Existence-dependency

- An entity type A is said **existent-dependent** on an entity type B if the existence of A depends on the existence of B.

  – If B is deleted, A must also be deleted. A is subordinate and B is dominant.

- Example: Employee's dependents cannot exist (as far as the DB is concerned) if the employee doesn't exist i.e. all dependents of employee are deleted if employee is deleted.

Weak entity types

- An entity type that does not have sufficient attributes to form a primary key is said a **weak entity type**.

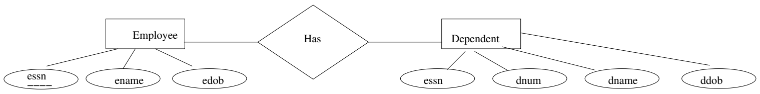
- A member of a weak entity type is subordinate to dominant entity with which it is associated. Attributes of the dominant entity are combined with those of the subordinate one to form a superkey of the weak entity type.

  A **discriminator** of a weak entity type is a set of attributes that allows distinguishing among entities that depend on a single dominant entity.

  A **superkey** of a weak entity type is formed by taking the union of a superkey of the strong entity type on which it is existence-dependent and a discriminator.

Example of a weak entity type

- A company insurance policy may insure an employee and his/her dependents. An employee may or may not have dependent but a dependent must be associated with an employee. A dependent cannot exist without an employee.



- Table for *Employee*:

<u>essn</u>	sname	edob
101	Clifante	Sunday, March 12, 1961
102	Smith	Monday, November 23, 1970
103	Whashington	Thursday, August 15, 1968

- 101 and 102 can have a child number 1 named Ali and born in 2000.

  Dependent is a weak entity. It is existent-dependent of *Employee*.

- The weak entity inherits all or part of the primary key from its strong counterpart. The *Dependent* primary key is composed on *essn* and *dnum*.

Schema of a relationship type

- **Relationship type schema:**
  - Relationship type name,
  - Attributes (and their domains),
  - Cardinalities constraints,
  - Roles,
  - Key constraints.

Extended E-R model

- One entity type might be **subtype** of another.

  Example:

  – Freshman is a subtype of Student.

  – A relationship exists between a Freshman entity and the corresponding Student entity.

  Example: Freshman John is a subtype of Student John.

- This relationship is called **IsA**.

  – The 2 entities related by IsA are always descriptions of the same real-world object.

  Example: Freshman is a student.

IsA

- Advantage: Use to create a more concise and readable E-R diagram.
  - Attributes common to different entity types need not to be repeated.
  - They can be grouped in one place as attributes of supertype.

Properties of IsA

- **Inheritance** - attributes of supertype apply to subtype.

  – Subtype inherits all attributes of supertype.

- **Transitivity** - Hierarchy of IsA.

  Example: Student is subtype of Person, Freshman is subtype of Student.

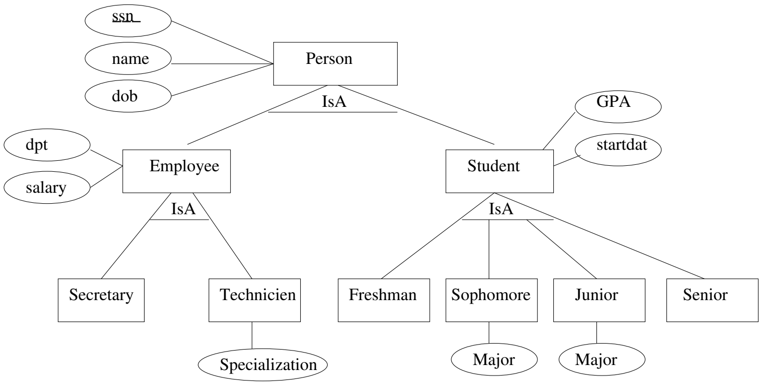
Hierarchy

- Might have associated constraints:
  - **Covering/Overlapping constraints:** Union of subtype entities is equal to set of supertype entities.

    Example: Employee is either a secretary or a technician (or both).
  - **Disjointness constraint:** Sets of subtype entities are disjoint from one another.

    Example: Freshman, Sophomore, Junior and Senior are disjoint sets.

Example



Example

Tiny College

What is the E-R diagram corresponding to the following specification?

- Tiny College is divided into several schools: a school of business, a school of education and a school of applied science. Each school is administered by a dean. There is one dean for each school and each dean is assigned to only one school.

- Each school is composed of several departments. For example, the school of business has an accounting department and a computer information system department. Each school has at least one department. Each department belongs to only a single school.

- Each department offer several courses. For example, the management/marketing department offers courses such that introduction to management, principles of marketing, production managment...

- A department may offer several classes of the same course.

- Each department has many professors assigned to it. One of those professors chairs the department. Only one of the professors cab chair the department to which s(he) is assigned and no professor is required to accept the chair position.

- Each professor may teach up to 4 classes, each one a class of a course. A professor may also be on a research contract and teach no classes at all.

- A student may enroll in several classes, but s(he) takes each class only once during any given enrollment period. For example, during the current enrollment period a student may decide to take 5 classes but that student will not be enrolled in the same class five times during the enrollment period. Each student may enroll in up to 6 classes and each class may have up to 35 students in it.

- Each department has several student who major is offered by that department. However each student has only a single major and is therefore associated with a single department.

- Each student has an advisor in his/her department. Each advisor counsels several students. An advisor is also a professor, but not all professors advise students.