Blocks

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return type name arguments

```
int myFunction (int a) {
    // code goes here
    return a;
}
```

return type **name** **arguments** **arguments**

```
int (^myFirstBlock) (int) = ^(int a) {
    // code goes here
    return a;
};
```

“ language - level feature added to C, Objective-C and C++, which allow you to create distinct segments of code that can be passed around to methods or functions as if they were value ”

block variable **block literal**

```
int (^myFirstBlock) (int) = ^(int a) {
    // code goes here
    return a;
};
```

```
^(int a) {
    // code goes here
    return a;
};
```

```objc
- (void)viewDidLoad {
    [super viewDidLoad];

    [self myFunctionWithBlock:^(int a) {
        NSLog(@"%i",a);
    }];
}

- (void)myFunctionWithBlock:(void (^)(int a))block {
    if (block) {
        block(3);
    }
}
```

Why use blocks?

- Blocks make your code easier to read and reuse
- Blocks allow you to perform advanced tasks easier
- Things like concurrency and callbacks become much easier
- …because you have to

Where use blocks?

- Callbacks of any kind are likely candidates for using blocks
- Anywhere you have a delegate, blocks are a good candidate for replacement
- Completion handlers or failure handlers
- Enumarations, NSOperations, etc..

Creating blocks

```
// As a local variable
int (^blockName)(int) = ^int (int a) {…};

// As a property
@property (nonatomic, copy) void (^blockName)(int a);

// As a method to parameter
[self myFunctionWithBlock:^(int a) {…}];

// As an argument to a method call
- (void)myFunctionWithBlock:(void (^)(int a))block {…}

// As a typedef
typedef void (^MyBlock)(int a);
```

Mutable variables

```
NSArray *array = @[];

__block BOOL anyResults = NO;
BOOL anyResultsFail = NO;

[array enumerateObjectsUsingBlock:^(id obj, NSUInteger i, BOOL
*stop) {
   if (obj == objectWeAreLookingFor) {
      anyResults = YES;
      anyResultsFail = YES;
      *stop = YES;
    }

}];
```

Memory management

- With ARC it just works
- Use copy instead of retain (strong)
- Adding block pointers to a collection, you need to copy them first
- Retain cycles are dangerous

Concurrent programming

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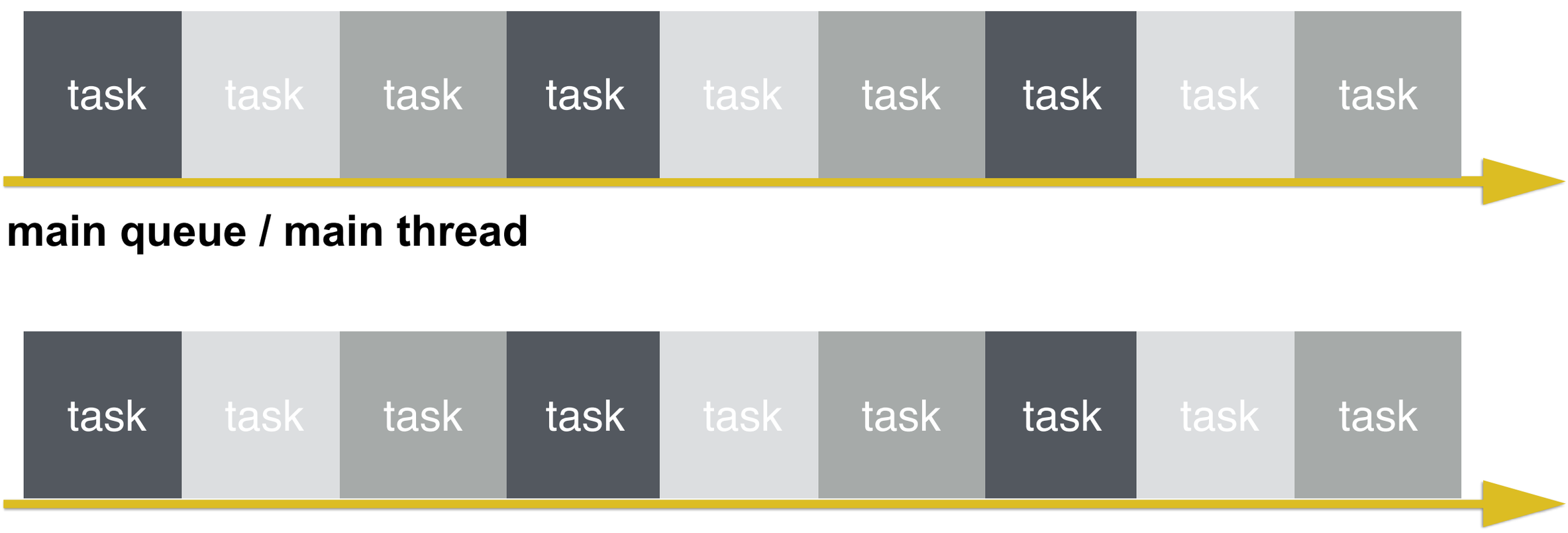
Working with queues



Options in iOS

- Classes with built-in concurrency

  many classes have blocks

- Grand Central Dispatch (GCD)

  simple, C function calls

- NSOperation & NSOperationQueue

  built on top of GCD, better control

- Manual multithreading (threads)

Threading

- **Thread** is used to refer to a separate path of execution for code
- **Process** is used to refer to a running executable, which can encompass multiple threads
- **Task** is used to refer to the abstract concept of work that needs to be performed

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Grand Central Dispatch

(GCD)

Benefits of GCD

- Straightforward and simple programming interface
- Automatic thread pool management
- More memory efficient
- Tasks cannot deadlock the queue
- More efficient alternative to locks and synchronization primitives

Using GCD

1. Create a new queue

    give it a name (reverse DNS)

Using GCD

1. Create a new queue

   give it a name (reverse DNS)

2. Add tasks (blocks) to the queue

Using GCD

1. Create a new queue

   give it a name (reverse DNS)

2. Add tasks (blocks) to the queue

3. There is no step 3

dispatch_queue_create

```
dispatch_queue_t backgroundQueue = dispatch_queue_create("backgroundQ", NULL);
```

dispatch_queue_create

```
dispatch_queue_t backgroundQueue = dispatch_queue_create("backgroundQ", NULL);
```

dispatch_async

```
dispatch_async(backgroundQueue, ^{ // code goes here });
```

Queues

1. Main queue

   main thread, FIFO order, don't block UI!

2. Serial queues

   may switch to a different thread between tasks

   always wait for a task to finish before going to the next one - FIFO

3. Concurrent queues

   submit tasks to any available thread or even make new threads

   FIFO order, but order of completion is not guaranteed.

Creating or getting queues

```
// Create a serial or concurrent queue
dispatch_queue_create

// Get the one and only main queue
dispatch_get_main_queue

// Get one of the global concurrent queues
dispatch_get_global_queue
```

Adding tasks to the Queues

```
// Asynchronous
dispatch_async
dispatch_after
dispatch_apply
```

```
// Synchronous
dispatch_once
dispatch_sync
```

Operation queues

NSOperation & NSOperationQueue

NSOperation

- Built on top of GCD
- Much better control
- Object-oriented approach
- Thread-safe, state, priority, dependencies, cancellation

State

- **isReady** returns YES to if the initialization steps are finished
- **isExecuting** returns YES if the operation is currently working on its task
- **isFinished** returns YES if the operation's task finished or if the operation was cancelled

Priority

- NSOperationQueuePriorityVeryHigh
- NSOperationQueuePriorityHigh
- NSOperationQueuePriorityNormal
- NSOperationQueuePriorityLow
- NSOperationQueuePriorityVeryLow

GCD vs Operations

Core Data

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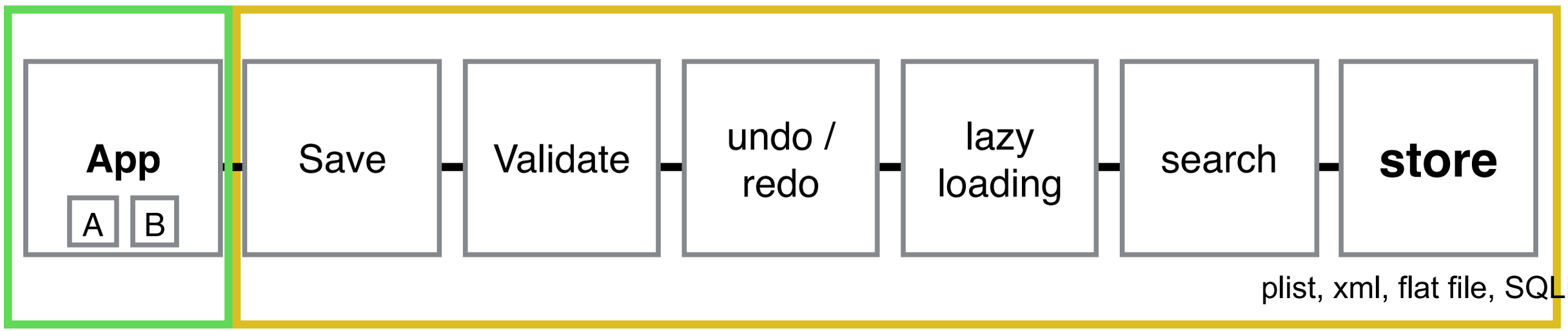
“ … Core Data is a schema-driven object graph management and persistence framework. ”

is Core Data..

… a database? no, but..

… ORM? no, but..

… like [insert what you want] ? no, but..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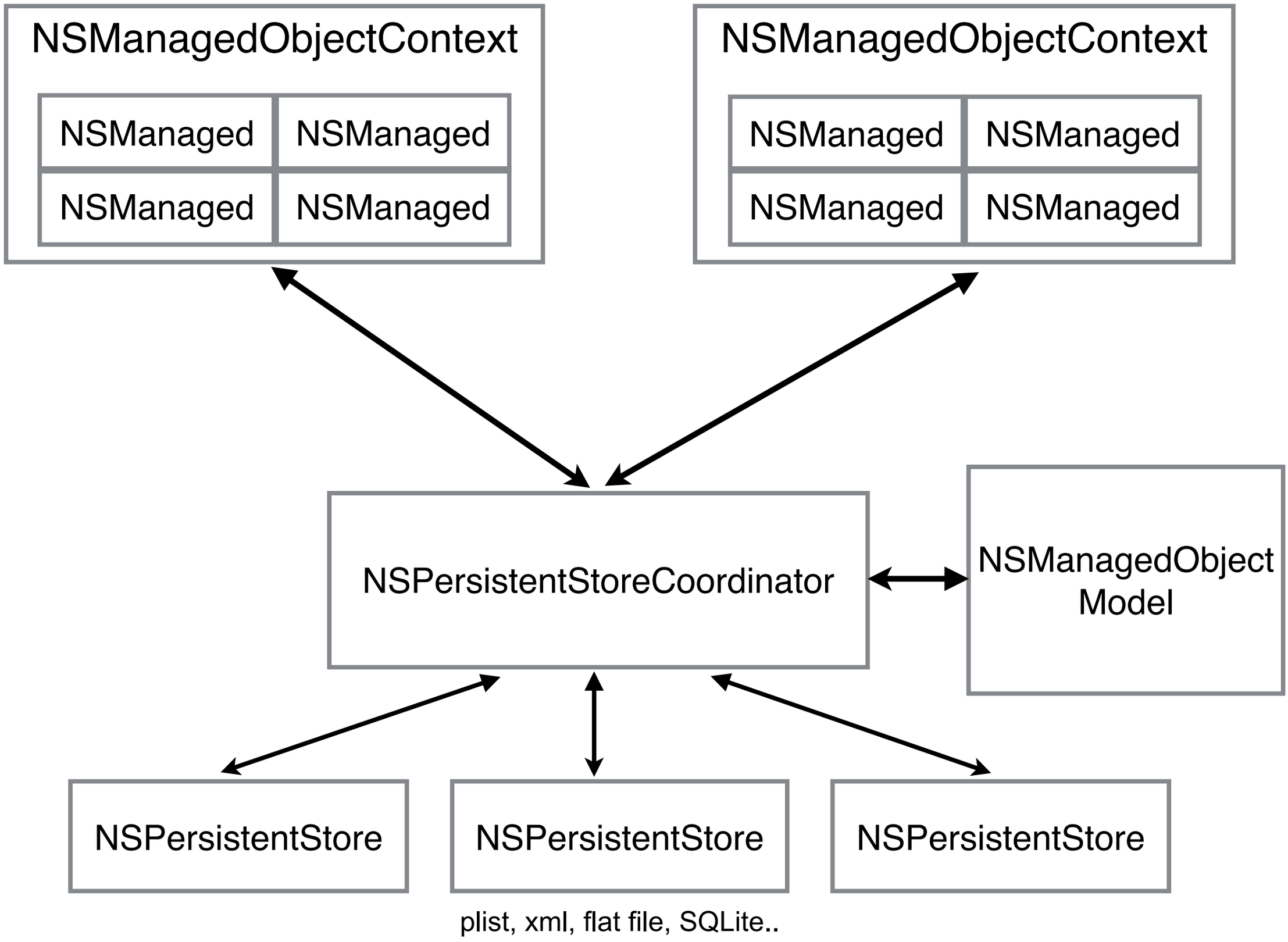
NSManagedObjectContext
NSManaged
NSManaged
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NSManaged
NSManagedObjectContext
NSManaged
NSManaged
NSManaged
NSManaged
NSPersistentStoreCoordinator
NSManagedObject Model
NSPersistentStore
NSPersistentStore
NSPersistentStore
plist, xml, flat file, SQLite..

Modeling in Core Data

- Introduction
- Creating entities
- Creating and configuring attributes
- Modeling relationships

Saving in Core Data

- Creating managed objects
- Understanding the managed object context
- Saving the managed object context

Fetching in Core Data

- Creating and using a fetch request
- Ordering with sort descriptors
- Using predicates

Next steps

- iOS App Programming Guide
- iOS Human Interface Guidelines
- iOS Developer Library
- Development Videos (WWDC)
- Stanford's iTunes U App Development Course
- NSHipster.com
- Objc.io