Alice	F	1986-04-05	Daughter
333445555	Theodore	M	1983-10-25	Son
333445555	Joy	F	1958-05-03	Spouse
987654321	Abner	M	1942-02-28	Spouse
123456789	Michael	M	1988-01-04	Son
123456789	Alice	F	1988-12-30	Daughter
123456789	Elizabeth	F	1967-05-05	Spouse

DBMS Tables

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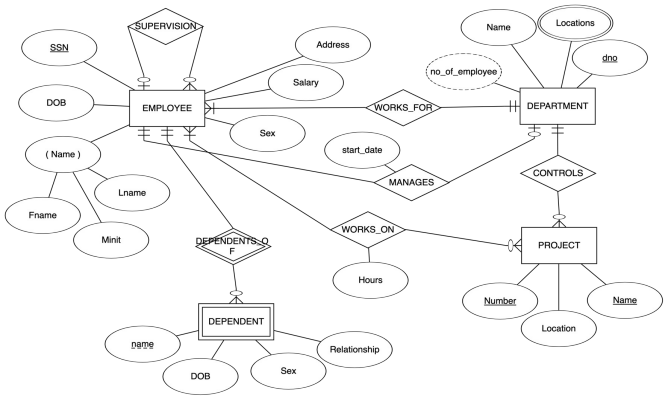

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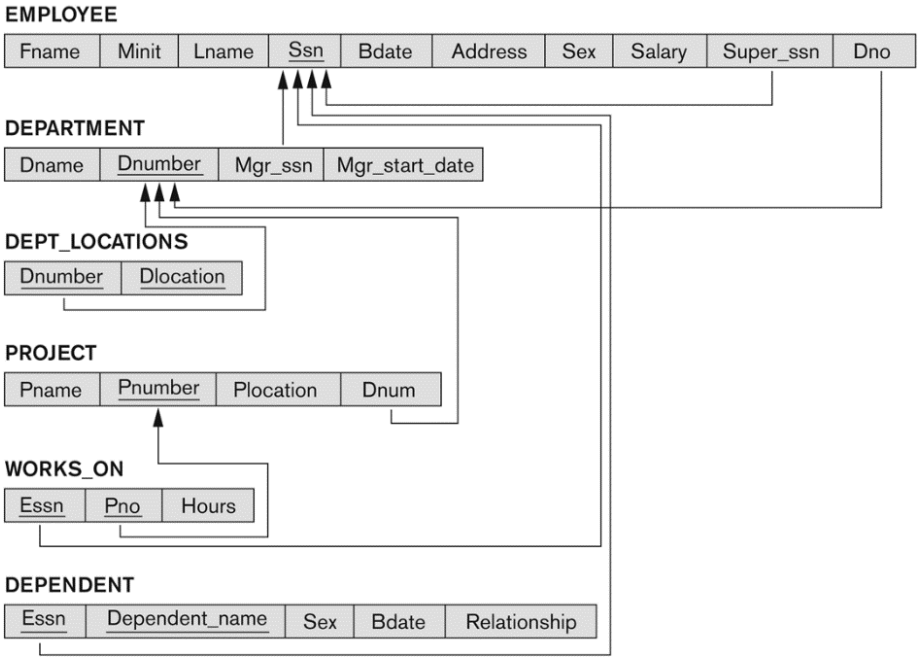
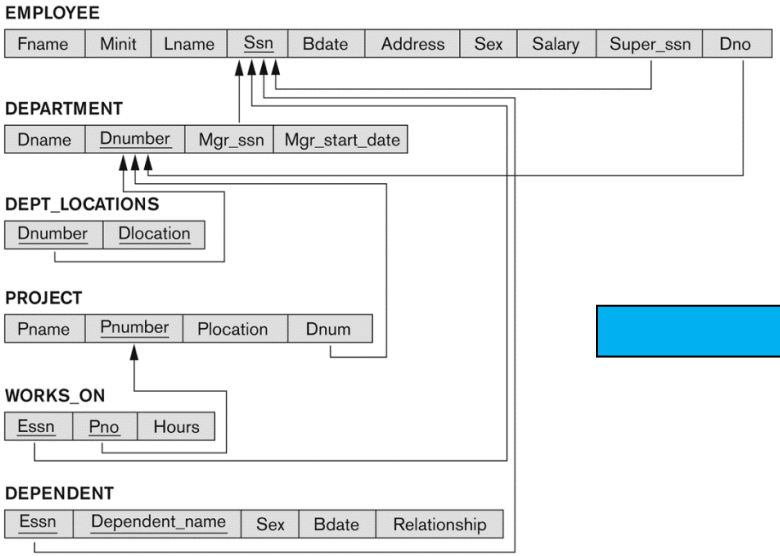


Relational Model
Close to DB Tables

Relational Model ⇔ DBMS Tables



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DBMS Tables

Full slide from book authors:

Chapter09.pdf