**The Composite Pattern**

**Problem**

Trees are commonly used to represent assemblies and other types of hierarchies.

**Solution**

The Composite Pattern introduces an abstract Component interface. There are two types of components: primitive or simple components and composite components (also called assemblies or aggregates). A composite component maintains a list of references (or copies) of its parts or children. These parts may be primitives or composites.

**Structure**

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**Behavior**

**Discussion**

The following Java implementation introduces Component as an empty interface:

interface Component { }

Alternatively, the Component base class could maintain a reference to its parent:

class Component {  
�� protected Composite parent = null;  
�� // etc.  
}

Primitive components are generics that can contain any type of data:

class Primitive<Data> implements Component {  
�� private Data data;  
�� public Primitive(Data data) {  
����� this.data = data;  
�� }  
�� public Data getData() { return data; }  
�� public void setData(Data data) { this.data = data; }  
}

A composite maintains a set of children which may be primitives or composites:

public class Composite implements Component {  
�� private Set<Component> children = new HashSet<Component>();  
�� public void add(Component child) { children.add(child); }  
�� public void remove(Component child) { children.remove(child); }  
�� public Iterator iterator() { return children.iterator(); }  
};

Here's some sample client Code:

����� Primitive<String> leaf1 = new Primitive<String>("Leaf 1");  
����� Primitive<String> leaf2 = new Primitive<String>("Leaf 2");  
����� Primitive<String> leaf3 = new Primitive<String>("Leaf 3");  
����� Composite parent1 = new Composite();  
����� Composite parent2 = new Composite();  
����� parent1.add(leaf1);  
����� parent1.add(leaf2);  
����� parent2.add(parent1);  
����� parent2.add(leaf3);

Here is a drawing of the tree the client constructed:

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