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Ternary Relationships

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A ternary relationship is a relationship between three entities. Sometimes, it is possible to replace a ternary relationship with 3 binary relationships, whereas sometimes it is not.
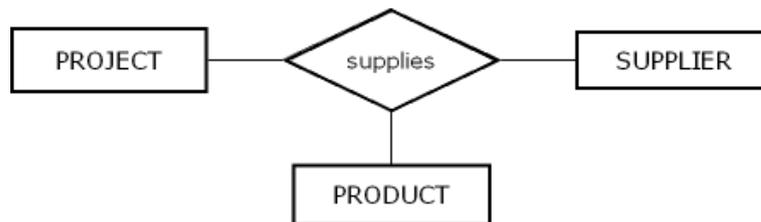

<div align="center">Figure 1: Ternary Relationship</div>

The ternary relationship here means that a supplier must supply a particular part to a particular project.

For example, Office-Depot supplies laser printer paper to project 112. Office-Max can supply paper clips to Project 112. Office-Max can supply pencils to project 115. According to that, Office-Max can't supply pencils to 112.)
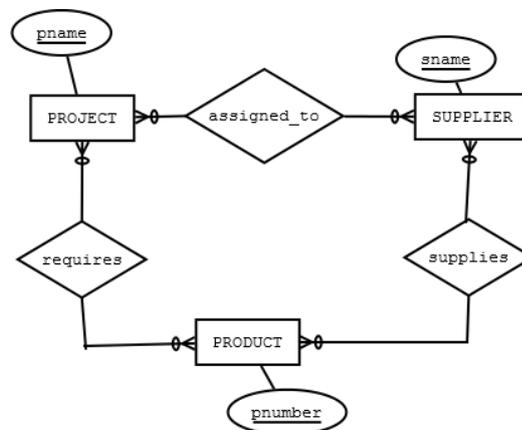

<div align="center">Figure 2: Using Binary Relationships</div>

The three binary relationship sets each represent something distinct. For example, through the relationship `supplies` , we might have an instance inferring that the supplier office-max can supply some certain product such as pencils. At the same time, `assigned_to` has the instance (`office-max,project112`) whenever office-max supplies some part to project 112. In addition, `requires` has the instance (`project112,pencils`) whenever project 112 needs pencils.
However, from the three instances we cannot infer that the instance
(`office-max,project112,pencils`) exists in the ternary relation since a part may be supplied by different suppliers and since a project may deal with different suppliers, ...etc.

Let us take a look at this other diagram which has both binary relationships and a ternary relationship. The question is whether the three binary relationships are sufficient.
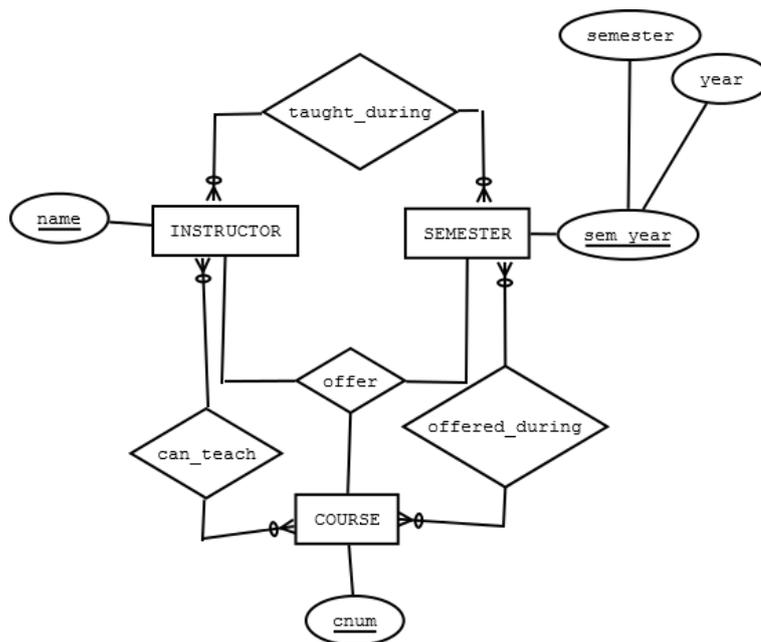
In this case, if we have the instance `(i,s)` for `taught_during` then this encodes the fact that instructor `i` has taught some course in semester `s`. The instance `(s,c)` for `offered_during` means that in semester `s`, some course `c` was offered. The instance `(i,c)` for `can_teach` means that instructor `i` has taught the course `c`. three instances do not infer however, that necessity of having an instance `(i,s,c)` in the ternary relationship. In addition, we cannot answer the question when did instructor `i` teach the course `c` from the three binary relationships since the course can be taught in different semesters and by different instructors.

If we however add the constraint that the course is taught by exactly one instructor and hat an instructor can teach only one course then the ternary relationship can be replaced by the three binary relationships.