Cbject docs

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1. Overview

Cbject makes it easier to write object oriented code in C.

1.1. Features

- Classes
- Objects
- Traits
- Interfaces
- Inheritance
- Polymorphism

1.2. Usage

Example 1. How to add it to a project

Include the following header file:

```
#include "Cbject.h"
```

Example 2. How to create an object

```
Object * object = allocInit_(Object);
printf("%d\n", hashCode_(object));
dealloc_(object);
```

1.3. Object model

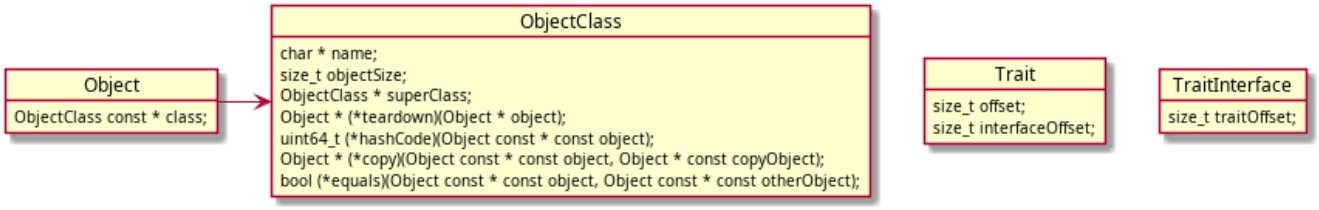

Figure 1. Building blocks

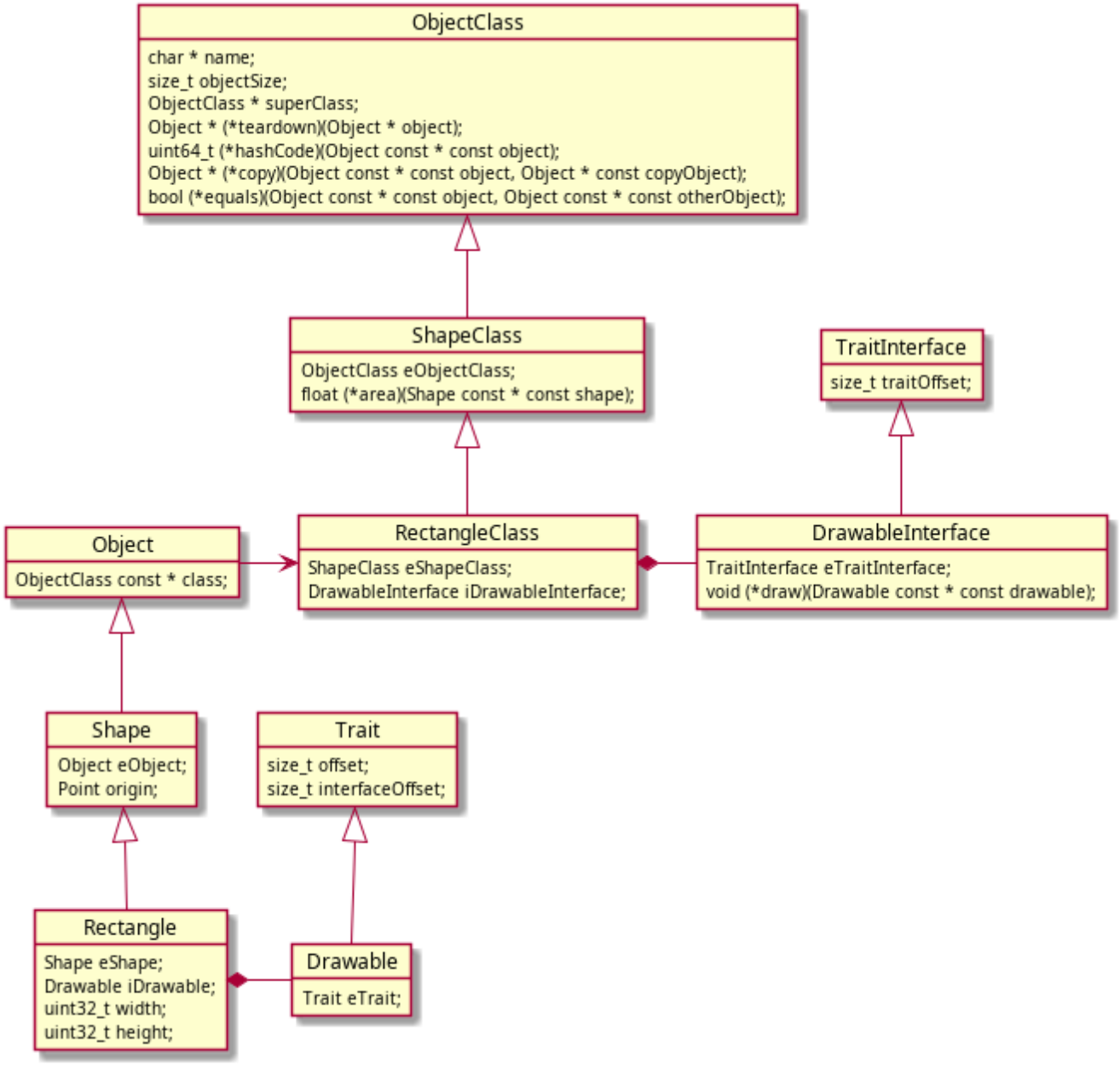

Figure 2. Rectangle class example

2. API

2.1. Object

2.1.1. Overview

The building block. All objects defined in Cbject need to extend Object.

2.1.2. Types

ObjectClass

```
typedef struct ObjectClass ObjectClass;
```

Typedef for struct ObjectClass

Object

```
typedef struct Object Object;
```

Typedef for struct Object

struct ObjectClass

```
struct ObjectClass {
    char * name;
    size_t objectSize;
    ObjectClass const * superClass;
    Object * (*teardown)(Object * object);
    uint64_t (*hashCode)(Object const * const object);
    Object * (*copy)(Object const * const object, Object * const copyObject);
    bool (*equals)(Object const * const object, Object const * const otherObject);
};
```

Definition of struct ObjectClass

Members

- name - Name of the class
- objectSize - Size in memory of object
- superClass - Super class of object
- teardown - Function pointer for the teardown method
- hashCode - Function pointer for the hash code method
- copy - Function pointer for the copy method
- equals - Function pointer for the equals method

struct Object

```
struct Object {
    ObjectClass const * class;
};
```

Definition of struct Object

Members

- class - Pointer to the class structure

2.1.3. Functions

ObjectClass_instance()

```
ObjectClass const * ObjectClass_instance(void);
```

Get ObjectClass instance

Return

Reference of the class instance

Object_alloc()

```
Object * Object_alloc(ObjectClass const * const class);
```

Allocate an object in heap memory

Params

- class - Class reference

Return

Reference of the allocated object

Object_dealloc()

```
Object * Object_dealloc(Object * const object);
```

Free memory allocated for an object

Params

- object - Object reference

Return

Always returns NULL

Object_init()

```
Object * Object_init(Object * const object);
```

Initialize an object

Params

- object - Object reference

Return

Initialized object

Object_teardown()

```
Object * Object_teardown(Object * object);
```

Teardown an object.

Params

- object - Object reference

Return

Always returns NULL

Object_copy()

```
Object * Object_copy(Object const * const object, Object * const copyObject);
```

Make a copy of an object.

Params

- object - Object reference
- copyObject - Reference of a new allocated object in which to copy the original one

Return

Pointer to a new object (copy of the original one)

Object_equals()

```
bool Object_equals(Object const * const object, Object const * const otherObject);
```

Compare two objects

Params

- object - Object reference
- otherObject - Reference for the compared object

Return

- true - If the objects are equal
- false - If the objects are different

Object_hashCode()

```
uint64_t Object_hashCode(Object const * const object);
```

Get hash code of object

Params

- object - Object reference

Return

Object hash code

Object_isOfClass()

```
bool Object_isOfClass(Object const * const object, ObjectClass const * const
class);
```

Check if an object is of a given class

Params

- object - Object reference
- class - Class reference

Return

- true - If the object is of the provided class
- false - If the object is of a different class

2.1.4. Macros

typedefClass_()

```
#define typedefClass_(className)
```

Syntactic sugar to typedef class types

Params

- className - Name of the class

class_()

```
#define class_(className)
```

Syntactic sugar to get class reference

Params

- className - Name of the class

Return

Class reference

setUpClass_()

```
#define setUpClass_(className, superClassName, class)
```

Class setup (initialize super, set the object size and super class)

Params

- className - Name of the class
- superClassName - Name of the super class
- class - Class instance

bindClassMethod_()

```
#define bindClassMethod_(className, methodName, class)
```

Bind a method of a class

Params

- className - Name of the class
- methodName - Name of the method
- class - Class instance

singleton_()

```
#define singleton_(className)
```

Syntactic sugar to get a singleton reference

Params

- className - Name of the class

Return

Singleton reference

initObject_()

```
#define initObject_(className, ...)
```

Syntactic sugar for object initialization

Params

- className - Name of the class
- ...
  - object - Object reference
  - ... - Init params

Return

Initialized object

sallocInit_()

```
#define sallocInit_(...)
```

Syntactic sugar to allocate and init an object in stack memory

Params

- ...
  - className - Name of class
  - ... - Init params

Return

Reference of the allocated and initialized object

classOf_()

```
#define classOf_(object)
```

Get the class of an object

Params

- object - Object reference

Return

Class reference

setUpObject_()

```
#define setUpObject_(className, superClassName, ...)
```

Object setup (initialize, set the object class)

Params

- className - Name of the class
- superClassName - Name of the super class
- ...
  - object - Object reference
  - ... - Init params

classNameOf_()

```
#define classNameOf_(object)
```

Get the class name of an object

Params

- object - Object reference

Return

(char *) Name of the class

objectSizeOf_()

```
#define objectSizeOf_(object)
```

Get the size in memory of an object

Params

- object - Object reference

Return

Object size

traitOf_()

```
#define traitOf_(className, interfaceName, object)
```

Get trait of an object

Params

- className - Name of the class
- interfaceName - Name of the interface
- object - Object reference

Return

Trait reference

objectMethodCall_()

```
#define objectMethodCall_(className, methodName, ...)
```

Call a method through an object

Params

- className - Name of the class
- methodName - Name of the method
- ...
  - object - Object reference
  - ... - Method params

Return

Depends on the called method

classMethodCall_()

```
#define classMethodCall_(className, superClassName, methodName, ...)
```

Call a method through a class

Params

- className - Name of the class
- superClassName - Name of the super class
- methodName - Name of the method
- ...
  - object - Object reference
  - ... - Method params

Return

Depends on the called method

alloc_()

```
#define alloc_(className)
```

Syntactic sugar to allocate an object in heap memory

Params

- className - Name of class

Return

Reference of the allocated object

allocInit_()

```
#define allocInit_(...)
```

Syntactic sugar to allocate and init an object in heap memory

Params

- ...
  - className - Name of class
  - ... - Init params

Return

Reference of the allocated and initialized object

dealloc_()

```
#define dealloc_(object)
```

Syntactic sugar to free memory allocated for an object

Params

- object - Object reference

Return

Always returns NULL

teardown_()

```
#define teardown_(object)
```

Syntactic sugar to teardown an object.

Params

- object - Object reference

Return

Always returns NULL

copy_()

```
#define copy_(className, object, copyObject)
```

Syntactic sugar to make a copy of an object.

Params

- className - Name of class
- object - Object reference
- copyObject - Reference of a new allocated object in which to copy the original one

Return

Pointer to a new object (copy of the original one)

allocCopy_()

```
#define allocCopy_(className, object)
```

Syntactic sugar to copy object in new object allocated in heap memory

Params

- className - Name of class
- object - Object reference

Return

Reference of the allocated object (copy of the original one)

sallocCopy_()

```
#define sallocCopy_(className, object)
```

Syntactic sugar to copy object in new object allocated in stack memory

Params

- className - Name of class
- object - Object reference

Return

Reference of the allocated object (copy of the original one)

equals_()

```
#define equals_(object, otherObject)
```

Syntactic sugar to compare two objects

Params

- object - Object reference
- otherObject - Reference for the compared object

Return

- true - If the objects are equal
- false - If the objects are different

hashCode_()

```
#define hashCode_(object)
```

Syntactic sugar to get hash code of object

Params

- object - Object reference

Return

Object hash code

isOfClass_()

```
#define isOfClass_(object, className)
```

Syntactic sugar to check if an object is of a given class

Params

- object - Object reference
- className - Class name

Return

- true - If the object is of the provided class
- false - If the object is of a different class

2.1.5. Tests

test_Object_class

Test setup of ObjectClass

Steps

1. Get ObjectClass instance
2. Check if object size stored in class is equal to the actual object size
3. Check that the function pointers in the class are initialized

test_Object_init

Test initialization of Object

Steps

1. Allocate object on stack an initialize it
2. Check if object class points to ObjectClass instance

test_Object_equals

Test equals method

Steps

1. Allocate object on stack an initialize it
2. Check if equals method returns true when comparing object to self
3. Allocate another object on stack an initialize it
4. Check if equals method returns false when comparing the two objects

test_Object_hashCode

Test hashCode method

Steps

1. Allocate object on stack an initialize it
2. Check if hashCode method returns the address in memory of the object

test_Object_isOfClass

Test isOfClass method

Preconditions

1. Define a dummy TestClass which extends ObjectClass

Steps

1. Allocate object on stack an initialize it
2. Check if isOfClass method returns true when checked against Object
3. Check if isOfClass method returns false when checked against Test

test_Object_copy

Test copy method

Steps

1. Allocate object on stack an initialize it
2. Allocate another object on stack and copy the first object into it
3. Check if the memory sections occupied by the two objects are equal
4. Allocate another object on heap and copy the first object into it
5. Check if the memory sections occupied by the two objects are equal
6. Deallocate the object from the heap memory

2.2. Trait

2.2.1. Overview

TODO

2.2.2. Types

TraitInterface

```
typedef struct TraitInterface TraitInterface;
```

Typedef for struct TraitInterface

Trait

```
typedef struct Trait Trait;
```

Typedef for struct Trait

struct TraitInterface

```
struct TraitInterface {
    size_t traitOffset;
};
```

Definition of struct TraitInterface

Members

- traitOffset - Offset of trait in containing object

struct Trait

```
struct Trait {
    size_t offset;
    size_t interfaceOffset;
};
```

Definition of struct Trait

Members

- offset - Offset of Trait in container Object
- interfaceOffset - Offset of TraitInterface in container ObjectClass

2.2.3. Functions

TraitInterface_instance()

```
TraitInterface const * TraitInterface_instance(void);
```

Get TraitInterface instance

Return

Reference of the trait interface

Trait_init()

```
Trait * Trait_init(Trait * const trait);
```

Initialize a trait

Params

- trait - Trait reference

Return

Initialized trait

2.2.4. Macros

typedefInterface_()

```
#define typedefInterface_(interfaceName)
```

Syntactic sugar to typedef interface types

Params

- interfaceName - Name of the interface

Return

Interface reference

interface_()

```
#define interface_(interfaceName)
```

Syntactic sugar to get interface reference

Params

- interfaceName - Name of the interface

Return

Interface reference

setUpInterface_()

```
#define setUpInterface_(interfaceName, interface)
```

Interface setup (initialize super)

Params

- interfaceName - Name of the interface
- interface - Interface instance

bindInterfaceMethod_()

```
#define bindInterfaceMethod_(interfaceName, methodName, interface)
```

Bind a method of an interface

Params

- interfaceName - Name of the interface
- superInterfaceName - Name of the super interface
- methodName - Name of the method
- interface - Interface instance

setUpInterfaceOf_()

```
#define setUpInterfaceOf_(className, interfaceName, class)
```

Interface setup in class (initialize super, set the trait offset in container object)

Params

- className - Name of the class
- interfaceName - Name of the interface
- class - Class instance

bindInterfaceMethodOf_()

```
#define bindInterfaceMethodOf_(className, interfaceName, methodName, class)
```

Bind a method of an interface

Params

- className - Name of the class
- interfaceName - Name of the interface
- methodName - Name of the method
- class - Class instance

offsetOf_()

```
#define offsetOf_(trait)
```

Get offset of a trait in container object

Params

- trait - Trait reference

Return

Offset of trait in container object

objectOf_()

```
#define objectOf_(trait)
```

Get container object from a trait

Params

- trait - Trait reference

Return

Reference of the container object

interfaceOffsetOf_()

```
#define interfaceOffsetOf_(trait)
```

Get the interface offset in container class

Params

- trait - Trait reference

Return

Offset of interface in container class

interfaceOf_()

```
#define interfaceOf_(trait)
```

Get the interface of a trait

Params

- trait - Trait reference

Return

Interface reference

initTrait_()

```
#define initTrait_(interfaceName, ...)
```

Syntactic sugar for trait initialization

Params

- interfaceName - Name of the interface
- ...
  - trait - Trait reference
  - ... - Init params

Return

Initialized trait

setUpTraitOf_()

```
#define setUpTraitOf_(className, interfaceName, ...)
```

Trait setup (initialize, set the trait offset and interface offset)

Params

- className - Name of the class
- interfaceName - Name of the interface
- ...
  - object - Object reference
  - ... - Init params

traitMethodCall_()

```
#define traitMethodCall_(interfaceName, methodName, ...)
```

Call a method through a trait

Params

- interfaceName - Name of the interface
- methodName - Name of the method
- ...
  - trait - Trait reference
  - ... - Method params

Return

Depends on the called method

interfaceMethodCall_()

```
#define interfaceMethodCall_(className, interfaceName, methodName, ...)
```

Call a method through an interface

Params

- className - Name of the class
- interfaceName - Name of the interface
- methodName - Name of the method
- ...
  - trait - Trait reference
  - ... - Method params

Return

Depends on the called method

2.3. Utils

2.3.1. Overview

TODO

2.3.2. Types

Any

```
typedef void Any;
```

Typedef for Any

Remark

To be used with pointers to anything

2.3.3. Macros

doOnce_

```
#define doOnce_
```

Run a block of code only once

Usage

```
doOnce_ {
    functionCall();
    anotherFunctionCall();
}
```

Remark

Not thread safe

assertStatic_()

```
#define assertStatic_(expression, identifier)
```

Compile time assert

Params

- expression - Expression to assert
- identifier - An identifier to describe the assertion

to_()

```
#define to_(typeName, instance)
```

Cast an instance to the provided typeName

Params

- typeName - Name of the type (class or interface)
- instance - Instance to cast

Return

Instance cast to the provided typeName

extends_()

```
#define extends_(typeName)
```

Syntactic sugar to extend a type

Remark

Should be used as the first member in the structure

Params

- typeName - Name of the type

extends_()

```
#define implements_(typeName)
```

Syntactic sugar to compose a type with the provided typeName

Remark

Should be used after extends_() macro

Params

- typeName - Name of the type

lengthOf_()

```
#define lengthOf_(array)
```

Get length of an array

Params

- array - Array for which to get the length

lengthOf_()

```
#define salloc_(typeName)
```

Syntactic sugar to allocate memory on the stack

Params

- typeName - Name of type

ignore_()

```
#define ignore_(var)
```

Syntactic sugar to ignore unused variables

Params

- var - Variable to be ignored

VaArgs_first_()

```
#define VaArgs_first_(...)
```

Get first argument from *VA_ARGS*

Params

- ... - *VA_ARGS*

VaArgs_rest_()

```
#define VaArgs_rest_(...)
```

Get list of arguments from *VA_ARGS* except the first

Remark

- Comma is added before the list
- Supports max 10 arguments

Params

- ... - *VA_ARGS*