Lecture 6

The Enhanced
Entity Relationship Data Model

Week 3

Overview

- Semantic integrity constraints
- Weak Entity types,
  - weak entity
  - identifying entity
  - identifying relationship type
- Generalisation and specialisation
- Alternatives to higher order relationships

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Semantic integrity constraints

- In addition to participation and integrity constraints, as well as attribute domain constraints there may be many propositions that must hold true of any database instance
- Since the variety of such constraints is endless, we use textual or First Order Logic (FOL) representations of additional constraints, *written on the schema*

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Weak entity types

- Weak entity types are entity types which have no key attributes of their own

SSN   name   dname   bdate
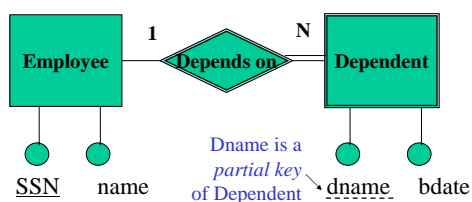
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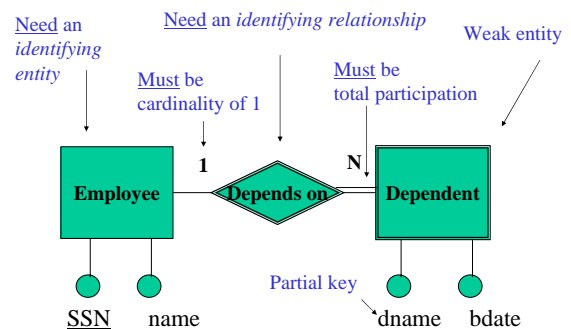# Weak entity types

- Weak entity types are entity types which have no key attributes of their own

Dname is a *partial key* of Dependent

SSN   name   dname   bdate
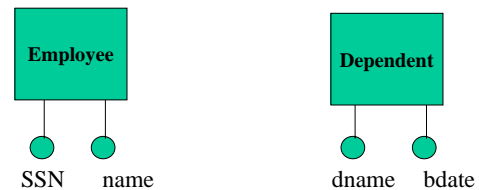
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The primary key of a weak entity type consists of its partial key *plus* the key of its identifying entity
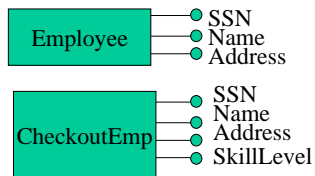E.g., the primary key of Dependent is {SSN, dname}

Need an *identifying entity*

Need an *identifying relationship*

Must be cardinality of 1

Must be total participation

Weak entity

Partial key

SSN   name   dname   bdate

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Generalisation and specialisation

- Often entity types in a universe of discourse display some resemblance

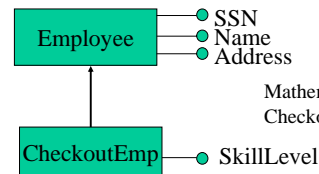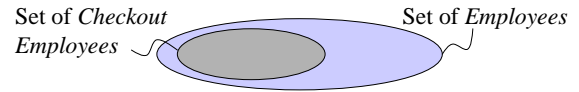Employee   (SSN, Name, Address)
CheckoutEmployee   (SSN, Name, Address, Skill Level)

Employee
- SSN
- Name
- Address

CheckoutEmp
- SSN
- Name
- Address
- SkillLevel

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Generalisation and <u>specialisation</u>

Set of *Checkout Employees*

Set of *Employees*

Employee
- SSN
- Name
- Address

Mathematically:
CheckoutEmp ⊂ Employee

CheckoutEmp — SkillLevel

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Derived subtype

Set of *Local Employees*

Set of *Employees*

Employee
- SSN
- Name
- Address

Address = 'Brisbane'

LocalEmployee

condition

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Partial generalisation / specialisation

Shelf distributors

"Any other..."

Set of *Employees*

Checkout Employees

Employee
- SSN
- Name
- Address

Single line means partial generalisation

d

'd' stands for 'disjoint'

Shelf distributor — Aisle Allocation

CheckoutEmployee — Skill Level

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Total generalisation / specialisation

NonflyingBird

Bird

FlyingBird

Double line stands for 'total generalisation'

Bird
- Species
- Family
- Common name

d

FlyingBird — Speed

NonflyingBird — ReasonWhy

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Overlapping generalisation / specialisation

AfricanBird

Bird

OzBird

'o' stands for overlapping generalisation

Bird
- Species
- Family
- Common name

o

AfricanBird — Lives in Serengeti

OzBird — Native
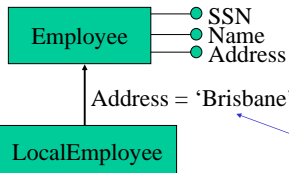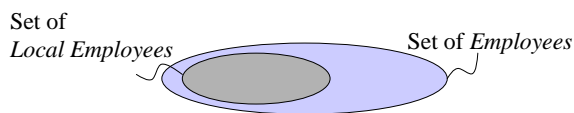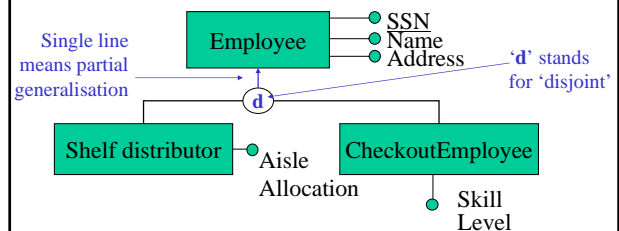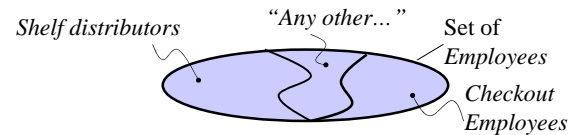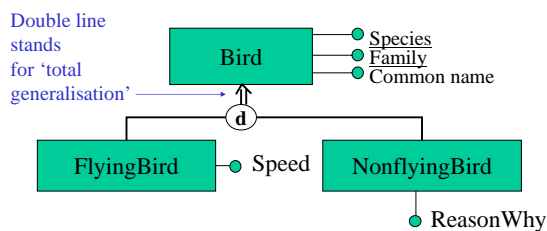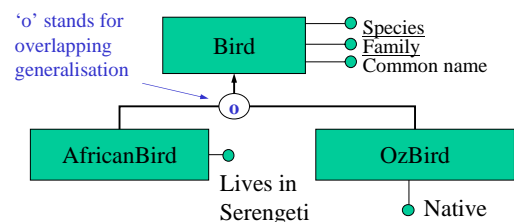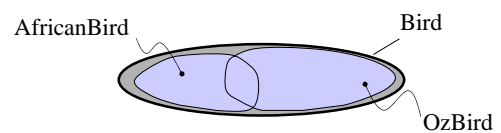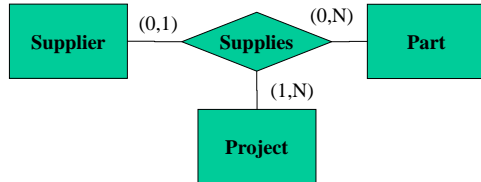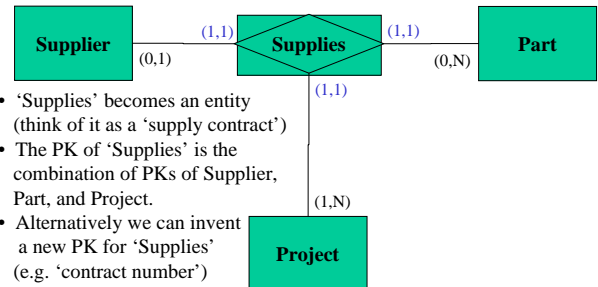
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Alternative Representation for Higher Order Relationship Types

What if we can represent binary relationship types only?
(e.g. a CASE tool often places this restriction)

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## Solution: 'objectify' the 'Supplies' relation

- 'Supplies' becomes an entity (think of it as a 'supply contract')
- The PK of 'Supplies' is the combination of PKs of Supplier, Part, and Project.
- Alternatively we can invent a new PK for 'Supplies' (e.g. 'contract number')

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The connecting lines represent binary relations between 'Supplies' and the entities involved

Often hard to give them a name, unless there are roles involved
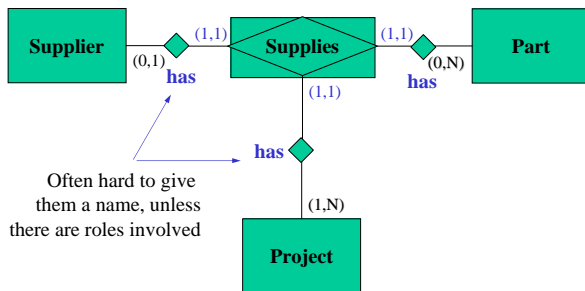
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## Example ER schema: the Company schema

You must be able to read an English description of a universe of discourse and transcribe its contents into an ER schema.

Your must be able to read an ER schema and transcribe it to *precise* English text.

You must be able to read an English description of a Universe of Discourse and an ER schema (representation) of it, and identify any mistakes and/or ambiguities in the ER schema.

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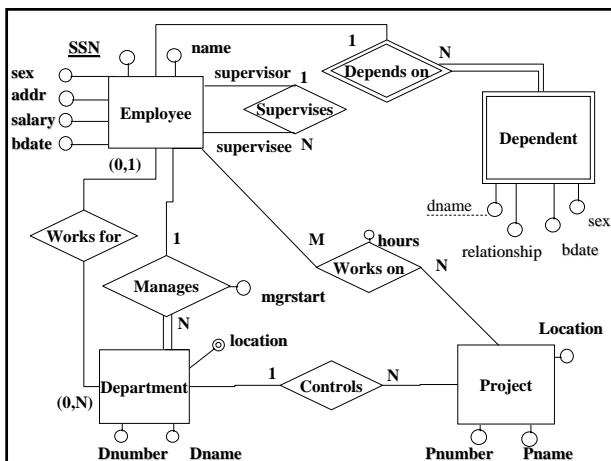
Summary

This lecture has covered the extensions to the ER data model, thus called EER (Enhanced / Extended ER) including:

- Semantic integrity constraints
- Weak Entity types,
- Generalisation and specialisation hierarchies
- Alternatives to higher order relationships

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The end

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