Advanced C++ Topics

Alexander Warg, 2018

Overview

WHAT IS BEHIND C++

- Language Magics
- Object Life Time
- Object Memory Layout

INTRODUCTION TO TEMPLATES

- Template Function
- Template Class

WHAT I DO NOT EXPLAIN

- Standard C++ Library

C++ vs C

Some more keywords
- new, delete, class, virtual, mutable, explicit...

Stricter type system
- e.g. no automatic conversion from void *
- custom class types
- strictly typed enums (C++11)

Function overloading / Operator overloading
- multiple functions with the same name but different arguments

Extensible hierarchical type system
- classes and inheritance

Generic programming via templates

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Destructors: Special Member Functions for object destruction

- Name: ~Classname()
- No return type
- No arguments

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(related to **operator = (Foo const &o)**, see later)

Foo(Type a, Type b, Type c) -> Normal Constructor

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Type &&x -> RValue refernce

Fast optimized move operations

Support for *perfect forwarding*

TYPE CONVERSION / CAST

Implicit type conversion

- among integer types (incl. enum)
- conversion ctor ?
- conversion operator ?
- from pointers/references of derived classes to pointers/references to base classes

Explicit type conversion (casts)

C++ has three (actually four) types of casts

- static_cast<type>(...)
- reinterpret_cast<type>(...)
- dynamic_cast<type>(...)
- const_cast<type>(...)

POLYMORPHISM (ADVANCED)

Virtual Functions

Support for Overriding functions in C++

Pure Virtual Functions (Abstract Function)

class A { void func() = 0; };

<A> cannot be instantiated (is abstract)

Multiple Inheritance

class A : public B, public C {...};

POLYMORPHISM – VIRTUAL DTOR

Virtual deletion ...

MULTIPLE INHERITANCE

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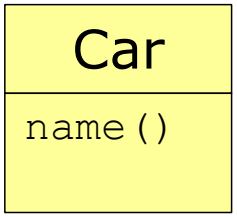

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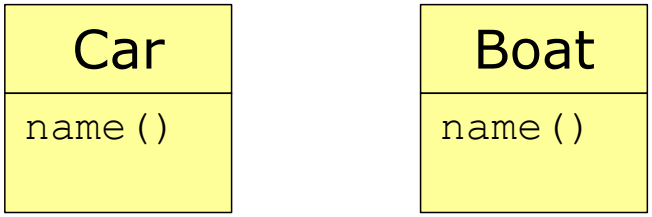

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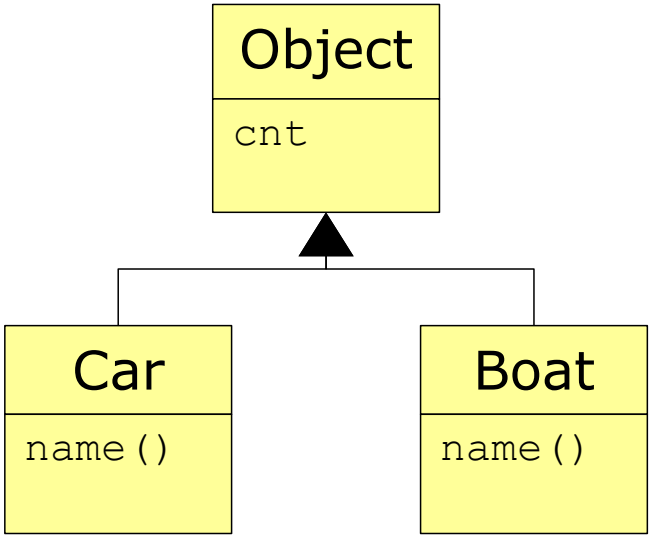

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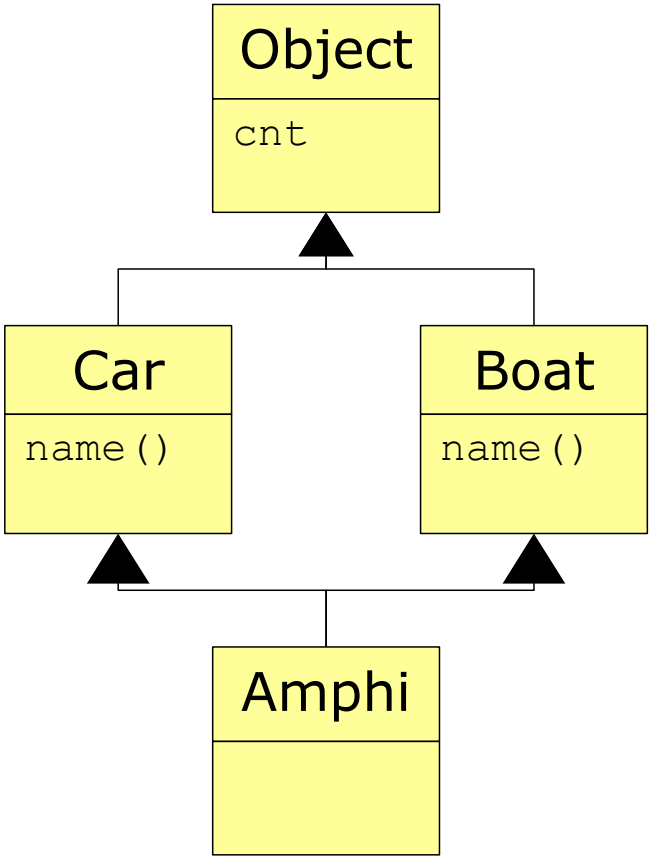

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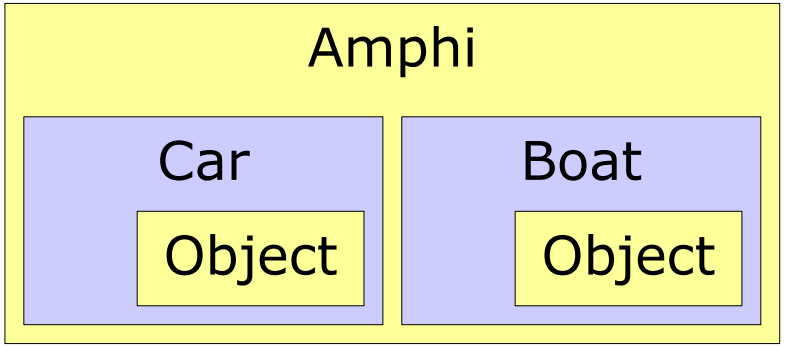

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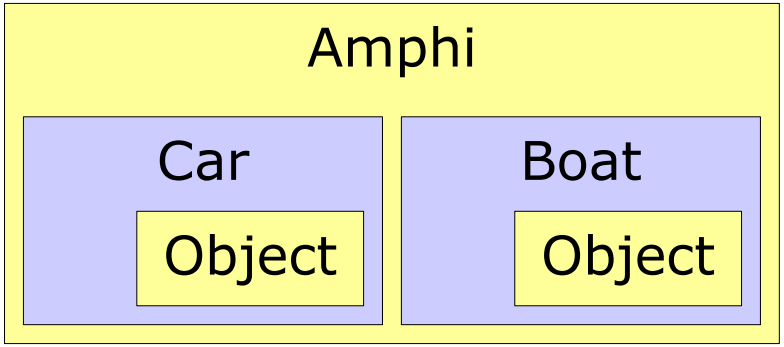

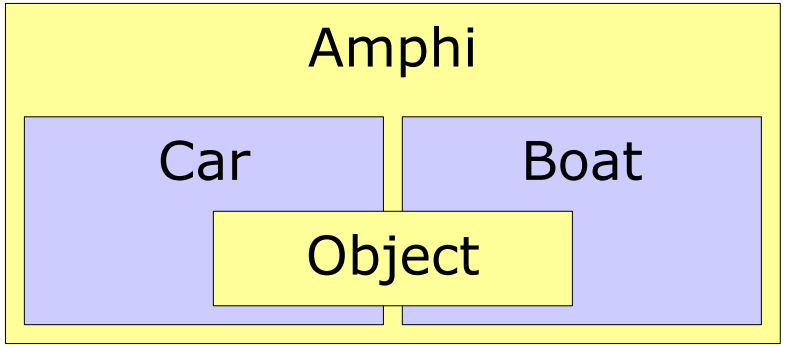

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T max(T a, T b)
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int a, b;
int x = max<int>(a, b);

double a, b;
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class List_item
{
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      void *_data;
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template< typename T >
class List_item
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};
```

DON'T DO THIS...

Too Much operator overloading

- Keep usual semantics
- Avoid implicit conversion operators

using namespace <X> in Header Files

#define ...

- Use enum's for constant values
- Use templates for functions