

# Objective-C Language Summary

Objective-C adds a small number of constructs to the C language and defines a handful of conventions for effectively interacting with the run-time system. This appendix lists all the additions to the language, but doesn't go into great detail. For more information, see Chapter 2 and Chapter 3 of this manual. For a more formal presentation of Objective-C syntax, see Appendix B, <sup>a</sup>Reference Manual for the Objective-C Language,<sup>o</sup> which follows this summary.

## Messages

Message expressions are enclosed in square brackets:

[*receiver message*]

The *receiver* can be:

- A variable or expression that evaluates to an object (including the variable **self**)
- A class name (indicating the class object)
- **super** (indicating an alternative search for the method implementation)

The *message* is the name of a method plus any arguments passed to it.

## Defined Types

The principal types used in Objective-C are defined in **objc/objc.h**. They are:

Type	Definition
<b>824895_TableHeadRule.eps</b> ↪	
id	An object (a pointer to its data structure)
933583_TableRule.eps ↪	
Class	A class object (a pointer to the class data structure)
166243_TableRule.eps ↪	
SEL	A selector, a compiler-assigned code that identifies a method name
520955_TableRule.eps ↪	
IMP	A pointer to a method implementation that returns an <b>id</b>
910718_TableRule.eps ↪	
BOOL	A boolean value, either YES or NO
328086_TableRule.eps ↪	

**id** can be used to type any kind of object, class, or instance. In addition, class names can be used as type names to statically type instances of a class. A statically typed instance is declared to be a pointer to its class or to any class it inherits from.

The **objc.h** header file also defines these useful terms:

Term	Definition
<b>376487_TableHeadRule.eps</b> ↪ nil	A null object pointer, ( <b>id</b> )0
499045_TableRule.eps ↪ Nil	A null class pointer, ( <b>Class</b> )0
439156_TableRule.eps ↪	

## Preprocessor Directives

The preprocessor understands these new notations:

Notation	Definition
<b>509337_TableHeadRule.eps</b> ↪ #import	Imports a header file. This directive is identical to <b>#include</b> , except that it won't include the same file more than once.
229486_TableRule.eps ↪ //	Begins a comment that continues to the end of the line.

950132\_TableRule.eps ↪

## Compiler Directives

Directives to the compiler begin with `@`. The following directives are used to declare and define classes, categories, and protocols:

Directive	Definition
<b>980352_TableHeadRule.eps</b> ↪	
<code>@interface</code> 11083_TableRule.eps ↪	Begins the declaration of a class or category interface
<code>@implementation</code> 281995_TableRule.eps ↪	Begins the definition of a class or category
<code>@protocol</code> 428549_TableRule.eps ↪	Begins the declaration of a formal protocol
<code>@end</code> 646153_TableRule.eps ↪	Ends the declaration/definition of a class, category, or protocol

The following mutually-exclusive directives specify the visibility of instance variables:

Directive	Definition
<b>729465_TableHeadRule.eps</b> ↪	
<code>@private</code> 475196_TableRule.eps ↪	Limits the scope of an instance variable to the class that declares it

`@protected` Limits instance variable scope to declaring and inheriting classes  
967809\_TableRule.eps ↪  
`@public` Removes restrictions on the scope of instance variables  
150003\_TableRule.eps ↪  
The default is **`@protected`**.

In addition, there are directives for these particular purposes:

Directive	Definition
<b><code>418025_TableHeadRule.eps</code></b> ↪	
<code>@class</code> 127057_TableRule.eps ↪	Declares the names of classes defined elsewhere
<code>@selector(<i>method</i>)</code> 468938_TableRule.eps ↪	Returns the compiled selector that identifies <i>method</i>
<code>@protocol(<i>name</i>)</code> 883665_TableRule.eps ↪	Returns the <i>name</i> protocol (an instance of the Protocol class)
<code>@encode(<i>spec</i>)</code> 296906_TableRule.eps ↪	Yields a character string that encodes the type structure of <i>spec</i>
<code>@defs(<i>classname</i>)</code> 734765_TableRule.eps ↪	Yields the internal data structure of <i>classname</i> instances

## Classes

A new class is declared with the `@interface` directive. It imports the interface file for its superclass:

```
#import "ItsSuperclass.h"
```

```
@interface ClassName : ItsSuperclass < protocol list >
{
    instance variable declarations
}
method declarations
@end
```

Everything but the compiler directives and class name is optional. If the colon and superclass name are omitted, the class is declared to be a new root class. If any protocols are listed, the header files where they're declared must also be imported.

A class definition imports its own interface:

```
#import "ClassName.h"

@implementation ClassName
method definitions
@end
```

## Categories

A category is declared in much the same way as a class. It imports the interface file that declares the class:

```
#import "ClassName.h"

@interface ClassName ( CategoryName ) < protocol list >
method declarations
```

```
@end
```

The protocol list and method declarations are optional. If any protocols are listed, the header files where they're declared must also be imported.

Like a class definition, a category definition imports its own interface:

```
#import "CategoryName.h"  
  
@implementation ClassName ( CategoryName )  
method definitions  
@end
```

## Formal Protocols

Formal protocols are declared using the **@protocol** directive:

```
@protocol ProtocolName < protocol list >  
method declarations  
@end
```

The list of incorporated protocols and the method declarations are optional. The protocol must import the header files that declare any protocols it incorporates.

Within source code, protocols are referred to using the similar **@protocol()** directive, where the parentheses enclose the protocol name.

Protocol names listed within angle brackets (<...>) are used to do three different things:

- In a protocol declaration, to incorporate other protocols (as shown above)
- In a class or category declaration, to adopt the protocol (as shown under <sup>a</sup>Classes<sup>o</sup> and <sup>a</sup>Categories<sup>o</sup> above)
- In a type specification, to limit the type to objects that conform to the protocol

Within protocol declarations, these type qualifiers support remote messaging:

Type Qualifier	Definition
<b>274939_TableHeadRule.eps ↵</b>	
oneway 996657_TableRule.eps ↵	The method is for asynchronous messages and has no valid return.
in 60065_TableRule.eps ↵	The argument passes information to the remote receiver.
out 921714_TableRule.eps ↵	The argument gets information returned by reference.
inout 654885_TableRule.eps ↵	The argument both passes information and gets information.
bycopy 485199_TableRule.eps ↵	A copy of the object, not a proxy, should be passed or returned.
byref 25984_TableRule.eps ↵	A reference to the object, not a copy, should be passed or returned.

## Method Declarations

The following conventions are used in method declarations:

- A `^+` precedes declarations of class methods.
- A `^-` precedes declarations of instance methods.
- Arguments are declared after colons (`:`). Typically, a label describing the argument precedes the colon. Both labels and colons are considered part of the method name.
- Argument and return types are declared using the C syntax for type casting.
- The default return and argument type for methods is `id`, not `int` as it is for functions. (However, the modifier **unsigned** when used without a following type always means **unsigned int**)

## Method Implementations

Each method implementation is passed two hidden arguments:

- The receiving object (`self`)
- The selector for the method (`_cmd`)

Within the implementation, both `self` and `super` refer to the receiving object. `super` replaces `self` as the receiver of a message to indicate that only methods inherited by the implementation should be performed in response to the message.

Methods with no other valid return typically return `void`.

## Naming Conventions

The names of files that contain Objective-C source code have a `.m` extension. Files that declare class and category interfaces or that declare protocols have the `.h` extension typical of header files.

Class, category, and protocol names generally begin with an uppercase letter; the names of methods and instance variables typically begin with a lowercase letter. The names of variables that hold instances usually also begin with lowercase letters.

In Objective-C, identical names that serve different purposes don't clash. Within a class, names can be freely assigned:

- A class can declare methods with the same names as methods in other classes.
- A class can declare instance variables with the same names as variables in other classes.
- An instance method can have the same name as a class method.
- A method can have the same name as an instance variable.

Likewise, protocols and categories of the same class have protected name spaces:

- A protocol can have the same name as a class, a category, or anything else.
- A category of one class can have the same name as a category of another class.

However, class names are in the same name space as variables and defined types. A program can't have a global variable with the same name as a class.