Composite in C++

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Composite design pattern

1. Identify the scalar/primitive classes and vector/container classes
2. Create an "interface" (lowest common denominator) that can make all concrete classes "interchangeable"
3. All concrete classes declare an "is a" relationship to the interface
4. All "container" classes couple themselves to the interface (recursive composition, Composite "has a" set of children up the "is a" hierarchy)
5. "Container" classes use polymorphism as they delegate to their children

```
#include <iostream>
#include <vector>
using namespace std;

// 2. Create an "interface" (lowest common denominator)
class Component
{
  public:
    virtual void traverse() = 0;
};

class Leaf: public Component
{
    // 1. Scalar class   3. "isa" relationship
    int value;
  public:
    Leaf(int val)
    {
        value = val;
    }
    void traverse()
    {
        cout << value << ' ';
    }
};

class Composite: public Component
{
    // 1. Vector class   3. "isa" relationship
    vector < Component * > children; // 4. "container" coupled to the interface
  public:
    // 4. "container" class coupled to the interface
    void add(Component *ele)
    {
        children.push_back(ele);
    }
    void traverse()
    {
        for (int i = 0; i < children.size(); i++)
        // 5. Use polymorphism to delegate to children
          children[i]->traverse();
    }
};

int main()
{
  Composite containers[4];
```

```
  for (int i = 0; i < 4; i++)
    for (int j = 0; j < 3; j++)
      containers[i].add(new Leaf(i *3+j));

  for (i = 1; i < 4; i++)
    containers[0].add(&(containers[i]));

  for (i = 0; i < 4; i++)
  {
    containers[i].traverse();
    cout << endl;
  }
}
```

Output

```
0 1 2 3 4 5 6 7 8 9 10 11
3 4 5
6 7 8
9 10 11
```

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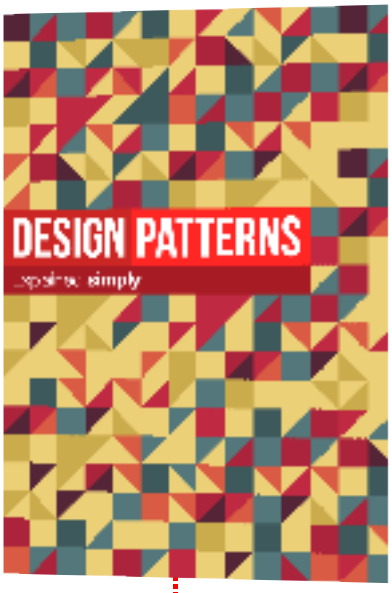

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