More Programming Languages

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Web Scripting

- We've seen how (relatively) easy it is to create a new language. This suggests that languages can actually be application-specific.

- Let's take a look at a web page:

helloworld.html

```
<html>
 <head>
  <title>Hello World title</title>
 </head>
 <body>
 <p>Hello World in html</p>
 </body>
</html>
```

How is this web page "executed"?

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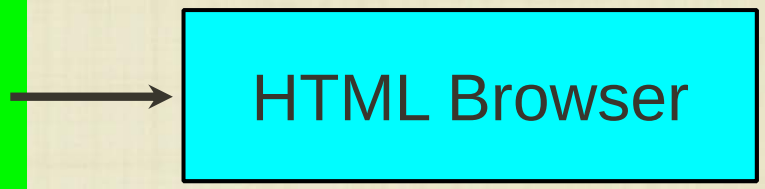


Like any other program, it must be parsed and transformed into machine instructions (that display things). But these pages are static, what if we want them to execute code?

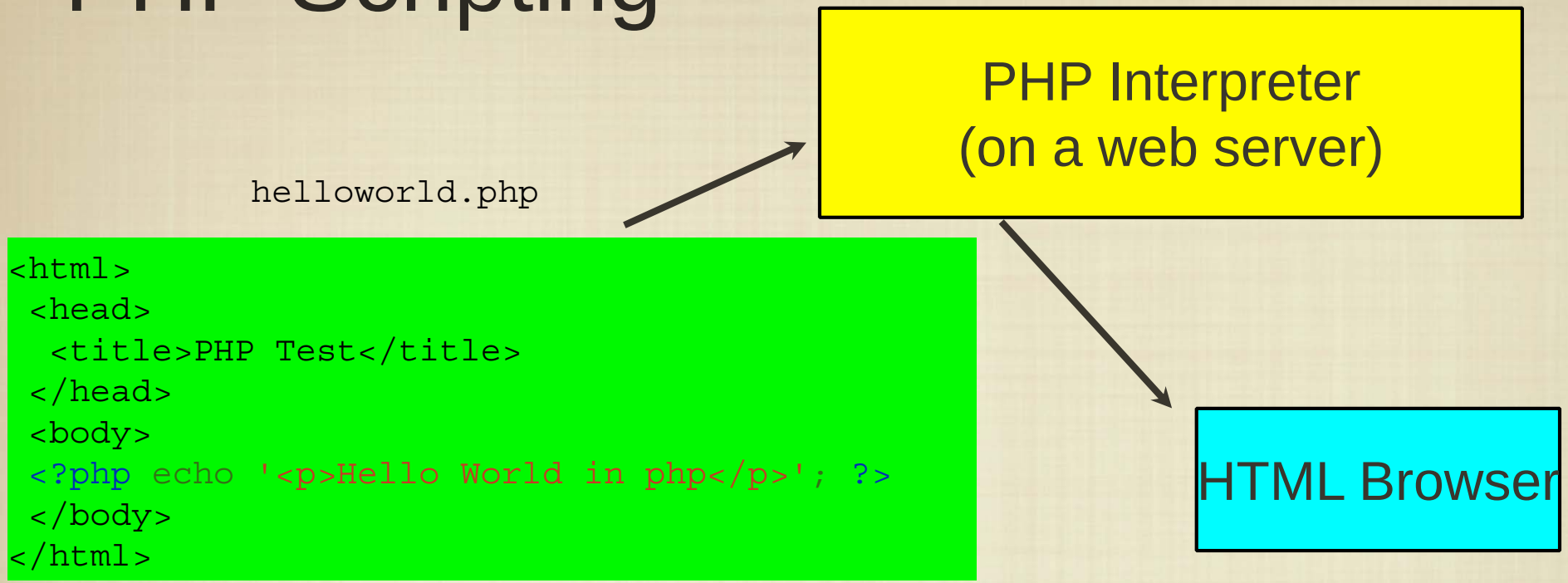
PHP Scripting

helloworld.php

```
<html>
 <head>
  <title>PHP Test</title>
 </head>
 <body>
 <?php echo '<p>Hello World in php</p>'; ?>
 </body>
</html>
```

PHP stands for “PHP: Hypertext Preprocessor”; this scripting language can be embedded into HTML code, and allows us to dynamically generate a page upon execution, possibly pulling information from a database answering a query from the user..

PHP Scripting



PHP stands for “PHP: Hypertext Preprocessor”; PHP code can be embedded into HTML code, and allows us to dynamically generate a page upon execution.

PHP is a full-featured programming language whose syntax is similar to C/Java.

Forms and Input

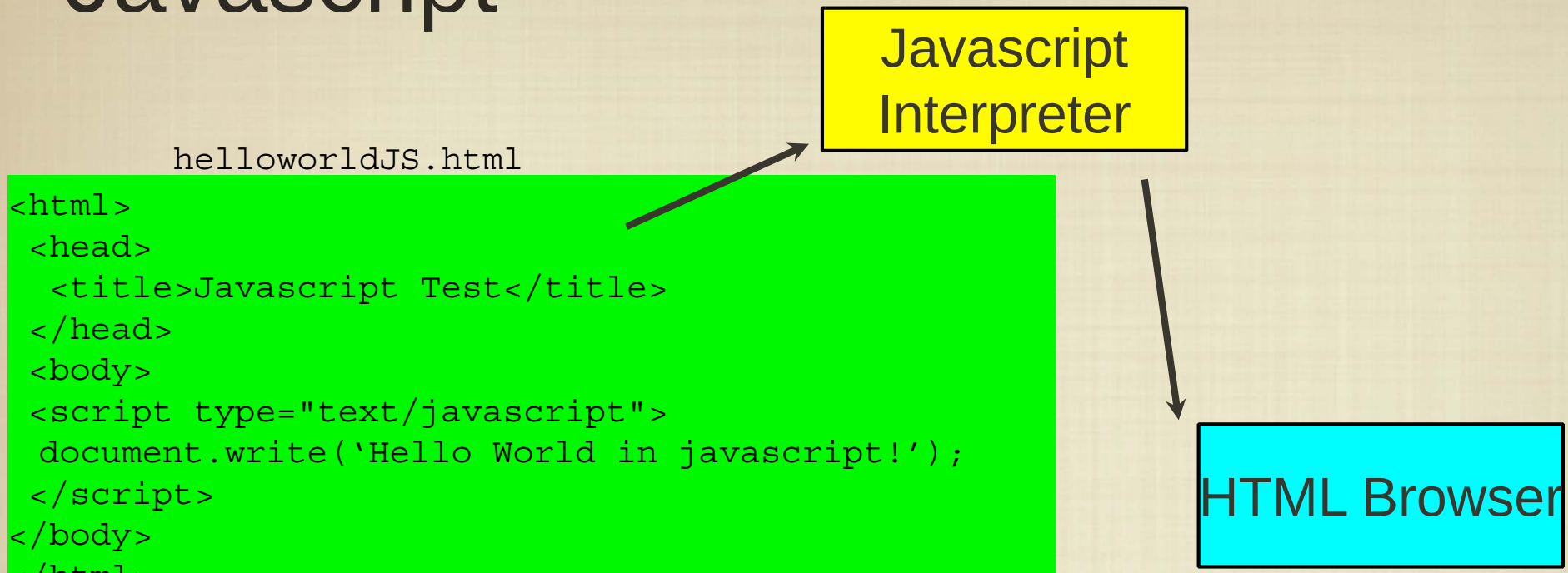
helloworldForm.php

```
<html>
 <head>
   <title>PHP Test: Hello World
form</title>
 </head>
 <body>
   <?php
      echo '<p>Hello World with form</p>';
   ?>

<form name="form" action="" method="get">
  <input type="text" name="subject"
id="subject" value="">
</form>

<?php echo $_GET['subject']; ?>

 </body>
</html>
```

PHP Interpreter
(on a web server)

HTML Browser

Javascript



JavaScript is embedded into an HTML page in the same way as PHP.

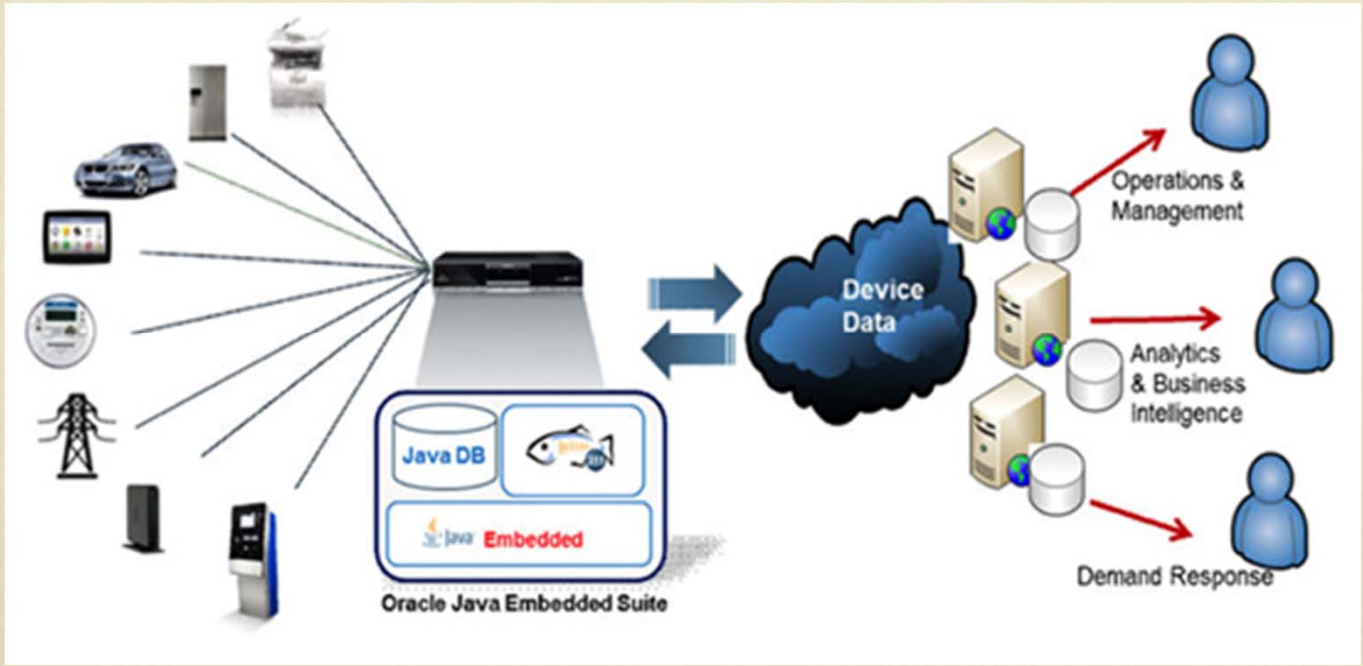
Embedded Devices

Embedded devices often have their own operating systems - how are applications implemented?

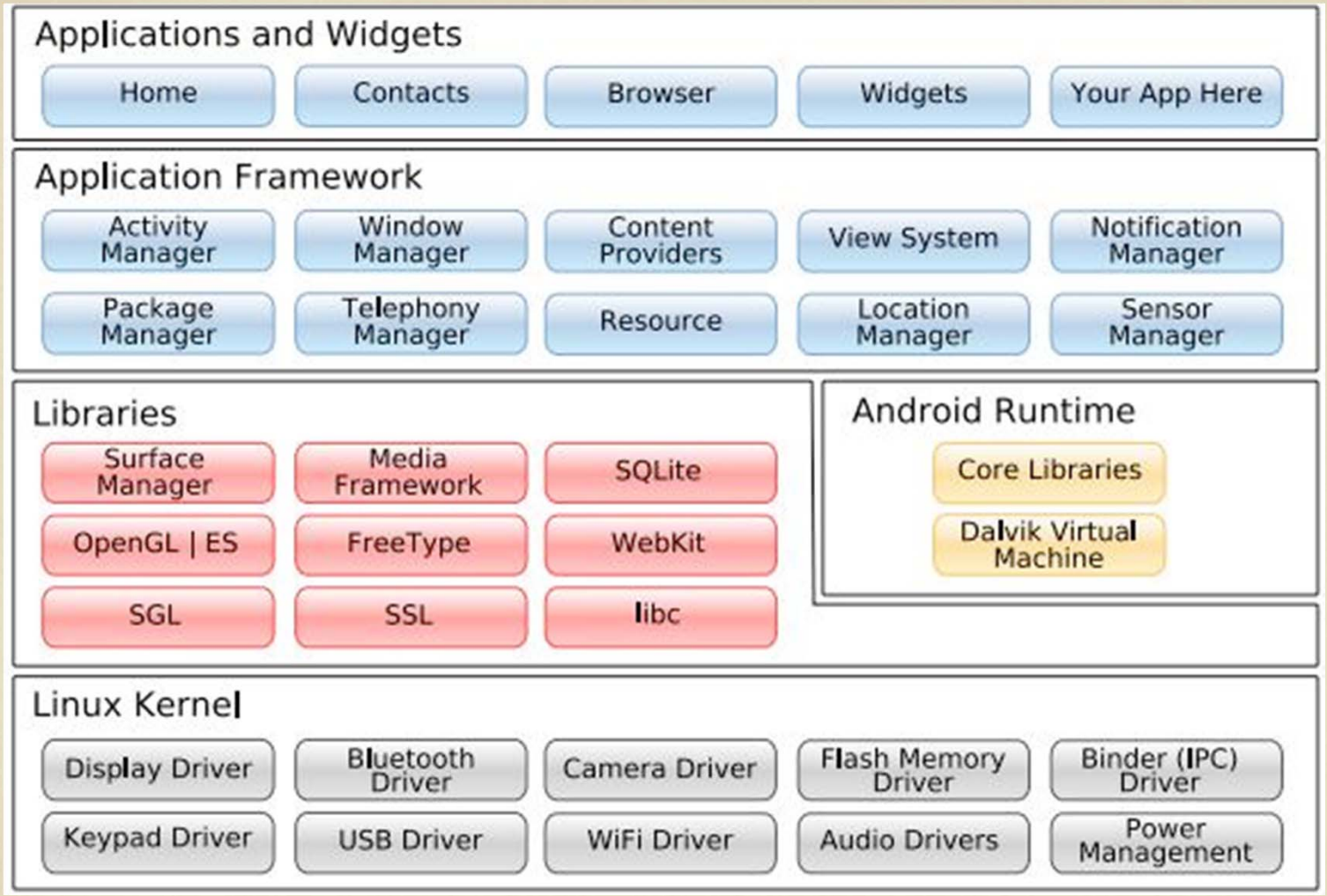
History of Java

- While we have been using it as a general-purpose language, Java was originally developed by James Gosling at Sun Microsystems in the early 1990s.

- Java is deployed on 3 billion devices. Is Java compiled or interpreted? Is it more or less “portable” than C?



Android

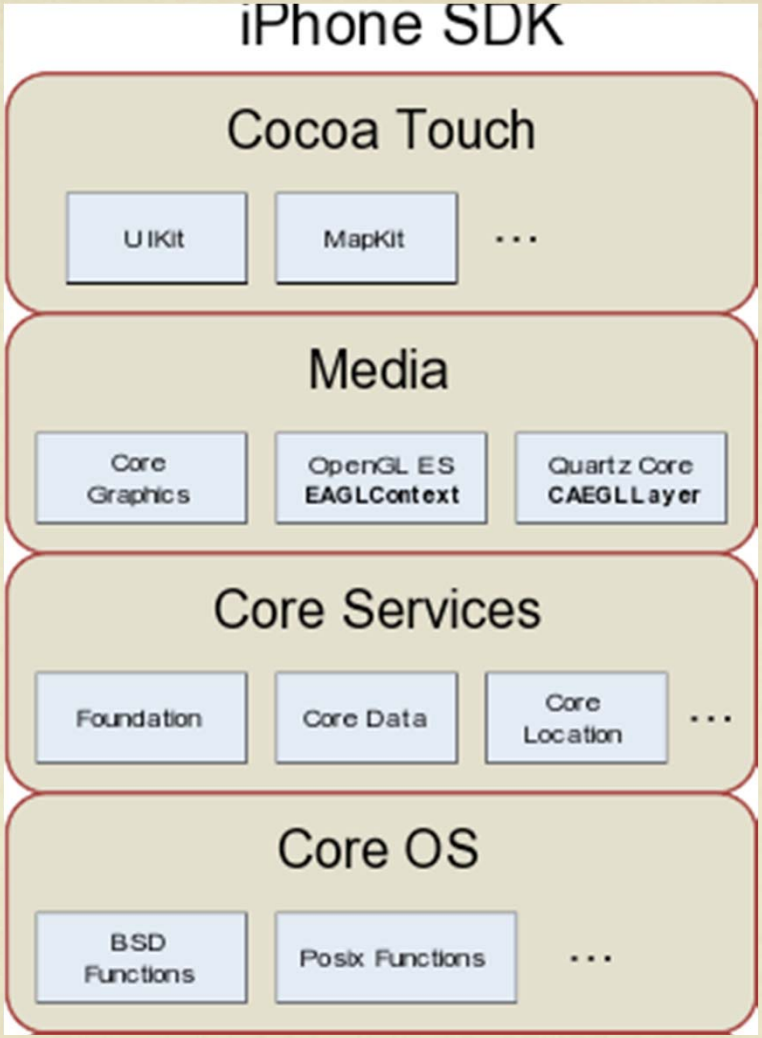


The core operating system functions in an Android device are derived from Linux.

Java API for Android

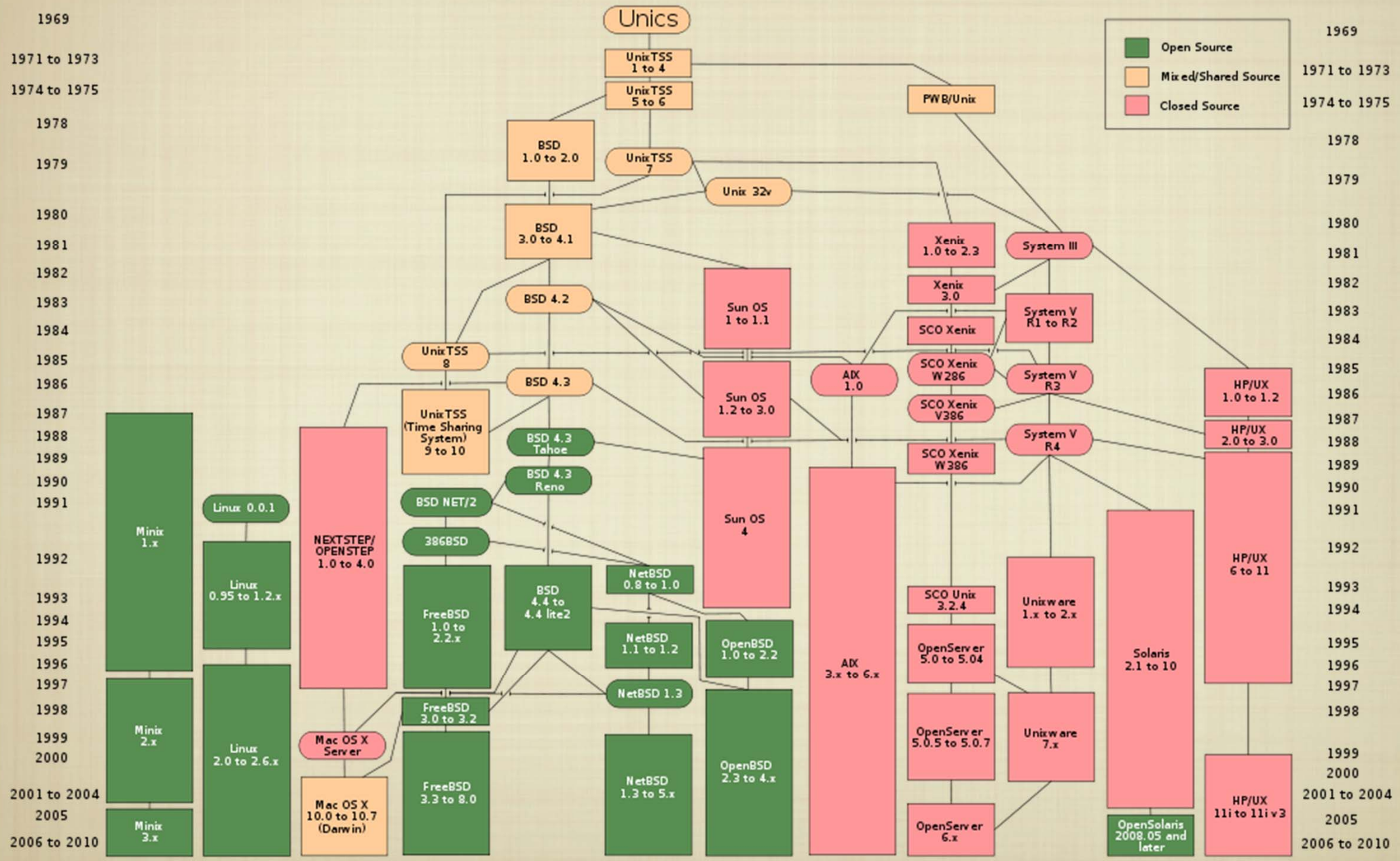
- While there could have been a specific language for Android, Java provides a large set of libraries that can be leveraged.
- So, Android applications simply look like the Java programs we've seen.
- These programs are converted into machine instructions using a chip-specific compiler.

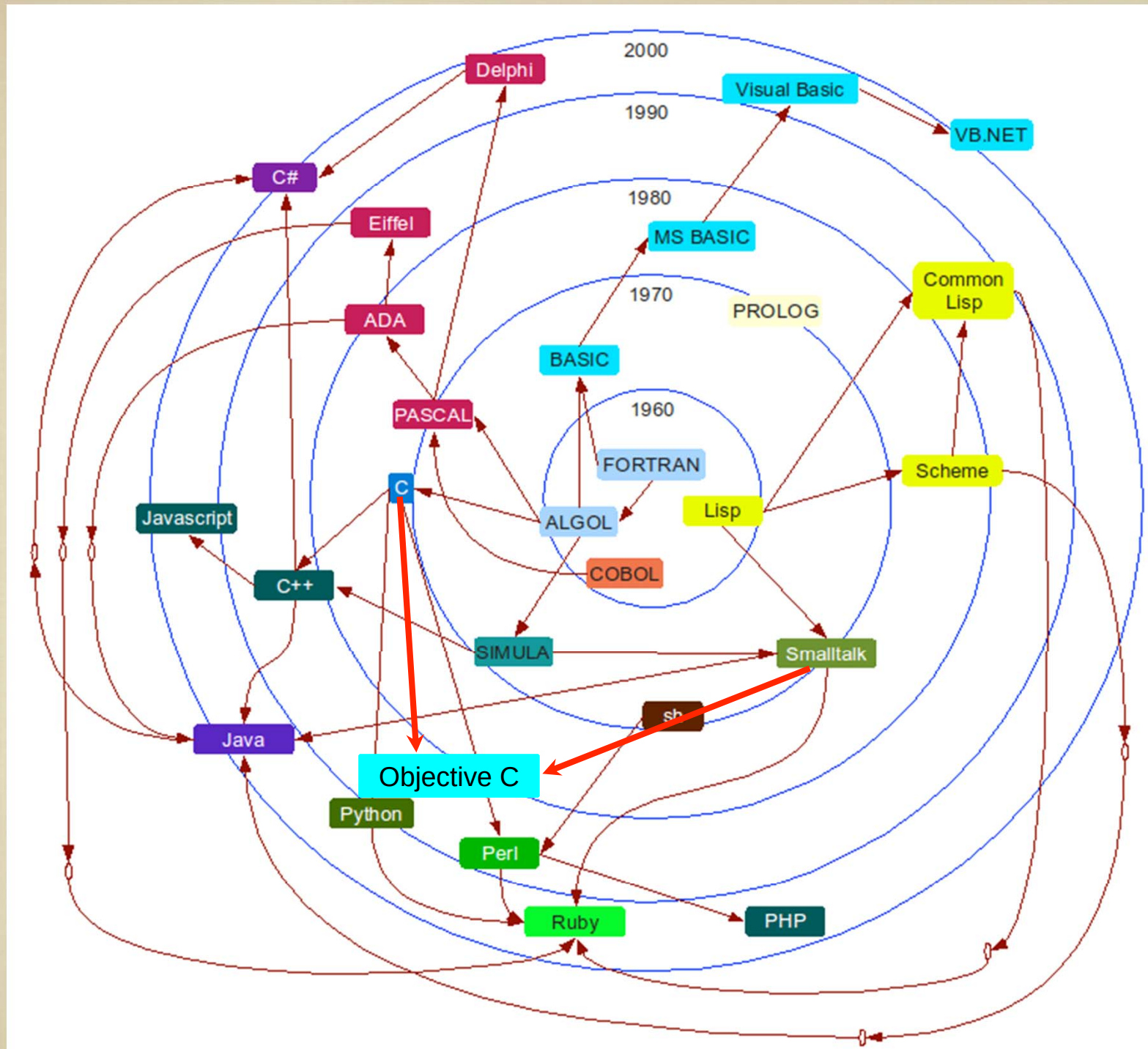
iOS (iPhone, iPad, iPod)



The core operating system functions in an “iOS” device are derived from OSX, which is itself derived from BSD (Unix).

UNIX is Everywhere




2000
1990
1980
1970
1960
Delphi
Visual Basic
VB.NET
C#
Eiffel
MS BASIC
Common Lisp
PROLOG
ADA
BASIC
PASCAL
FORTRAN
Scheme
C
Javascript
ALGOL
Lisp
COBOL
C++
SIMULA
Smalltalk
sh
Java
Objective C
Python
Perl
Ruby
PHP

iOS

- Apple utilizes Objective C as the language of choice for iOS apps.

- Objective C is an interesting extension to the C language that implements features of SmallTalk.

```
#import <stdio.h>

int main( int argc, const char *argv[] ) {
    printf( "hello world\n" );
    return 0;
}
```

The C features are familiar, but the object-oriented programming model is somewhat unorthodox.

Objective C

MyClass.h

```
#import <Foundation/NSObject.h>

@interface MyClass: NSObject {
  @private
    -int a;
    @public
    -int b;
    +int count;
}

-(void) print;
-(void) set_a: (int) n;
+(int) count;
@end
```

+: Static

-: Instance

MyClass.m

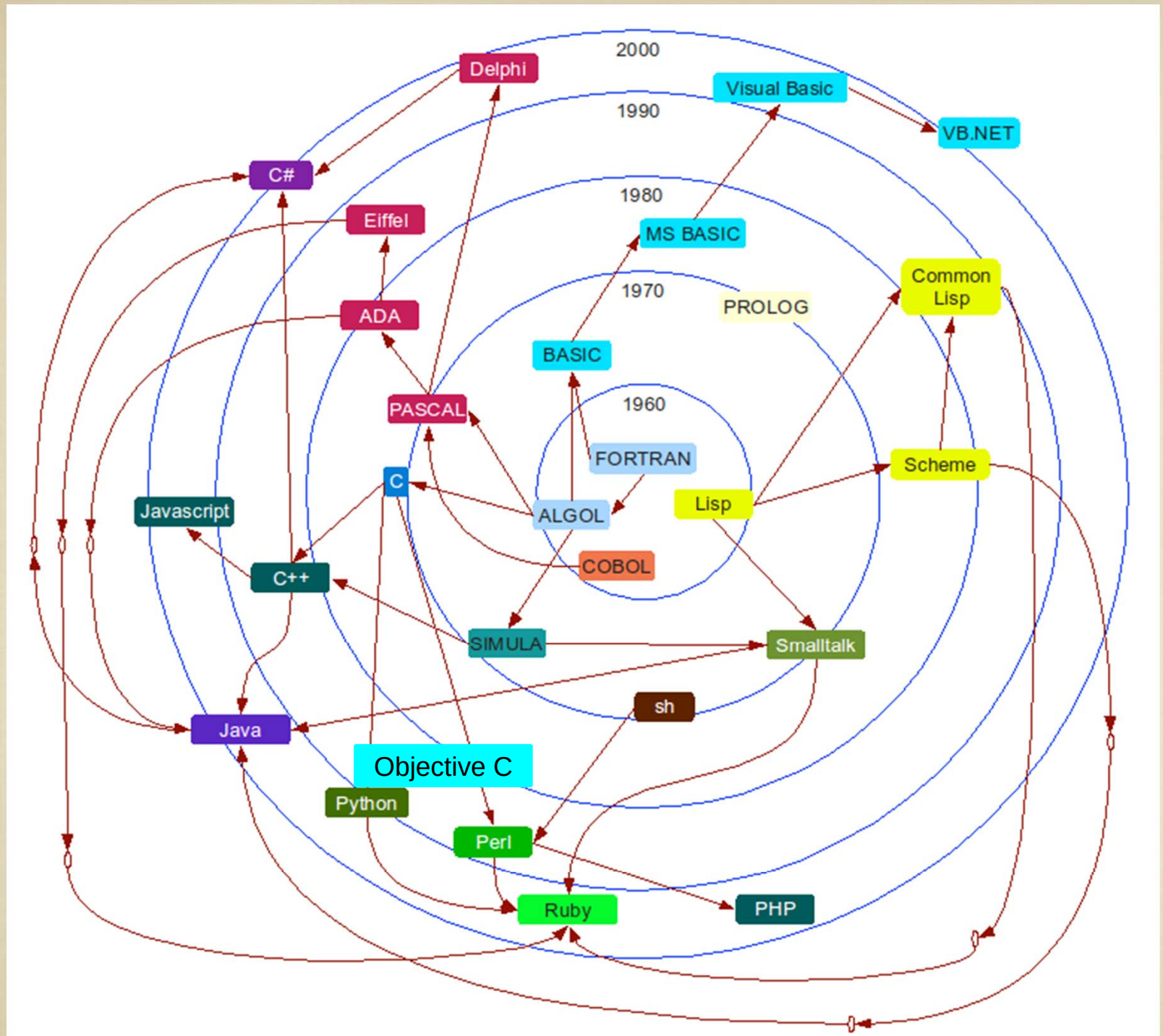
```
#import "MyClass.h"
#import <stdio.h>

@implementation MyClass
-(id) init {
  count += 1;
  return self;
}

-(void) print {
    printf( "%i\n",a);
}

-(void) set_a: (int) n {
    a = n;
}

+(int) count {
    return count;
}
@end
```

C++ vs. Objective C

```
#include <stdio.h>
#include "MyClass.h"

int main(int argc, const char *argv[] ) {
    // create a new instance
    MyClass *x = new MyClass();

    // set the values
    x.set_a(1);

    // print it
    printf("x is: %d\n", x.get_a());

    // free memory
    free(x);

    return 0;
}
```

```
#import <stdio.h>
#import "MyClass.h"

int main(int argc, const char *argv[] ) {
    // create a new instance
    MyClass *x = [[MyClass alloc] init];

    // set the values
    [x set_a: 1];

    // print it
    printf( "x is: " );
    [x print];
    printf( "\n" );


    // free memory
    [x release];

    return 0;
}
```

Objective C essentially replaces the membership operators (. , ->) and uses “messages” to class members.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