Data Storage

Dr. Sarah Abraham

University of Texas at Austin
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Model Layer of MVC

- Contains the data to be displayed
- Data can be:
  - Stored on device
  - Pulled down from a server
- Data displayed in app should be:
  - Personalized
  - Secure

User Defaults and Plists

- Both provide storage on the device itself
- User Defaults holds persistent key/value pairs
  - Good for small amounts of data
  - Usually related to device user
- Plists provide XML input
  - Good for data that is consistent between users

Core Data

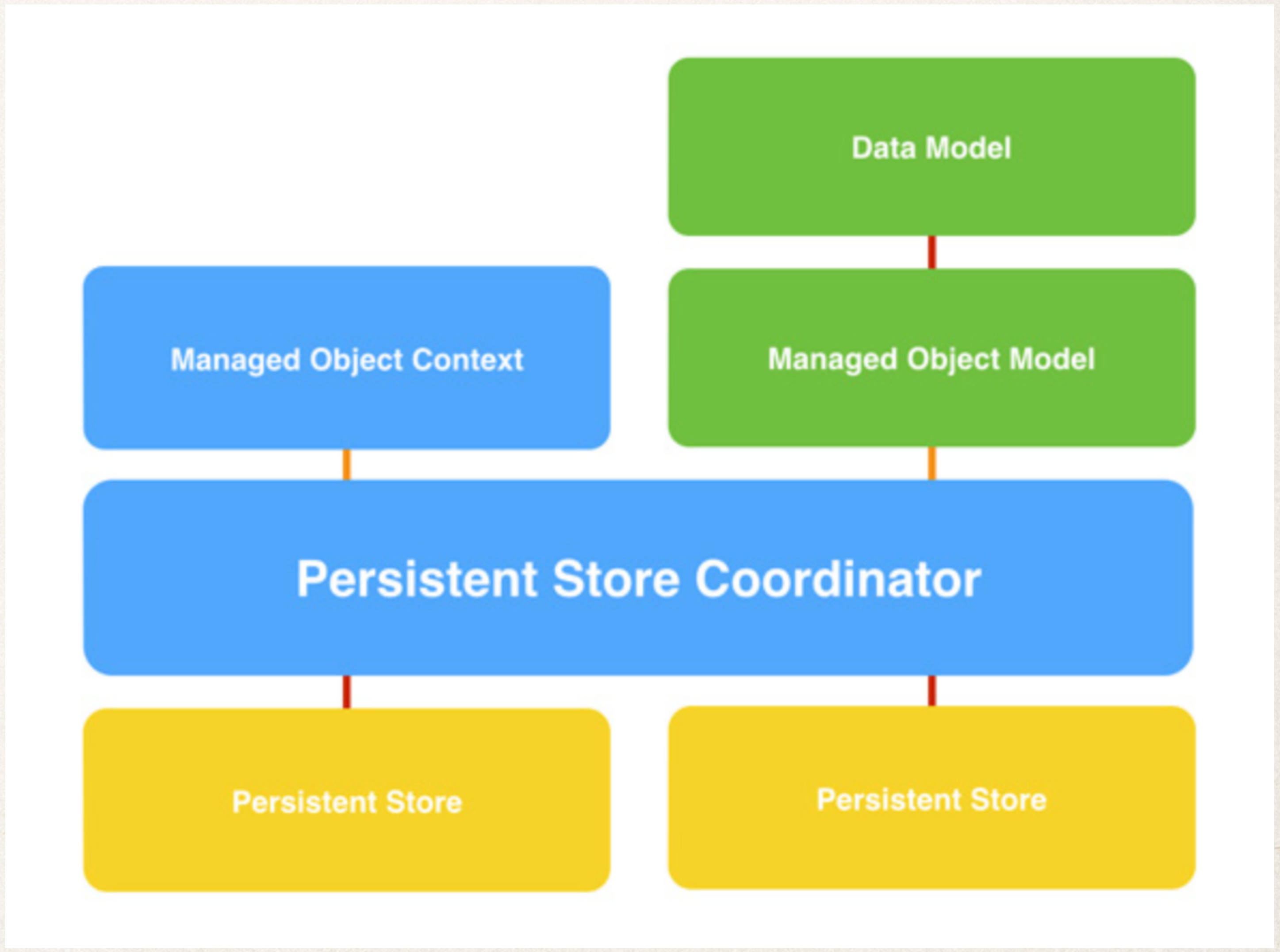
- Framework for modeling data in object-oriented way
- Allows for data persistence on device
- Used for non-trivial storage
- Not a database in of itself
- Can be mapped to a true database management system like SQL/SQLite

Core Data Features

- Models data efficiently
- Manages data object life cycles
- Tracks changes to data
- Supports undo functionality
- Saves data to disk

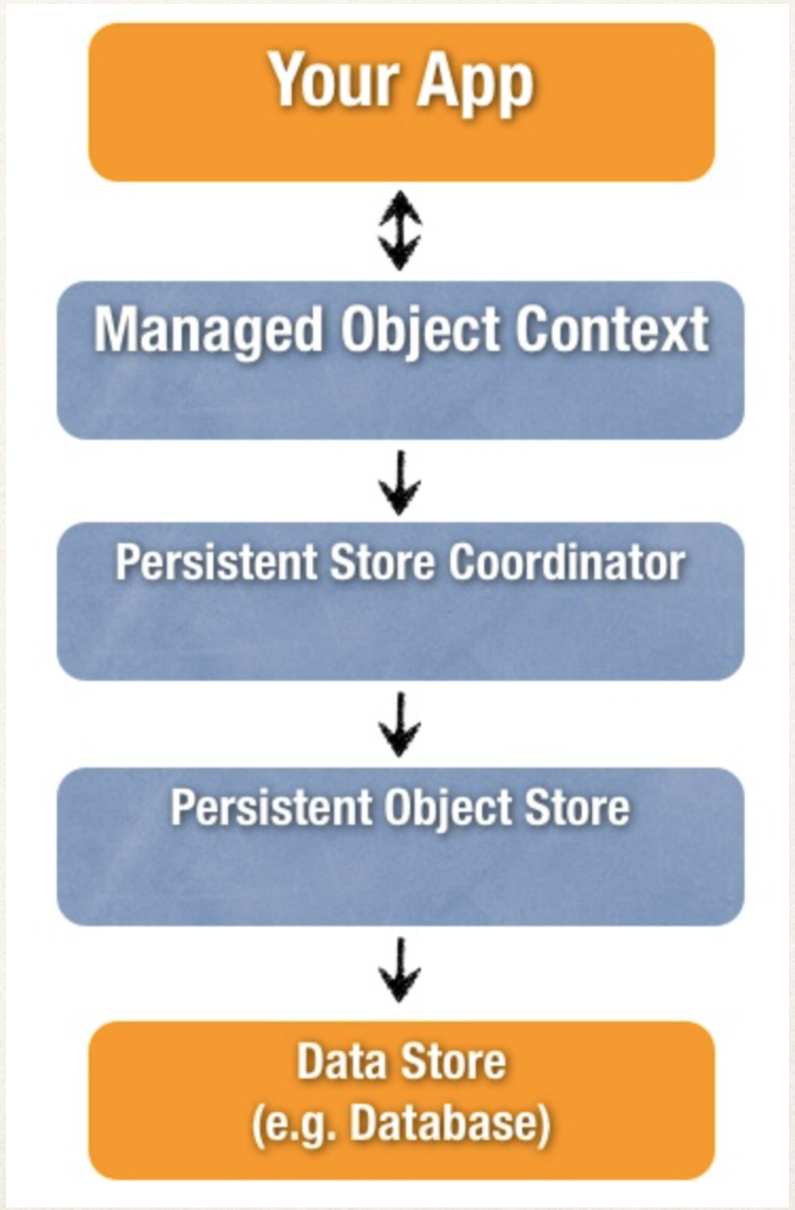
Managed Object Model

- Defines structure of data
  - Data types
  - Relationships
- Xcode provides design tools to build object model



Managed Object Context

- Temporary scratch space in memory
- Objects fetched from persistent store placed in context for manipulation
- Monitors for changes to data
- Can save data back to Persistent Store

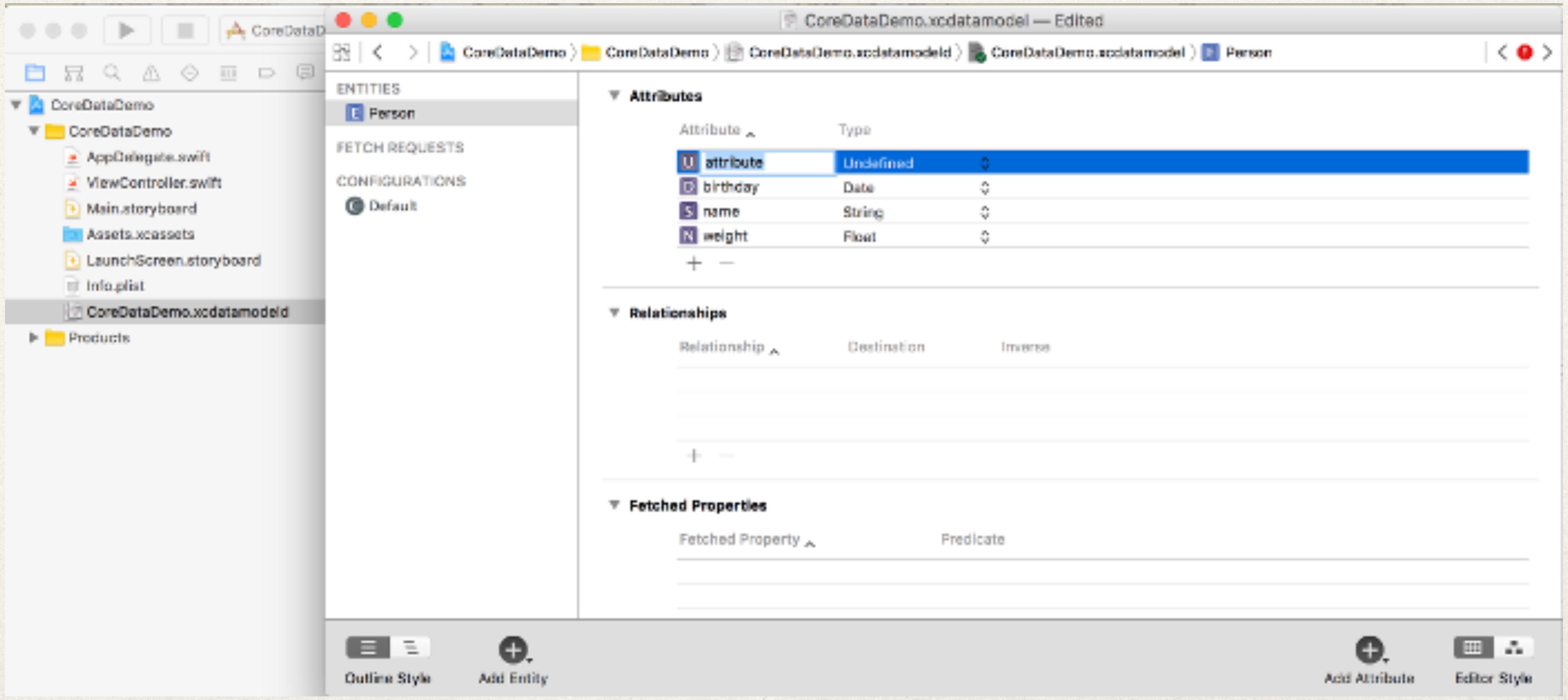


Entities, Attributes and Relationships

- Entities are data model instances in Core Data
    - Table in relational database
    - Example: Employee entity defines a company employee
- Attributes are properties stored in entities
    - A column in a relationship database table
    - Example: Employee entity has attributes name, position, salary
- Relationships are connections between entities
    - One-to-One (Country to Capital; Capital to Country)
    - One-to-Many (Manager to Employee)
    - Many-to-One (Employee to Manager)

Using Core Data

- Select "Use Core Data" as option for new project
- `.xcdatamodeld` file defines entities, attributes and relationships



Attribute	Type
attribute	Undefined
birthday	Date
name	String
weight	Float

Displaying Core Data

- Create variable to hold instances of managed objects:
  - `var managedObjects = [NSManagedObjects]()`
- Allows other objects in program to access and display managed objects

Writing to Core Data

```
func addPerson(name: String, occupation: String, age: Int) {
    let appDelegate = UIApplication.shared.delegate as! AppDelegate
    let managedContext = appDelegate.managedObjectContext
    let entity = NSEntityDescription.entity(forEntityName: ”Person", in:
    managedContext)

    let person = NSManagedObject(entity: entity!, insertInto: managedContext)

    person.setValue(name, forKey: "name")
    person.setValue(age, forKey: "age")
    person.setValue(occupation, forKey: "occupation")

    do {
        try managedContext.save()
    } catch {
        let nserror = error as NSError
        NSLog("Unable to save \(nserror), \(nserror.userInfo)")
        abort()
    }

    people.append(person) //people contains NSManagedObjects
}
```

KVC

- Key Value Coding
- Ability to read and set a property using its name
- NSObject contains default methods:
    - `setValue(AnyObject?, forKey: String)`
    - `value(forKey: String)`
- Any class derived from NSObject can use KVC
- Managed Objects must be accessed with key-value coding

Reading from Core Data

```
        let appDelegate = UIApplication.shared.delegate as! AppDelegate
        let managedContext = appDelegate.managedObjectContext
        let fetchRequest =
NSFetchRequest<NSFetchRequestResult>(entityName:"Person")
        var fetchedResults:[NSManagedObject]? = nil

        do {
            try fetchedResults = managedContext.fetch(fetchRequest) as?
[NSManagedObject]
        } catch {
            let nserror = error as NSError
            NSLog("Unable to fetch \(nserror), \(nserror.userInfo)")
            abort()
        }

        if let results = fetchedResults {
            people = results
        }
```

Core Data Demo

Quiz Question!

- What part of the Core Data system saves data back to persistent storage?

   A. Managed Object Model

   B. Managed Object Context

   C. Key-value Coding