Mobile Application Programming

Swift

Swift

- An object-oriented and functional language designed with code safety as a core goal in the language syntax
  - No pointers, single-line branches, bounds checking
- Built to co-exist with Objective-C, Apple's previously preferred language, as well as use existing frameworks
- Uses a memory management technology called Automatic Reference Counting to determine object life
- Strongly typed, but uses type inference to reduce code
- Generics with built-in support for Array and Dictionary

Swift Syntax

C++ Syntax

```
Person* person = new Person();

int age = person->age();

person->setHeight(1.8);

delete person;
```

```
Car* car = new Car(Car.viper);

float velocity = car->velocity();

car->setVelocity(velocity + 200.0);

delete car;
```

Swift Syntax

```
var person: Person = Person()

var age: Int = person.age

person.height = 1.8

// Handled automatically by ARC
```

```
var car: Car = Car(type: Car.viper)

var velocity: Float = car.velocity

car.velocity = velocity + 200.0

// Handled automatically by ARC
```

Swift Syntax

C++ Syntax

```
car.setVelocityAndAcceleration(200.0f, 10.0f);
```

Swift Syntax

```
car.setVelocity(200.0, andAcceleration: 10.0)
```

Swift Syntax

C++ Syntax

```
typedef struct
{
   float x;
   float y;
} Point;

Point PointMake(float x, float y)
{
   Point p;
   p.x = x;
   p.y = y;
   return p;
}

//...

car.setPosition(
   PointMake(10.0, 50.0));
```

Swift Syntax

```
struct Point
{
   var x: Float = 0.0
   var y: Float = 0.0
}

func PointMake(x: Float, y: Float) ->
    Point
{
   var p: Point = Point()
   p.x = x
   p.y = y
   return p
}

//...

car.position = PointMake(10.0, 50.0)
```

Swift Syntax

C++ Syntax (.h)

```
class Car
{
   Point position;
   float velocity;
   int model;
   char* vin;

public:
   static const int viper = 1;

   Car(int model);
   ~Car();

   Point position();
   void setPosition(Point p);
};
```

Swift Syntax

```
class Car
{
   private var _position: Point
   private var _velocity: Float
   private var _model: Int
   private var _vin: String

   class func viper() -> Int { return 1 }

   init(model: Int) { /*…*/ }
   deinit { /*…*/ }

   var position: Point
   {
      get { return _position }
      set { _position = newValue }
   }
}
```

Swift Features

- Explicit Nullable Types called Optionals with *?* shorthand in declaration. Unwrap with *!* or *if let x = opX*
- Mutability supported on structure types via declaration keywords *var* (Mutable) and *let* (Immutable). For reference types like classes, *let* permanently binds an instance to an name, but the instance can still change.
- Support for tuples in declarations and function returns
- Flexible *switch* statements use *fallthrough* not *break*
- First-class functions that are implemented as closures
- Classes, structures, enums with advanced features

Swift Top-Level Entities

- Like C/C++ but unlike Java, Swift allows declarations of functions, variables, and constants at the top-level, outside any class declaration
- Constants are declared using the let keyword
- Variables are declared using the var keyword
- Functions are declared using the func keyword with parameter names interleaved with the name of the function, causing it to read like a sentence

Swift Objects

- Classes, structures, and enums are all object types with different defaults in usage
  - Classes are reference types that share the same object when assignments are made
  - Structs are always copied on assignment
- Single inheritance, but may conform to many protocols
- Add functions and protocols to existing objects using *extension* keyword. Also used to break up large objects

Swift Classes

- Member functions and properties declared using same syntax as top-level declarations
- Function declarations use parameter labels, but the first label is omitted when declared in a class
- Properties declare both getter / setter and a (hidden) backing variable using *var* and *let* keywords
- Use *private*, *fileprivate*, *internal* (default), *public,* and *open* for access control
- Constructors are declared using *init*(), but have different inheritance rules than most languages

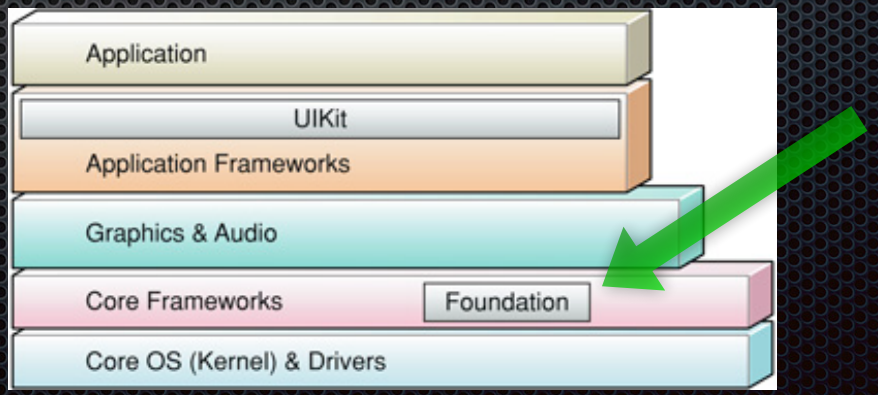
Swift Optional Unwrap

- Working with optional values can be tiresome because they are constantly being checked against nil
- Swift offers many facilities to improve the experience
  - Use of ? and ! to unwrap the optional
  - Chaining expressions using ? like a?.property?.go()
  - Conditional unwrapping using *if let* a = a { }
  - Inverted unwrapping using the *guard* keyword

Cocoa Foundation Framework

- Standard Library for Swift, like STL or java.*
- Originally coded by NextStep, updated for Swift
- Works identically on Mac OS X and iOS
- Objective-C objects that have Swift compatibility

iOS Architecture



Foundation

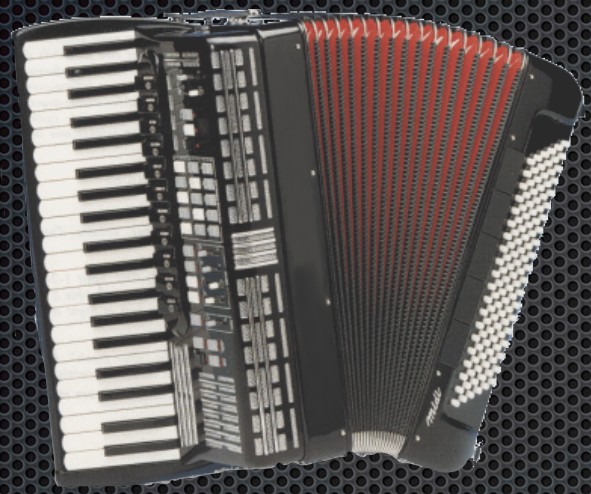
Basic Classes

- NSObject
- NSString
- NSNumber
- NSData
- NSArray
- NSDictionary

A Few Other Good Ones

- NSDate
- NSTimer
- NSRunLoop
- NSThread
- NSFileManager
- NSSocketPort

NSArray, Array, or [ ]

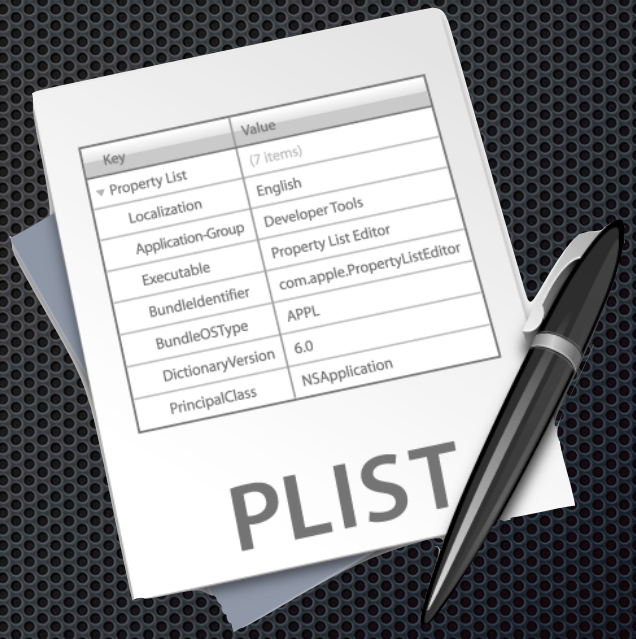


Auto-Expanding

Sorting

NSDictionary, Dictionary, [:]

Key-Value Encoding



Read / Write Files