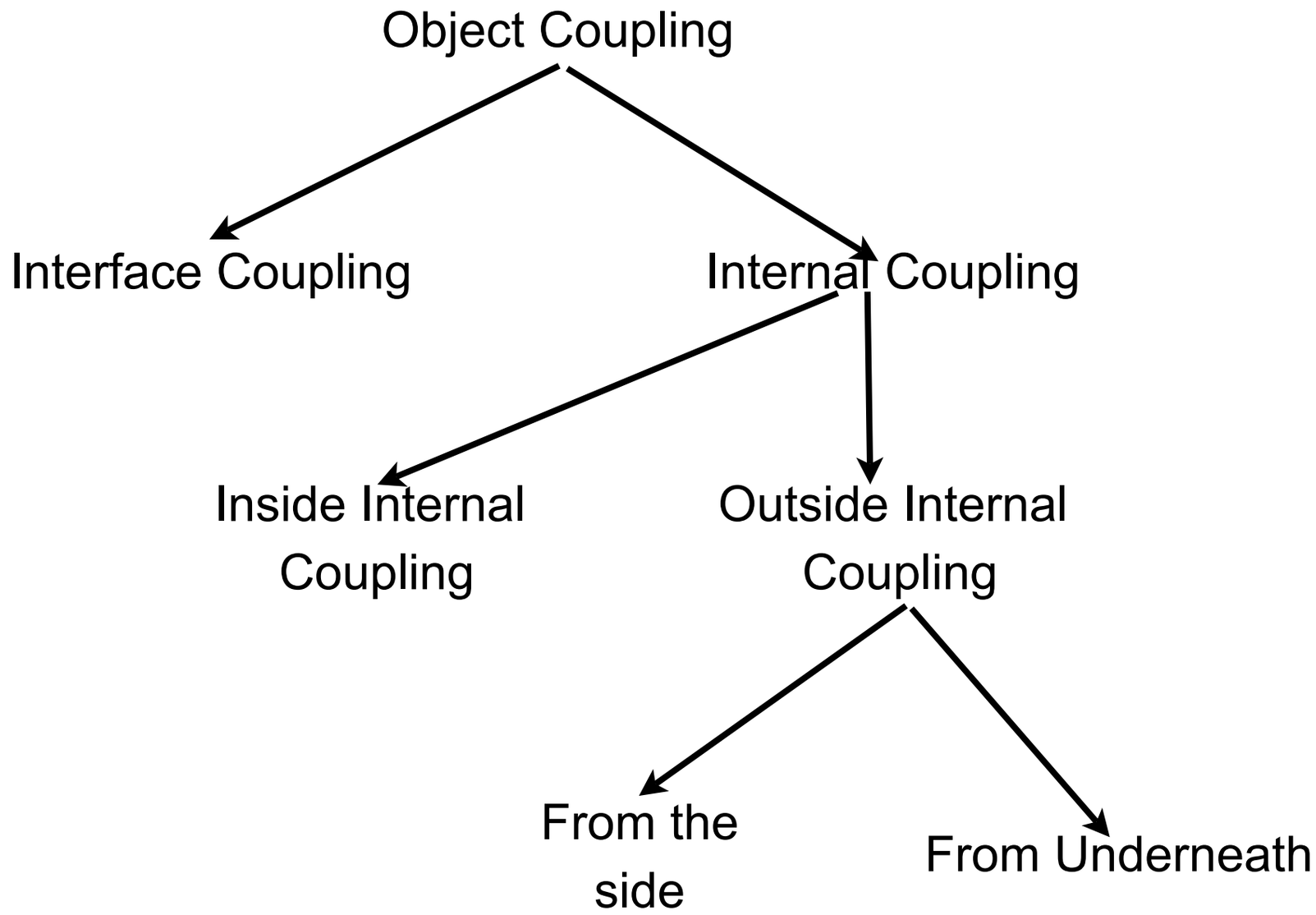
CS 635 Advanced Object-Oriented Design & Programming

Spring Semester, 2007
Doc 9 Object Coupling
Feb 22, 2007

References

Object Coupling and Object Cohesion, chapter 7 of Essays on Object-Oriented Software Engineering, Vol. 1, Berard, Prentice-Hall, 1993, pp 92-111


Object Coupling
Interface Coupling
Internal Coupling
Inside Internal Coupling
Outside Internal Coupling
From the side
From Underneath

Internal Coupling & Cohesion

Internal Coupling

Physical relationships among the items that comprise an object

Cohesion

Logical relationships among the items that comprise an object

Interface Coupling

One object refers to another specific object, and the original object makes direct references to one or more items in the specific object's public interface

Includes module coupling already covered

Weakest form of object coupling, but has wide variation

Issues

- Object abstraction decoupling
- Selector decoupling
- Constructor decoupling
- Iterator decoupling

Object Abstraction Decoupling

Assumptions that one object makes about a category of other objects are isolated and used as parameters to instantiate the original object.

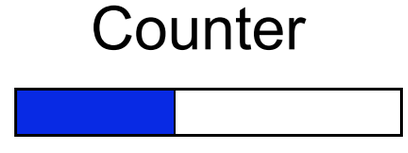
C++/Java 1.5 Example

```
class LinkedListCell {
        int cellItem;
        LinkedListCell* next;

        // code can now use fact that cellItem is an int
        if ( cellItem == 5 ) print( "We Win" );
}

template <class type>
class LinkedListCell#2 {
        type cellItem;
        LinkedListCell* next;

        // code does not know the type, it is just a cell item,
        // it becomes an abstraction
}
```

Selector Decoupling

Counter Example

```
class Counter{
        int count = 0;

        public void increment()     {  count++; }
        public void reset()         { count = 0; }
        public void display() {
                Java Swing code to display the counter
                in a slider bar
}
```



Selector Decoupled

```
class Counter{
        int count = 0;

        public void increment()     {  count++; }
        public void reset()         { count = 0; }
        public int count()          {return count;}
        public String toString()    {return String.valueOf( count );}
}
```

Primitive Methods

Any method that cannot be implemented simply, efficiently, and reliably without knowledge of the underlying implementation of the object

Functionally cohesive, they perform a single specific function

Small, seldom exceed five "lines of code"

Types

Selectors (get operations)
Constructors (not the same as class constructors)
Iterators

Composite method

Any method constructed from two or more primitive methods

sometimes from different objects

Selectors

Return state information about their encapsulated object and
Do not alter the state of their encapsulated object

```
public void display()   {
        Swing GUI code to display the counter
}
```

Selector
decoupling

```
public String toString() {return String.valueOf( count );}
```

Primitive Objects

Primitive objects are objects that are both:

- Defined in the standard for the implementation language
- Globally known

Primitive objects don't count in coupling with other objects

Why not?

Constructors

Operations that construct a new, or altered version of an object

```
class Calendar {
        public void getMonth( from where, or what) { blah }
}
```

```
class Calendar {
        public static Calendar fromString( String date ) { blah}
}
```

Composite Object

Object **conceptually** composed of two or more objects

Heterogeneous Composite Object

Object **conceptually** composed from objects which are not all **conceptually** the same

```
class Date{
        int year;
        int month;
        int day;
}
```

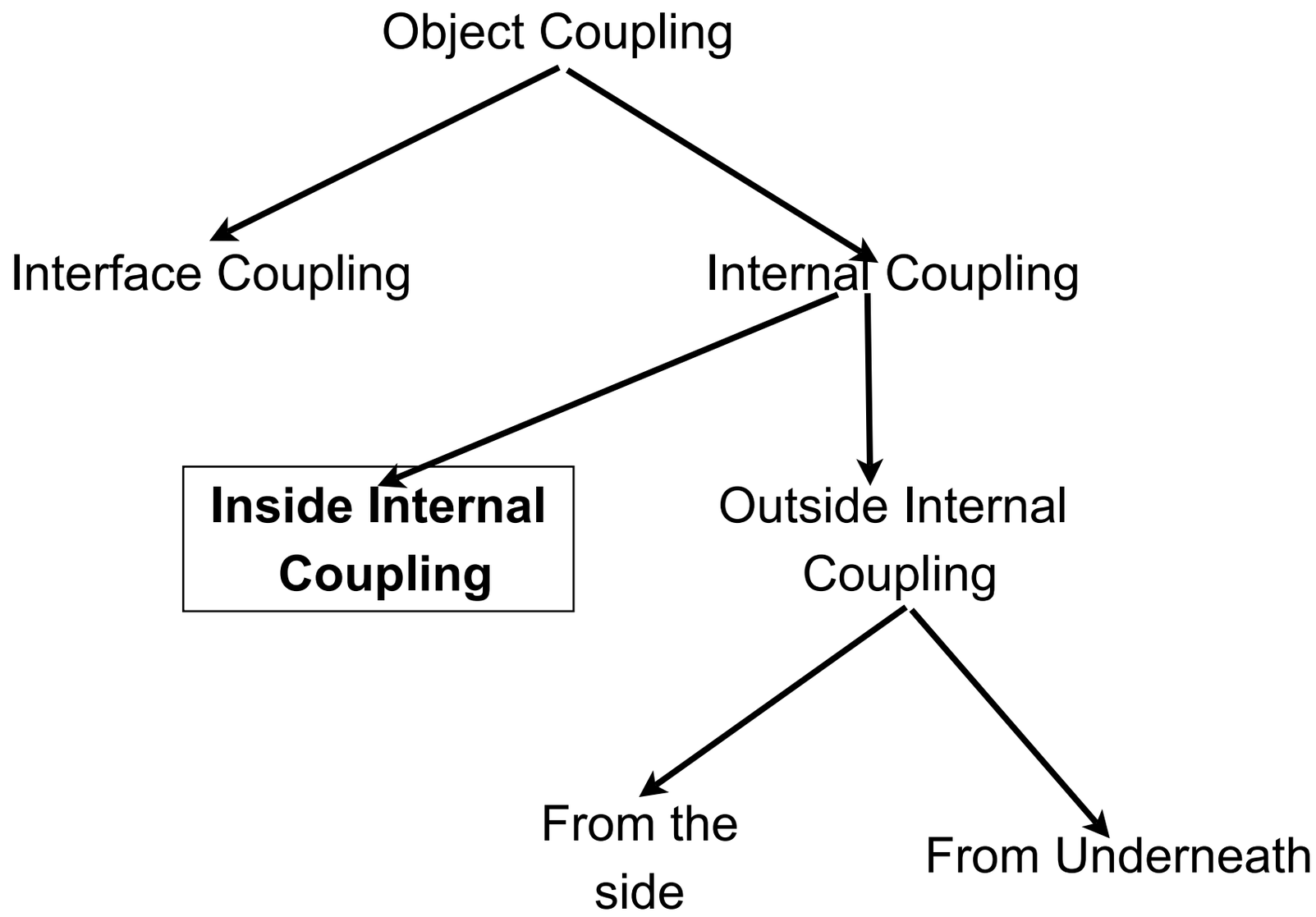
Homogeneous Composite Object

Object **conceptually** composed from objects which are all **conceptually** the same

list of names - each item is a member of the same general category of object – a name

Iterator

Allows the user to visit all the nodes in a homogeneous composite object and to perform some user-supplied operation at each node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Inside Internal Object Coupling

Coupling between state and operations of an object

The big issue: Accessing state

Changing the structure of the state of an object requires changing all operations that access the state including operations in subclasses

Solution: Access state via access operations

C++ implementation

Provide private functions to access and change each data member

Outside Internal Coupling from Underneath

Coupling between a class and subclass involving private state and private operations

Major Issues

Access to inherited state

Direct access to inherited state

Access via operations

Unwanted Inheritance

Parent class may have operations and state not needed by subclass

Outside Internal Coupling from the Side

Class A accesses private state or private operations of class B

Class A and B are not related via inheritance

Main causes

Using non-object-oriented languages

Special language "features"

C++ friends