# Architecting iOS Project

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# Massimo Oliviero


La prima community di sviluppatori iOS e Mac OS X in Italia.

http://pragmamark.org/

https://www.facebook.com/groups/pragmamark/

# Agenda

- **Project**, how to design Xcode project
- **Application**, how to design an iOS app
- **Resources**, links, books and videos

# Source code

**Kimera**

A simple iOS application for educational purpose

https://github.com/maxoly/Kimera

# Project

# Project

- **Conventions**, how to naming file and folders
- **Structure**, how make the foundation of the project
- **Folders**, how to organize files and folders

# Conventions

# Naming Conventions

- **First establish a naming convention for all the things**
  for file names, class names, project names, images, etc.
- **Use Pascal Case for files, folders and class**
  start with a capital letter i.e. Controllers, MyClass, BestAppEver, etc.
- **Use Camel Case for methods, properties & variables**
  start with a lowercase letter i.e setFirstName:, userPassword, etc.
- **Avoid using of acronyms and abbreviations**
  What the hell does it mean “usrPswdLbl”? Yuck!

# Coding Conventions

- **Choose your coding conventions & style**
  there are ton of conventions out there
- **K&R Style, or Allman Indent Style**
  http://en.wikipedia.org/wiki/Indent_style
- **Also read Coding Guidelines for Cocoa by Apple**
  http://developer.apple.com/library/mac/#documentation/Cocoa/Conceptual/CodingGuidelines/CodingGuidelines.html
- **But most important, choose a convention and respect it**
  the important thing is always be consistent in your project

# Structure

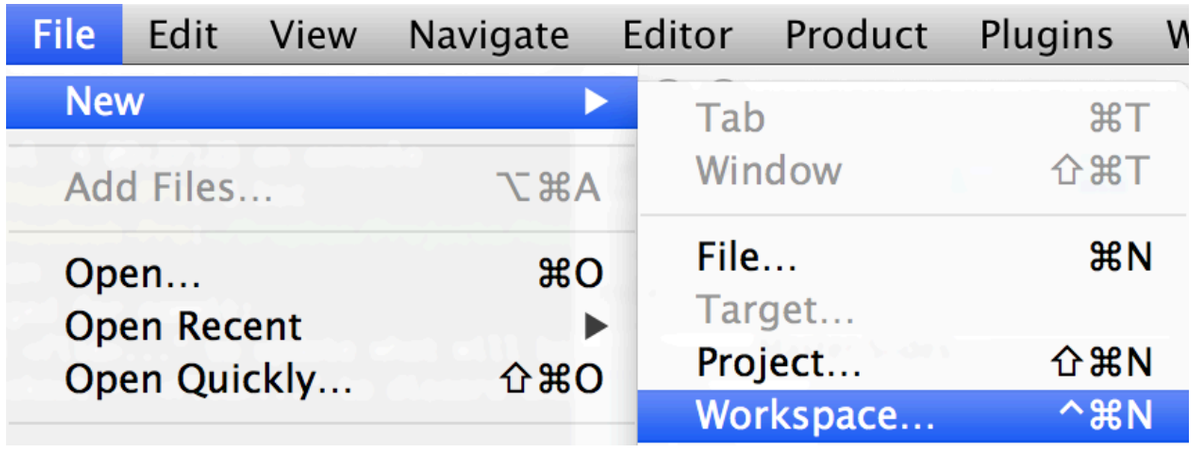
# Structure

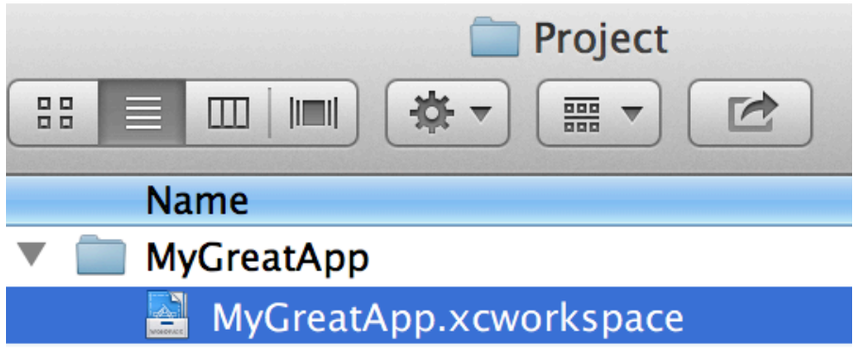
- **Create a specific workspace**
  don't let Xcode do it for you
- **Setting up projects with correct name and prefix**
  use simple word (only alphanumeric) and at least 3 chars for prefix
- **Create a Build Automation to scripting common tasks**
  to compiling source code or to deploy artifacts with one command

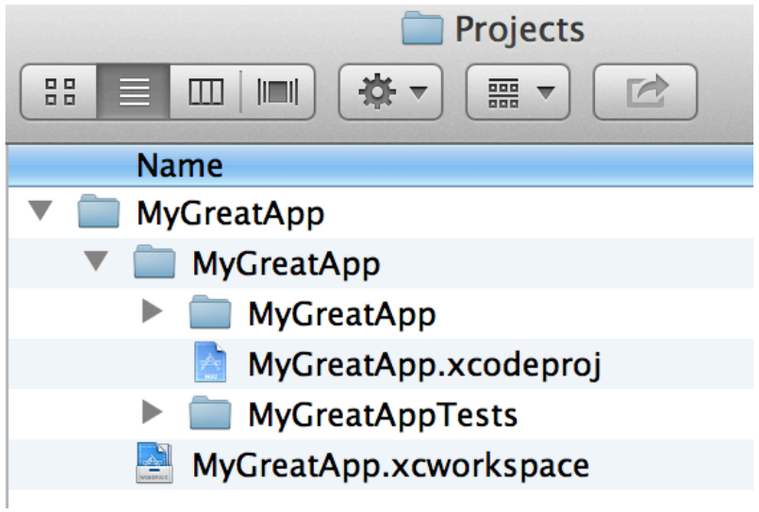
# Structure

- **Create a AdHoc and AppStore Build Configuration**
  So you can handle configuration for different destination
- **Configure Build Settings to improve quality**
  i.e. you can enable Static Analyzer or Treat Warnings as Errors
- **Manage third-part libraries with CocoaPods**
  it reduces headaches of storing/managing 3rd party libraries

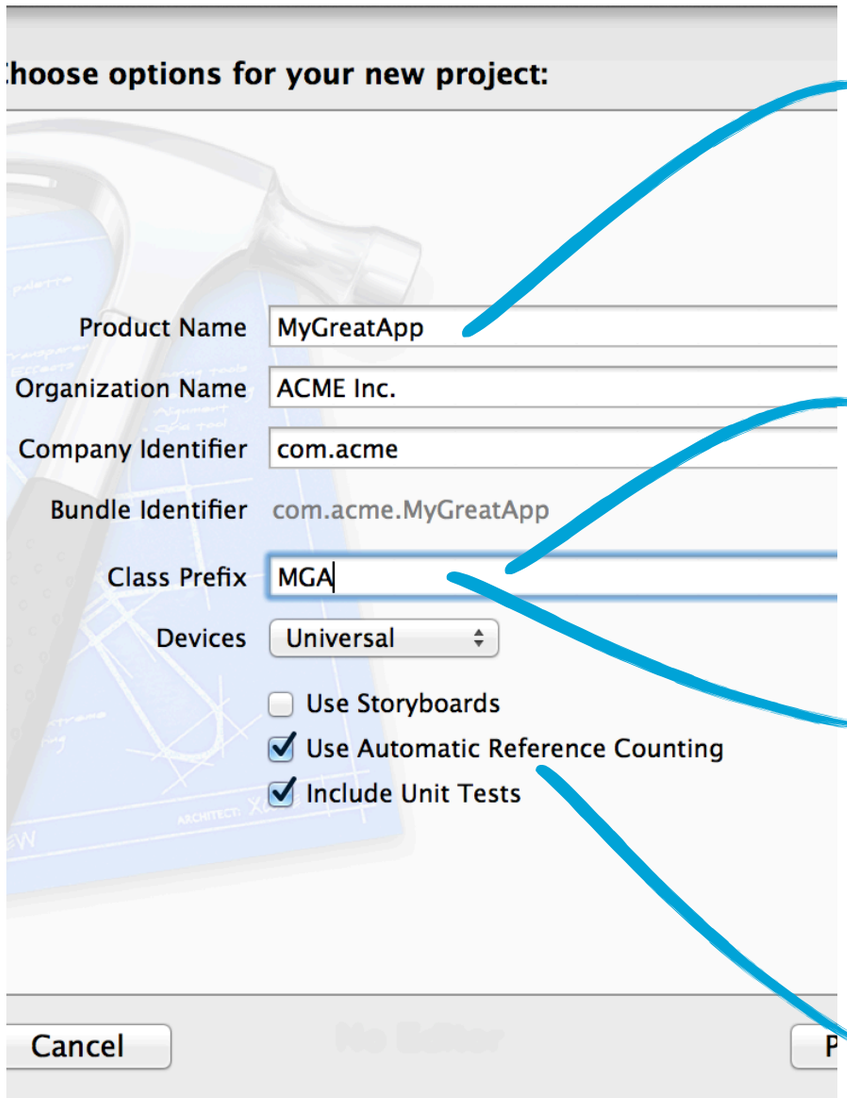
# Workspace


File
Edit
View
Navigate
Editor
Product
Plugins
New
Add Files... ⌥⌘A
Open... ⌘O
Open Recent
Open Quickly... ⇧⌘O
Tab ⌘T
Window ⇧⌘T
File... ⌘N
Target...
Project... ⇧⌘N
Workspace... ^⌘N


Project
Name
MyGreatApp
MyGreatApp.xcworkspace


Projects
Name
MyGreatApp
MyGreatApp
MyGreatApp
MyGreatApp.xcodeproj
MyGreatAppTests
MyGreatApp.xcworkspace

# Project Name & Prefix




- **Choose a simple Program Name**
  Only alphanumeric characters, avoid spaces
- **Choose a right Class Prefix**
  At least 3 chars, use product name's acronym
- **Choose your Personal Prefix**
  Use it in your Library Projects
- **Use Automatic Reference Counting**
  If app targets iOS 5.0 or above

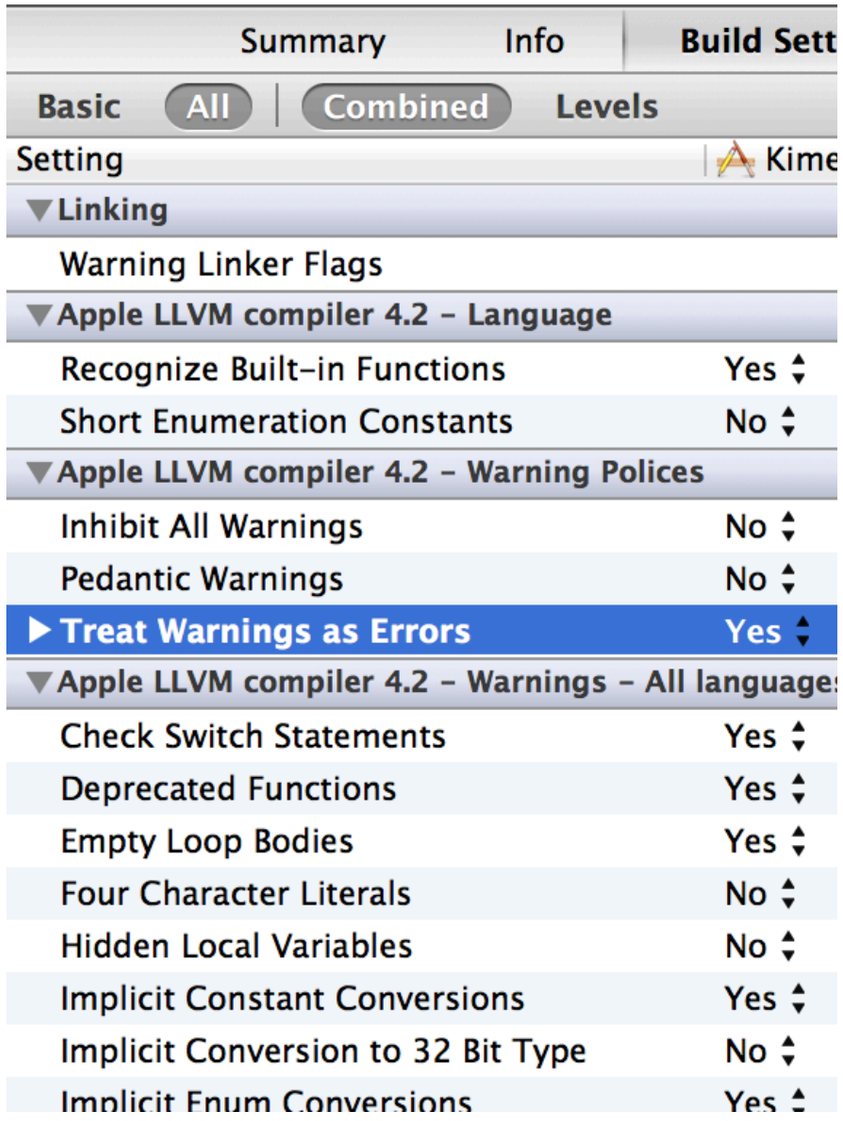
# Build Automation

- **It's the act of automating a wide variety of tasks**
  you can use build tools like Ant, Maven, Make , CMake or Rake
- **At least you must automate Compiling and Deploying**
  compiling and deploying are the most common tasks for developer
- **You can also automate Testing and Docs generation**
  they are useful to use in combination with a Continuous Integration

# AdHoc & AppStore Configuration

- **Use different Configurations to specialize the behavior**
  i.e. Code Signing Identity, Preprocessor Macros, Linker Flags, etc.
- **Use AdHoc Configuration to deploy testing app**
  i.e. app for TestFlight with its own Code Signing Identity & Linker Flags
- **Use AppStore Configuration to deploy on App Store**
  Duplicate Release Configuration to use the same optimizations

# Build Settings




- **Enable Run Static Analyzer**
  run the Clang static analysis tool on source files

- **Enable Treat Warning as Errors**
  it causes all warnings to be treated as errors

- **Disable Compress PNG Files**
  instead use ImageOptim

# CocoaPods

- **Manage third-part libraries with CocoaPods**
  download from http://cocoapods.org/
- **CocoaPods manage dependency for you**
  it download source files, imports headers and configures flags
- **It's like Ruby Gem but for Objective-C!**
  you can search pods, install & update with one command

# Folders

# Folders

- **Put things in the right place**
  ...and everything makes sense, unfortunately, Xcode doesn't help us
- **Map all Xcode group folder to file system directory**
  Xcode group folder don't represent physical folder
- **Please remove Supporting Files group folder**
  Who wants "Supporting Files" anymore? yuck!

# My folders structure

- **Application**
  specific app related stuff like AppDelegate, main.m, .pch etc
- **Controllers**
  view (.xib) and view controller stuff put together (obviously)
- **Library**
  specific application classes like helpers, base classes, services, etc

# My folder structure

- **Models**
  application domain models and entities, Core Data model too
- **Resources**
  assets like images, fonts, sounds, videos, etc.
- **Vendors**
  third part libraries and frameworks

# Controllers

- Put .xib, .h and .m together in the same folders
- One (physical) folder for each view controller
- If there are too many, group them into a subfolder
- Group them by tab (TabBar) or by functions

# Resources

- **One folder for each type of asset**
  images, fonts, sounds, videos, strings, plist, samples
- **One subfolder for each type of image**
  buttons, backgrounds, logos, shapes, icons, app (splash etc.)
- **If your app support multiple themes, create a hierarchy**
  themes > themes name > images, fonts, etc.
- **Name image files based on state**
  “button_blue_normal.png”, “button_blue_highlighted.png”, etc.

# Application

# Application

- **Design**, a quick recap to design principles and patterns
- **Layers**, how to organize your app classes
- **Compositions**, a group of reusable components
- **Best Practices**, a list of useful techniques

# Design

# Design

- **Typically an application is divided into layers**
  A layer is a black box with a contract that define an input and output
- **To increase the cohesion and decoupling of the software**
  The layers, if well designed, help to decouple and increase the cohesion
- **Cohesion indicates strongly related software module**
  it would be a subroutine, class or library with common responsibilities
- **Coupling measure the level of dependency**
  between two software module, such as classes, functions or library

# Design Principles

- **Single Responsibility Principle**

  A module should have a single responsibility, and that responsibility should be entirely encapsulated by the module

- **Open Closed Principle**

  A module should be open for extension but closed for modifications

- **Liskov's Substitution Principle**

  Derived types must be completely substitutable for their base types

# Design Principles

- **Interface Segregation Principle**

  Clients should not be forced to depend upon interfaces that they don't use

- **Dependency Inversion Principle**

  High-level modules should not depend on low-level modules. Both should depend on abstractions. Abstractions should not depend on details. Details should depend on abstractions

- **SOLID: the "first five principles"**

  Single responsibility, Open-closed, Liskov substitution, Interface segregation and Dependency inversion

# From Principles to Patterns

- **Design Pattern is a general reusable solution**
  to a commonly occurring problem within a given context

- **It's a description or template for how to solve a problem**
  It's not a finished design that can be transformed into source code

- **There are many types of design patterns**
  Architectural, Algorithm strategy, Computational, Implementation strategy, Structural, etc.

# Most Common Design Patterns

- **Model View Controller Design Pattern**

  It's a fundamental design pattern in Objective-C.

- **Singleton Design Pattern**

  For your information the AppDelegate is a singleton

- **Chain Of Responsibility Design Pattern**

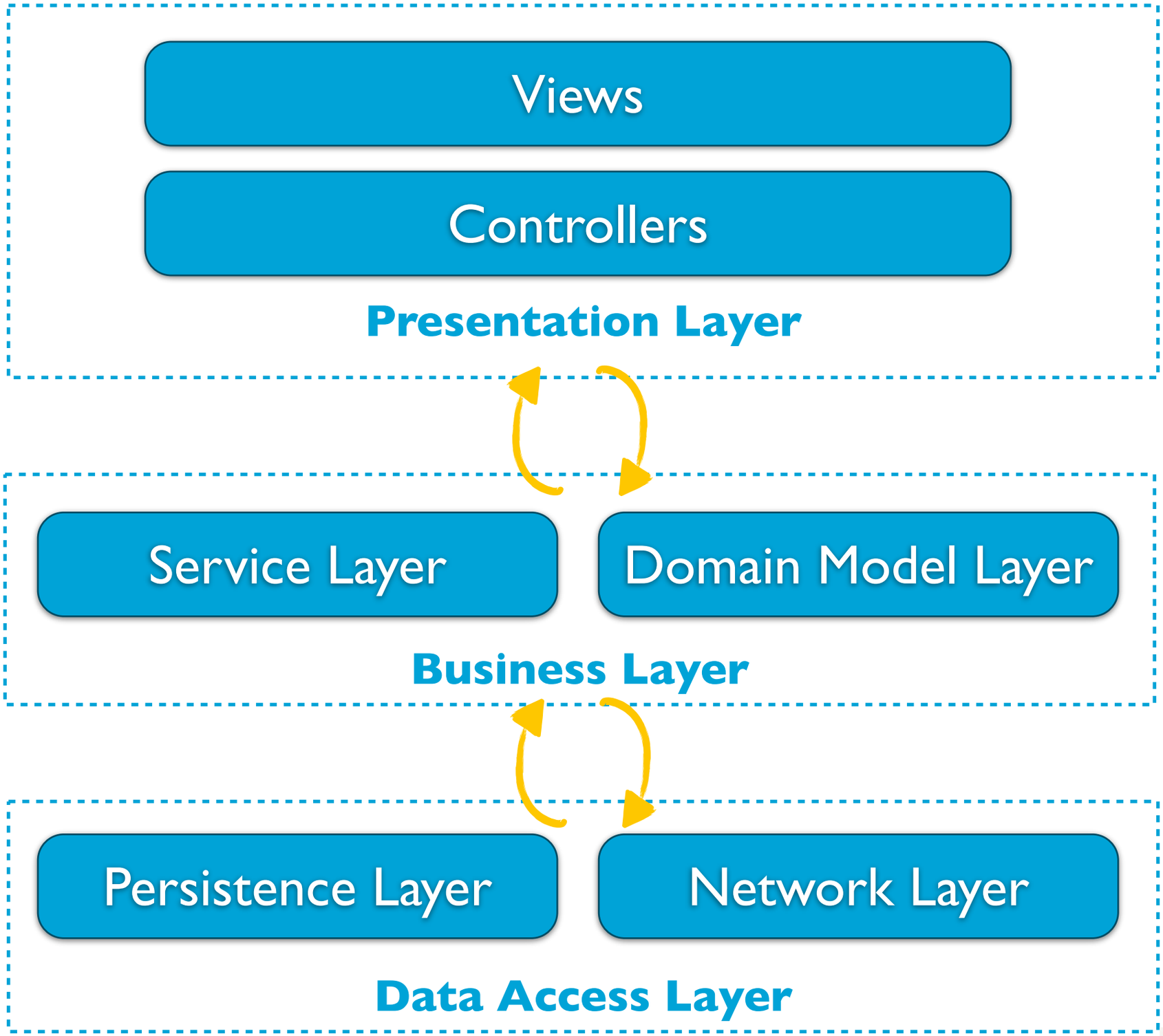
  Have you ever met the Next Responder or the First Responder?

# Layers

# Layers

- **Layer represents a logical section of the system**
  Layer enforce reusability and testability
- **A typical client/server app have at least 3 layers**
  Presentation Layer, Business Layer and Data Access Layer

# Layers


Views
Controllers
Presentation Layer
Service Layer
Domain Model Layer
Business Layer
Persistence Layer
Network Layer
Data Access Layer

# Presentation Layer

# Presentation Layer

- **It have 2 components: the UI and the presentation logic**
  in Cocoa the UI is the View and the presentation logic is the Controller

- **Cocoa adopt Model View Controller Design Pattern**
  the Presentation Layer is already in iOS SDK out-of-the-box

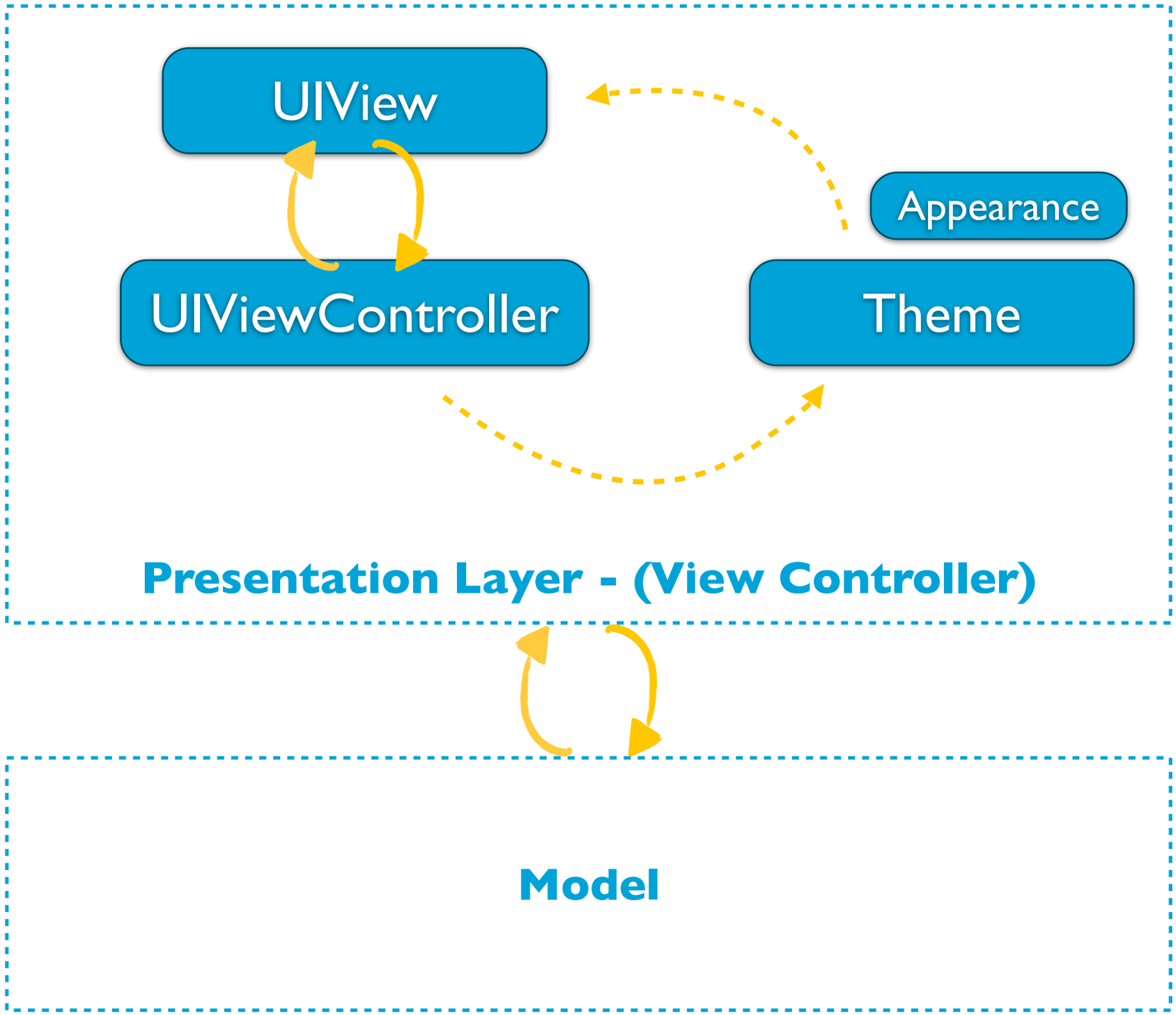
- **Advanced Appearance Customization with Theme**
  user Appearance Proxy and Theme technique to customize UI.

# Theme

- Create a @protocol that define a “theme”
- Implements @protocol in your theme class

```
@protocol MGATheme <NSObject>

- (void)themeLabel:(UILabel *)label type:(MGAThemeLabelType)type;
- (void)themeButton:(UIButton *)button type:(MGAThemeButtonType)type;

@end

@interface MGABlueTheme : NSObject<MGATheme>

@end

@interface MGAMetalTheme : NSObject<MGATheme>

@end
```

# Presentation Layer



# Business Layer

# Business Layer

- **It holds the specific app Business Logic and Behaviors**

  It is concerned with the retrieval, processing, transformation, and management of application data; application of business rules and policies

- **The Domain Model is a conceptual model of business**

  It describes the various entities, their attributes, roles, and relationships, plus the constraints that govern the problem domain

- **Business Layer gets data through a Service Layer**

  Service Layer defines an application's boundary with a layer of services that establishes a set of available operations and coordinates the application's response in each operation

# Domain Model Layer

- **Domain Model**

  An object model of the domain that incorporates both behavior and data

- **You can use simple Objective-C objects**

  A plain old Objective-C object that inheriting from NSObject

- **Or you can use Core Data objects**

  you can extend the class NSMangedObject with your Objective-C class

# Service Layer

- **Service Layers is a design pattern**

  The benefits a Service Layer provides is that it defines a common set of application operations available to different clients and coordinates the response in each operation.

- **Service Layer uses Data Access Layer to access data**

  Service Layer uses DAL to performs the task of retrieving and storing data both from server via network and from database

- **Service Layer is used by ViewController**

  No more  a ton of line of codes in your ViewController, instead few lines of simple Service Layer calls

# Data Access Layer

# Data Access Layer

- **It's a layer which provides simplified access to data**

  The data may be stored in a persistent storage like SQLite or in a backend accessible by network

- **It may uses a Persistence Layer or Network Layer**

  Both exposes a simplify contract to access data

# Persistence Layer

- **The persistence layer deals with persisting**
  The persistence layer is responsible for manipulating the database, and it is used by the service layer
- **You can use Core Data as Persistence Layer**
  Or, in alternative, you can use FMDB for direct access to SQLite

# Network Layer

- **Network Layer is responsible of all networking calls**
- **You can use AFNetworking as Network Layer**

  AFNetworking is a delightful networking library for iOS and Mac OS X. It's built on top of NSURLConnection, NSOperation, and other familiar Foundation technologies

# Composition

# Composition

- **It's a way to combine objects into more complex ones**

  Compositions are a critical building block of many basic data structures, including the tagged union, the linked list, and the binary tree, as well as the object used in object-oriented programming

- **In a real-world app composition takes an important role**

  On iOS / OS X App composition is necessary for a good layering and for a structure UI.

# Composition - Custom Views

- **Custom Views are an example of composition**

  A custom view is used to manage small portions of the interface in order to recycle the content and its management

- **In a real-world iOS/OS App there are many custom views**

  For example, all views that must be inserted in a scroll view, or all those portions of the view that occur multiple times in different view and only with different content.

# Best Practices

# General Best Practice

- **Use Automatic Reference Counting**

  Always use ARC. All new code should be written using ARC, and all legacy code should be updated to use ARC

- **Use AppDelegate as Singleton**

  Create all common and singleton objects in App Delegate and then expose them by UIResponder Category

# Coding Best Practice

- **Create a property for every ivar and use self to access it**

  Always create a @property for every data member and use “self.name” to access it throughout your class implementation

- **Alway declare “atomic” or “nonatomic” attribute**

  Always use the “nonatomic” attribute on your properties, unless you are writing a thread-safe class and actually need access to be atomic

- **User literals and modern Objective-C syntactic sugar**

  The source code will be less verbose and more clear.

# Presentation Best Practice

- **Create a base UIViewController**

  Create a MYBaseViewController from which all the view controllers inherit. In this way all the controllers can inherit common behavior.

- **Create a base UIView**

  Create a MYBaseView from which all the custom views inherit. In this way all the views can inherit common style and appearance

- **Create a base UITableViewCell**

  Create a MYBaseTableViewCell from which all the custom table view cells inherit. In this way all the cells can inherit common style and appearance

# Code Design Best Practice

- **API Design**

  Pay attention to the design of your API. Learn your target platform's conventions before coding. Define the rules that are in accordance with the convention of language

- **Block and Delegation**

  When should I use blocks instead of delegation for callbacks? Pay attention to this topic and alway look at Apple docs to see how they done

# Resources

# Links

- **Blocks vs Delegation**

  http://thejoeconwayblog.wordpress.com/2012/05/29/blocks-or-delegation/

- **API Design**

  http://mattgemmell.com/2012/05/24/api-design/

- **Modern Objective-C**

  http://www.slideshare.net/giuseppearici/modern-objectivec-pragma-night

# Links

- **objc.io - A periodical about best practices and advanced techniques in Objective-C**

  http://www.objc.io/

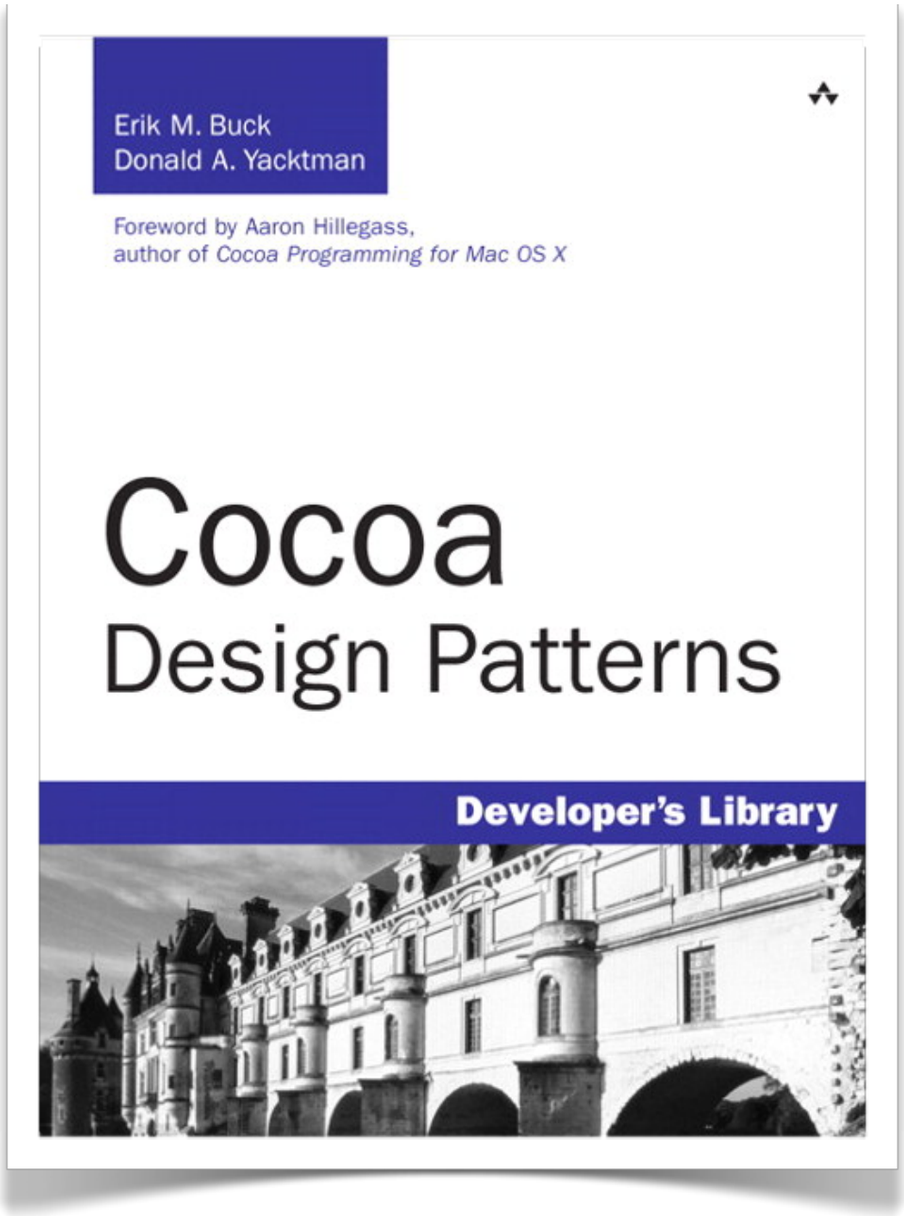
- **Automatic Reference Counting**

  http://www.slideshare.net/giuseppearici/pragma-night-automaticreferencecounting

# Videos

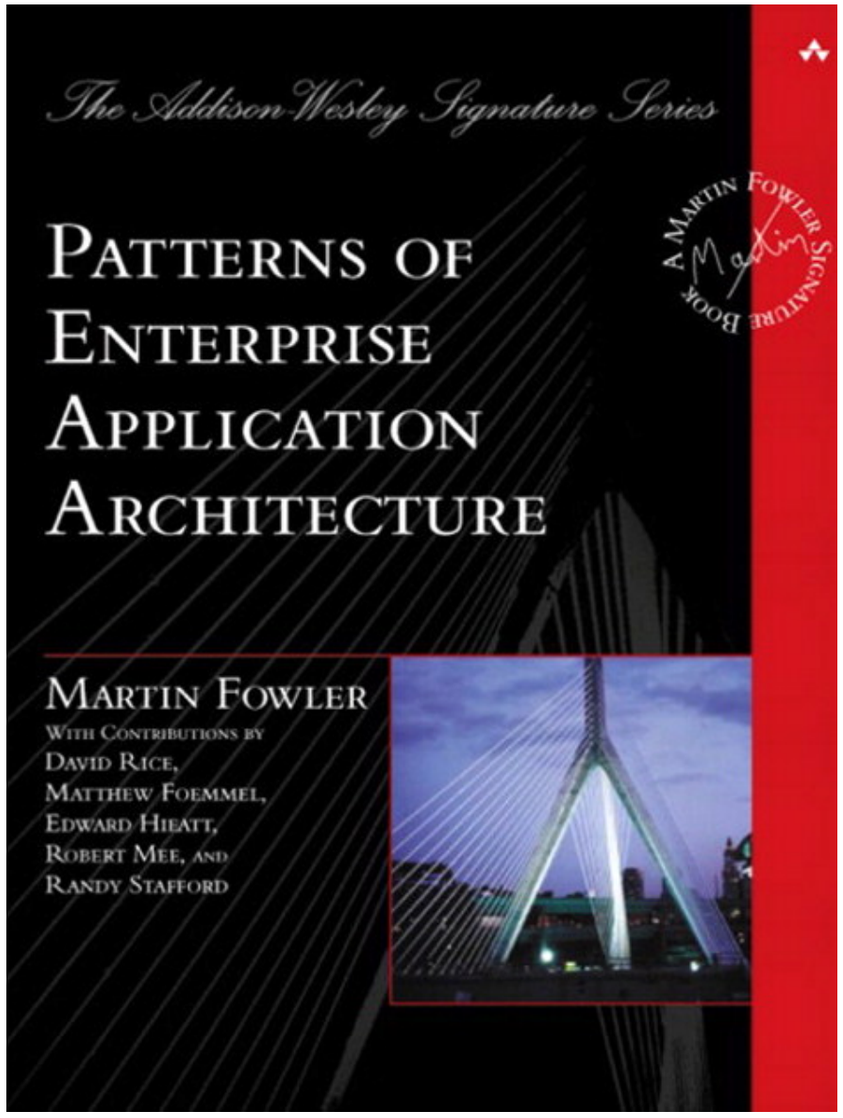
- **Customizing the Appearance of UIKit Controls**
  Session 114 - WWDC 2011 Session Videos
- **Advanced Appearance Customization on iOS**
  Session 216 - WWDC 2012 Session Videos

# Books




- Cocoa Design Patterns
- Erik M. Buck & Donald A. Yacktman
- Addison Wesley

# Books




- Patterns Of Enterprise Application Architecture
- Martin Fowler
- Addison-Wesley Professional
- updates: http://martinfowler.com/books/eaa.html

# Thank you

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