# Data Modeling Part-3

**Content :-**

1. **Specialization**
2. **Generalization**
3. **Aggregation**

**Extended E-R Features:**

**Specialization:-** An entity set E may include some sub-groups of entity (say $E_1, E_2, E_3, \dots E_n$) such that each of thesesub-groups may have some distinct attributes different than the other sub-groups. There will be some attributes that will have common to all the sub-groups. The process of designating these sub-groups within an entity set is called **specialization.**
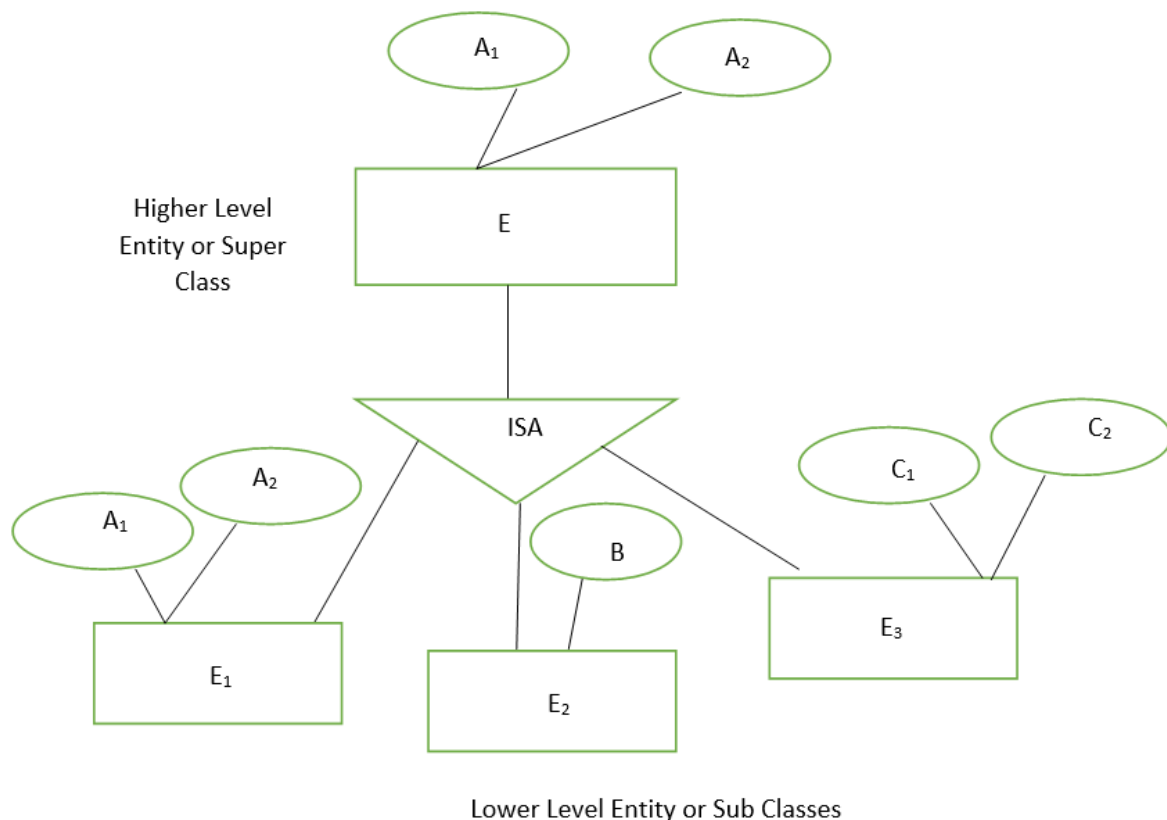


In the given example, an Entity set E has been specialized into sub-groups designated as $E_1$, $E_2$, $E_3 \dots E_n$ . E is called "Super class" or "Higher Level Entity Set" and the entity sets $E_1$, $E_2$, $E_3 \dots E_n$ are called "Sub Classes" or "Lower Level Entity Set" of E. The common attributes of all entity sets are represented with the super entity set.

The relationship of Higher level Entity Set with its Lower Level Entity Sets is called ISA relationship. It is read as "is a".

**Specialization Constraints:**

a. **Disjoint :** It implies that an entity does not belong to more than one lower level entity set i.e. an account is either saving-account or current but not both.

b. **Overlapping :** In overlapping , an entity may belong to more than one lower-level entity sets with a single generalization.
c. **Total :** Each higher level entity must belong to a lower-level entity set .
d. **Partial:** Some higher level entities may not belong to any lower-level entity set.

**Generalization :-** Specialization is a top-down approach; where as Generalization is exactly inverse of that. Generalization refers to the process of fusing several distinct entity sets into a single higher level entity set , on the basis of commonality of their attributes. Then the fused sets for sub classes or lower level entity sets. The common attributes of the lower level entity sets will be assigned to the higher level entity set. Thus the generalization is a process, which proceeds in a bottom-up manner , in which multiple entities are synthesized into a single higher-level entity set on the basis of their common features.

**Aggregation:** One limitation of E-R Model is that it fails to express relationship sets or relationship between a relationship set on one side and an entity set on the other side. Aggregation provide the solution in this case. Aggregation is an abstraction through which relationship are treated as high-level entities, which can be participate in relationships with other entity sets or with other relationship sets.
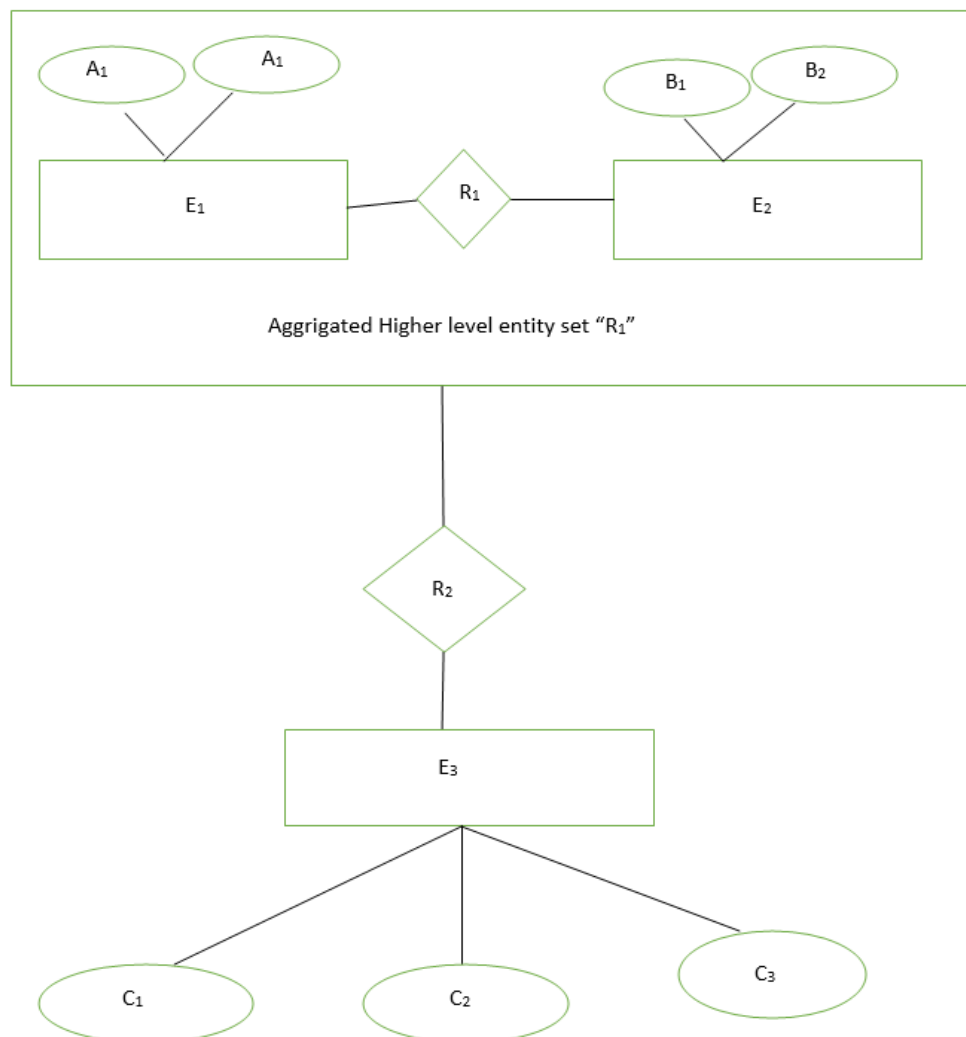
**Example:-** Suppose, we have Entity Sets "EMPLOYEE", "BRANCH" , and "JOB" which is related through a Relationship "EBJ" which indicates , "which employee" is performing "what jobs" at "which branch". There will be multiple jobs at each branch and assume that each employee may be performing multiple jobs at one of the branches. Suppose, we want to relate another Entity Set "MANAGER" to indicate:
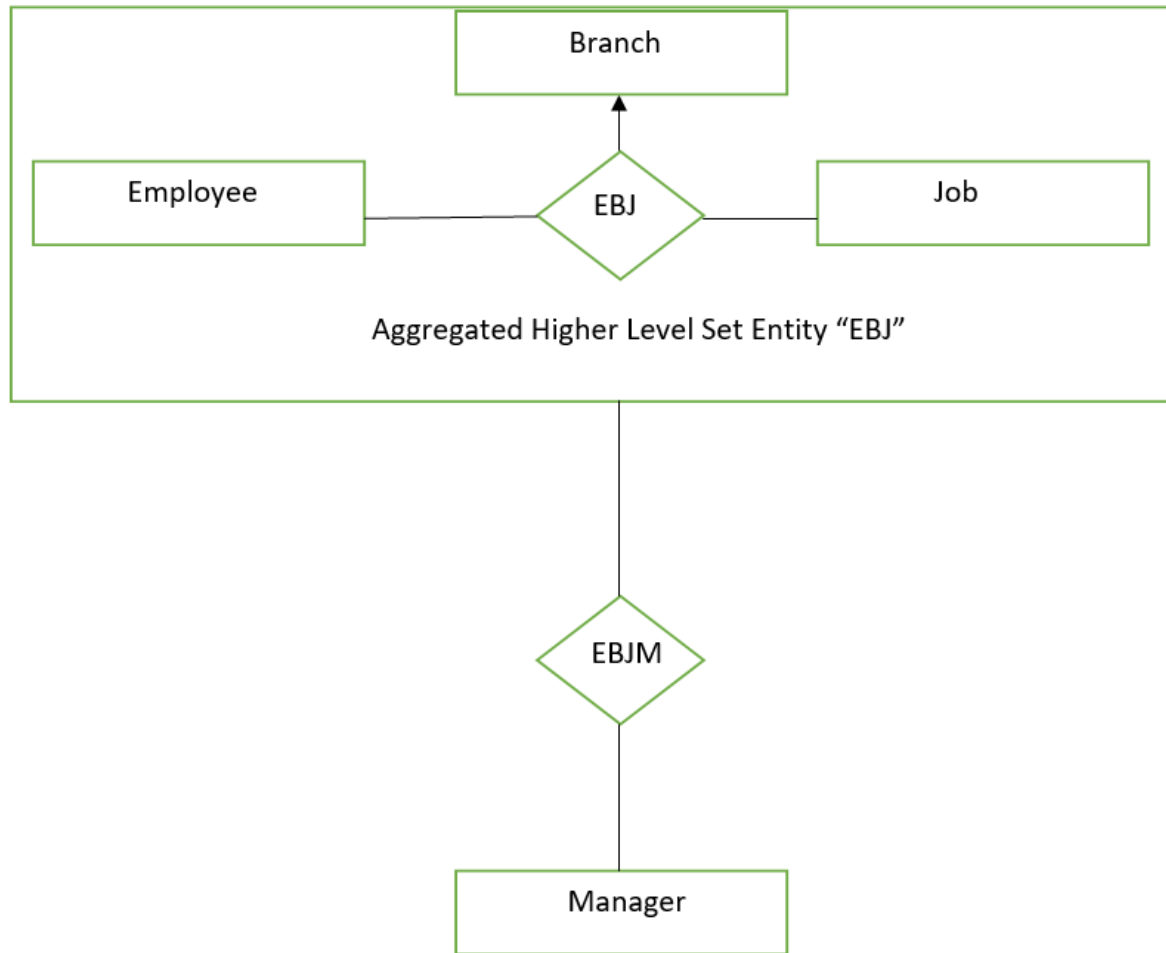
    i.        The set of employees managed by a manager
   ii.        The set of jobs managed by a manager
  iii.        The branches managed by a manager (assume that manager can manage only one branch)

It is represented in ER model without aggregation as follows :
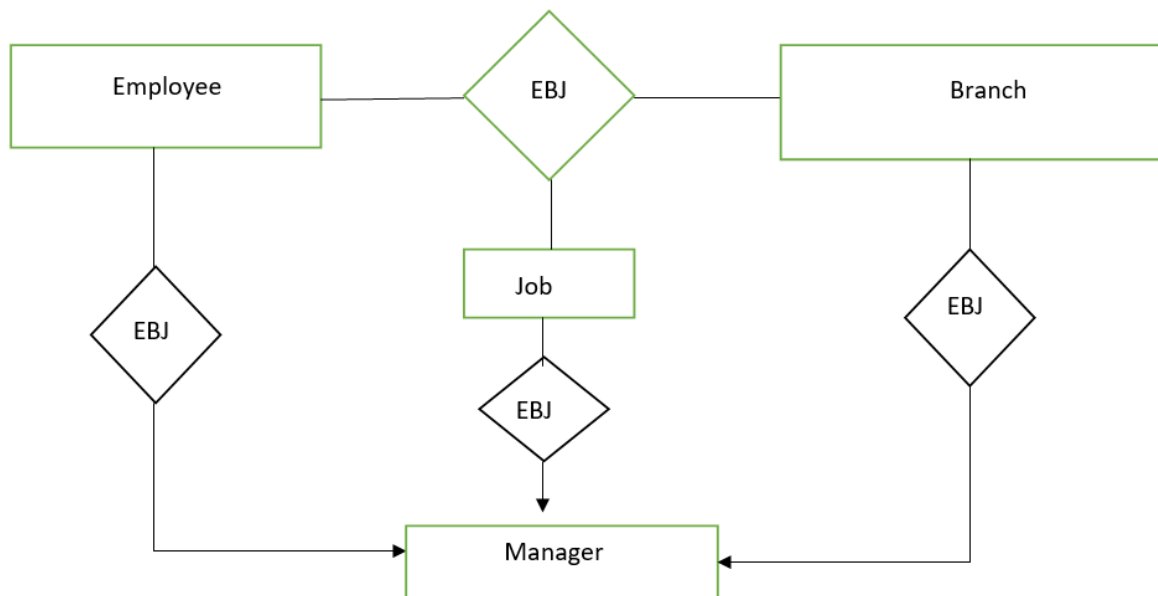


The above scenario can be better modelled by aggregating the relationship as follows :-

Aggregated Higher Level Set Entity "EBJ"

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