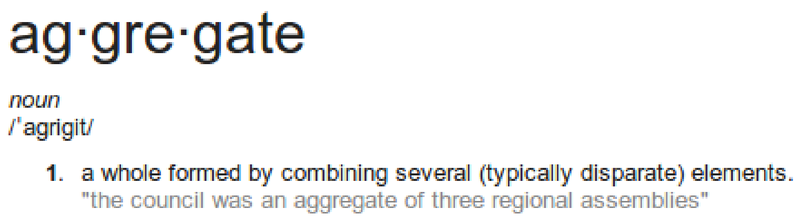
2. Object Oriented Design :: Aggregation Relationships

An **aggregation relationship** exists between classes C and D when C "aggregates" one or more objects of D. For example, suppose we have classes *Company* and *Department*:

```
public class Company {
  private ArrayList<Department> mDepartments;
  ...
}

public class Department {
  ...
}
```



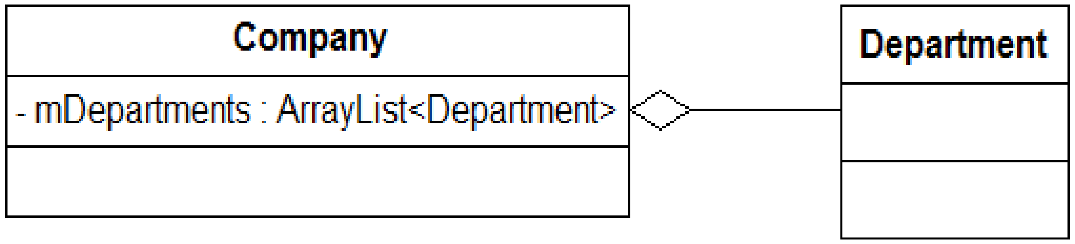
ag·gre·gate

noun

/ˈagrigit/

1. a whole formed by combining several (typically disparate) elements.
   "the council was an aggregate of three regional assemblies"

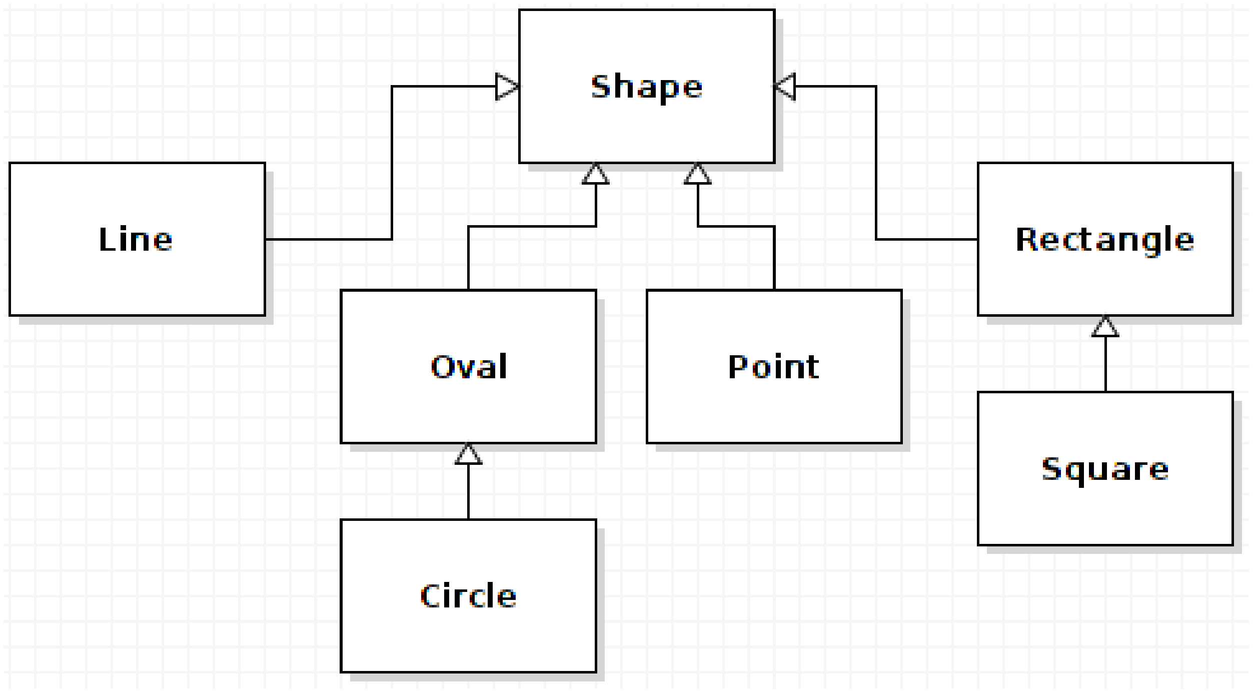
where a *Company* consists of several *Department*s. The UML representation for aggregation relationships is a solid line with a diamond shape on the aggregating class end:



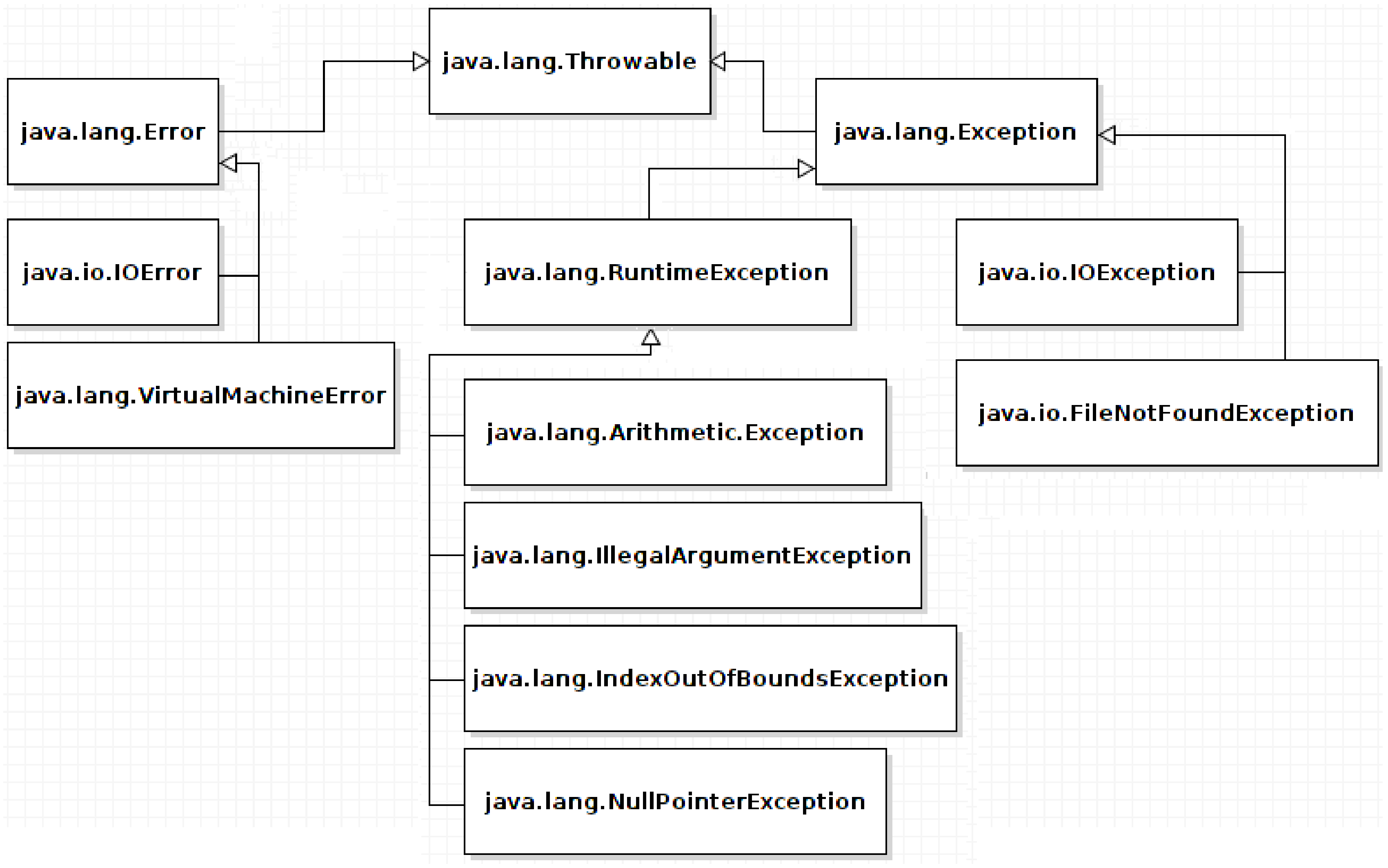
Aggregation is a form of a "has a" relationship, i.e., a *Company* "has a" *Department*s.

2. Object Oriented Design :: Inheritance or Generalization Relationships

A **generalization** or **inheritance relationship** exists between classes B and C when class C (called the **subclass** or **derived class**) is based on class B (called the **superclass** or **base class**). For example, suppose we are writing a paint program that draws various shapes: *Point*s, *Line*s, *Circle*s, *Oval*s, *Rectangle*s, and *Square*s. A little thought should lead you to the realization that a *Circle* is a specialization of *Oval*, i.e., a *Circle* is a specific type of *Oval* or conversely, an *Oval* is a generalization of *Circle*. A similar relationship holds between *Square*s and *Rectangle*s: a *Square* is a specific type of *Rectangle*, or conversely, *Rectangle* is a generalization of *Square*. In fact, all of these shapes are specific types of a general class that we could name *Shape*. Inheritance is indicated by a solid line connecting the subclass to the superclass, with a triangle on the superclass end.



2. Object Oriented Design :: Example from the Java Class Library


java.lang.Throwable
java.lang.Error
java.lang.Exception
java.io.IOError
java.lang.RuntimeException
java.io.IOException
java.lang.VirtualMachineError
java.lang.Arithmetic.Exception
java.io.FileNotFoundException
java.lang.IllegalArgumentException
java.lang.IndexOutOfBoundsException
java.lang.NullPointerException