Entity Relationship Model

- **Entity: A thing of interest in the real world**

  (e.g. employee, product)

- **Attribute: A property of the entity**

  (e.g. salary, sex, birthdate)

  - atomic attribute
  - composite attribute

    (e.g. **Name**(FirstName, MI, LastName, Suffix), **BirthDate**(M,D,Y))

- **Value: an instance of an attribute for a particular entity**

(e.g. Employee(SSN, Sex, Bdate)

⇓ ⇓ ⇓

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value of the attribute ‘sex’

***single valued attribute**

***multivalued attribute** – set of values (unordered sets)

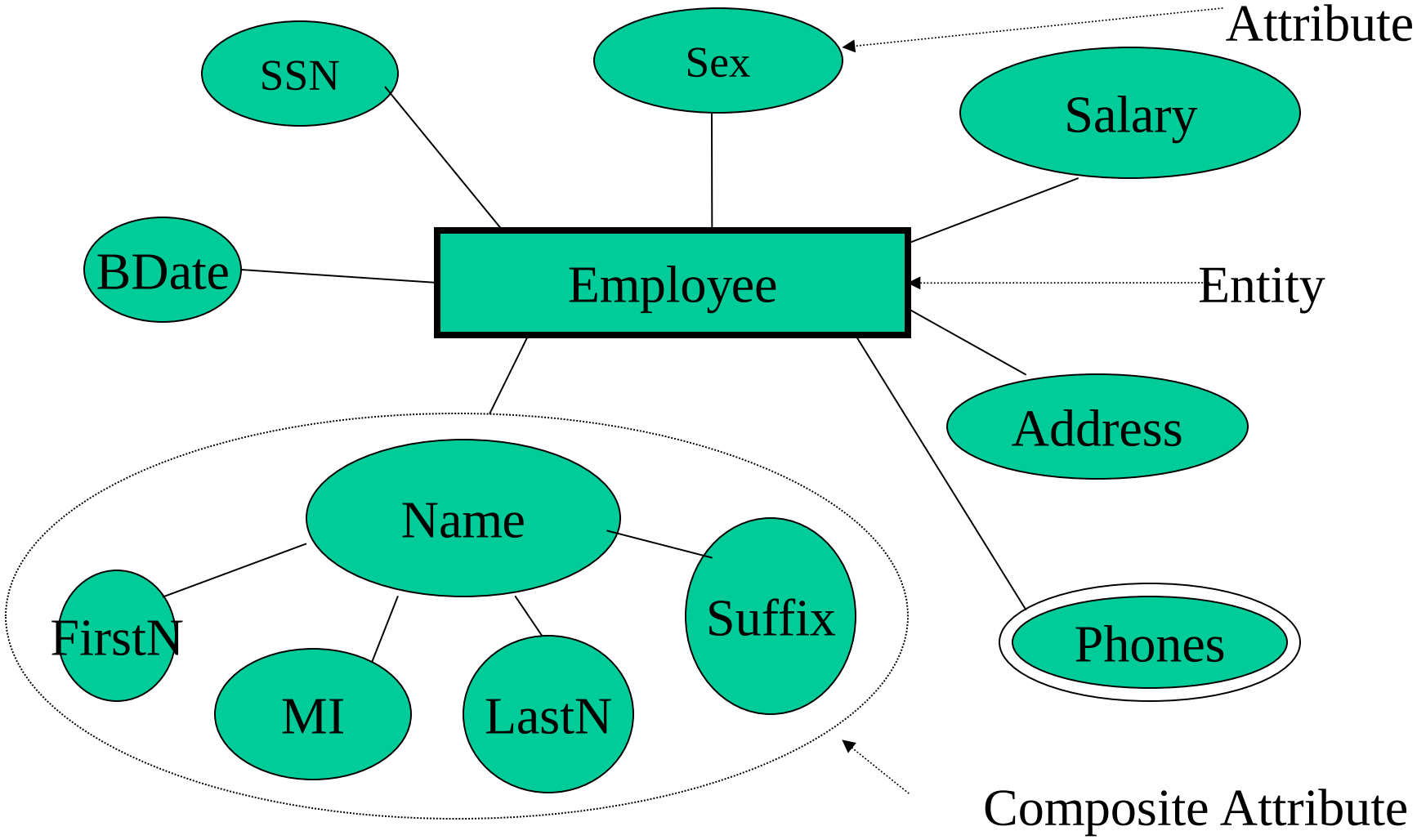
(e.g. Phones = {Business-phone, home-phone, cell-phone)

***composite attributes – sturctured fields (name)**

- **Domain of an Attribute**

the set of values that may be assigned to the attribute

Graphical Presentation of Entities

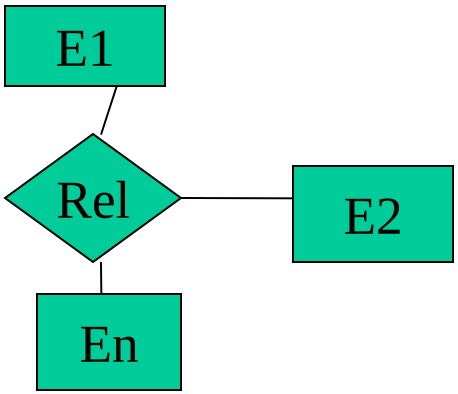


Relationship

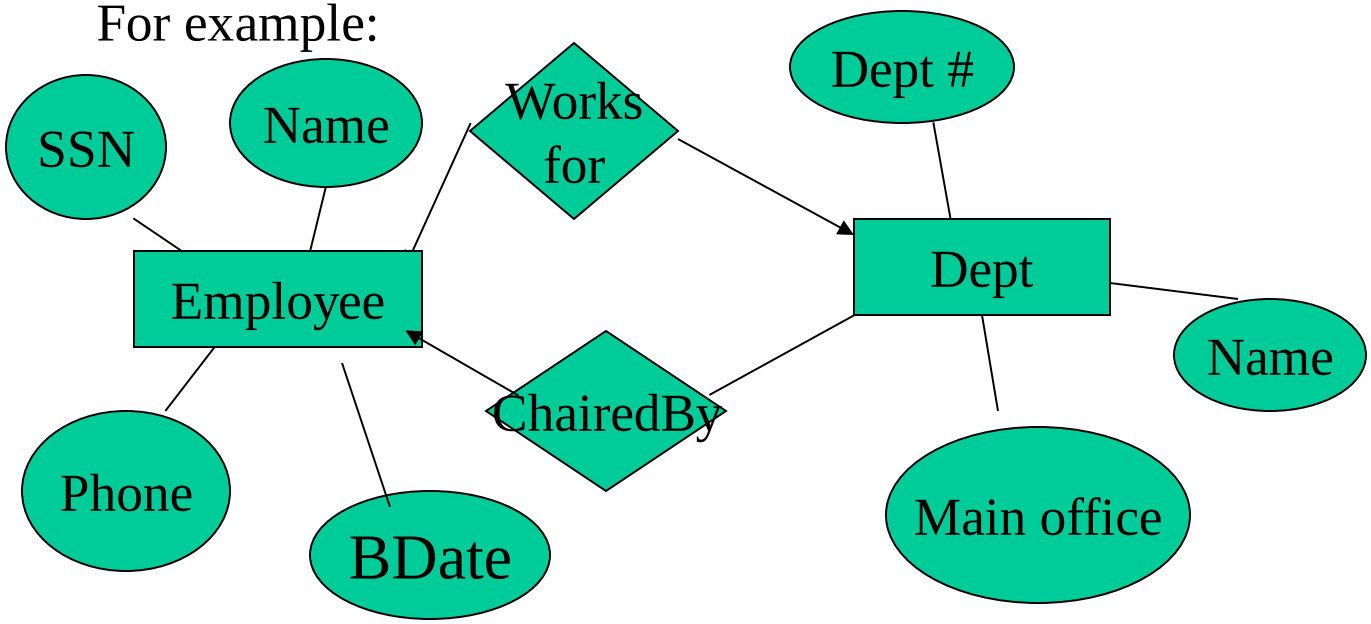
An association among Entities E1 … En

by the n-tuple Rel (E1 …, En)

Or graphically as:

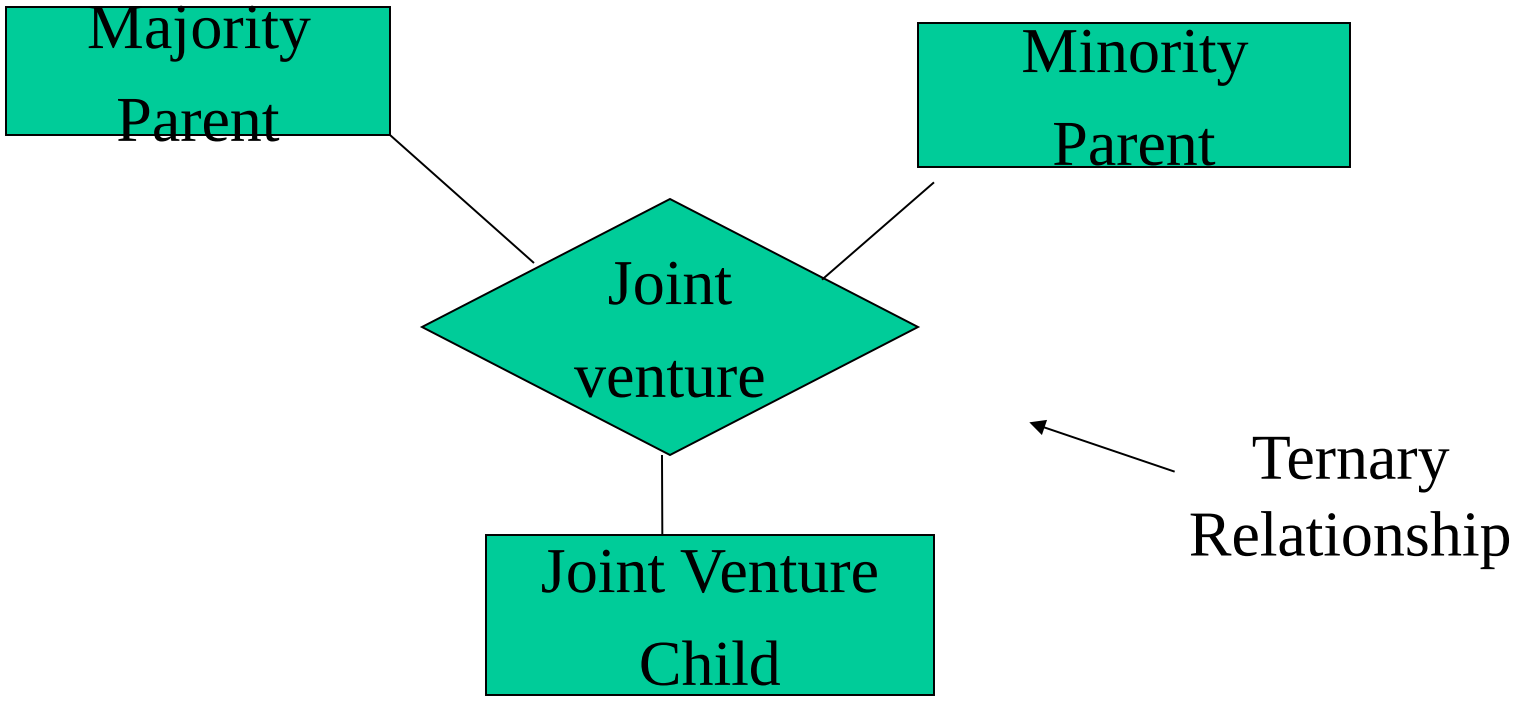


For example:



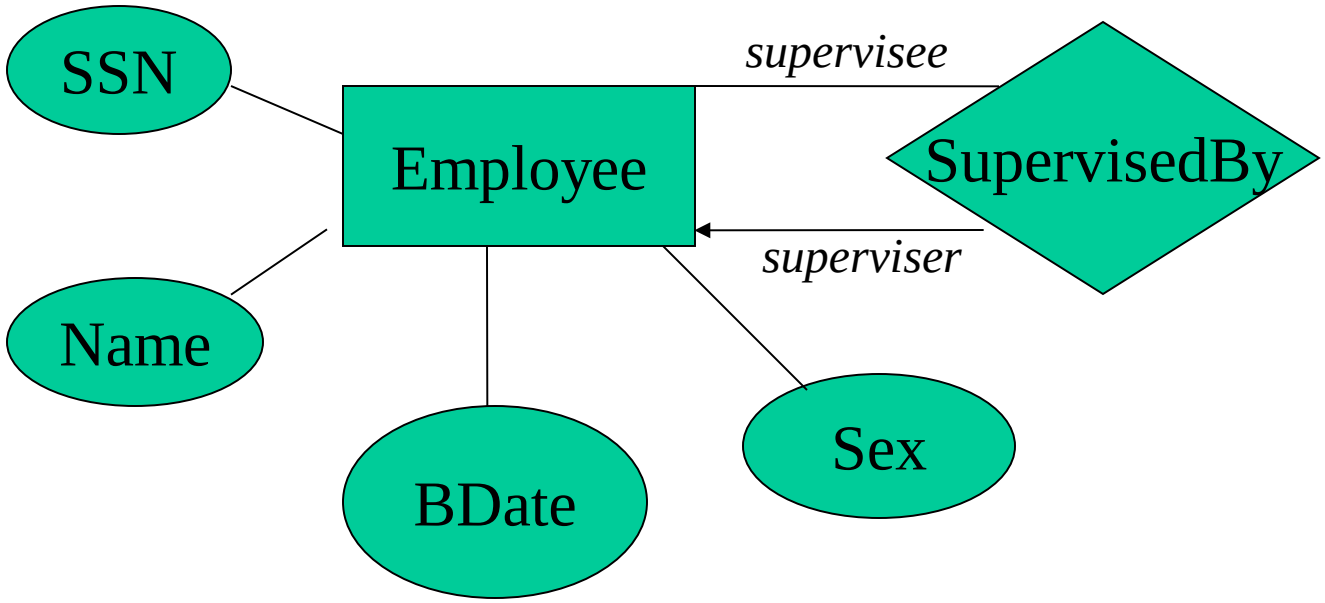
Degree of Relationship

⇒number of participating entity sets



Relationships

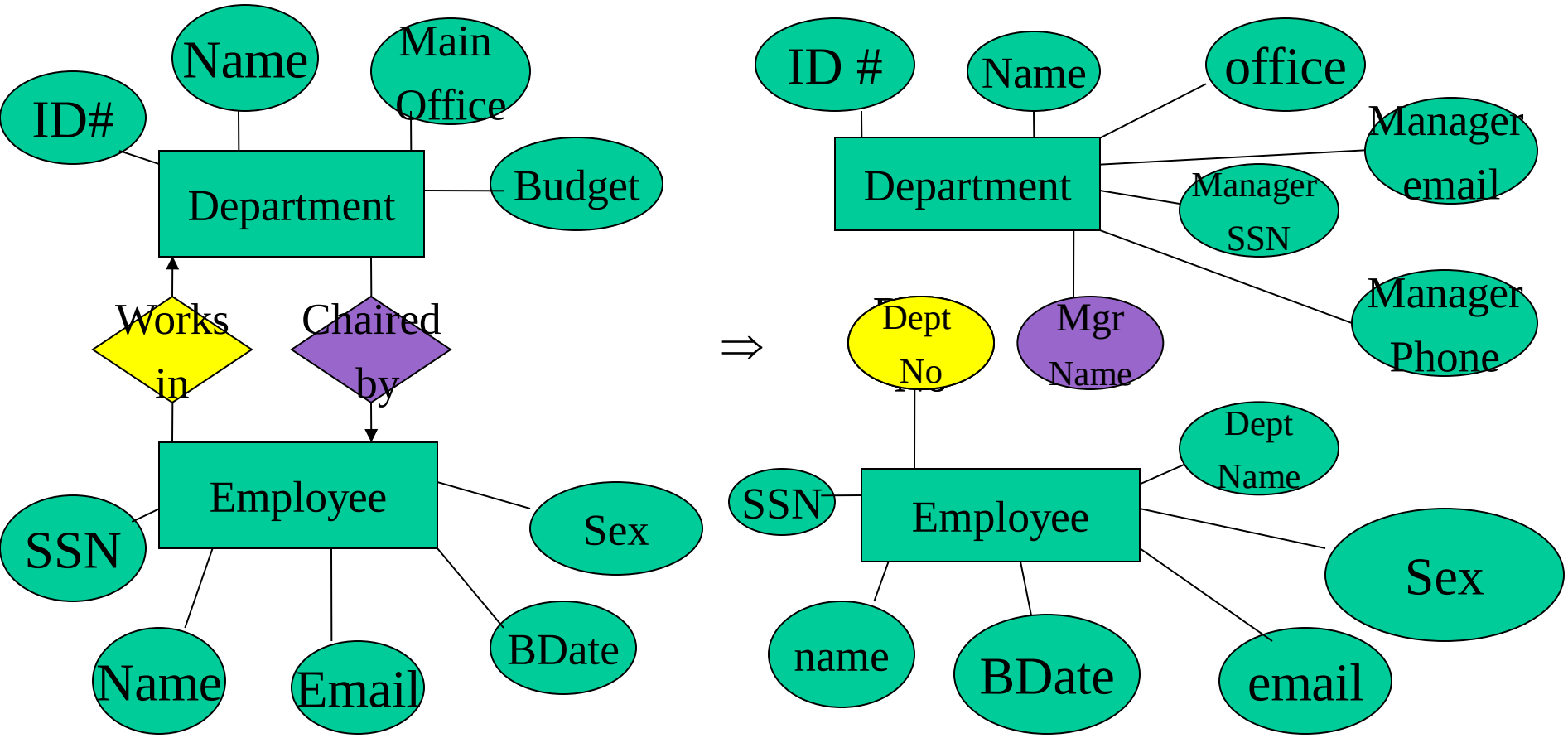
An entity can participate multiple timer in a relationship:



The semantics of the Relationship are defined by the Role Names

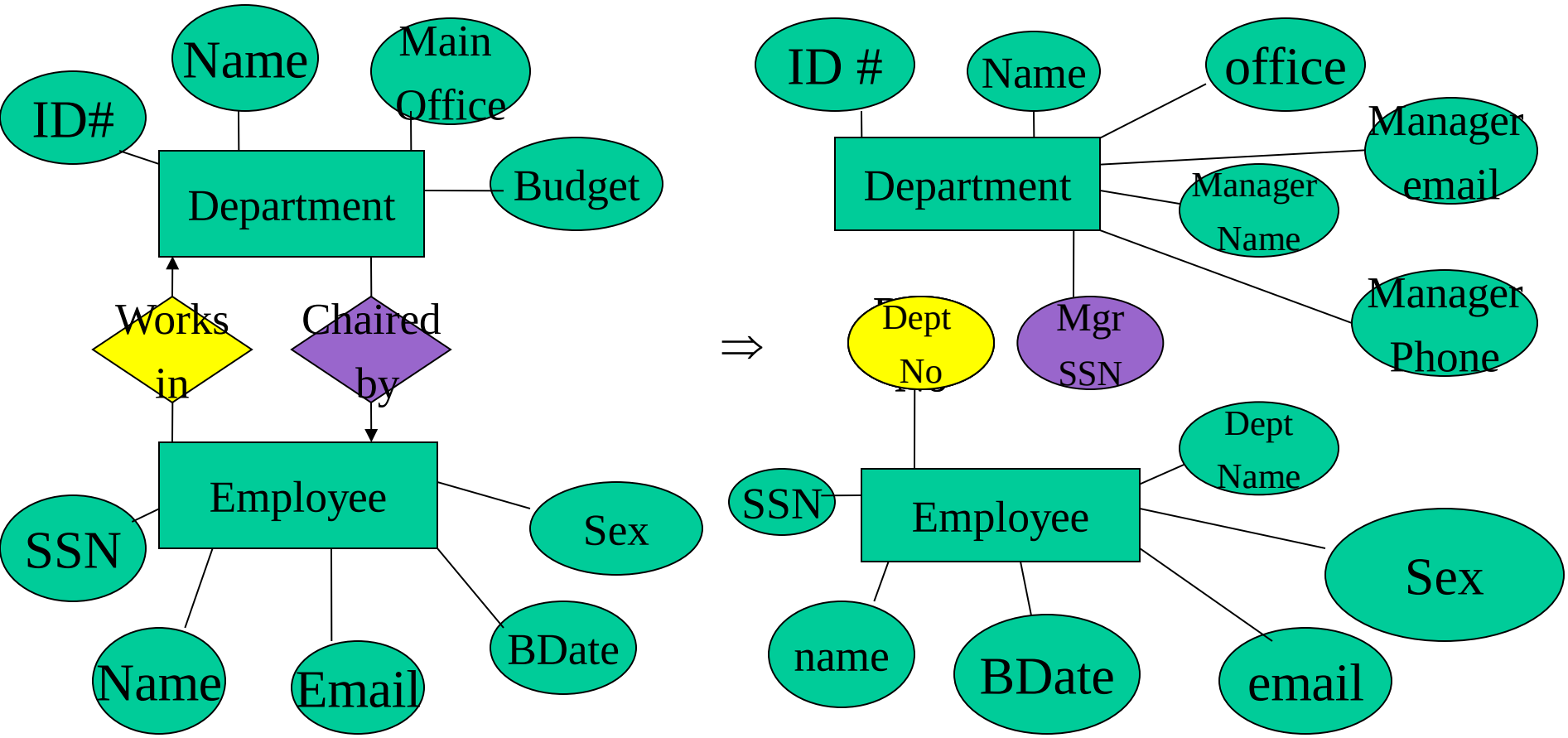
Relationships

A relationship can be represented as an attribute (and vice versa)



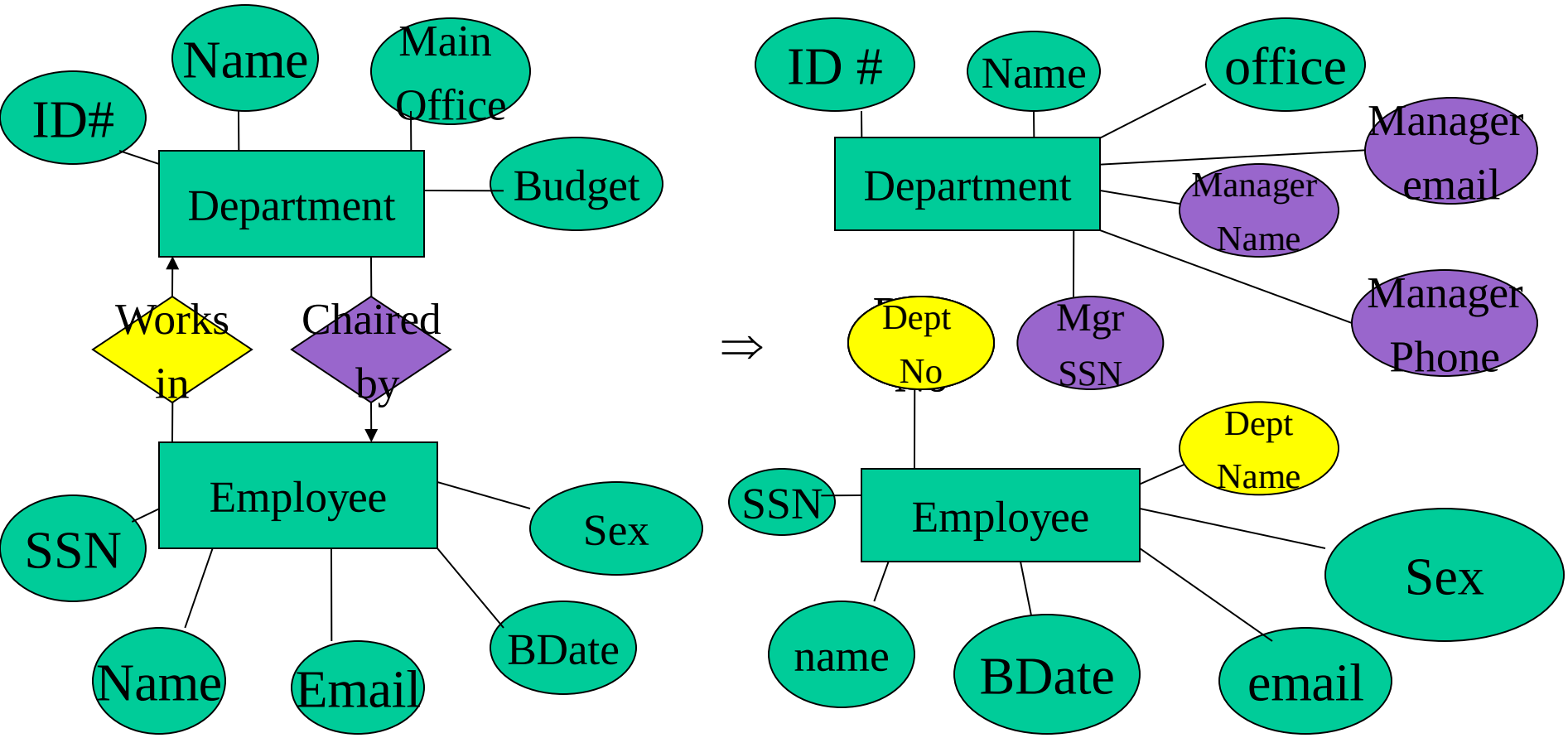
Relationships

A relationship can be represented as an attribute (and vice versa)



Relationships

A relationship can be represented as an attribute (and vice versa)



Language Analogy

Entities = Nouns

Attributes = Adjectives

Relationships = Verbs

Language Analogy

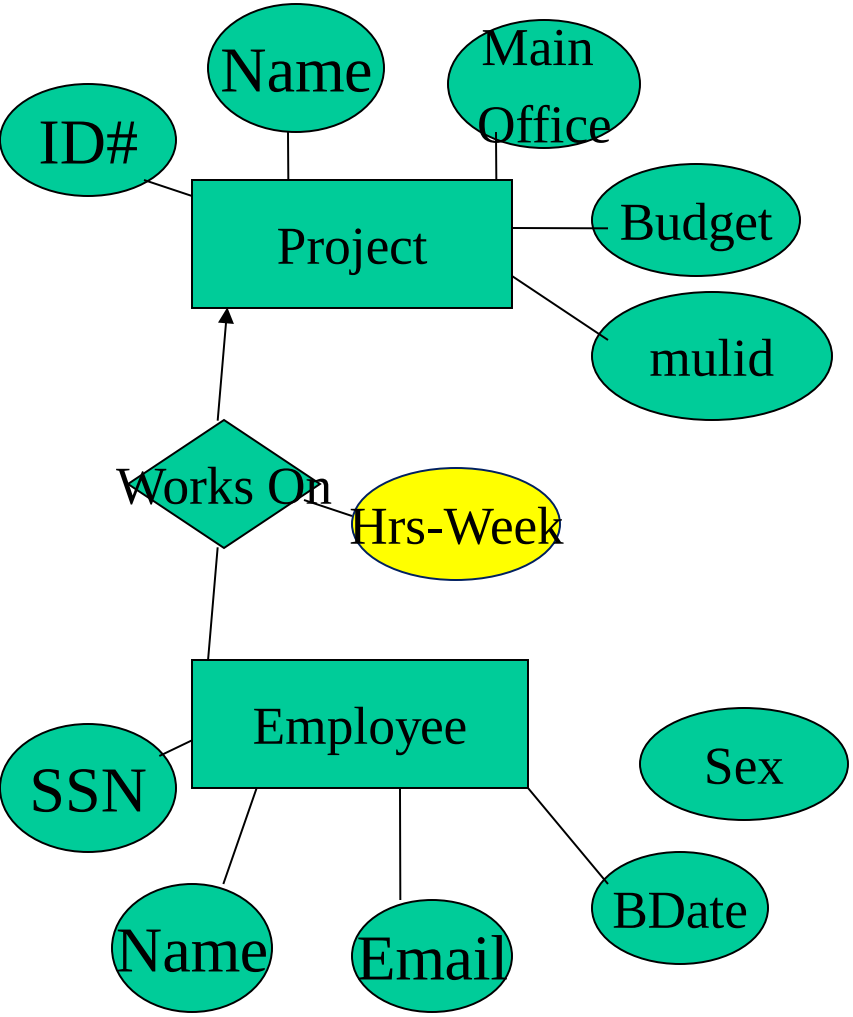
Entities = Nouns

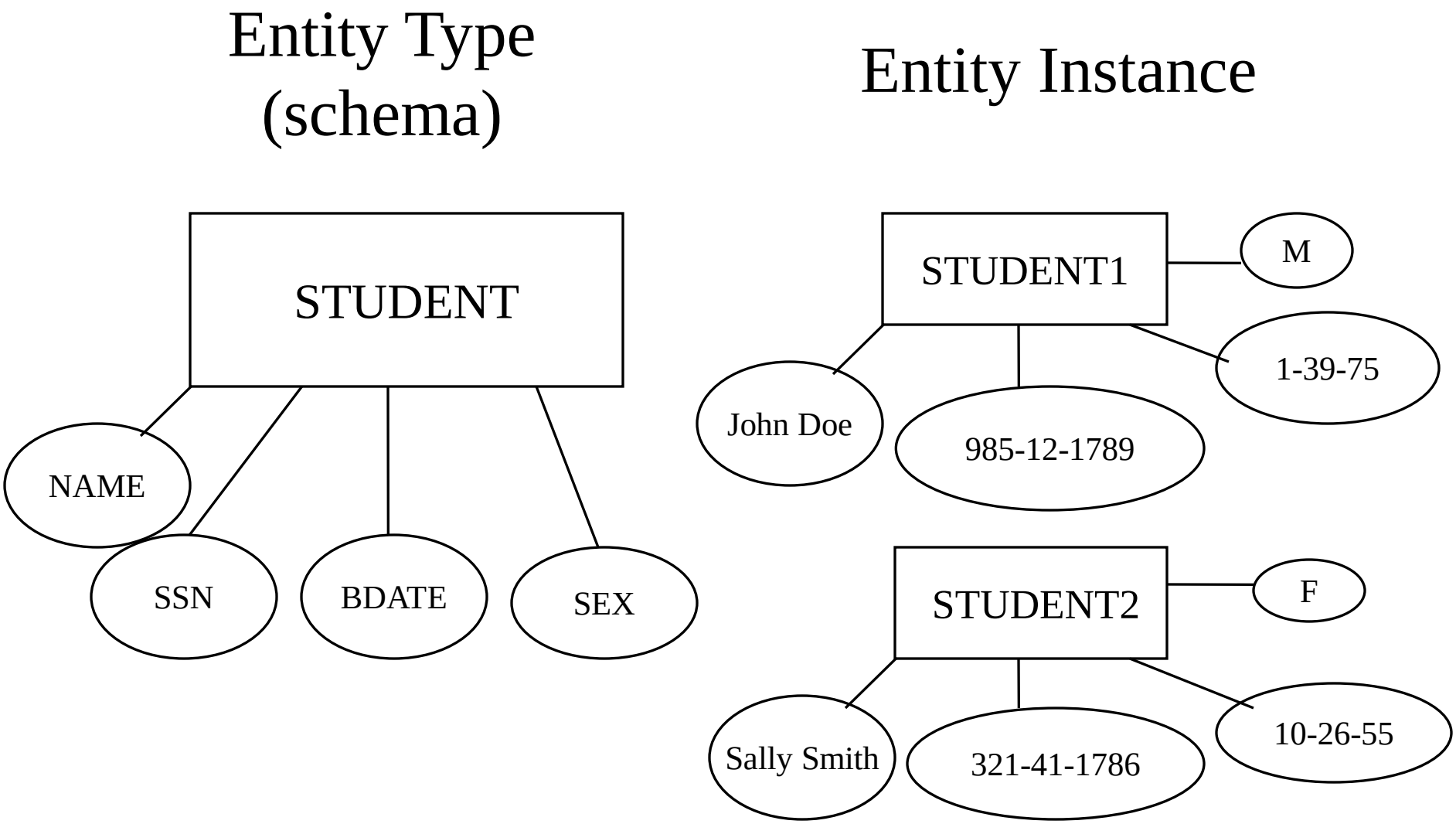
Attributes = Adjectives

Relationships = Verbs

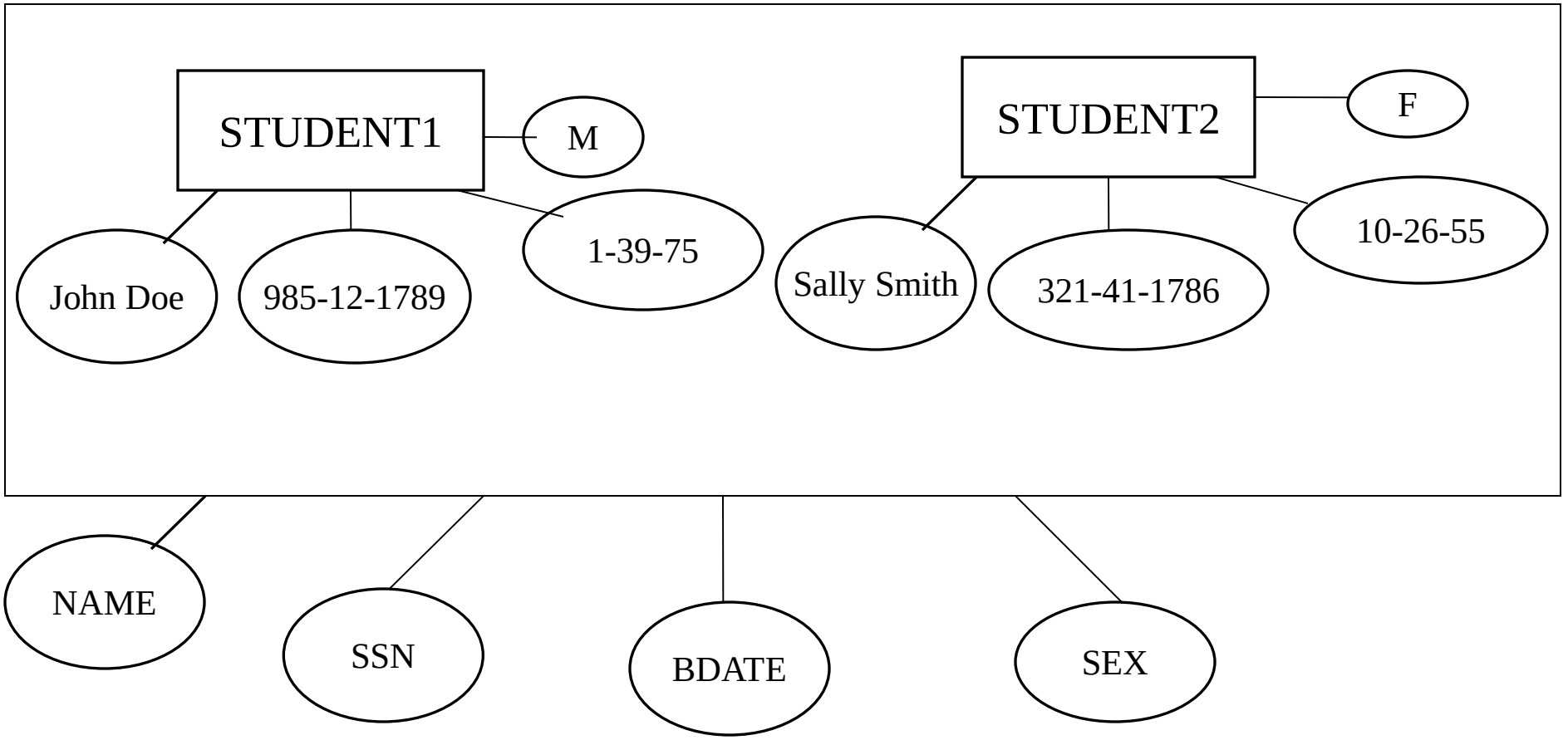
??? = Adverbs

Attributes of relationships (Adverbs)




Entity Type
(schema)
Entity Instance
STUDENT
NAME
SSN
BDATE
SEX
STUDENT1
M
1-39-75
John Doe
985-12-1789
STUDENT2
F
Sally Smith
321-41-1786
10-26-55

Entity Sets


STUDENT1
M
John Doe
985-12-1789
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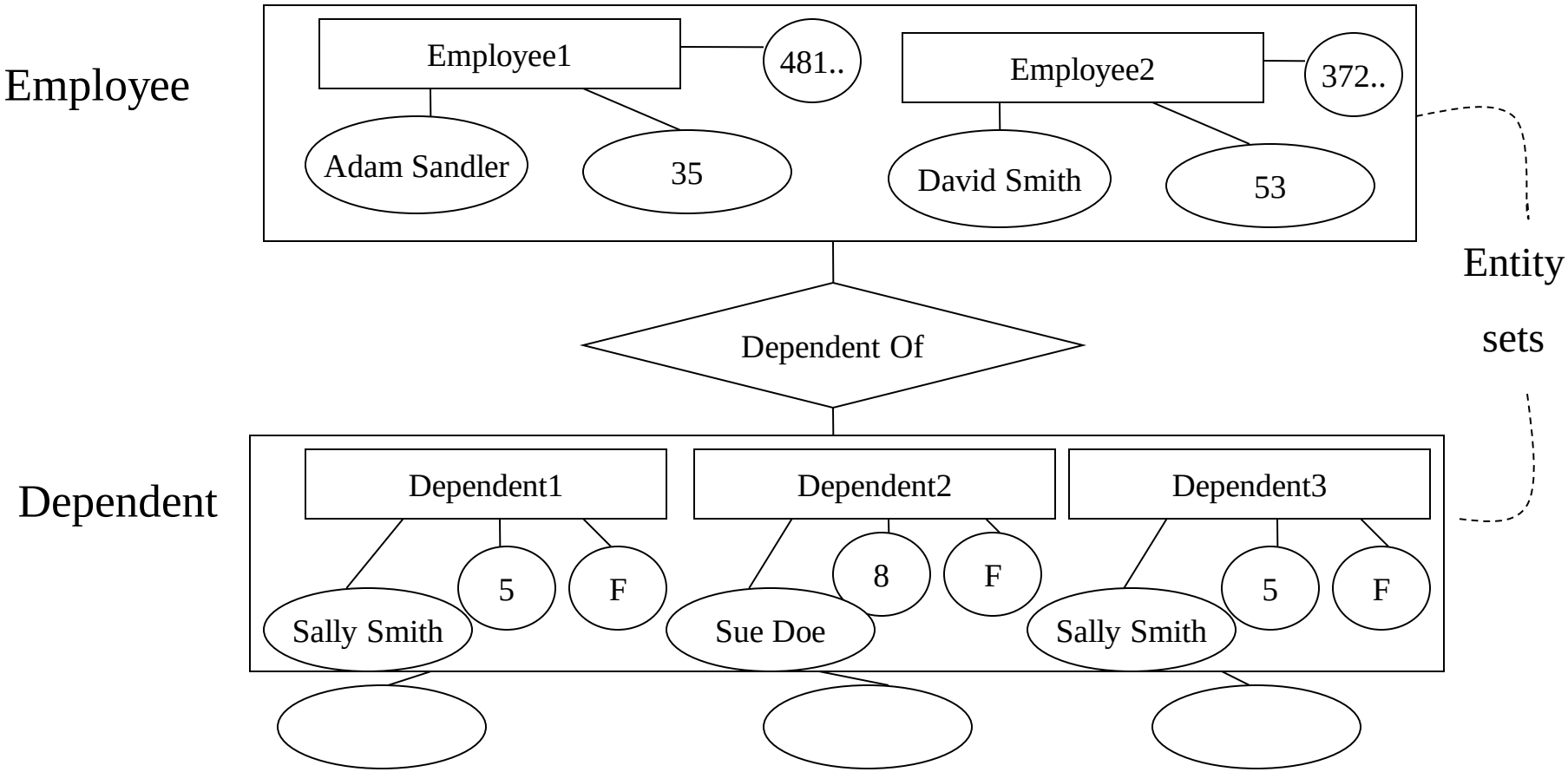
STUDENT2
F
Sally Smith
321-41-1786
10-26-55
NAME
SSN
BDATE
SEX

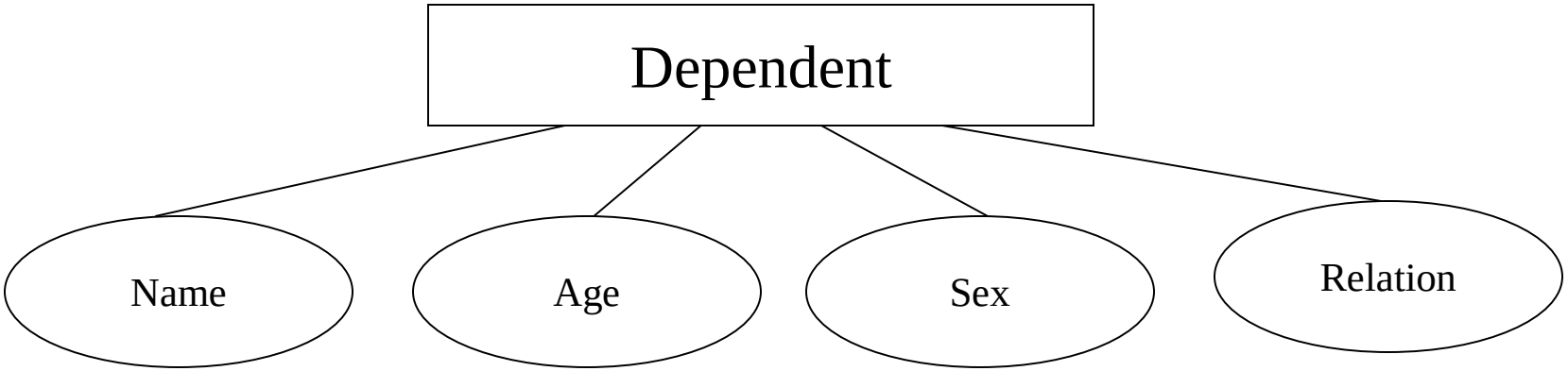
WEAK ENTITY SETS



Identify relashinship : Relashionship through which weak entity set can be uniquely identified

Identifying Owner : Entity that allows for unique id

WEAK/STRONG ENTITY SETS



Sally Smith	5	F	Daughter
Johny Smith	3	M	Son
Sue Doe	1	F	Daughter
Billy Doe	8	M	Son
Sally Smith	5	F	Daughter

E-R Terminology

SUPERKEY ATTRIBUTES:

A Set of attributes that allows us to identify an entity uniquely

(eg : Name, Address…)

CANDIDATE KEYS: minimal superkeys

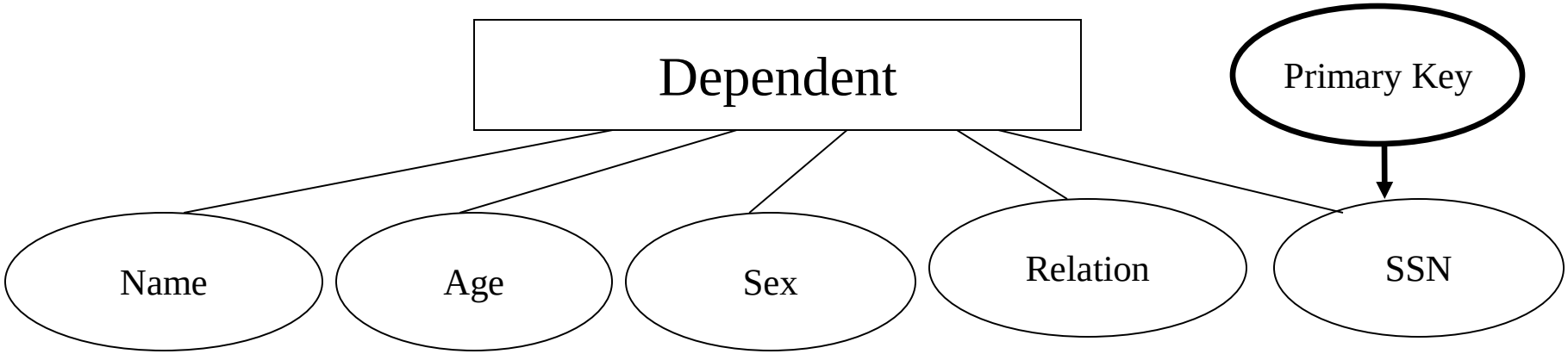
(I.e. no proper subset is a superkey){ SSN, Names – superkey

SS = candidate key}

PRIMARY KEY :

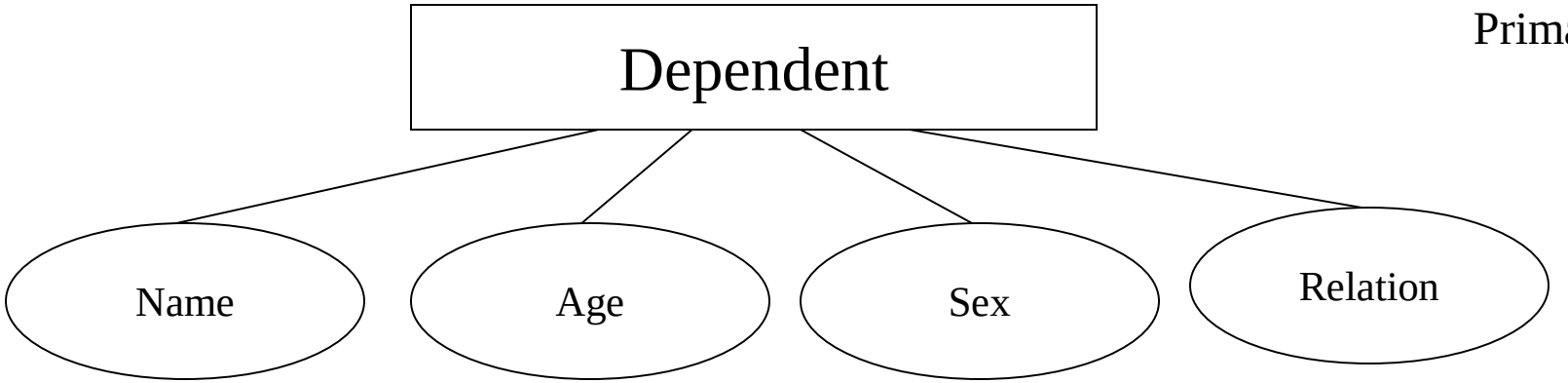
Candidate key chosen as principal identifier for the entity (e.g. SSN)

WEAK/STRONG ENTITY SETS



Sally Smith	5	F	Daughter	480-34-0771
Johny Smith	3	M	Son	192-76-3879
Sue Doe	1	F	Daughter	862-33-0112
Billy Doe	8	M	Son	114-39-3728
Sally Smith	5	F	Daughter	033-69-8791

WEAK/STRONG ENTITY SETS



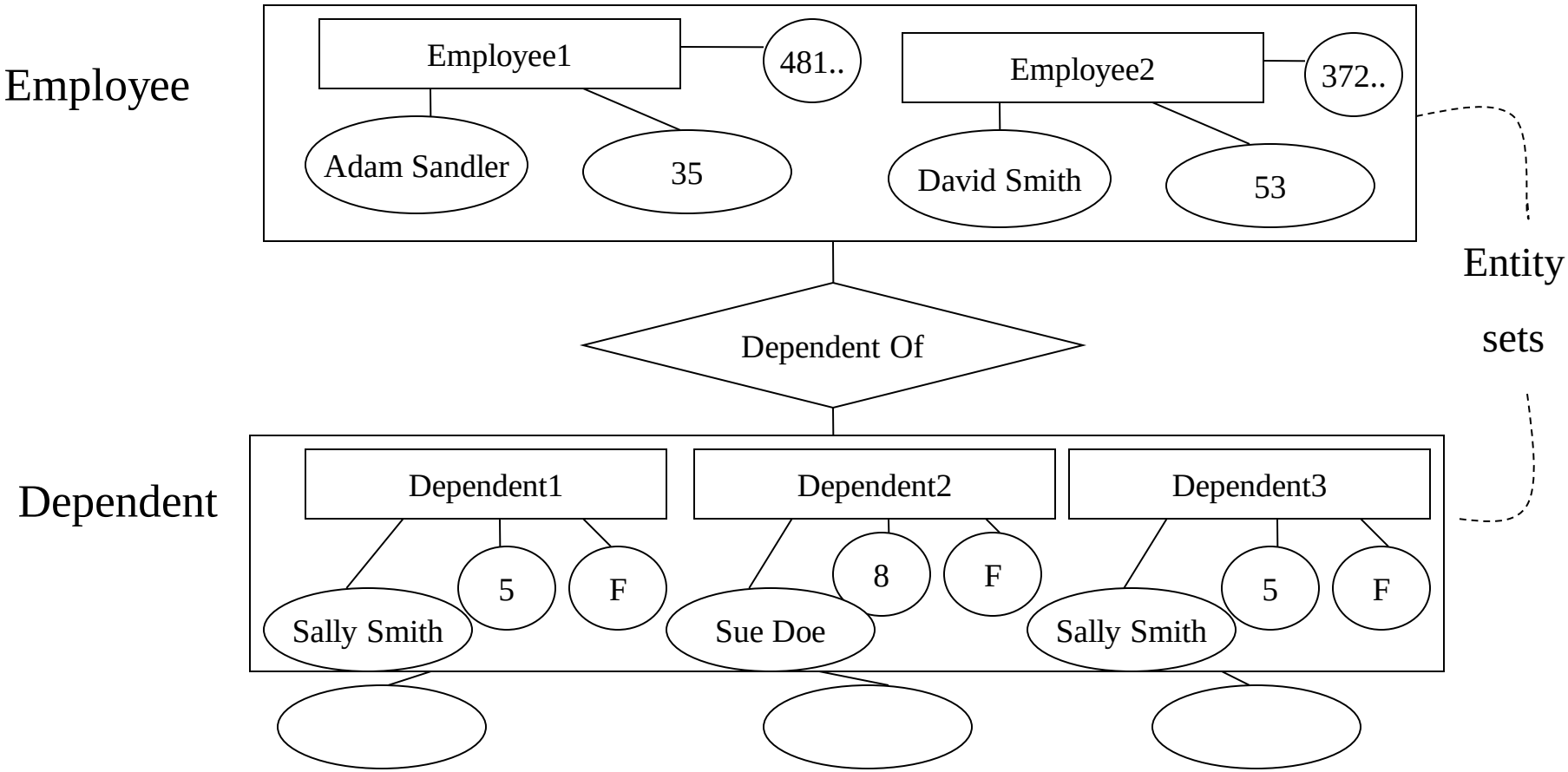
Primary key

Sally Smith	5	F	Daughter
Johny Smith	3	M	Son
Sue Doe	1	F	Daughter
Billy Doe	8	M	Son
Sally Smith	5	F	Daughter

If Primary Key exists => Strong Entity Set

If Primary Key does not exist => Weak entity Set

WEAK ENTITY SETS

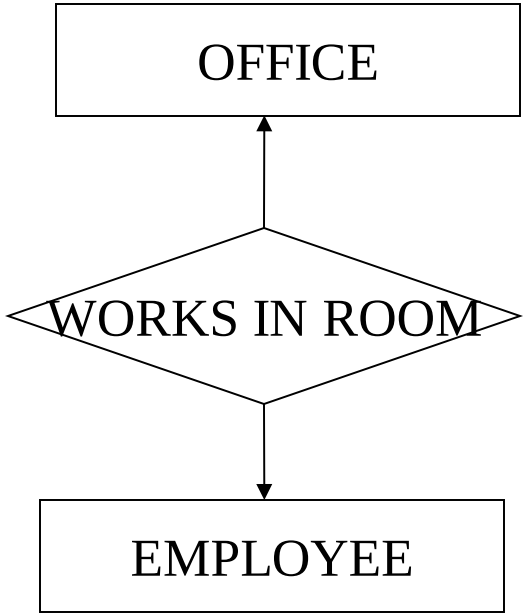


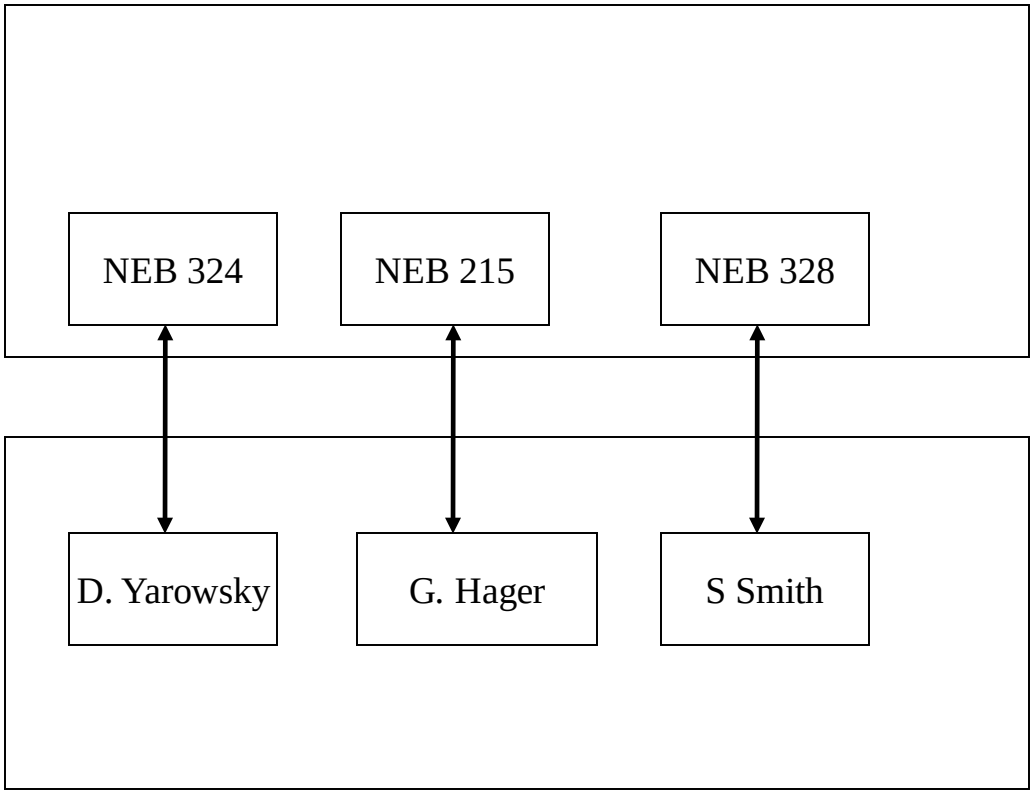
Identify relashinship : Relashionship through which weak entity set can be uniquely identified

Identifying Owner : Entity that allows for unique id

MAPPING CONSTRAINTS

1:1 (one to one)

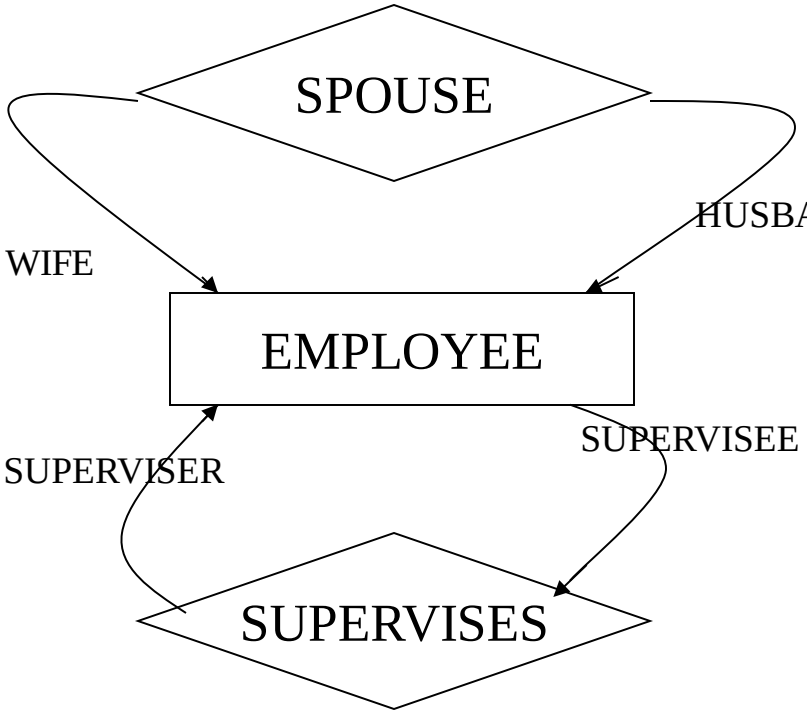


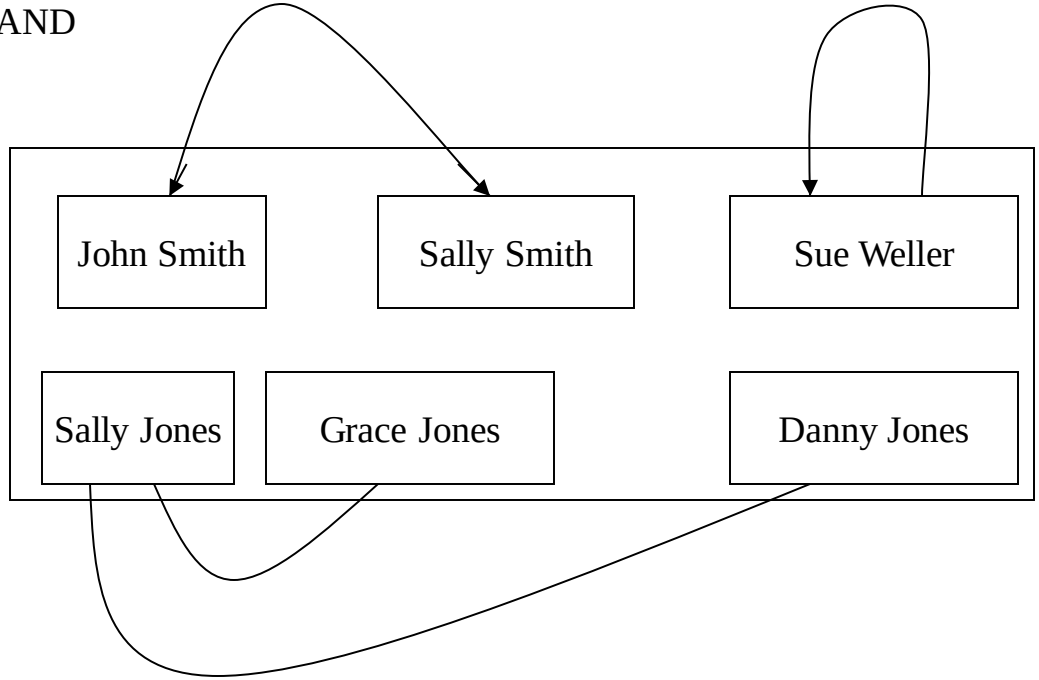


MAPPING CONSTRAINTS

1:1 (one to one)

Relationship mapping does not need to be total

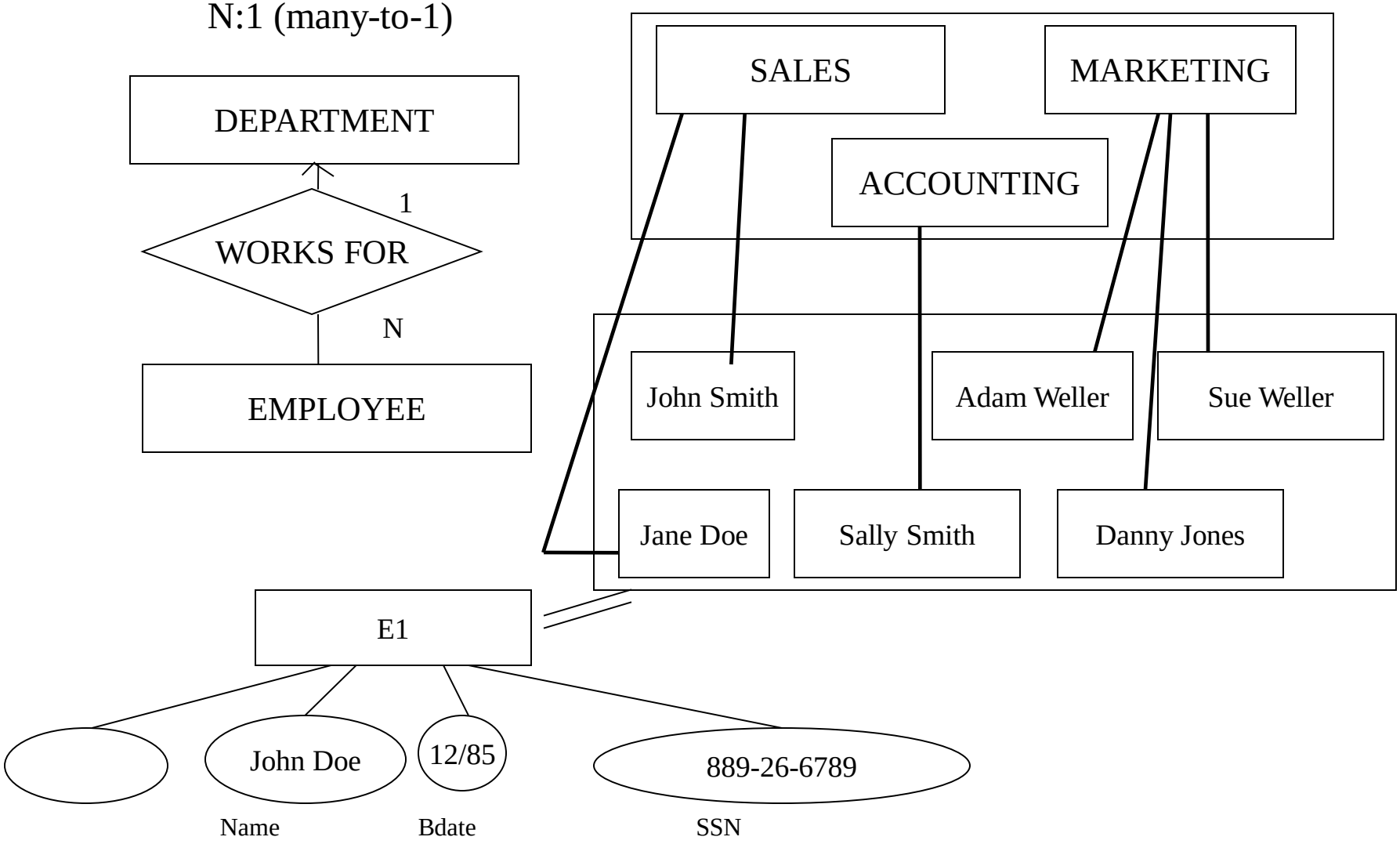




MAPPING CONSTRAINTS

(cardinality constraints)

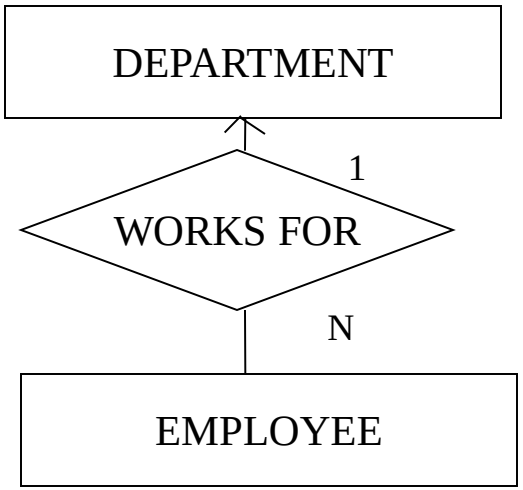
N:1 (many-to-1)

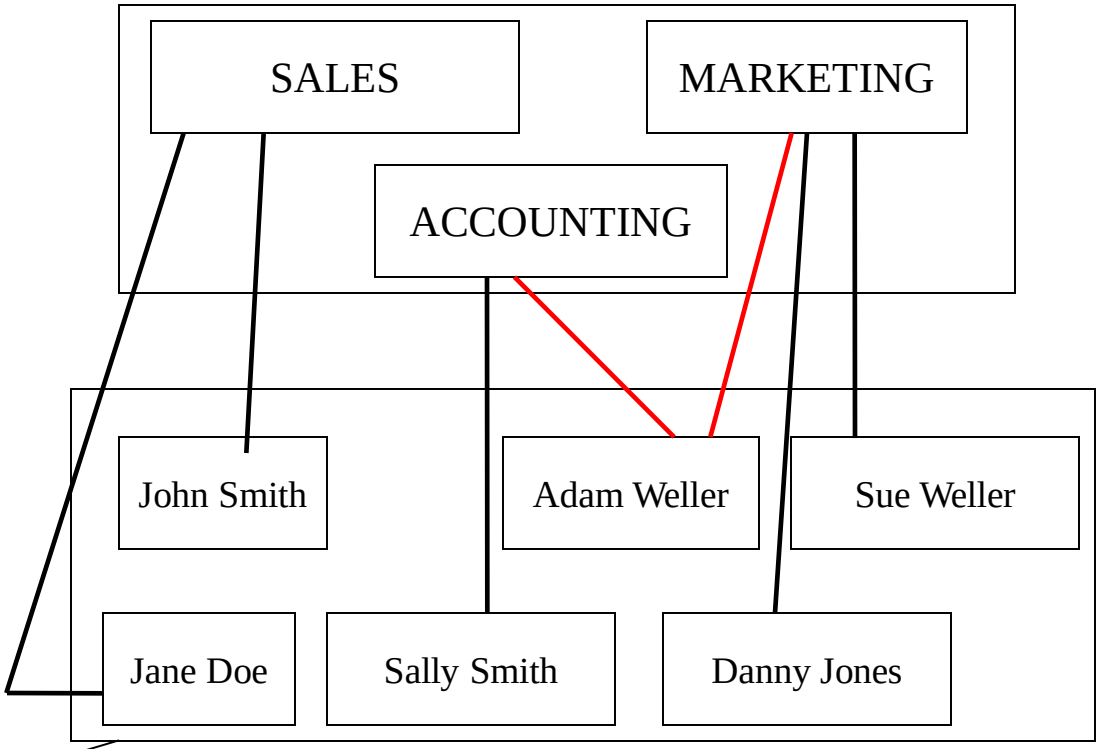


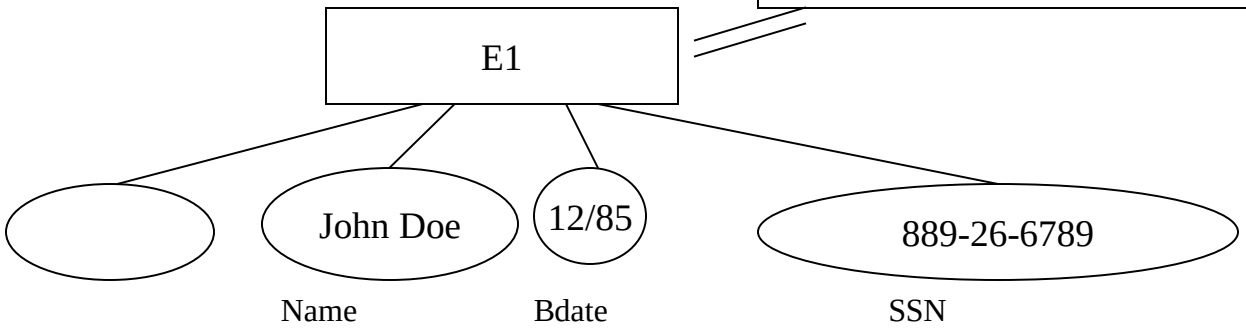
MAPPING CONSTRAINTS

(cardinality constraints)

N:1 (many-to-1)



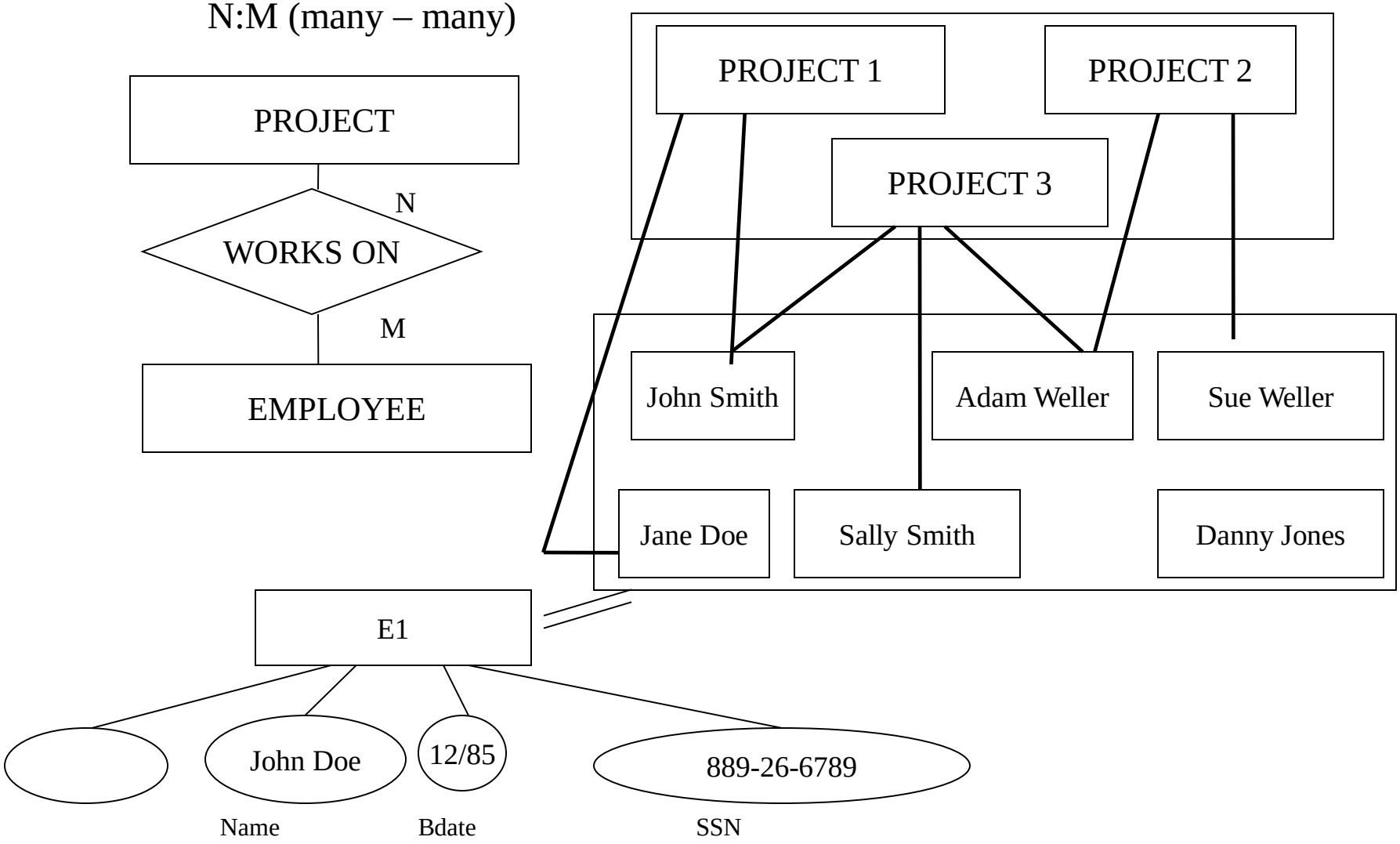




MAPPING CONSTRAINTS

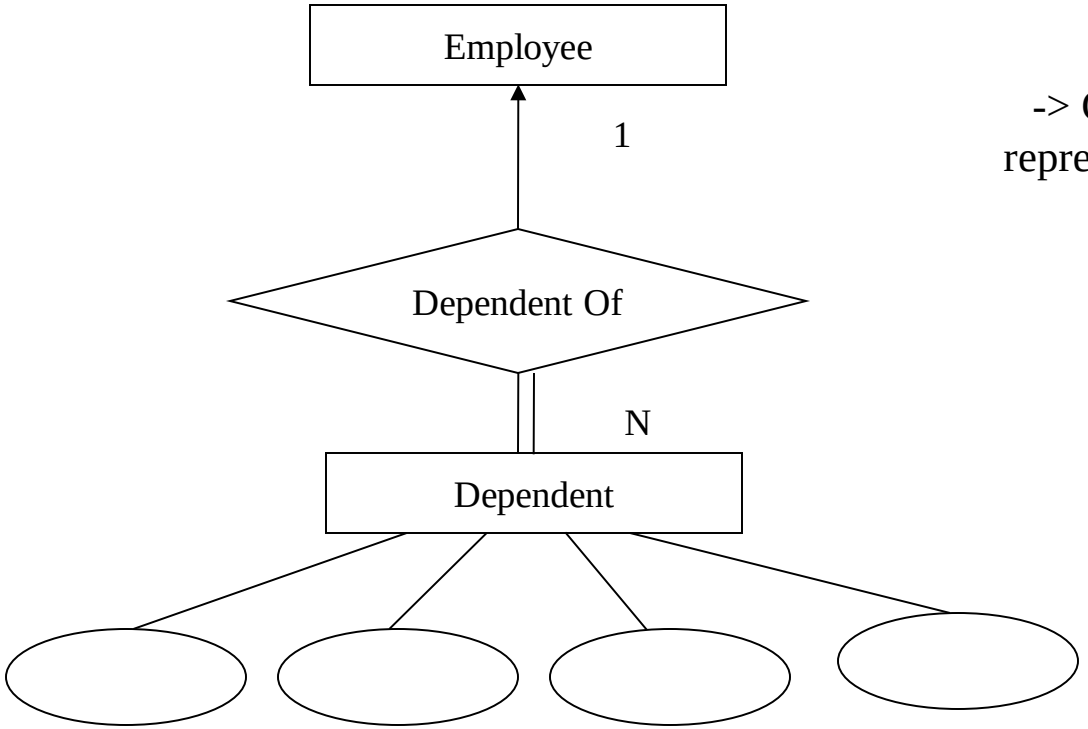
(cardinality constraints)

N:M (many – many)



PARTICIPATION CONSTRAINT

Total Participation:

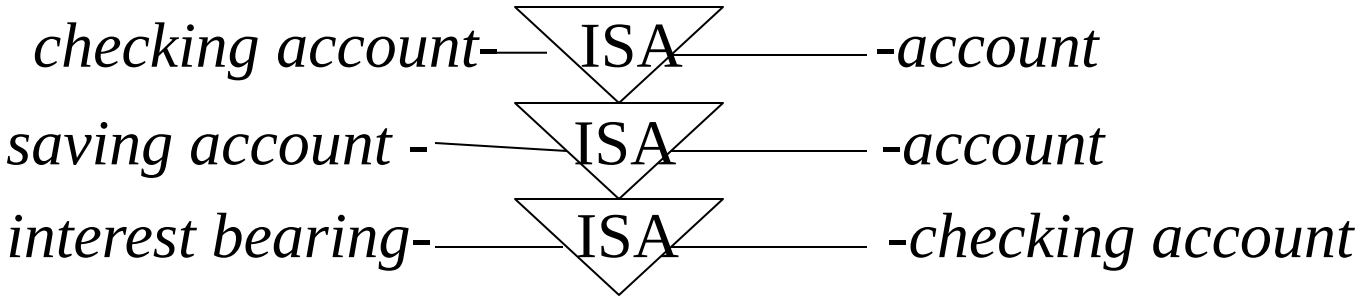


-> Candidate for representation as an attribute

=> Existence Dependency (I.e. dependent in database without sponsoring employee)

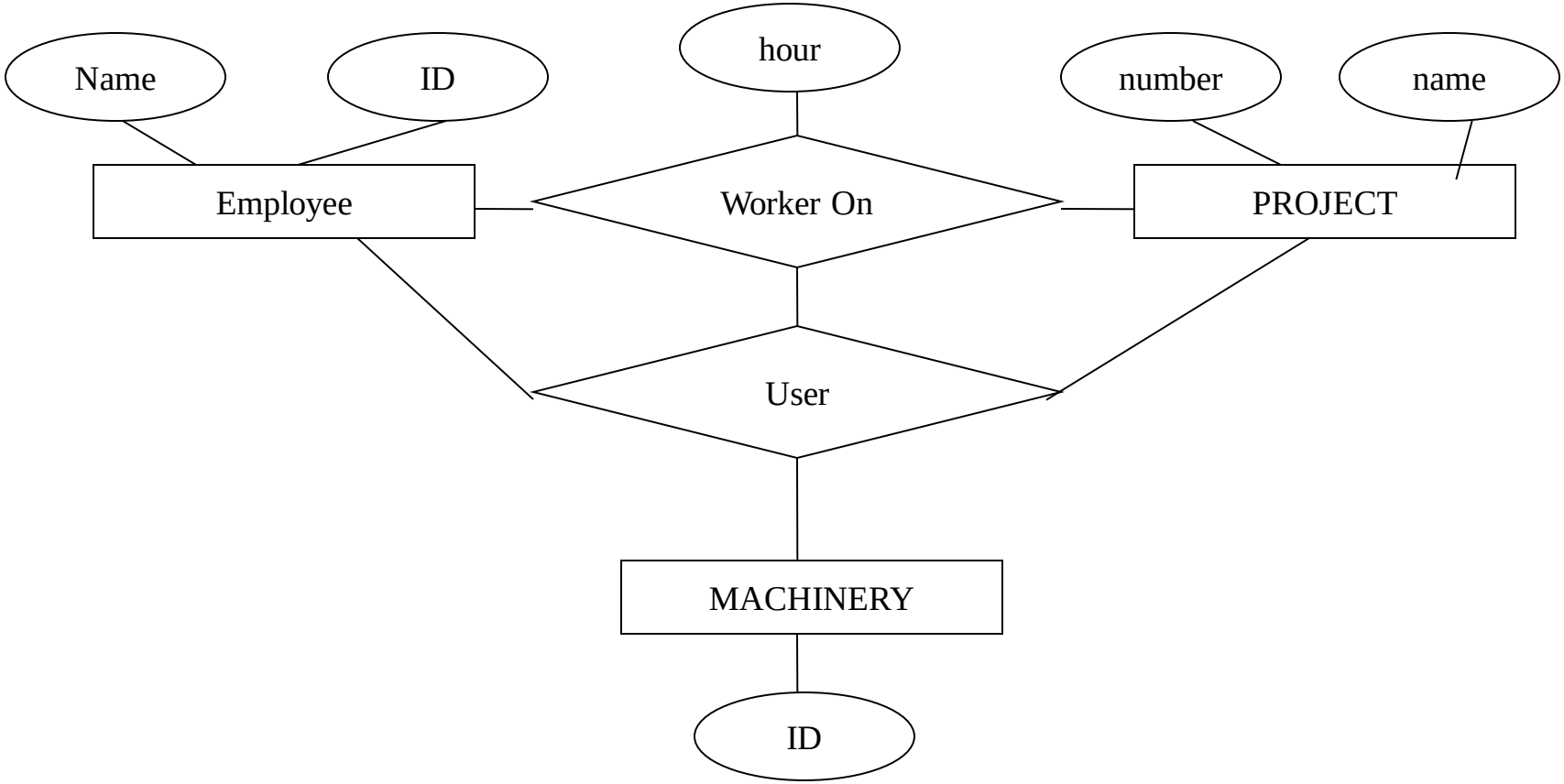
Specialization

- **Notation that avoids duplication of entity structure**
- **Inheritance of attributes**

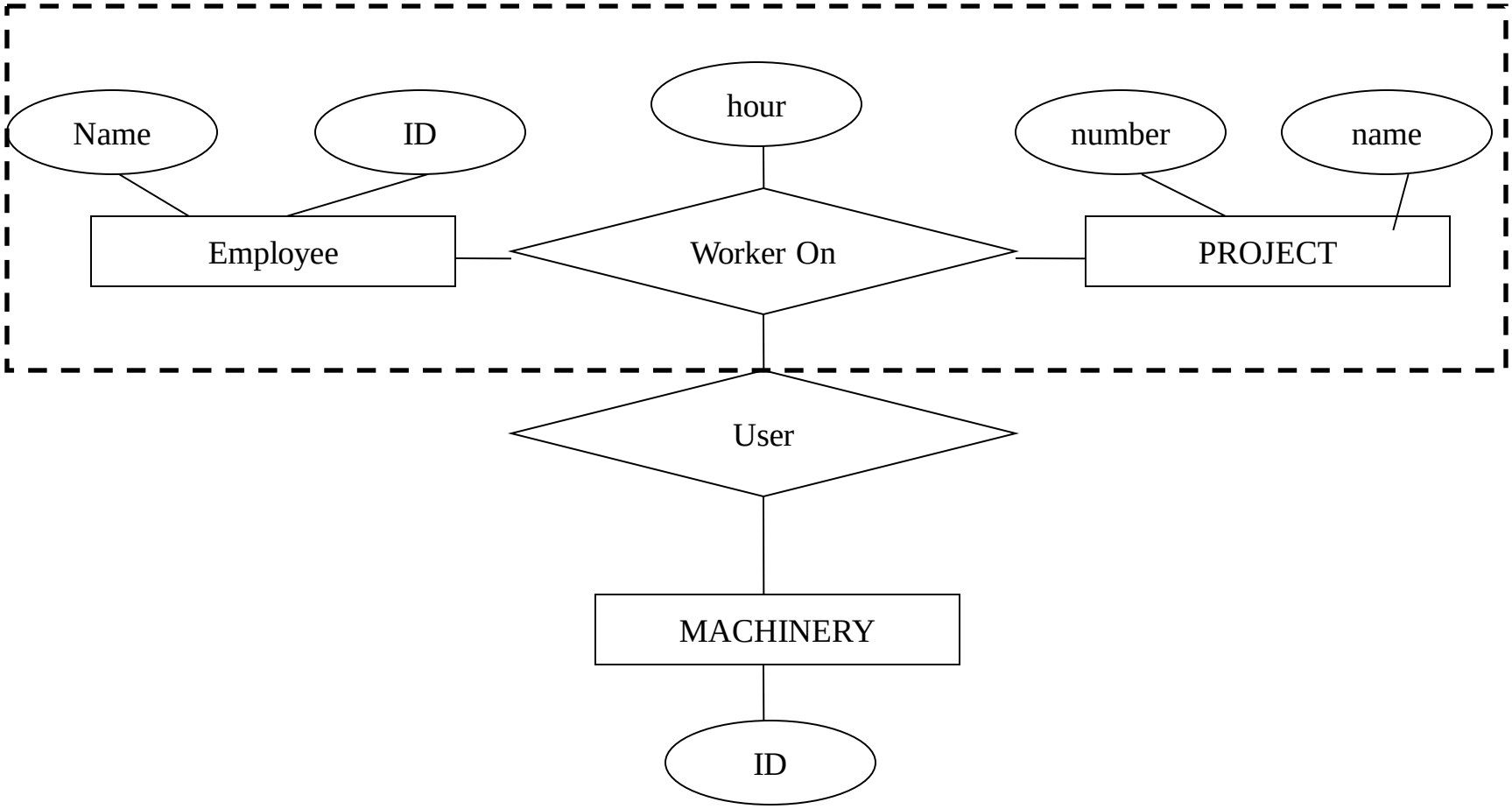


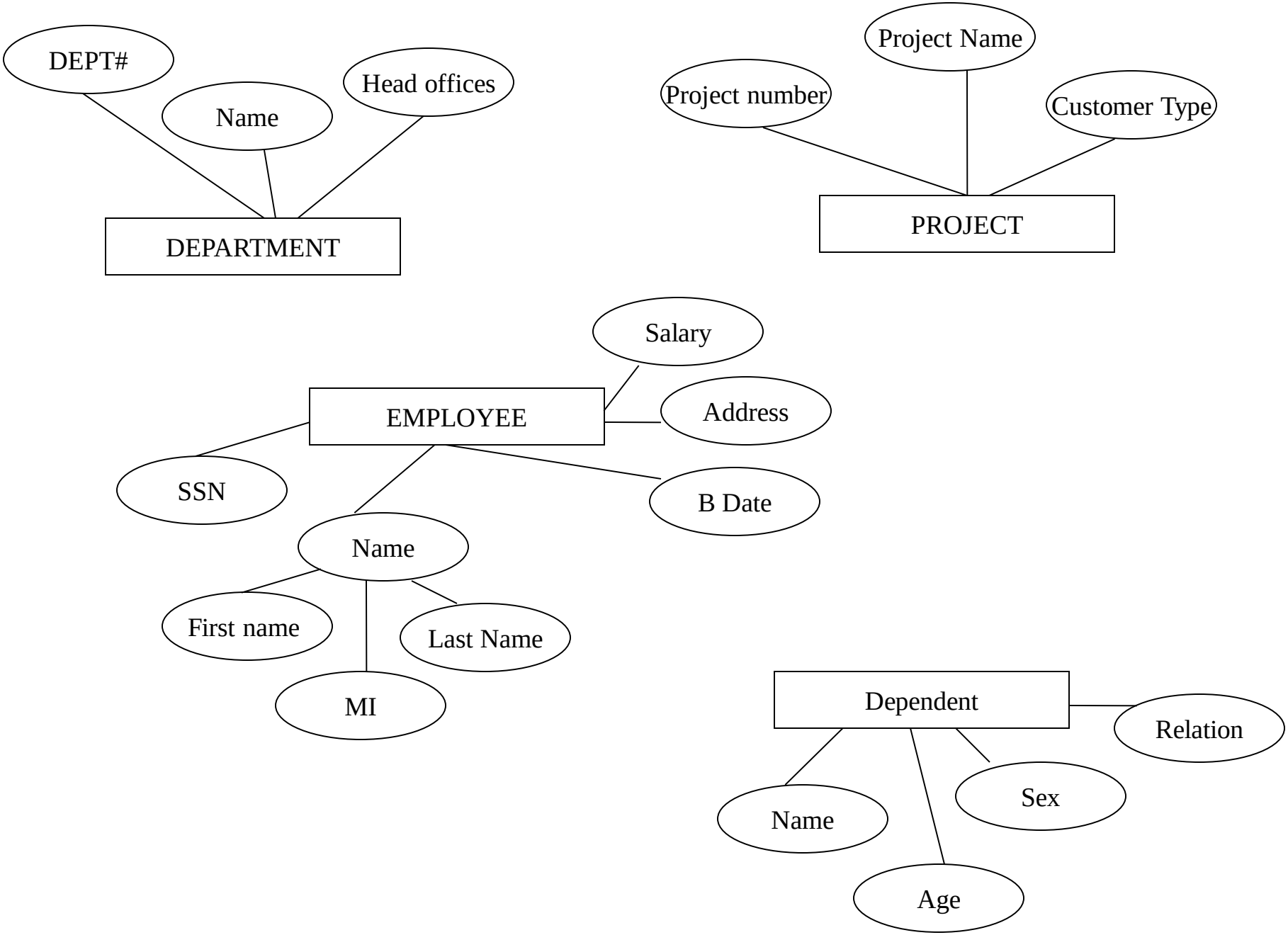
- **Important in object-oriented model design**

AGGREGATION



AGGREGATION




DEPT#
Name
Head offices
DEPARTMENT
Project Name
Project number
Customer Type
PROJECT
Salary
EMPLOYEE
Address
SSN
B Date
Name
First name
Last Name
MI
Dependent
Relation
Name
Sex
Age