Effective Core Data with Swift

try! Swift NYC 2018

Tom Harrington, tph@atomicbird.com

@atomicbird on a social network near you

Core Data vs. Swift: Fight!

What we'll cover

- Core Data vs. Swift
- What Xcode can and can't do for you
- Core Data WTFs when using Swift
- Better Core Data with Swift

Not an intro to Core Data

Core Data vs. Swift

Timeline (abridged):

- 2005: Core Data for Mac OS X 10.4
- 2009: Core Data for iOS 3.0
- 2014: Swift 1.0
- 2018: Swift 4.2

Core Data still shows Objective-C roots.

How does this show up?

Data model

- Can only store model **objects**
- Model objects must inherit from `NSManagedObject`

How does this show up?

Properties

How does this show up?

Properties

- Core Data properties must be representable in Objective-C.

How does this show up?

Properties

- Core Data properties must be representable in Objective-C.
- No pure Swift types (no **`struct`**, **`enum`**)

How does this show up?

Properties

- Core Data properties must be representable in Objective-C.
- No pure Swift types (no `struct`, `enum`)
- Objects must inherit from `NSObject`.

How does this show up?

Properties

- Core Data properties must be representable in Objective-C.
- No pure Swift types (no **`struct`**, **`enum`**)
- Objects must inherit from **`NSObject`**.
- Optionals can be tricky

How does this show up?

Properties

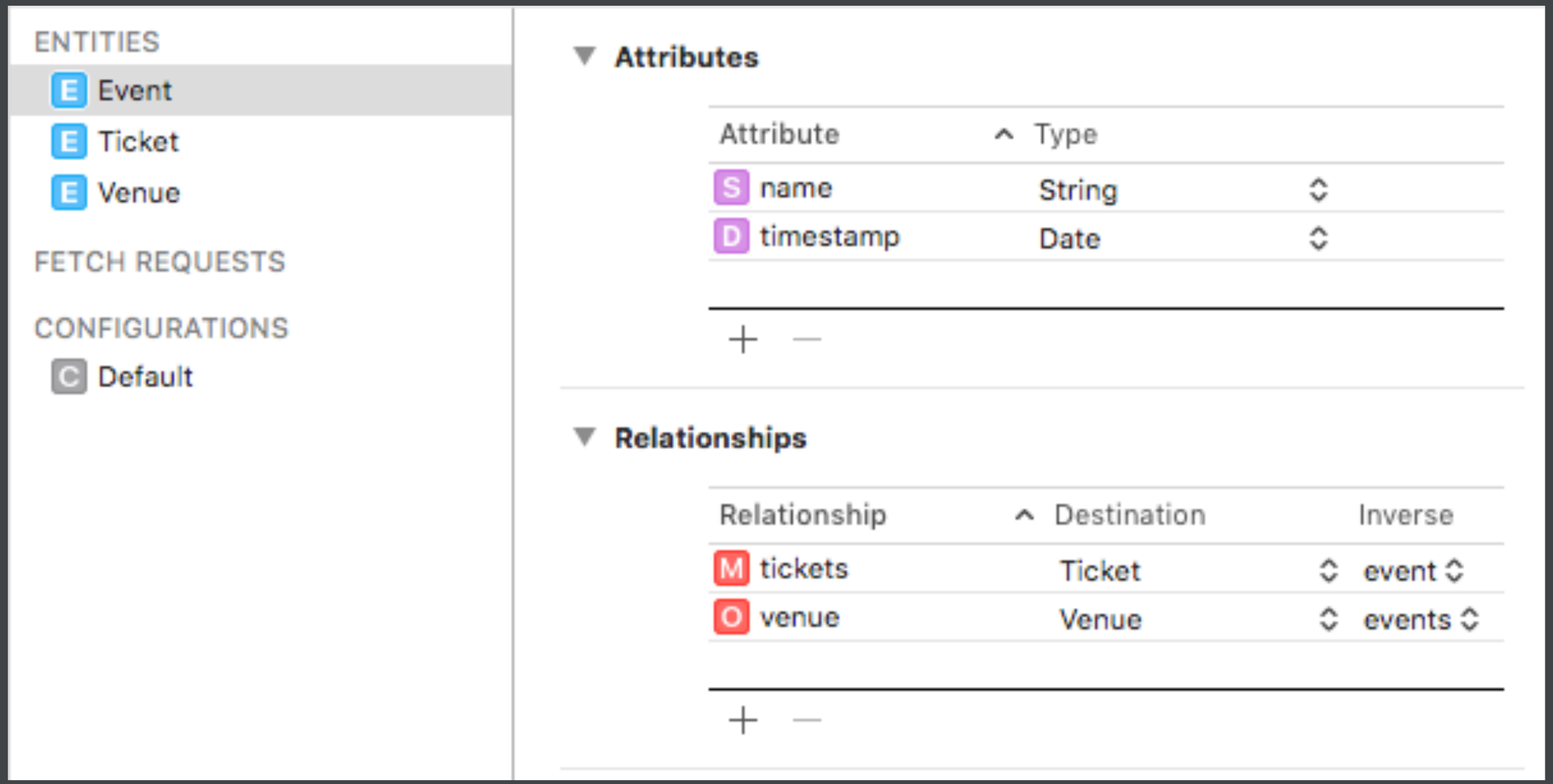
- Core Data properties must be representable in Objective-C.
- No pure Swift types (no **`struct`**, **`enum`**)
- Objects must inherit from **`NSObject`**.
- Optionals can be tricky
- Support for **`NSCoding`** but not **`Codable`**

How does this show up?

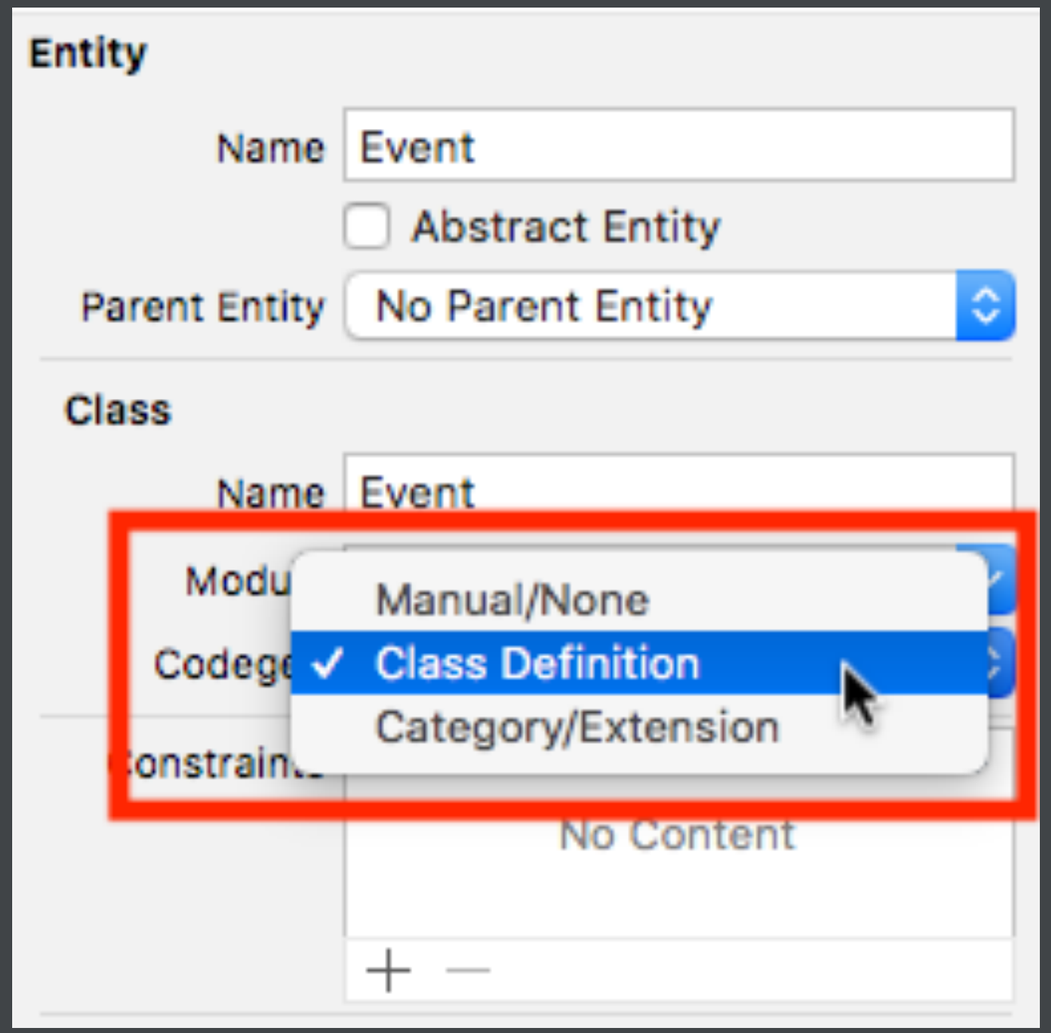
Relationships

- To-many relationships are untyped `NSSet`s
- Need weird add/remove methods to modify to-many relationships

Xcode, Swift, and Core Data



Xcode code generation



Generated code

```
extension Event {

    @nonobjc public class func fetchRequest() -> NSFetchRequest<Event> {
        return NSFetchRequest<Event>(entityName: "Event")
    }

    @NSManaged public var name: String?
    @NSManaged public var timestamp: Date?
    @NSManaged public var tickets: NSSet?
    @NSManaged public var venue: Venue?

}
```

With Xcode's generated code...

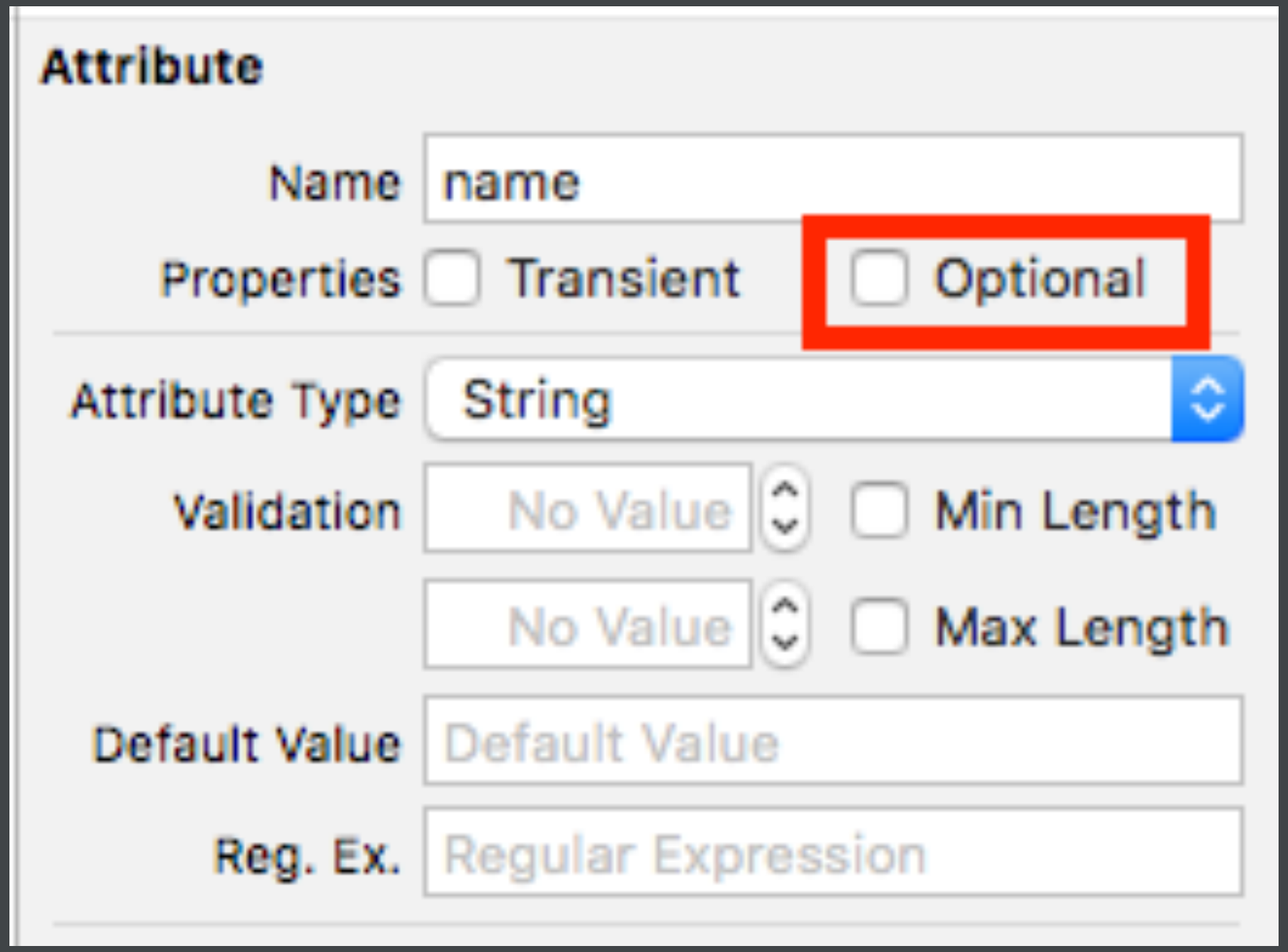
- Add more extensions to add custom code
- You need to **`NSSet`** <--> **`Set<Ticket>`** a lot
- Scalar types can't be optional
- Can't easily inspect code

Core Data WTFs: Optionals #1

Swift has optionals!

Core Data has optionals!

But remember the timeline...




```
@NSManaged public var name: String?
```

Core Data WTFs: Optionals #1

(Non-optionals, really)

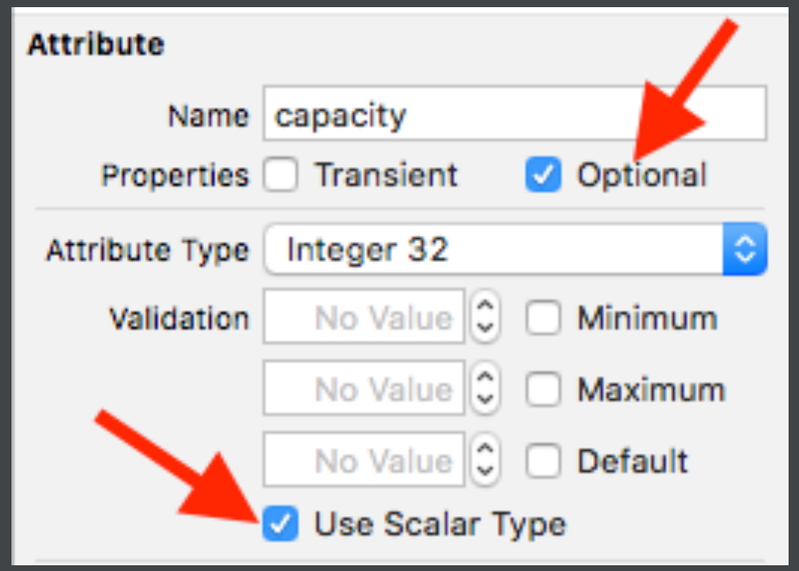
- Core Data: Must not be nil **when you save changes**
- Swift: Must not be nil **at any time**

So...

- Xcode generates Swift properties as optionals

Core Data WTFs: Optionals #2

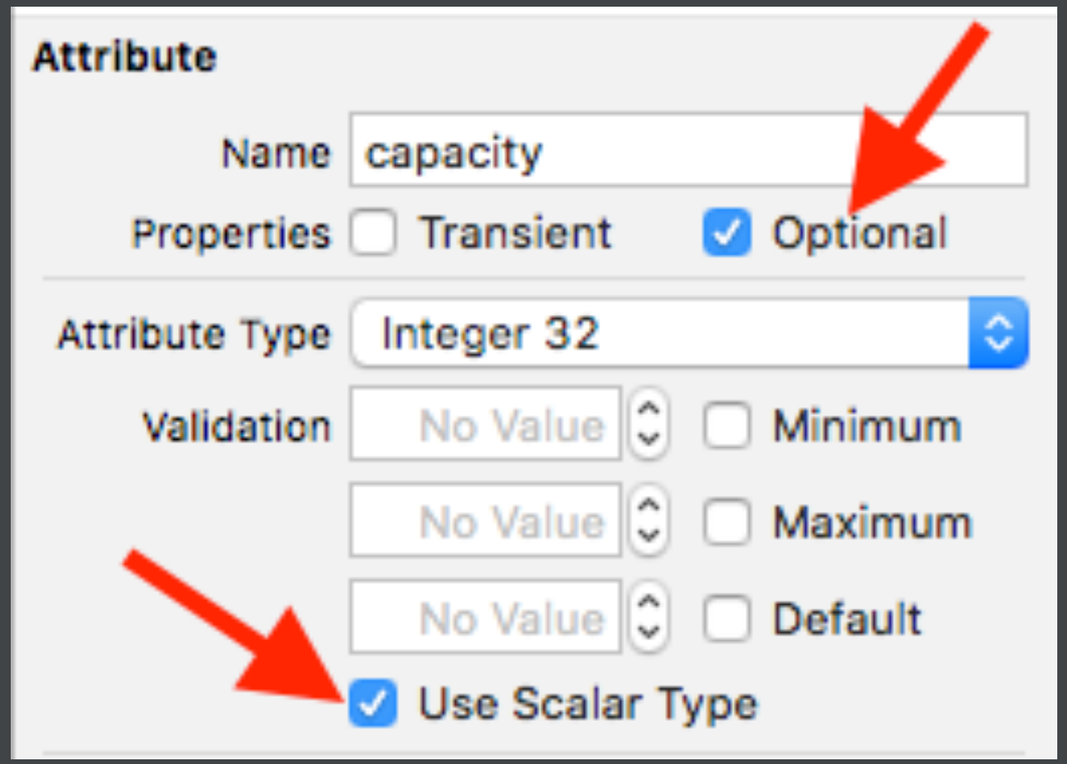
But wait, there's more!




```
@NSManaged public var capacity: Int32
```

Core Data WTFs: Optionals #2

- *Core Data properties must be representable in Objective-C.*
- Objective-C doesn't have optional scalars.
- **These properties have default values** even if you don't configure a default.
  - `0` for numeric types
  - `false` for boolean



Can we do better?

(spoiler warning)

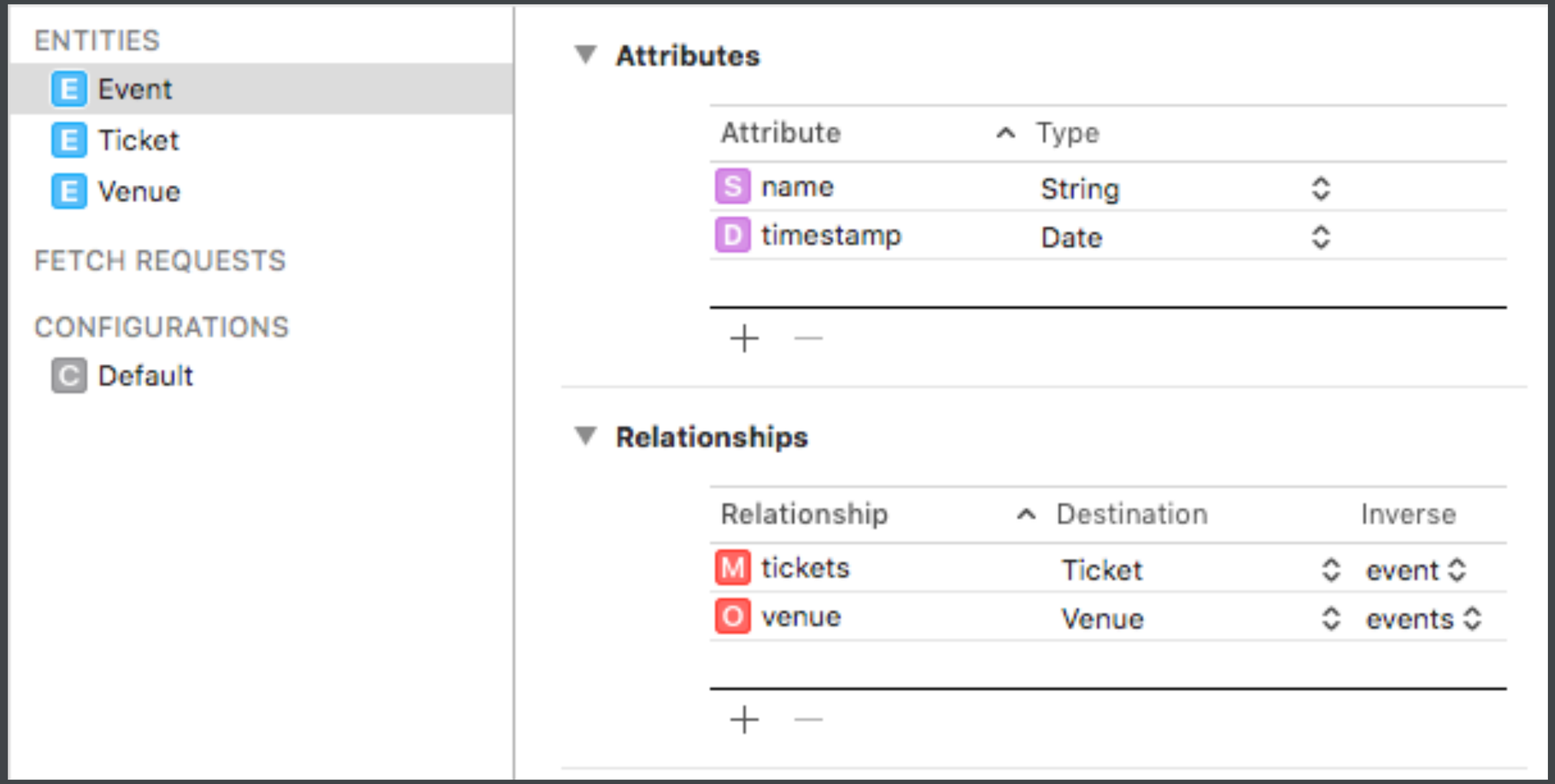
Yes we can.

But first a little background...

`NSManagedObject.self`

- You start by creating **Entities**
- **`NSManagedObject`** instances represent an entity
- Properties are declared by the entity, not **`NSManagedObject`**

NSManagedObject.self



NSManagedObject.self

Subclassing is *recommended* but not required.

```
let myEvent: NSManagedObject =
    NSEntityDescription.insertNewObject(forEntityName:"Event",
        into: context)

myEvent.setValue("try! Swift", forKey: "name")

let name = myEvent.value(forKey: "name") as? String
```

NSManagedObject.self

Subclassing is *recommended* but not required.

```
let myEvent: NSManagedObject =
    NSEntityDescription.insertNewObject(forEntityName:"Event",
        into: context)

myEvent.setValue("try! Swift", forKey: "name")

let name = myEvent.value(forKey: "name") as? String
```

NSManagedObject.self

Subclassing is *recommended* but not required.

```
let myEvent: NSManagedObject =
    NSEntityDescription.insertNewObject(forEntityName:"Event",
        into: context)

myEvent.setValue("try! Swift", forKey: "name")

let name = myEvent.value(forKey: "name") as? String
```

NSManagedObject.self

Subclassing is *recommended* but not required.

```
let myEvent: NSManagedObject =
    NSEntityDescription.insertNewObject(forEntityName:"Event",
        into: context)

myEvent.setValue("try! Swift", forKey: "name")

let name = myEvent.value(forKey: "name") as? String
```

NSManagedObject.self

Subclassing with Xcode

```
extension Event {
    @NSManaged public var capacity: Int32
    @NSManaged public var name: String?
    @NSManaged public var timestamp: Date?
    @NSManaged public var tickets: NSSet?
    @NSManaged public var venue: Venue?
}
```

NSManagedObject.self

Subclassing with Xcode

```
extension Event {
    @NSManaged public var capacity: Int32
    @NSManaged public var name: String?
    @NSManaged public var timestamp: Date?
    @NSManaged public var tickets: NSSet?
    @NSManaged public var venue: Venue?
}
```

NSManagedObject.self

Subclassing with Xcode

```
extension Event {
    @NSManaged public var capacity: Int32
    @NSManaged public var name: String?
    @NSManaged public var timestamp: Date?
    @NSManaged public var tickets: NSSet?
    @NSManaged public var venue: Venue?
}
```

```
@NSManaged public var name: String?
```

```
@NSManaged public var name: String?
```

- **@NSManaged** is not a stored property

```
@NSManaged public var name: String?
```

- **`@NSManaged`** is not a stored property
- Computed property? But no **`set`**, **`get`**?

```
@NSManaged public var name: String?
```

- **`@NSManaged`** is not a stored property
- Computed property? But no **`set`**, **`get`**?
- **`NSManagedObject`** dynamically creates the accessors

```
@NSManaged public var name: String?
```

- **`@NSManaged`** is not a stored property
- Computed property? But no **`set`**, **`get`**?
- **`NSManagedObject`** dynamically creates the accessors
- **`@NSManaged`** declaration must match the entity

🤯 @NSManaged is not required

```
@NSManaged public var name: String?

public var name: String? {
    set {
        willChangeValue(forKey: "name")
        defer { didChangeValue(forKey: "name") }
        setPrimitiveValue(newValue, forKey: "name")
    }
    get {
        willAccessValue(forKey: "name")
        defer { didAccessValue(forKey: "name") }
        return primitiveValue(forKey: "name") as? String
    }
}
```

🤯 @NSManaged is not required

```
@NSManaged public var name: String?

public var name: String? {
    set {
        willChangeValue(forKey: "name")
        defer { didChangeValue(forKey: "name") }
        setPrimitiveValue(newValue, forKey: "name")
    }
    get {
        willAccessValue(forKey: "name")
        defer { didAccessValue(forKey: "name") }
        return primitiveValue(forKey: "name") as? String
    }
}
```

`NSManagedObject.self`

- *Core Data properties must be representable in Objective-C.*

Except...

- This applies to the *entity*, not necessarily to the class.
- Custom accessors can convert to/from Swift types.

```
enum EventType: Int {
    case conference
    case party
    case meeting
    case concert
}

@NSManaged public var eventType: EventType?

@NSManaged public var eventType: Int16
```

```
enum EventType: Int {
    case conference
    case party
    case meeting
    case concert
}

@NSManaged public var eventType: EventType?

@NSManaged public var eventType: Int16
```

```
enum EventType: Int {
    case conference
    case party
    case meeting
    case concert
}

@NSManaged public var eventType: EventType?

@NSManaged public var eventType: Int16
```

However...

```
public var eventType: EventType? {
    set {
        willChangeValue(forKey: "eventType")
        defer { didChangeValue(forKey: "eventType") }
        setPrimitiveValue(newValue?.rawValue, forKey: "eventType")
    }
    get {
        willAccessValue(forKey: "eventType")
        defer { didAccessValue(forKey: "eventType") }
        guard let rawValue = primitiveValue(forKey: "eventType") as? Int else {
            return nil
        }
        return EventType(rawValue: rawValue)
    }
}
```

However...

```
public var eventType: EventType? {
    set {
        willChangeValue(forKey: "eventType")
        defer { didChangeValue(forKey: "eventType") }
        setPrimitiveValue(newValue?.rawValue, forKey: "eventType")
    }
    get {
        willAccessValue(forKey: "eventType")
        defer { didAccessValue(forKey: "eventType") }
        guard let rawValue = primitiveValue(forKey: "eventType") as? Int else {
            return nil
        }
        return EventType(rawValue: rawValue)
    }
}
```

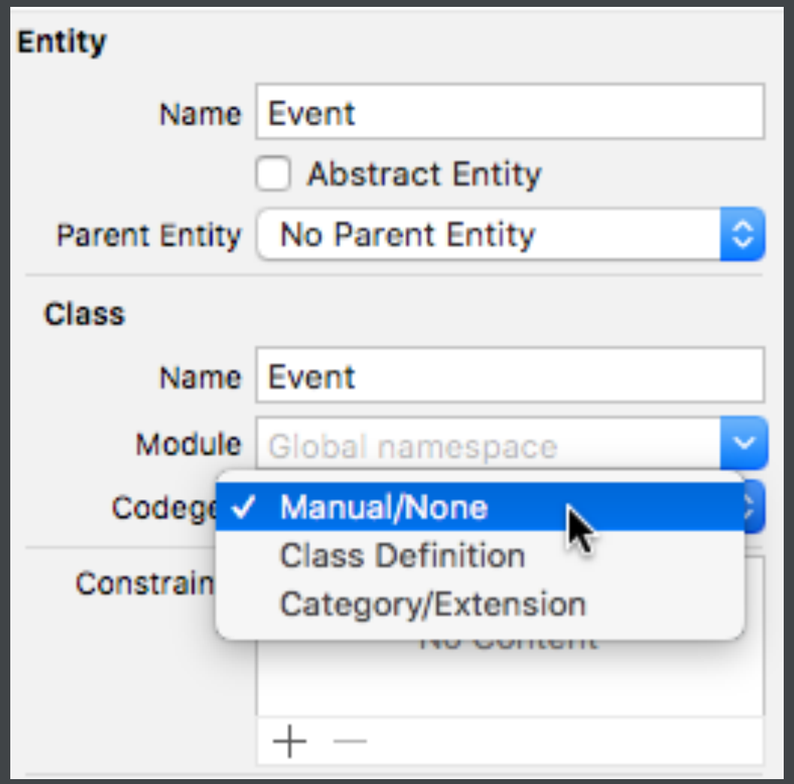
However...

```
public var eventType: EventType? {
    set {
        willChangeValue(forKey: "eventType")
        defer { didChangeValue(forKey: "eventType") }
        setPrimitiveValue(newValue?.rawValue, forKey: "eventType")
    }
    get {
        willAccessValue(forKey: "eventType")
        defer { didAccessValue(forKey: "eventType") }
        guard let rawValue = primitiveValue(forKey: "eventType") as? Int else {
            return nil
        }
        return EventType(rawValue: rawValue)
    }
}
```

Xcode will fight you on this

- Generated code lives in **`DerivedData`**
- Will be re-generated and overwritten
- Can't add it to your code repo
- So turn off Xcode code generation?

But then what?



Generate code without Xcode

mogenerator generates Objective-C code for your Core Data custom classes

Unlike Xcode, mogenerator manages *two* classes per entity: one for **machines**, one for **humans**

The machine class can always be overwritten to match the data model, with humans' work effortlessly preserved

Download mogenerator 1.31

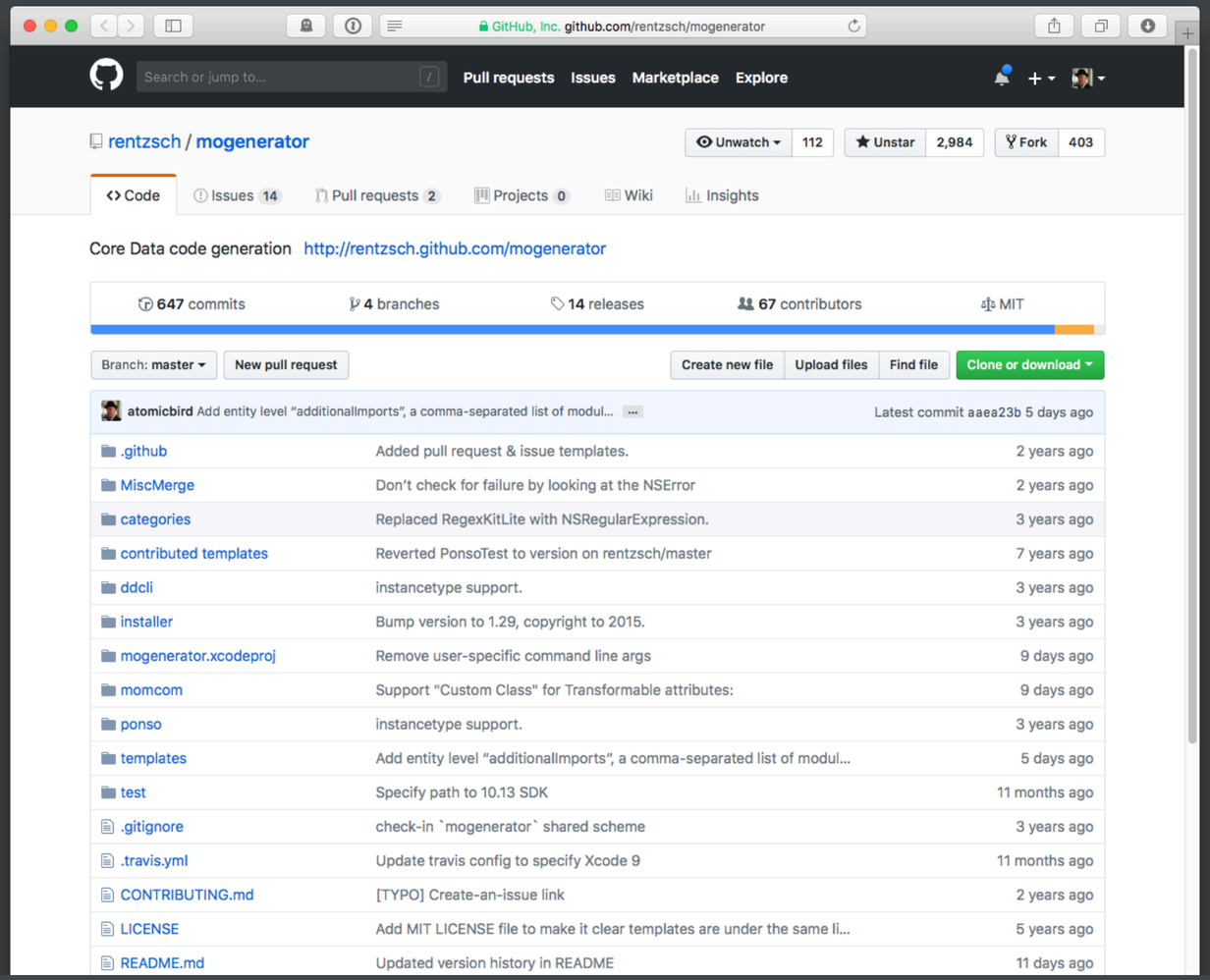
or install via homebrew:

```
$ brew install mogenerator
```

upgrading using homebrew:

```
$ brew update && brew upgrade mogenerator
```

Managed Object Generator



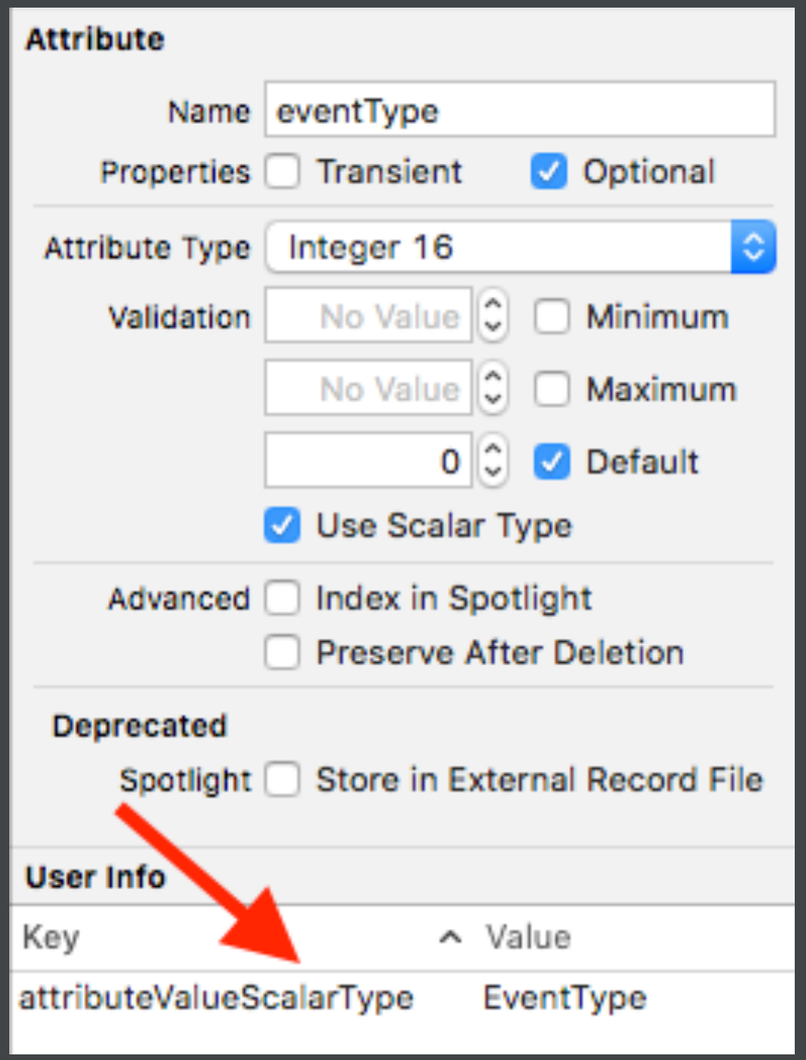
Timeline (abridged) (revised):

- 2005: Core Data for Mac OS X 10.4
- **2006: mogenerator**
- 2009: Core Data for iOS 3.0
- 2014: Swift 1.0
- 2018: Swift 4.2

`mogenerator`

- Command line tool
- Reads data model
- Generates **`NSManagedObject`** subclasses using templates
- Better Swift

Note: The following slides refer to ***`mogenerator swift42`*** *branch. Release coming very soon.*



mogenerator

SWIFT TYPED RELATIONSHIPS 😁

```
@NSManaged public var tickets: NSSet?
@NSManaged public var tickets: Set<Ticket>?
```

mogenerator

SWIFT TYPED RELATIONSHIPS 😁

```
@NSManaged public var tickets: NSSet?
@NSManaged public var tickets: Set<Ticket>?
```

Optional scalars: They just work

```
public var capacity: Int32? {
    get {
        let key = Event.Attributes.capacity
        willAccessValue(forKey: key)
        defer { didAccessValue(forKey: key) }

        return primitiveValue(forKey: key) as? Int32
    }
    set {
        let key = Event.Attributes.capacity
        willChangeValue(forKey: key)
        defer { didChangeValue(forKey: key) }

        guard let value = newValue else {
            setPrimitiveValue(nil, forKey: key)
            return
        }
        setPrimitiveValue(value, forKey: key)
    }
}
```

Optional scalars: They just work

```
public var capacity: Int32? {
    get {
        let key = Event.Attributes.capacity
        willAccessValue(forKey: key)
        defer { didAccessValue(forKey: key) }

        return primitiveValue(forKey: key) as? Int32
    }
    set {
        let key = Event.Attributes.capacity
        willChangeValue(forKey: key)
        defer { didChangeValue(forKey: key) }

        guard let value = newValue else {
            setPrimitiveValue(nil, forKey: key)
            return
        }
        setPrimitiveValue(value, forKey: key)
    }
}
```

Optional scalars: They just work

```
public var capacity: Int32? {
    get {
        let key = Event.Attributes.capacity
        willAccessValue(forKey: key)
        defer { didAccessValue(forKey: key) }

        return primitiveValue(forKey: key) as? Int32
    }
    set {
        let key = Event.Attributes.capacity
        willChangeValue(forKey: key)
        defer { didChangeValue(forKey: key) }

        guard let value = newValue else {
            setPrimitiveValue(nil, forKey: key)
            return
        }
        setPrimitiveValue(value, forKey: key)
    }
}
```

mogenerator

Avoid stringly typing:

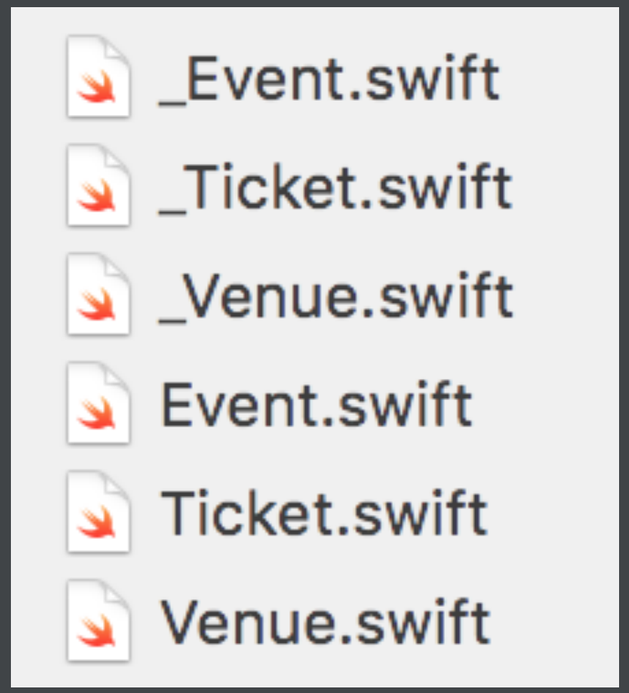
```
public struct Attributes {
    static let capacity = "capacity"
    static let eventType = "eventType"
    static let name = "name"
    static let timestamp = "timestamp"
}

public struct Relationships {
    static let tickets = "tickets"
    static let venue = "venue"
}
```

mogenerator

Simplest case:

```
$ mogenerator --model Model.xcdatamodeld/ --swift
3 machine files and 3 human files generated.
```



mogenerator

Two files per entity:

- **`_EntityName.swift`**: All generated code.

```
public extension Event {
    ...
}
```

- **`EntityName.swift`**: Put your code here

```
objc(Event)
open class Event: NSManagedObject {
    ...
}
```

Event.swift

```swift
import Foundation
import CoreData

@objc(Event)
open class Event: NSManagedObject {

    // Custom code for Event goes here.

}
```

_Event.swift

```swift
// DO NOT EDIT. This file is machine-generated and constantly overwritten.
// Make changes to Event.swift instead.

import CoreData

public extension Event {

    @objc public class var entityName: String {
        return "Event"
    }

    @objc public class func entity(managedObjectContext: NSManagedObjectContext) -> NSEntityDescription? {
        return NSEntityDescription.entity(forEntityName: entityName, in: managedObjectContext)
    }

    // Attribute names for Event
    public struct Attributes {
        static let capacity = "capacity"
        static let eventType = "eventType"
        static let eventTypeString = "eventTypeString"
        static let name = "name"
        static let organizer = "organizer"
        static let timestamp = "timestamp"
    }

    ....
```

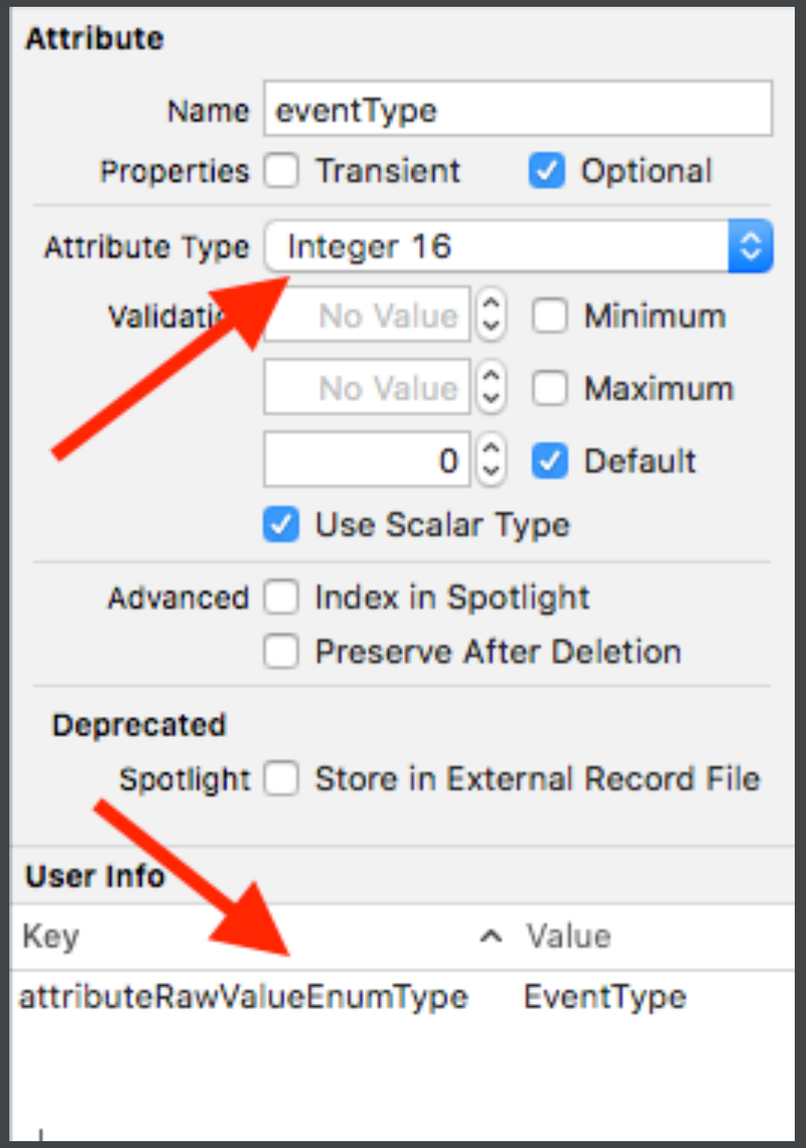
mogenerator

Enumerations with raw values

```
enum EventType: Int {
    case conference
    case party
    case meeting
    case concert
}
```

Generated declaration:

```
public var eventType: EventType?
```



```
public var eventType: EventType? {
    get {
        let key = Event.Attributes.eventType
        willAccessValue(forKey: key)
        defer { didAccessValue(forKey: key) }

        guard let primitiveValue = primitiveValue(forKey: key) as? EventType.RawValue
            else { return nil }
        return EventType(rawValue: primitiveValue)
    }
    set {
        let key = Event.Attributes.eventType
        willChangeValue(forKey: key)
        defer { didChangeValue(forKey: key) }

        guard let value = newValue else {
            setPrimitiveValue(nil, forKey: key)
            return
        }
        setPrimitiveValue(value.rawValue, forKey: key)
    }
}
```

mogenerator

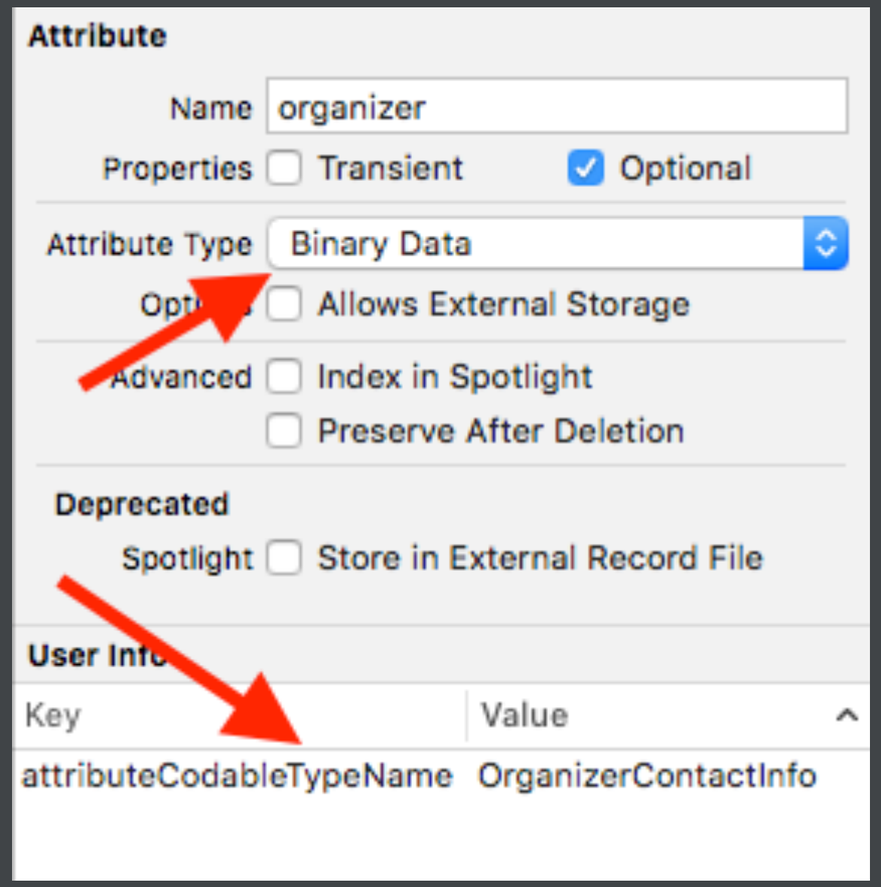
Support for **Codable** properties.

```
public struct OrganizerContactInfo: Codable {
    let name: String
    let email: String
    let twitter: String
}
```

Generated declaration:

```
public var organizer: OrganizerContactInfo?
```

- Uses **JSONEncoder/JSONDecoder** internally.



Coming soon: `Codable` managed objects

```
public class Event: NSManagedObject: Codable {
    required convenience public init(from decoder: Decoder) throws {
        guard let context = decoder.userInfo[.context] as? NSManagedObjectContext else {
            throw [...]
        }
        ...
    }

    ...
}
```

Coming soon: `Codable` managed objects

```
public class Event: NSManagedObject: Codable {
    required convenience public init(from decoder: Decoder) throws {
        guard let context = decoder.userInfo[.context] as? NSManagedObjectContext else {
            throw [...]
        }
        ...
    }

    ...
}
```

Coming soon: `Codable` managed objects

```
public class Event: NSManagedObject: Codable {
    required convenience public init(from decoder: Decoder) throws {
        guard let context = decoder.userInfo[.context] as? NSManagedObjectContext else {
            throw [...]
        }
        ...
    }

    ...
}
```

mogenerator

Other options:

```
--output-dir
--base-class-import TEXT
--machine-dir
--human-dir
```

github.com/rentzsch/mogenerator/

- `swift42` branch merging soon

rentzsch / mogenerator

Unwatch 112 | Unstar 2,984 | Fork 403

Core Data code generation http://rentzsch.github.com/mogenerator

4 releases | 67 contributors | MIT

Branch: master | New pull request | Create new file | Upload files | Find file | Clone or download

atomicbird Add entity level "additionalImports", a comma-separated list of modul... | Latest commit aaea23b 5 days ago

.github	Added pull request & issue templates.	2 years ago
MiscMerge	Don't check for failure by looking at the NSError	2 years ago
categories	Replaced RegexKitLite with NSRegularExpression.	3 years ago
contributed templates	Reverted PonsoTest to version on rentzsch/master	7 years ago
ddcli	instancetype support.	3 years ago
installer	Bump version to 1.29, copyright to 2015.	3 years ago
mogenerator.xcodeproj	Remove user-specific command line args	9 days ago
momcom	Support "Custom Class" for Transformable attributes:	9 days ago
ponso	instancetype support.	3 years ago
templates	Add entity level "additionalImports", a comma-separated list of modul...	5 days ago
test	Specify path to 10.13 SDK	11 months ago
.gitignore	check-in `mogenerator` shared scheme	3 years ago

Other Core Data questions?

See me after class

Office hours, Noon - 12.25

Effective Core Data with Swift

Tom Harrington

@atomicbird