



MAKE
SCHOOL

CORE DATA

AGENDA

Intro

Core Data Stack

Data Modeling

Adding Core Data to your App

Queries

INTRO TO CORE DATA

CORE DATA

Allows us to work with (almost) regular Swift objects and persist them

Provides a query interface to search through persisted objects

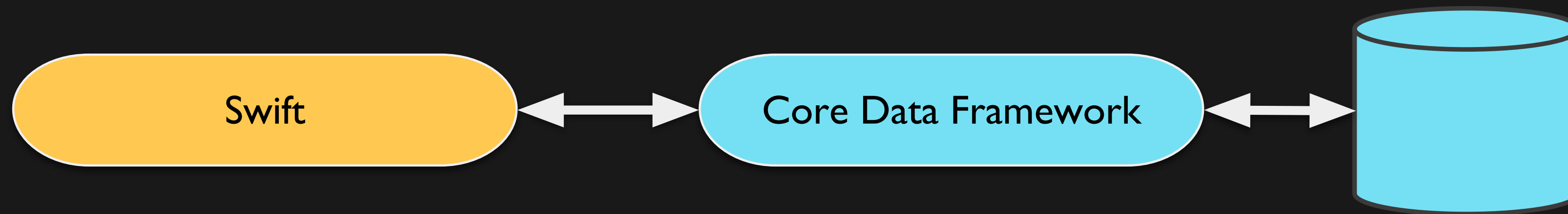
Provides advanced features such as migrations, delete rules, etc.

CORE DATA

“Core Data provides an infrastructure for change management and for saving objects to and retrieving them from storage. It can use SQLite as one of its persistent store types. **It is not, though, in and of itself a database.** (To emphasize this point: you could for example use just an in-memory store in your application. You could use Core Data for change tracking and management, but never actually save any data in a file.)”

CORE DATA

Core Data provides a Swift interface to a persistent store



WHY CORE DATA?

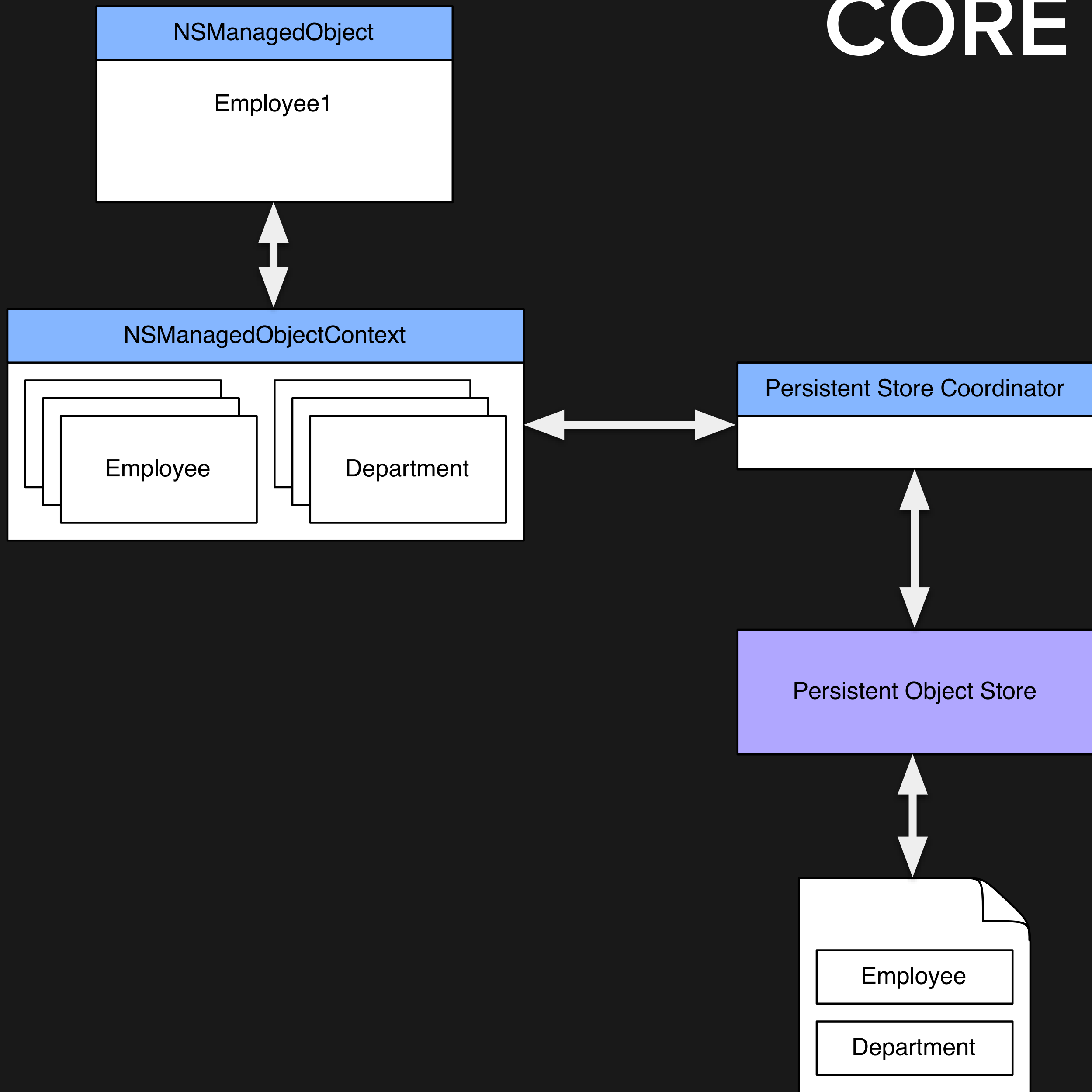
Can be complicated, but is the most powerful persistence framework on iOS

(Still) used by a majority of apps that utilize local storage

If you master Core Data you can master almost any of Apple's other frameworks

CORE DATA STACK

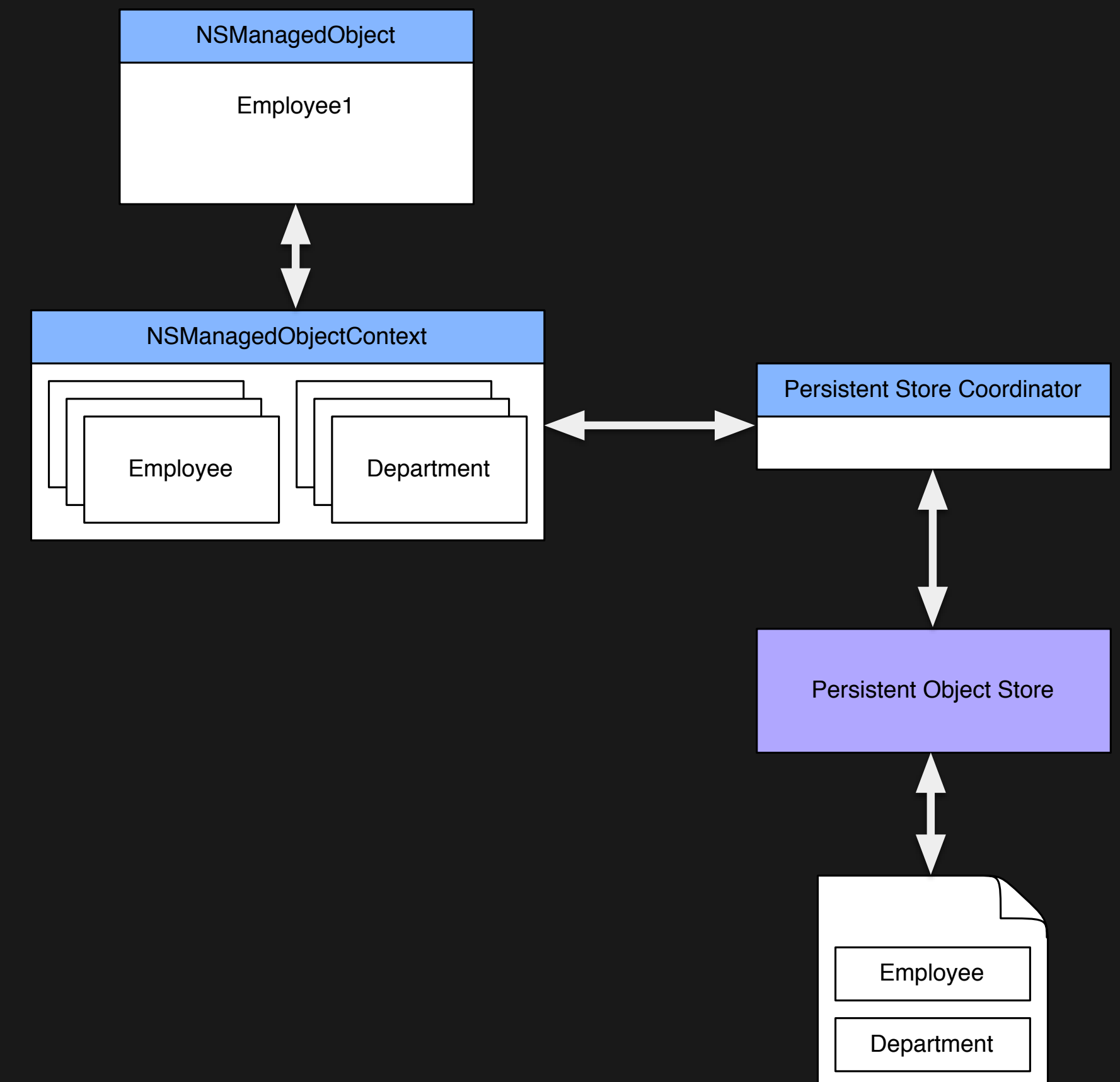
CORE DATA STACK



CORE DATA STACK

We mostly interact with managed object context

Core Data makes the actual persistent store transparent allowing for applications to use it with SQLite DBs, in memory storage, XML storage, etc.



CORE DATA KEY PLAYERS

NSManagedObject(MO) - Temporary Representation of an Object in the Object Store.

NSManagedObjectContext(MOC) - Primary Interface between **your** Application Code and Core Data. Provides a Scratch Pad for changes to the Object Store

Persistent Store Coordinator(PSC) - Hides implementation details of Persistent Object Store from NSManagedObjectContext

Persistent Store(PS) - Actual Storage

MANAGED OBJECT

A temporary representation of a Object in the persistent store

All ManagedObjects need to be registered with one
ManagedObjectContext

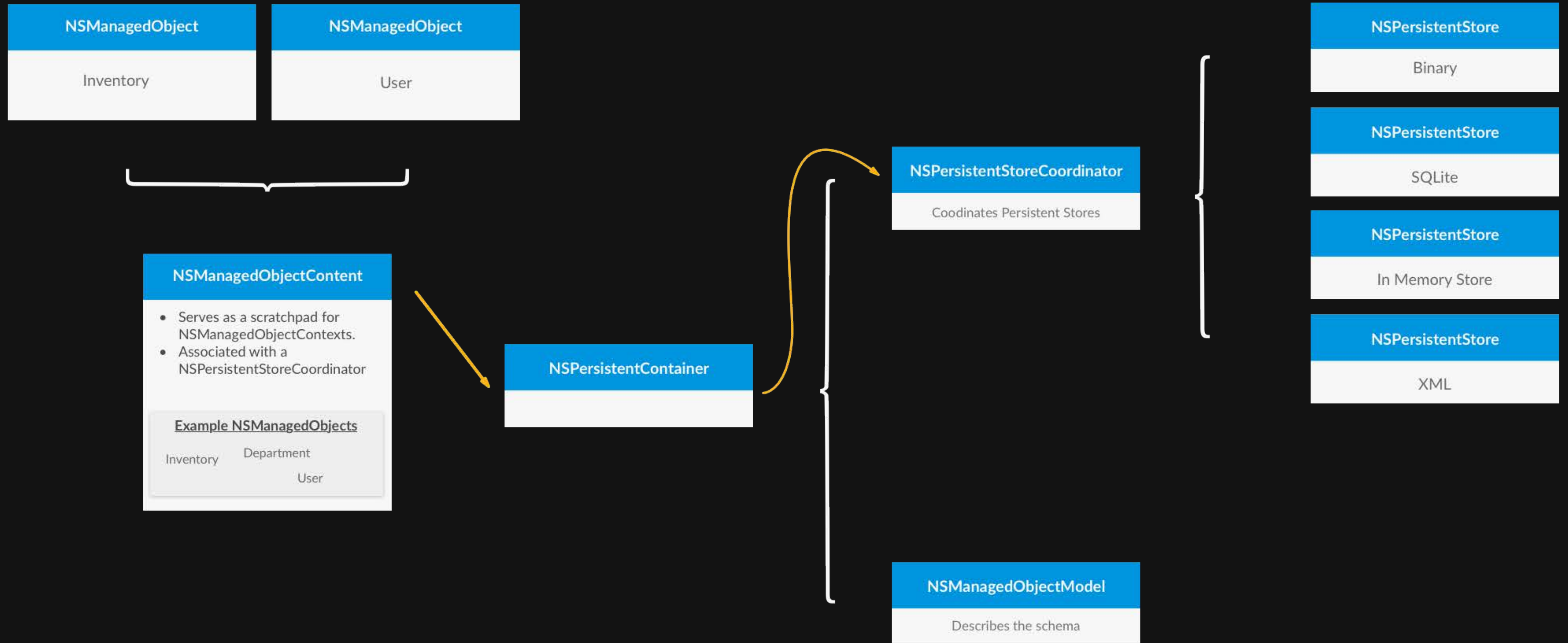
You can create **Custom Managed Object Subclasses**

MANAGED OBJECT CONTEXT

A scratchpad for changes to persisted Objects

- We fetch ManagedObjects from a ManagedObjectContext
- We create new ManagedObjects within a ManagedObjectContext
- A ManagedObjectContext can be saved, saving will persist the changes that the Context has tracked
- **You can create one on a private queue or the main queue(for viewing)**

NSPersistentContainer (iOS10 +)



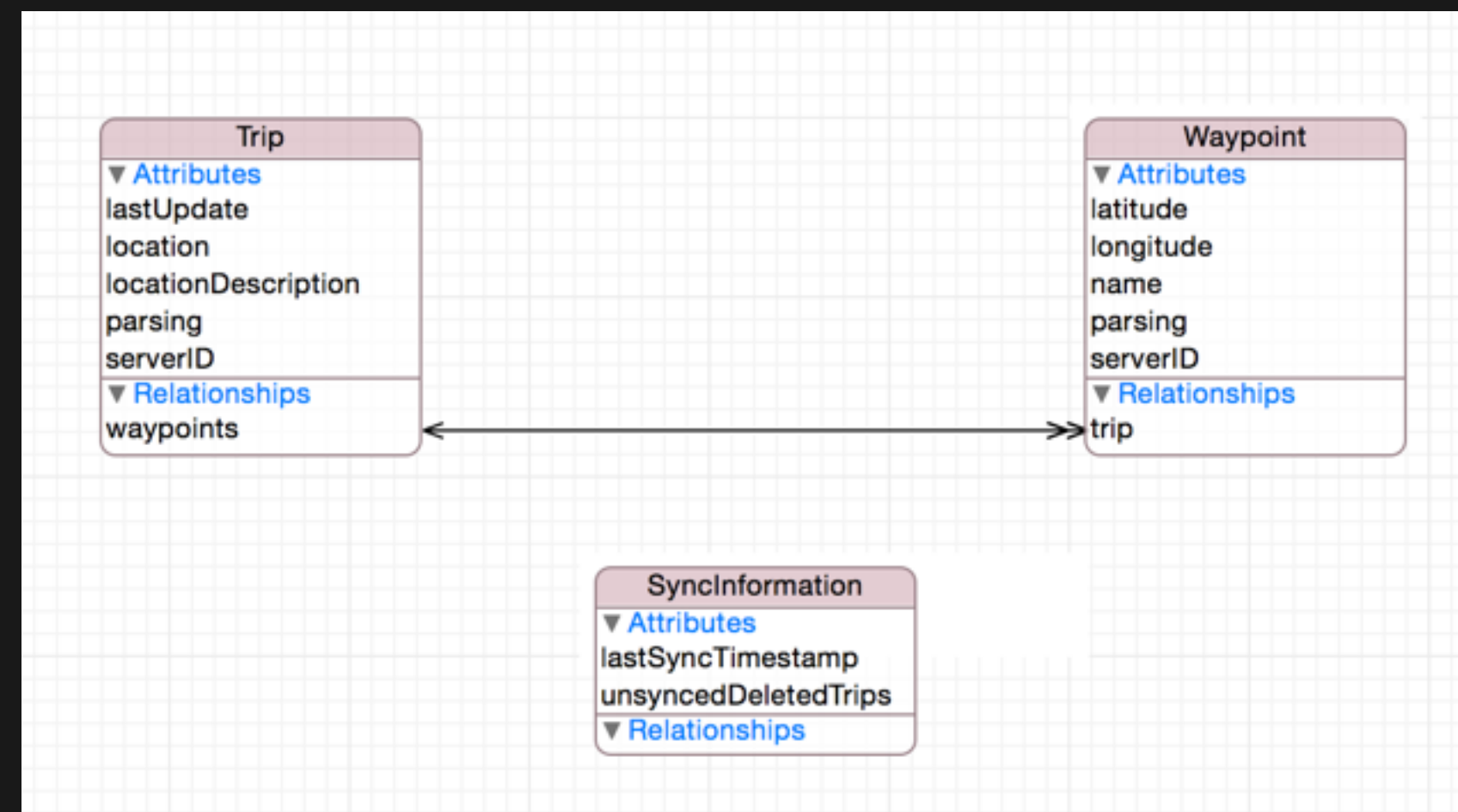
DATA MODELING

MANAGED OBJECT MODEL

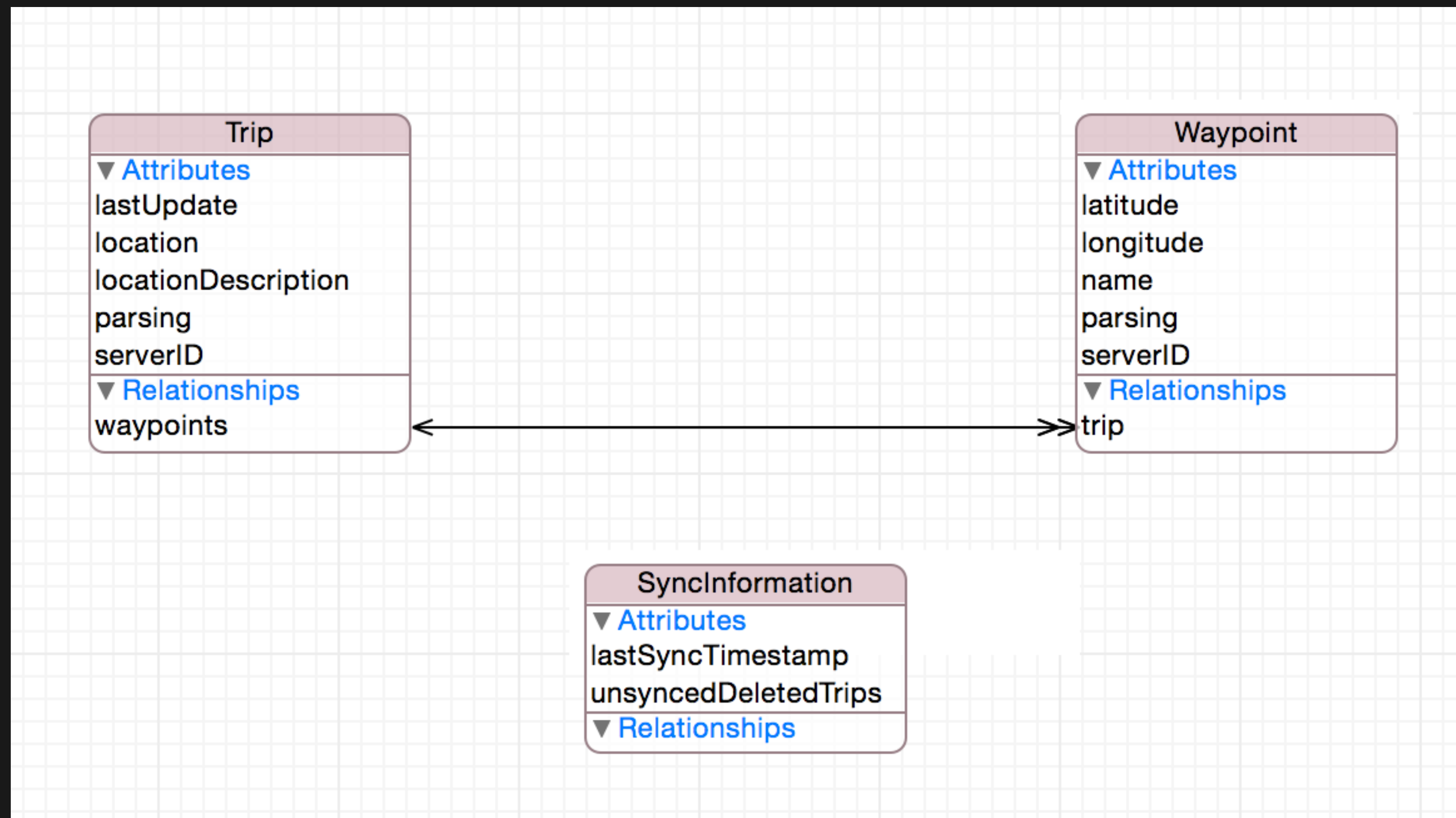
Xcode allows to create a data model visually

Entities can store values and relationships to other Entities (one-to-one, one-to-many, many-to-many)

Advanced Features: Delete Rules, Optional Values, Value Validation, Fetched Properties



RELATIONSHIPS



DEFINING A RELATIONSHIP

ENTITIES

E

 SyncInformation

E

 Trip

E

 Waypoint

FETCH REQUESTS

CONFIGURATIONS

C

 Default

▼ Attributes

Attribute ^	Type	
<div>N</div> lastUpdate	Integer 64	⬆ ⬇ ⬆
<div>T</div> location	Transformable	⬆ ⬇ ⬆
<div>S</div> locationDescription	String	⬆ ⬇ ⬆
<div>B</div> parsing	Boolean	⬆ ⬇ ⬆
<div>S</div> serverID	String	⬆ ⬇ ⬆

+ -

▼ Relationships

Relationship ^	Destination	Inverse
<div>M</div> waypoints	Waypoint	⬆ trip ⬇

+ -

▼ Fetched Properties

Fetches Property ^	Predicate
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Relationship

Name waypoints

Properties ☐ Transient ☒ Optional

Destination Waypoint ⬆

Inverse trip ⬆

Delete Rule Cascade ⬆

Type To Many ⬆

Arrangement ☐ Ordered

Count Unbounded ⬆ ☐ Minimum

Unbounded ⬆ ☐ Maximum

Advanced ☐ Index in Spotlight

☐ Store in External Record File

User Info

Key	Value
-----	-------

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MAKE SCHOOL

RELATIONSHIPS

“It is highly recommended that you model relationships in both directions, and specify the inverse relationships appropriately. Core Data uses this information to ensure the consistency of the object graph if a change is made.”

Apple's Core Data Programming Guide

ESTABLISHING A RELATIONSHIP

```
waypoint.trip = tripToStuttgart
```

The inverse relationship is maintained automatically

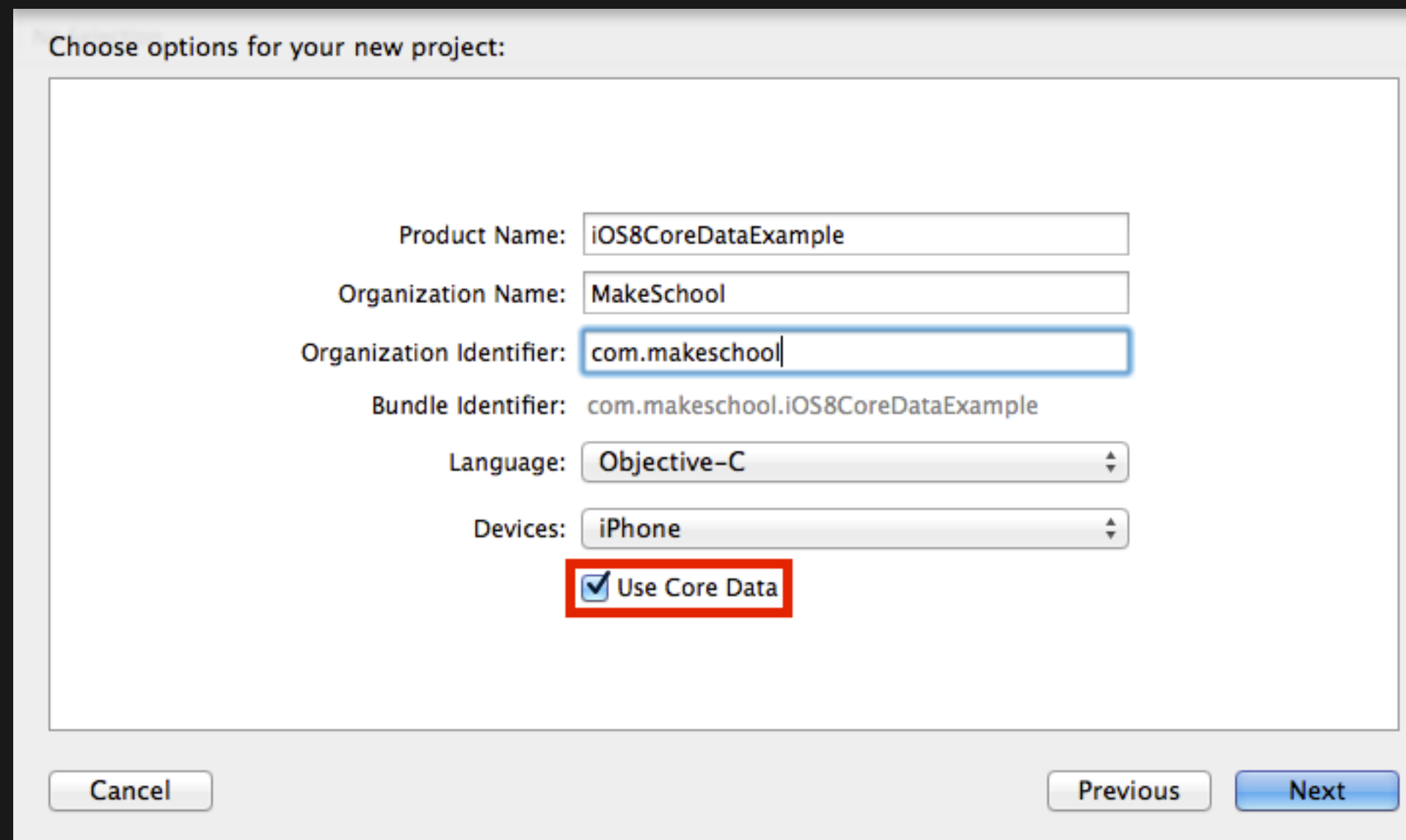
The waypoint is added to the trip

CORE DATA IMPLEMENTATION

ADDING CORE DATA TO A PROJECT

ADDING CORE DATA TO A PROJECT

The Easy Way



Choose options for your new project:

Product Name: iOS8CoreDataExample

Organization Name: MakeSchool

Organization Identifier: com.makeschool

Bundle Identifier: com.makeschool.iOS8CoreDataExample

Language: Objective-C

Devices: iPhone

☒ Use Core Data

Cancel Previous Next

Downside: Clutters your AppDelegate with Core Data code 🥲

ADDING CORE DATA TO A PROJECT

You *can* start a project by including Core Data but we recommend you remove the boilerplate code from the AppDelegate

Instead create dedicated CoreDataStack class

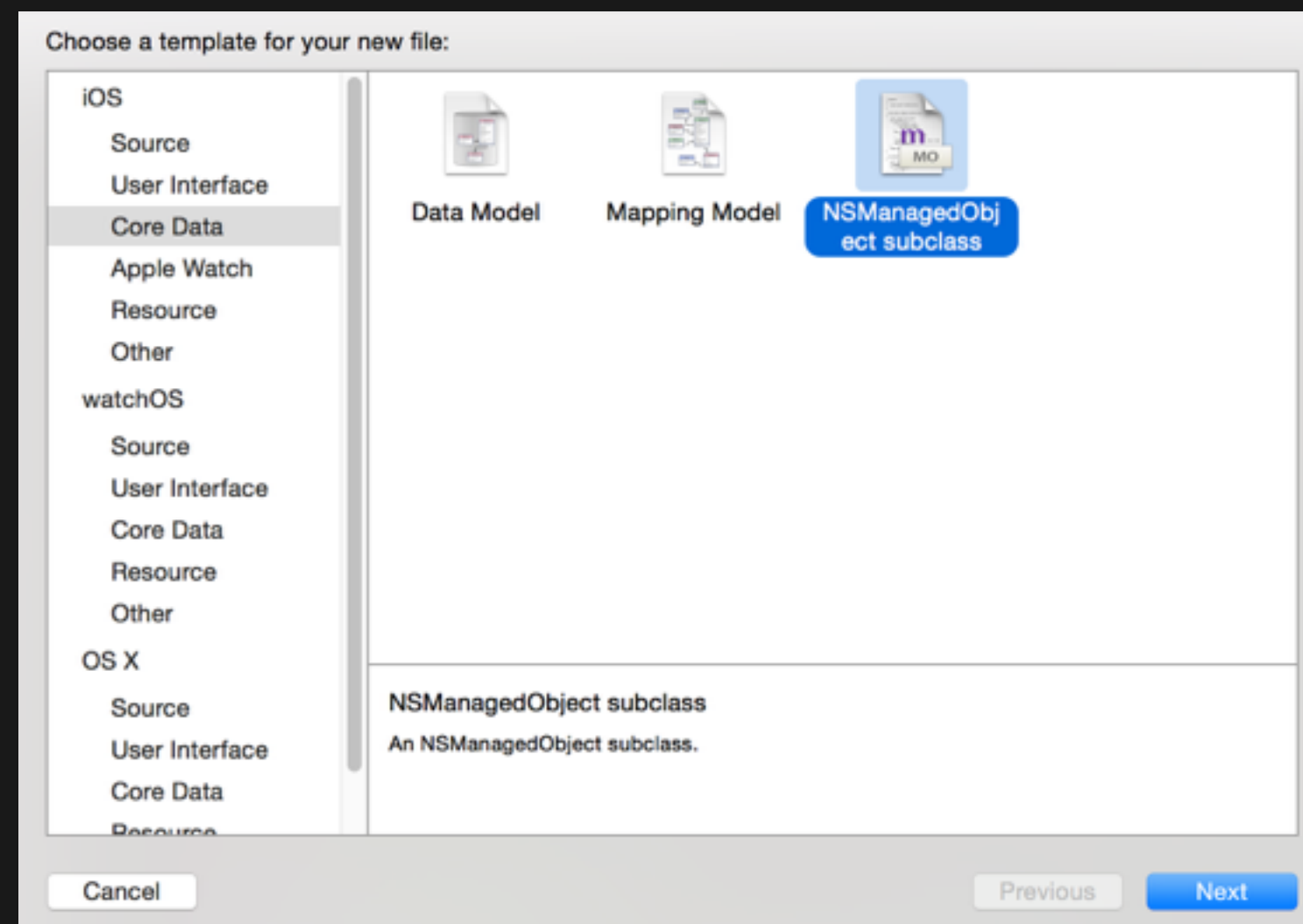
When adding Core Data to *existing* project, read this but add code to dedicated class instead of AppDelegate

CORE DATA IMPLEMENTATION

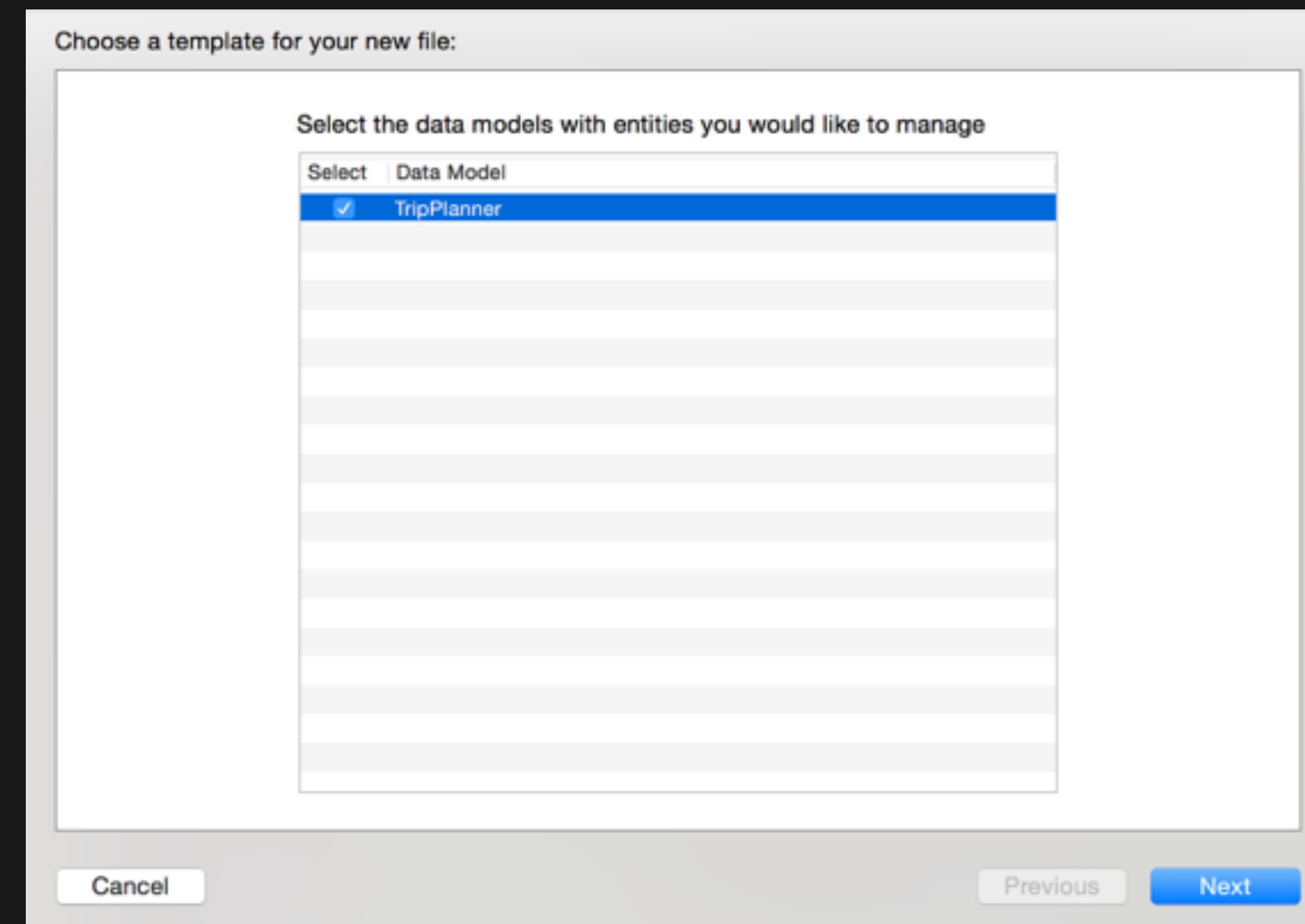
CUSTOM ENTITY CLASSES

CREATING CUSTOM ENTITY CLASSES

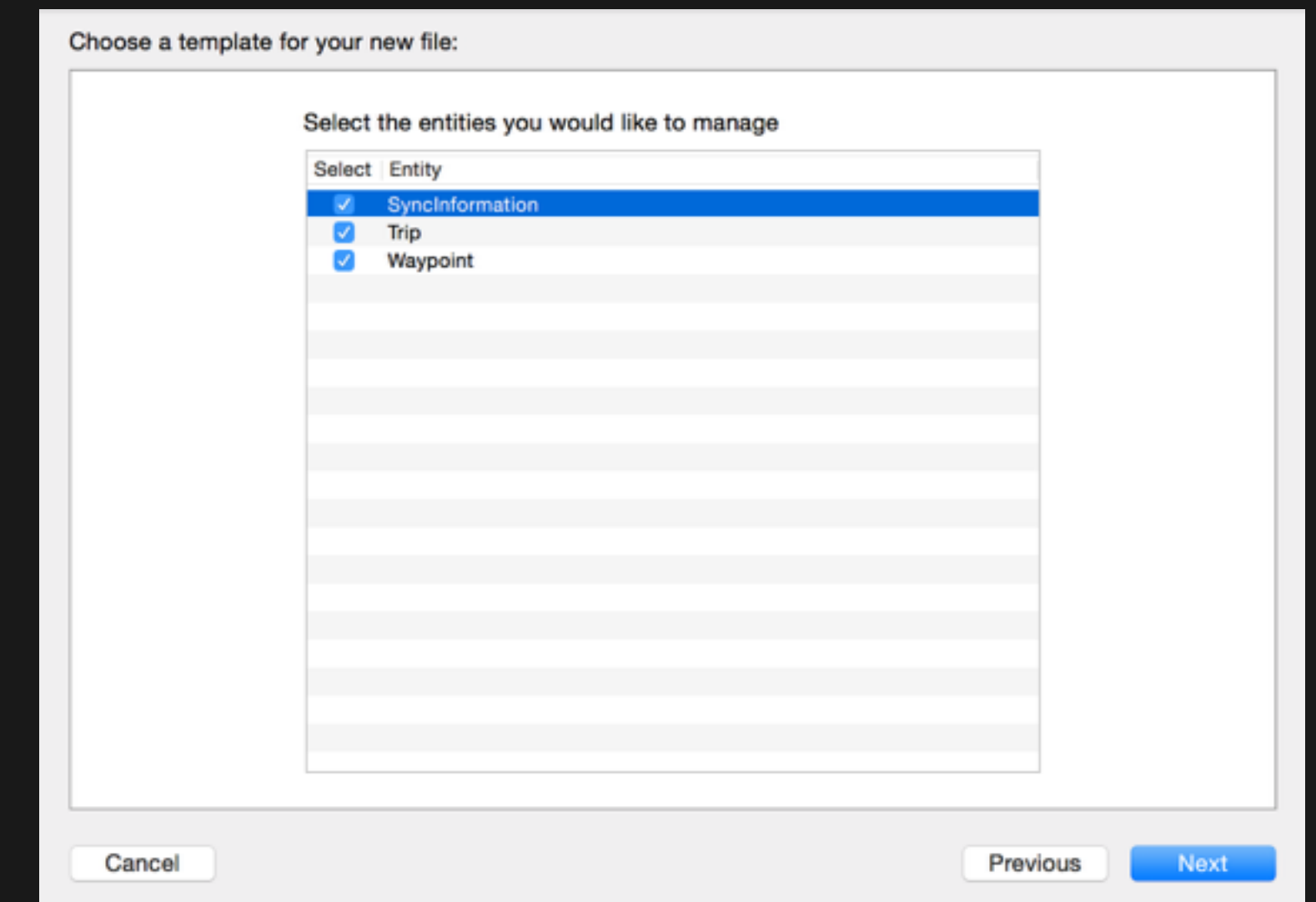
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CREATING CUSTOM ENTITY CLASSES

Generates a blank class that allows you to customize behavior:

```
class Trip: NSManagedObject {  
  
    // Insert code here to add functionality to your managed object subclass  
  
}
```

Generates an extension that provides the Core Data boilerplate code:

```
extension Trip {  
  
    @NSManaged var name: String?  
    @NSManaged var duration: NSNumber?  
    @NSManaged var startDate: NSDate?  
  
}
```

CORE DATA IMPLEMENTATION

CREATING NEW INSTANCES

CREATING NEW INSTANCES

```
// access managed object context
let context = (UIApplication.sharedApplication().delegate as?
AppDelegate)?.managedObjectContext
guard let managedContext = context else { return }

// create new instance using the name of the entity
let trip: Trip = NSEntityDescription.insertNewObjectForEntityForName("Trip",
inManagedObjectContext: managedContext) as! Trip
trip.duration = 20

// attempt to save changes
do {
    try managedContext.save()
} catch let error as NSError {
    print(error.localizedDescription)
}
```



CREATING NEW INSTANCES: IMPROVEMENTS

Provide initializer that hides the entity string within the class:

```
final class Trip: NSManagedObject, TripPlannerManagedObject {  
  
    convenience init(context: NSManagedObjectContext) {  
        let entityDescription = NSEntityDescription.entityForName("Trip", inManagedObjectContext:  
context)!  
        self.init(entity: entityDescription, insertIntoManagedObjectContext: context)  
    }  
    ...  
}
```

Then creating a new instance is much cleaner:

```
let trip = Trip(context: CoreDataClient.context)
```

CREATING NEW INSTANCES: IMPROVEMENTS

Try to encapsulate Core Data stack in a separate class

Try to provide another access mechanism that does not require to retrieve the Core Data Context through the App Delegate

CORE DATA IMPLEMENTATION DELETING INSTANCES

DELETING INSTANCES

```
// access managed object context
let context = (UIApplication.sharedApplication().delegate as?
AppDelegate)?.managedObjectContext
guard let managedContext = context else { return }
// provide entity that should be deleted
context?.deleteObject(trip)

// attempt to save changes
do {
    try managedContext.save()
} catch let error as NSError {
    print(error.localizedDescription)
}
```

QUERIES

FETCH REQUESTS

Fetch Requests are queries that are used to retrieve data from a persistent store

Each Fetch Requests consists of one Entity type that shall be fetched + optional query parameters

NSPredicates are used to build queries

You can create FetchRequestTemplates in code and in the graphical editor

FETCHING INSTANCES

```
// access managed object context
let context = (UIApplication.sharedApplication().delegate as? AppDelegate)?.managedObjectContext
guard let managedContext = context else { return }

// create a new fetch request with the entity description for the entity we are selecting
let fetchRequest = NSFetchRequest(entityName: "Trip")

// OPTIONAL: apply a filter by creating a predicate and adding it to the request
let duration = 10
fetchRequest.predicate = NSPredicate(format: "duration = %@", duration)

// OPTIONAL: create a sort rule and add it to the request
let sortDescriptor = NSSortDescriptor(key: "duration", ascending: true)
fetchRequest.sortDescriptors = [sortDescriptor]

var results: [Trip]?

do {
    results = try managedContext.executeFetchRequest(fetchRequest) as? [Trip]
} catch let error as NSError {
    print(error)
}

// test if result is available
if let results = results {
    print(results)
}
```

SUMMARY

SUMMARY

Core Data provides a highly flexible and powerful solution to model, persist, query and migrate data in your application

Working with Core Data requires good understanding of the fundamental architecture of the framework

ADDITIONAL RESOURCES

ADDITIONAL RESOURCES

[Core Data Programming Guide](#)

[Core Data Programming Guide: Custom Managed Objects](#)

[MartianCraft's Core Data Stack](#)

[Talk: Core Data and Swift](#)