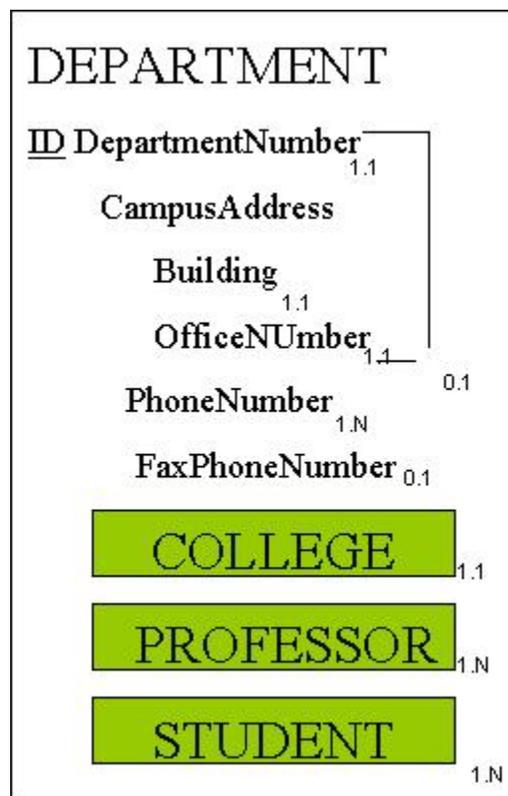


Attribute Cardinality

Each attribute in a semantic object has both a minimal cardinality and a maximum cardinality. The minimum cardinality indicates the number of instances of the attribute that must exist in order for the object to be valid. Usually this number is either 0 or 1. If it is 0 the attribute is not required to have a value. If it is 1 the attribute must have a value. Although it is unusual, the minimal cardinality can sometimes be larger than 1.

The maximum cardinality indicates the maximum number of instances of the attribute that the object may have. It is usually either 1 or N. If it is 1, the attribute can have no more than one instance; if it is N, the attribute can have many values, and the absolute number is not specified. Sometimes the maximum cardinality is a specific number such as 5 meaning the object can contain no more than exactly 5 instances of the attribute. Cardinalities are shown as subscripts of attributes in the format **N.M**, where N is the minimal cardinality and M is the maximum.

In the following **figure**, the minimum cardinality of the DepartmentName is 1 and the maximum is also 1, which means that exactly one value of DepartmentName is required. The cardinality of PhoneNumber is 1.N, meaning that a DEPARTMENT is required to have at least one PhoneNumber, but may have many. The cardinality of 0.1 in FaxPhoneNumber means that a DEPARTMENT may have either 0 or 1 FaxPhoneNumber.



The cardinalities of groups, and the attributes N groups can be subtle. Consider the attribute CampusAddress. Its cardinalities are 0..1, meaning a DEPARTMENT need not have an address and has atmost 1.