Classes

EECS 211

Winter 2017
A counter struct

// A counter
struct Counter
{
    unsigned long value;
};

// Increments the value of the given counter
void increment(Counter& counter);

// Returns the value of the given counter
unsigned long get(const Counter& counter);
A counter struct

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struct Counter
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unsigned long get(const Counter& counter);
Counter client code

Counter c{0};

increment(c);
increment(c);

CHECK_EQUAL(2, get(c));
Bad counter client code

Counter c{0};
increment(c);
increment(c);

CHECK_EQUAL(2, get(c));

c.value = 0;

Bad!
Encapsulation restricts direct access to (some of) an object’s components:

```cpp
// A counter
class Counter
{
    unsigned long value; // private now!
};

// Increments the value of the given counter
void increment(Counter& counter);

// Returns the value of the given counter
unsigned long get(const Counter& counter);
```
Implementation of Counter class

```cpp
void increment(Counter & counter) {
    ++counter.value; // error! member value is private
}

unsigned long get(const Counter & counter) {
    return counter.value; // error! member value is private
}
```

This doesn’t work anymore because making Counter a class made member value private
Member functions

In Counter.h:

    class Counter
    {
        unsigned long value_ = 0;
    public:
        void increment();
        unsigned long get() const;
    }

In Counter.cpp:

    void Counter::increment()
    {
        ++value_; 
    }

    unsigned long Counter::get() const
    {
        return value_; 
    }
Counter class client code

Counter c;

c.increment();
c.increment();

CHECK_EQUAL(2, c.get());
The rule

class Class_name {

    // private stuff

public:

    // public stuff

private:

    // more private stuff

};

Private members can only be accessed by other members
The rule

class Class_name
{
    // private stuff

public:
    // public stuff

private:
    // more private stuff

};

Private members can only be accessed by other members

Thus, clients must interact via public members
Initialization

What if we want to initialize the counter to a number other than 0?

Counter c{10};

This won’t work! Why?
Constructors

Constructors are special functions that are run each time a class object is created.

A constructor is given an uninitialized object and must initialize it.

The name of the constructor is the same as the name of the class, and it has no return type.
Counter class with constructors

class Counter
{

public:
    Counter();
    explicit Counter(unsigned long);
    void increment();
    unsigned long get() const;

private:
    unsigned long value_;
Counter class constructor implementation

Counter::Counter() : value_(0)
{
}

Counter::Counter(unsigned long value) : value_(value)
{
}
Counter class client code

Counter c1;
Counter c2(10);

CHECK_EQUAL(0, c1.get());
CHECK_EQUAL(10, c2.get());
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