iOS Dev Accelerator
Week 7 Day 2

- Cocoa Pods
- AFNetworking
- Grand Central Dispatch

Cocoa Pods

Cocoa Pods

- Cocoa Pods is a popular application that allows you to easily integrate third party code into your apps
- Check out CocoaPods.org, the official website of Cocoa pods to read up on it, see how it works, why it works, etc.
- And then check out cocoacontrols.com for a list of cool third party controls you can use.

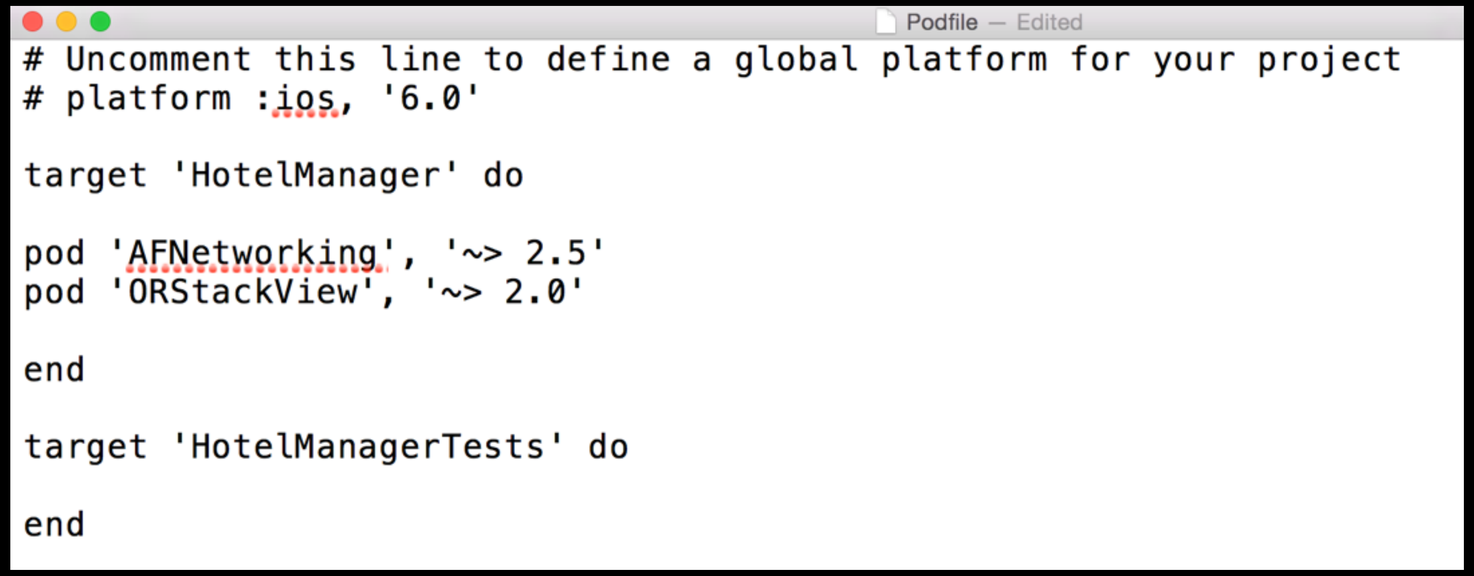
Cocoa Pods Install Workflow

- First you will need to install Cocoa Pods on your computer.
- Cocoa Pods is built with Ruby. Standard Ruby comes installed on OS X.
- Run this command in terminal to install cocoa pods :
- **sudo gem install cocoapods**

Cocoa Pods Workflow

- With cocoa pods installed, you can now use cocoa pods within any directory of your choosing.
- Once you have found a cool third party pod to use, go to the **root directory** of the xcode project you want to import the pod into.
- Create a text file named **Podfile**
- **Instead of manually creating it, just use the command pod init**

Podfile



- In this podfile, you list all the third party APIs you want to import into your project.

- pod ‘AFNetworking’
- would install the latest version of
- pod ‘AFNetworking’ ‘> 2.5’
- would install AFNetworking version 2.5 or higher

For full list of operators you can use on the pod line go to https://guides.cocoapods.org/using/the-podfile.html

Pod install and workspaces

- Once you have your Podfile ready to go, run this command:
- **pod install**
- This does 2 things:
  - Downloads the dependancies listed in your pod file
  - Creates a workspace files to manage both your project and the dependancies. **You must now open this workspace file to work on your app, not the project file.**

Demo

AFNetworking

AFNetworking

- AFNetworking is a third party networking library for iOS and OS X
- It is generally accepted as the best way to make HTTP requests in your iOS app. It is used in some of the most popular and critically acclaimed apps out there.
- Open source (has over 2900 pull requests merged in)
- Has a swift counter part called Alamofire

AFNetworking

- AFNetworking has 2 ways to make requests:
  - Using a set of classes built on top of NSURLConnection
  - Using a set of classes built on top of NSURLSession
- When making HTTP requests that are not long file downloads or uploads, use the NSURLConnection classes (because NSURLSession's NSURLCache feature is broken)

AFHTTPRequestOperationManager

- AFHTTPRequestOperationManager has everything you need to work with a web application over HTTP (built on NSURLConnection)
- use GET and POST methods on an instance of this manager to perform requests.
- These methods have 2 completion handlers, one for the success case (which by defaults runs for status codes 200-299) and one for the failure case
- The data of the response comes pre serialized in the success handler (supports JSON, XML, and p-lists)

Demo

AFNetworkReachabilityManager

- AFNetworkReachabilityManager is a class designed to monitor the reachability of domains and address for both WIFI and WWAN network interfaces
- You can use this class to know why an operation failed, and also to be notified when the reachability status changes.
- You should never use it to prevent a request, just make the request and see what response (or error) you get

AFNetworkReachabilityManager Workflow

1. In app delegate didFinishLaunchingWithOptions: start monitoring on the sharedManager singleton of AFNetworkingReachabilityManager
2. In your error handling of your network requests, check the reachability of the sharedManager singleton, and if its false you know theres no connect, and respond accordingly

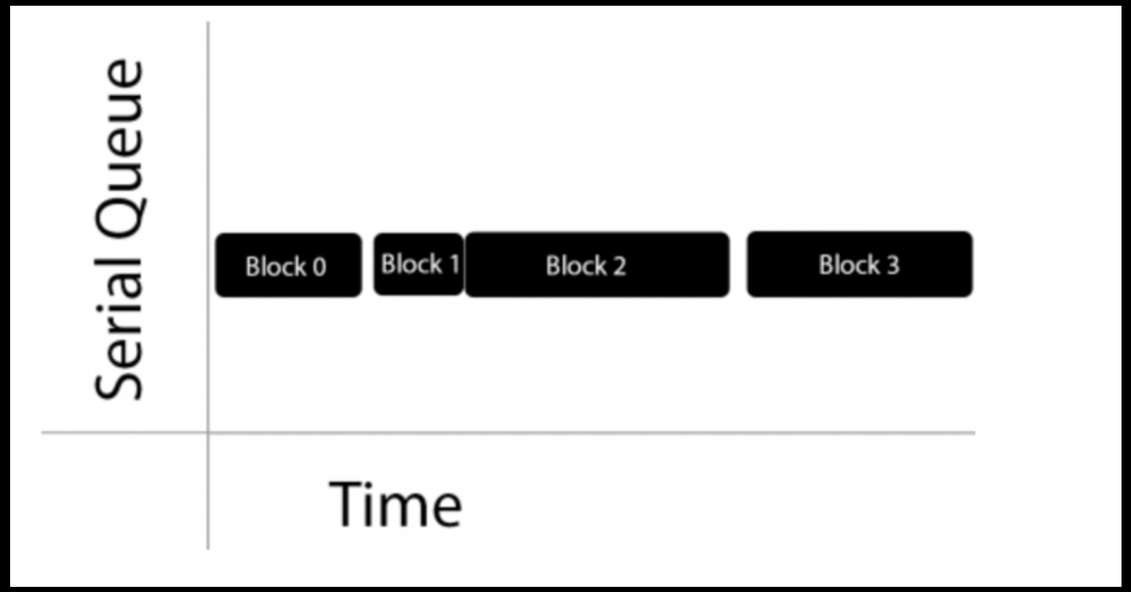
Demo

Grand Central Dispatch

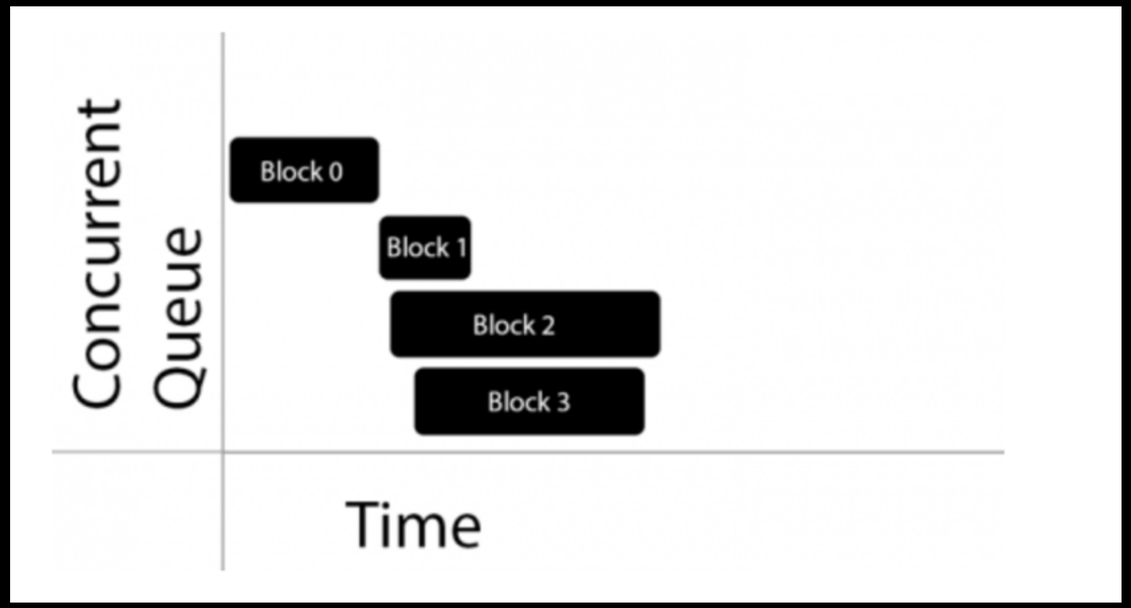
Grand Central Dispatch

- “Grand Central Dispatch (GCD) comprises language features, runtime libraries, and system enhancements that provide systemic, comprehensive improvements to the support of concurrent code execution on multicore hardware on iOS and OS X"
- GCD is a system you can use for concurrency
- GCD sits above manually creating threads and locks, and below NSOperationQueue
- GCD feels a lot like NSOperationQueue, so it’s not a drastic transition going from NSOperationQueue to GCD
- GCD is a C-style API, so you don’t call the methods on classes, they are just global functions. The functions will look_like_this

- Tasks executed serially are executed one at a time



- Tasks executed concurrently might be executed at the same time or different times



Async vs synchronous

- A synchronous function returns only after the completion of tasks that it orders
- An asynchronous function returns immediately, ordering the task to be done but does not wait for it (does not block for it)

Concurrency and structure

- Even when using a higher level API like NSOperationQueue, you need to think about and structure your app with concurrency in mind. Specifically you need to design with these things in mind:
  - **Race Conditions:** The behavior of your app depends on the timing of certain events that are being executed in an uncontrolled concurrent manner
  - **Dead Locks:** Two or more threads are deadlocked if one thread is waiting for another thread to finish, while the other thread is waiting for the first thread to finish
  - **Thread safety:** Thread safe code is safe to call from multiple threads or concurrent tasks. Code that is not thread safe must be only accessed in one context at a time. An immutable array is thread safe because it cannot be changed, while a mutable array is not thread safe since one thread could be changing it while another is trying to read it.
  - **Critical Sections:** Any piece of code that must not be executed from more than one thread or task. For example manipulating a shared resource that isn't thread safe.

GCD and Queuing Tasks for Dispatch

- GCD provides and manage FIFO queues to which your app can submit tasks in form of blocks (or closures in swift)
- Blocks submitted on dispatch queues are executed on a pool of threads that are managed by the system
- 3 types of queues:
  - Main: tasks execute serially on your app's main thread
  - Concurrent: tasks are dequeued in FIFO order, but run concurrently
  - Serial: tasks execute one at a time in FIFO order

Queuing a task for the main queue

```
NSArray *results = [Question questionsFromJSON:data];
dispatch_async(dispatch_get_main_queue(), ^{
  completionHandler(results,nil);
});
```

- dispatch_async is a function that takes in two parameters:

  1. The queue you want to execute a task on

  2. a block that represents the task you want to execute

Using a concurrent global queue

- Global Queues are created by the system for your app and are available to use without any setup
- To access a global queue you use the function dispatch_get_global_queue
- dispatch_get_global_queue has 2 parameters:
  - identifier: how you tell GCD which queue you want to enqueue tasks on
  - flags: ‘will be used in the future’ just use 0

global queue identifiers

These are the newest set of QOS identifiers to help you choose which global queue to use:

- QOS_CLASS_USER_INTERACTIVE: highest priority since the user experience relies on it
- QOS_CLASS_USER_INITIATED: should be used when the user is waiting on results to continue interaction
- QOS_CLASS_UTILITY: long running tasks, designed to be energy efficient
- QOS_CLASS_BACKGROUND: anything the user isn't directly aware of.

global queue identifiers

These are the old, and less confusing ones

- DISPATCH_QUEUE_PRIORITY_HIGH
- DISPATCH_QUEUE_PRIORITY_DEFAULT
- DISPATCH_QUEUE_PRIORITY_LOW
- DISPATCH_QUEUE_PRIORITY_BACKGROUND

You can use the old or new ones, just know that both sets exist

Using a concurrent global queue

```
  dispatch_queue_t imageQueue = dispatch_get_global_queue
(DISPATCH_QUEUE_PRIORITY_DEFAULT, 0);

dispatch_async(imageQueue, ^{

  NSURL *url = [NSURL URLWithString:avatarURL];
  NSData *data = [[NSData alloc] initWithContentsOfURL:url];
  UIImage *image = [UIImage imageWithData:data];

  dispatch_async(dispatch_get_main_queue(), ^{
    completionHandler(image,nil);
  });
});
```

Creating a private queue

- You can create a private queue if you want to run tasks on a serial or concurrent queue that isn't a global queue or the main queue
- The only structural difference between using a private queue and a global queue is that a private queue **can** be a serial queue.
- To create a private queue use the function dispatch_queue_create which takes in 2 parameters:
  - label - string to attach to the queue to uniquely identity what process is launching these queues. Use reverse DNS, or pass in NULL
  - attr - specify DISPATCH_QUEUE_SERIAL or DISPATCH_QUEUE_CONCURRENT or NULL (which sets it to serial)

Queuing up your tasks

- The two primary ways of enqueuing your tasks for execution are:
  - dispatch_sync
  - dispatch_async

there is also dispatch_once which is great for singletons

dispatch_async

- Dispatches a task to to run asynchronously and returns immediately
- This is by bar the most common way to enqueue a task on a dispatch queue
- Even if adding tasks to a serial queue, still use dispatch_async

dispatch_sync

- Submits a block to execute on a dispatch queue and waits until that block completes before returning
- Rarely will use this

dispatch_async vs sync

```
dispatch_queue_t myQueue = dispatch_get_global_queue
  (QOS_CLASS_BACKGROUND, 0);

NSLog(@"1");

dispatch_async(myQueue, ^{
  NSLog(@"2");
});

NSLog(@"3");

dispatch_async(myQueue, ^{
  NSLog(@"4");
});
```

prints 1,3,2,4

```
dispatch_queue_t myQueue = dispatch_get_global_queue
  (QOS_CLASS_BACKGROUND, 0);

NSLog(@"1");

dispatch_sync(myQueue, ^{
  NSLog(@"2");
});

NSLog(@"3");

dispatch_sync(myQueue, ^{
  NSLog(@"4");
});
```

prints 1,2,3,4

dispatch_sync & deadlock

- If you ever call dispatch_sync on a queue and pass in that queue as the queue to dispatch to, you will get a deadlock.
- This happens because:
  - dispatch_sync blocks the queue you called it from
  - this now blocked queue will never be able to perform the task that was passed into dispatch_sync because the queue is already blocked

dispatch_sync & deadlock

```
dispatch_queue_t myQueue = dispatch_queue_create(NULL,
  DISPATCH_QUEUE_SERIAL);

dispatch_async(myQueue, ^{
  //do something expensive on this background queue

  //do another thing
  //this queue is now dead locked
  dispatch_sync(myQueue, ^{
    NSLog(@"Brad");
  });
  //will never reach this line

});
```

Demo

GCD vs NSOperationQueue

- Sometimes NSOperationQueue is a better choice than GCD. The advantages of NSOperationQueue:
  - Canceling operations is possible in NSOperationQueue, GCD is fire and forget
  - KVO compatibility (more on this later in the week)
  - Operation priorities make it easy to modify how operations are scheduled

Dispatch Groups

Dispatch Groups

- Dispatch Groups are a GCD feature that allows you to easily group tasks
- You can then wait on that set of tasks to finish or be notified by a callback when those tasks finish
- This is awesome when you are performing multiple tasks concurrently and need to be notified when they are all complete.
- A dispatch group is created with this function:
- dispatch_group_t myGroup = dispatch_group_create()

Associating tasks with groups

- Two ways to do this:
  - use this function dispatch_group_async(group, queue, block)
    - This looks like normal async dispatch, except it takes in a group as well.
  - use these two functions: dispatch_group_enter(group) and dispatch_group_leave(group)
    - This causes the number of tasks the group thinks are currently running to increase(enter) or decrease(leave). Its a simple counter. This means for every enter there must be a leave.

Waiting on a dispatch group to finish

- Two ways to be notified when a dispatch group is finished, one blocking, one not blocking:
  - dispatch_group_wait(group, timeout) ->long : This function takes the group to wait on and a time out value. This function blocks the current queue you are on, until either the group is finished or the timeout thresh hold is hit. You can pass in DISPATCH_TIME_FOREVER if you dont want a timeout
  - dispatch_group_notify(group, queue,block) : this function takes in the group, a queue to run the block, and a block. This is different than the wait because it does not block. Its Asynchronous.

Demo