David Schirduan CSCI360 Computer Architecture and Design

Bowring 2/28/11

Factory Method

Computers are simple machines, in theory at least. Programmers make all of the important decisions for the computer to execute: which numbers to add, multiply, subtract; where to store those numbers; in what order operations should be executed, etc. Everything is laid out very plainly, and in theory all the computer has to do is execute the directions exactly as the programmer has laid out. Every once in a while though, programmers expect more of computers. Sometimes decisions must be made by the computer, very quickly and accurately, which will then carry out those decisions. Fortunately for the computer, programmers make it very clear the conditions and requirements for this decision to be executed by the computer. One of these decisions involves something called the “Factory Method”.

Sometimes a program is required to manipulate or create multiple types of objects. Programmers call these “Abstract Classes”, which create a base architecture for classes to follow. Abstract classes cannot be instantiated, which means that an object cannot be created from that class. The benefits of an abstract class is that it can act as the “parent” so more specialized classes that share inheritance. For example, an abstract class might be “mammal” which contains the common elements of mammals, while the more specific sub-classes can define difference mammals in more detail. Abstract classes act as the generic base for more specific classes to draw on and inherit attributes from.

Although there is no concrete history of the development of this method, it is easy to see how this method may have become a common, accepted solution to the problem that it solves. When software was still in it's infancy, problems could be directly solved, and there

were simple solutions to simple problems. As programs became more complex, and faster, they required more maintenance and thus more complexity. Since computers were moving at the speed of light, they had to start making their own complex decisions at those same speeds, instead of relying on user input. Instead of making huge and complex if-then statements, it is easier to split programs into different classes that may call upon or override one another. This way each individual class can be relatively simple, and also be interchangeable. This idea is called coupling. The Factory Method keeps coupling low by separating responsibilities through subclasses.

Basically, the Factory Method is an expanded, outsourced if-then statement. When a program needs to decide which type of class it will create, it allows the Factory Method to make that determination. Although in reality, the Factory Method just allows the sub-clases to override the object creation, and take control of the creation process. This is accomplished through the use of several specialized sub-classes. These sub-classes contain the details of the possible objects that may be created. The Factory Method decides which sub-classes is required for this specific situation, and calls on that class to create the needed object that is covered by that subclass. After the correct object is created, the program can continue to the next command.

The main benefit of this method is that it allows for expansion. By adding additional sub-classes, and modifying the parameters for the decision of class creation, a programmer can effectively expand the types of objects that this Factory Method can create. This can be extremely useful when first designing a program that may require expansion over time or alteration.

The biggest problems with this method are the obvious ones. It is not very useful when there are only one or two types of objects that are necessary. Creating separate subclasses for each one is a waste of resources. Also, some programming languages handle object

creation differently. For example, in an assembly language, such as MIPS, it would be much better to have an extended if-then statement than to require the jumping to multiple loops, and usage of several registers. The Factory Method also requires fairly consistent and expanded naming conventions. Often times there are multiple abstract classes, concrete objects, and methods all interacting with one another; resulting in even more objects being created and added to the fray. It is essential to name classes appropriately according the language and the specific characteristics and functions of those classes or methods.

The factory method is a very effective way to solve the problem of multi-class creation. This allows you to have one creation method or function for multiple types of objects, as opposed to simply replicating code for different objects. When used correctly, it allows for easy expansion of classes, and keeps coupling low. Depending on the complexity of the sub-classes, this can significantly reduce your overhead, with entire sections of code being skipped over, or unused except in the rare case that the particular object is needed.

Works Cited

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```
public abstract Barracks                                    //main structure
{
        public abstract needTroops createTroop(input type);  //factory class
        {
        neededtroop Troop = whichTroop(type)

                switch (Troop)                              //this section picks which troop
                {                                           //subclasses need to be called
                                                            //upon to create the correct object
                        case Mage:
                                return new MakeMage(type);
                        case Warrior:
                                return new MakeWarrior(type);
                        case Archer:
                                return new MakeArcher(type);

                }
        }
}


public class MakeWarrior implements Barracks                //these are the sub-classes that
{                                                           //create the needed troops
        public needTroops createTroop()
        {
                //code here...
                return troop
        }
}

public class MakeArcher implements Barracks
{
        public needTroops createTroop()
        {
                //code here...
                return troop
        }
}

public class MakeMage implements Barracks
{
        public needTroops createTroop()
        {
                //code here...
                return troop
        }
}
```