A Swift Journey

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Hi, I'm Luke 👋

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I'm the Head of Mobile 3Squared

- Software for Rail and Construction industries
- Based in Sheffield
- Build Web apps
  - C# .NET
- Build native iOS and Android apps
  - Swift, Objective-C & Java
- I lead team of 7 mobile developers

Our "Swift" Journey

for 2 reasons...

1. We moved from Objective-C to Swift

2. We did it Quickly

Our 2016 Goals

1. Train the mobile team in Swift
2. Move from Obj-C to Swift for new projects
3. Develop reusable Swift code
4. Modernise & standardise our tools and practises

1. Training

Looking for Training

We needed training materials that could be used for:

- New / Inexperiences developers - placement students
- Experienced non-iOS developers - Android developers
- Experienced iOS developers

Styles of Learning

- Follow guided tutorials
- Build a simple project in Swift
  - Request data from GitHub API
  - Parse & persist
  - Display on screen
- Build a wrapper and other reusable code

Just Do It!

Learn whilst Building Something Real

Learning & Discussion as a Team was Crucial

2. New Projects in Swift

First Project

100% Swift from the Start!

First Project

- Chose a small / medium complexity project
- Evaluated Swift's readiness for production
- Discussed code design and style as a team
- Identified gaps in our knowledge & our tools

Results

- Project delivered on time
- No major problems - Swift is production ready
- Beginnings of an agreed code style
- Built helpers for using Core Data & Storyboards

The Next Projects

Following Code Style, using Helpers

Next Projets

- 2 new projects 100% Swift from start
- More ambitions in scope and longer in duration
- More of the team involved
- Followed code style
- Used helper code from first project

Trialling Reusable Code

- At this stage reusable code was unversioned
- Just dropped straight into an Xcode project
- Provided freedom to adapt and change
- However this led to code divergence
- At a suitable point team decided to standardise the approaches

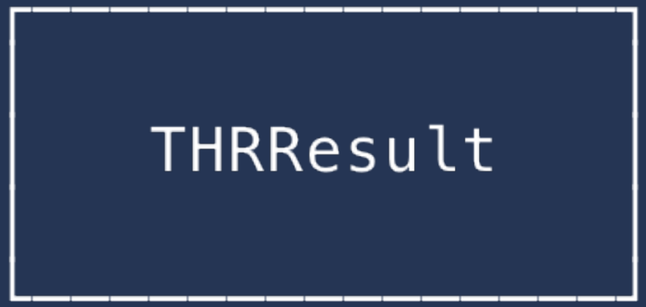
Results

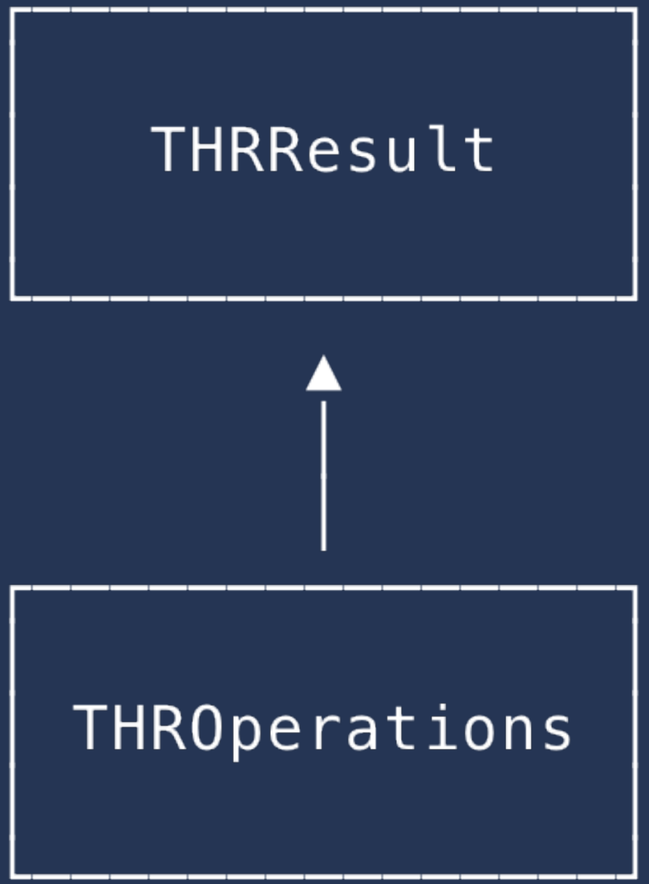
- Both projects delivered on time
- Code style adapted
- Filled more gaps - Networking, Threading, Error Handling
- Helper code adapted and now versioned using cocoapods

3. Reusable Code

The "THR" Micro Frameworks

(Inspired by other works)


THRResult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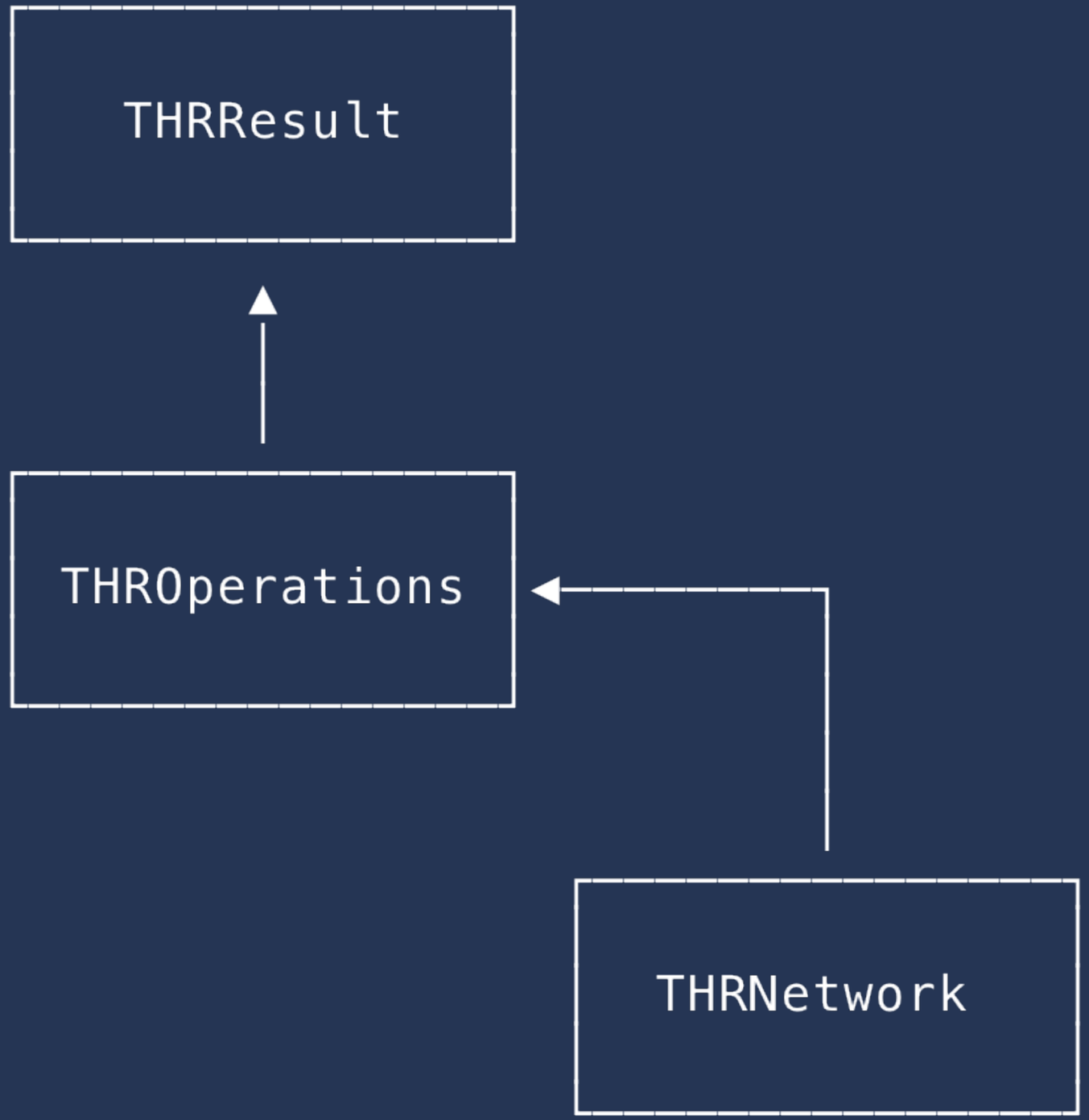
THROperations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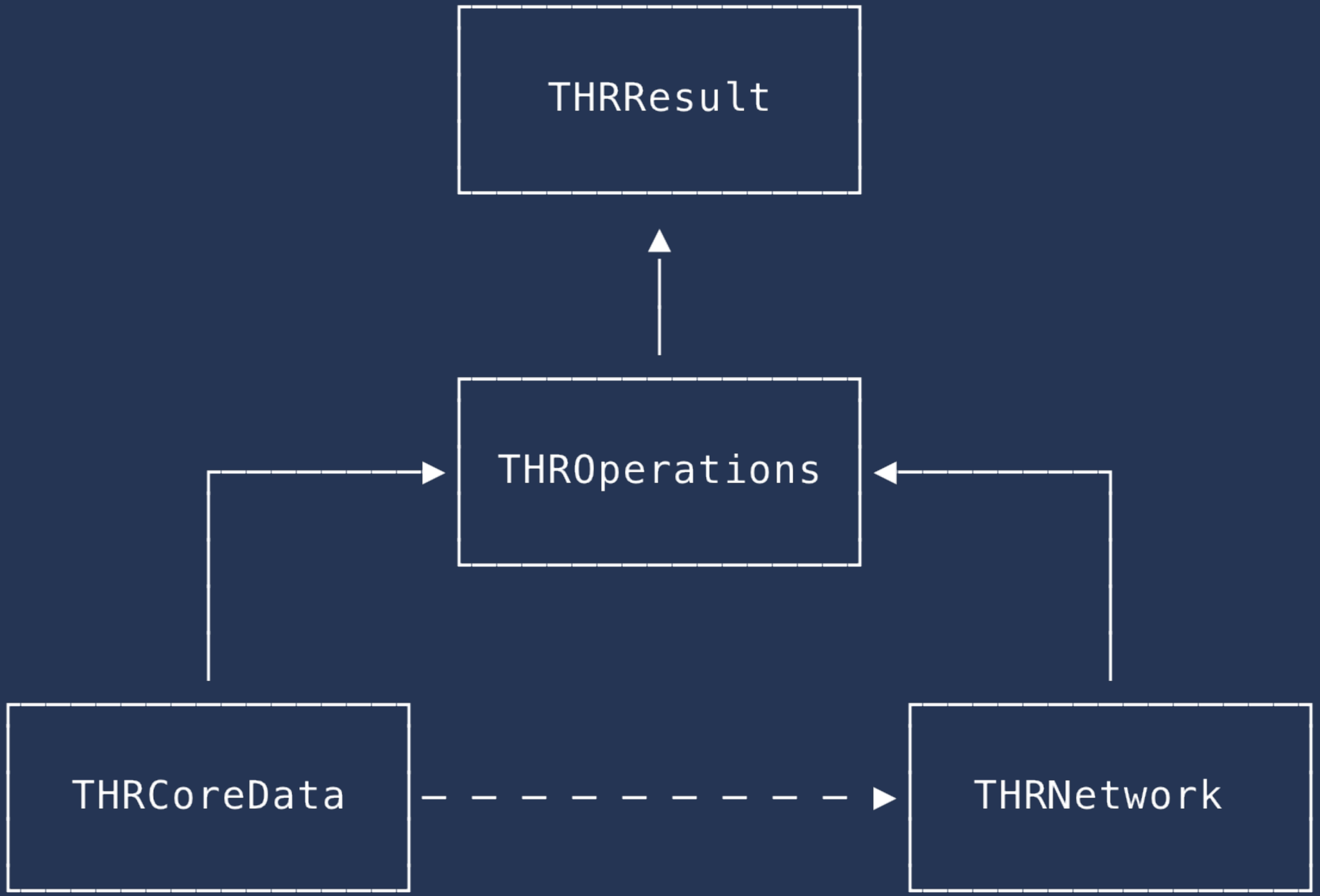
THROperations
THRNetwork


THRResult
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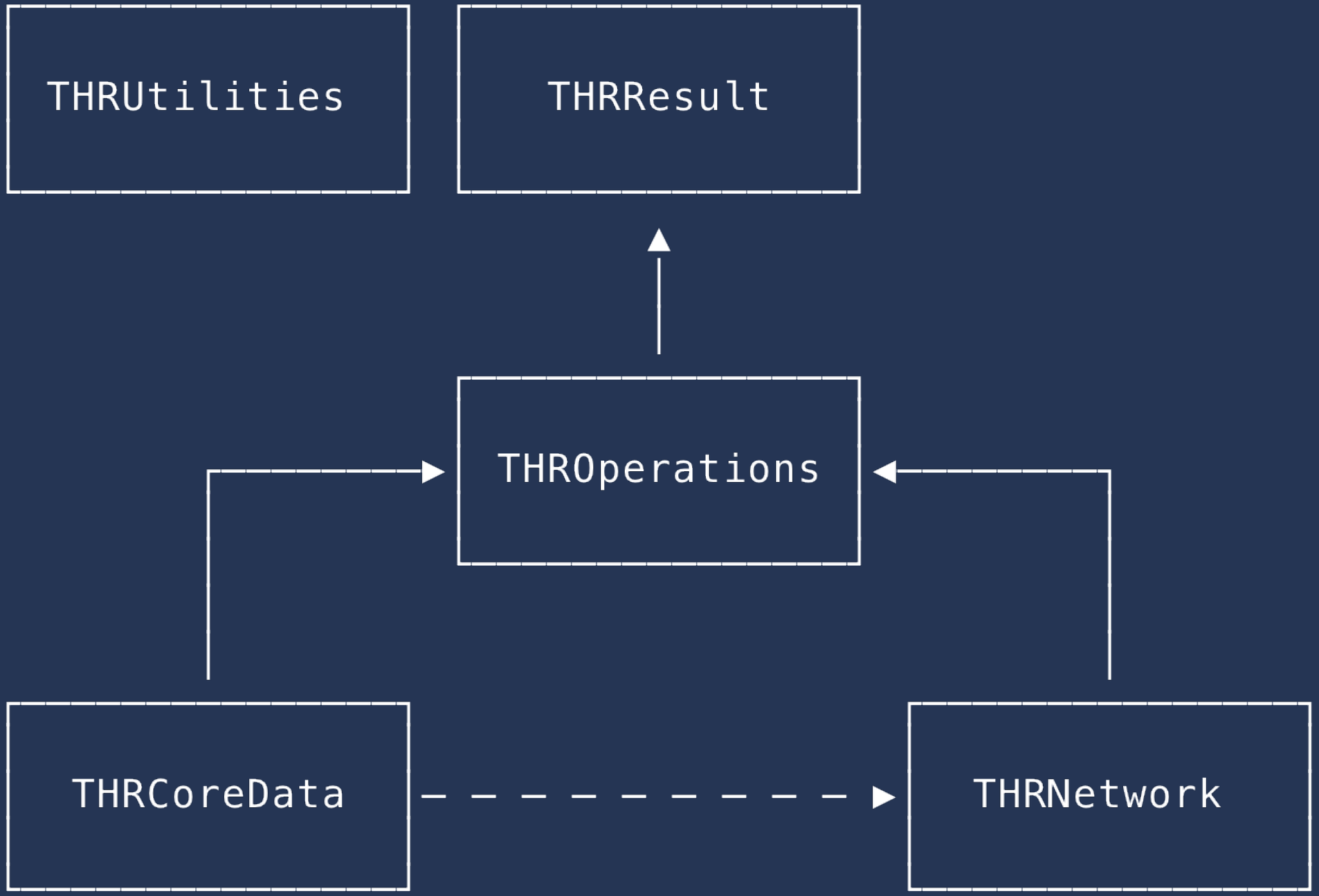
THRUtilities
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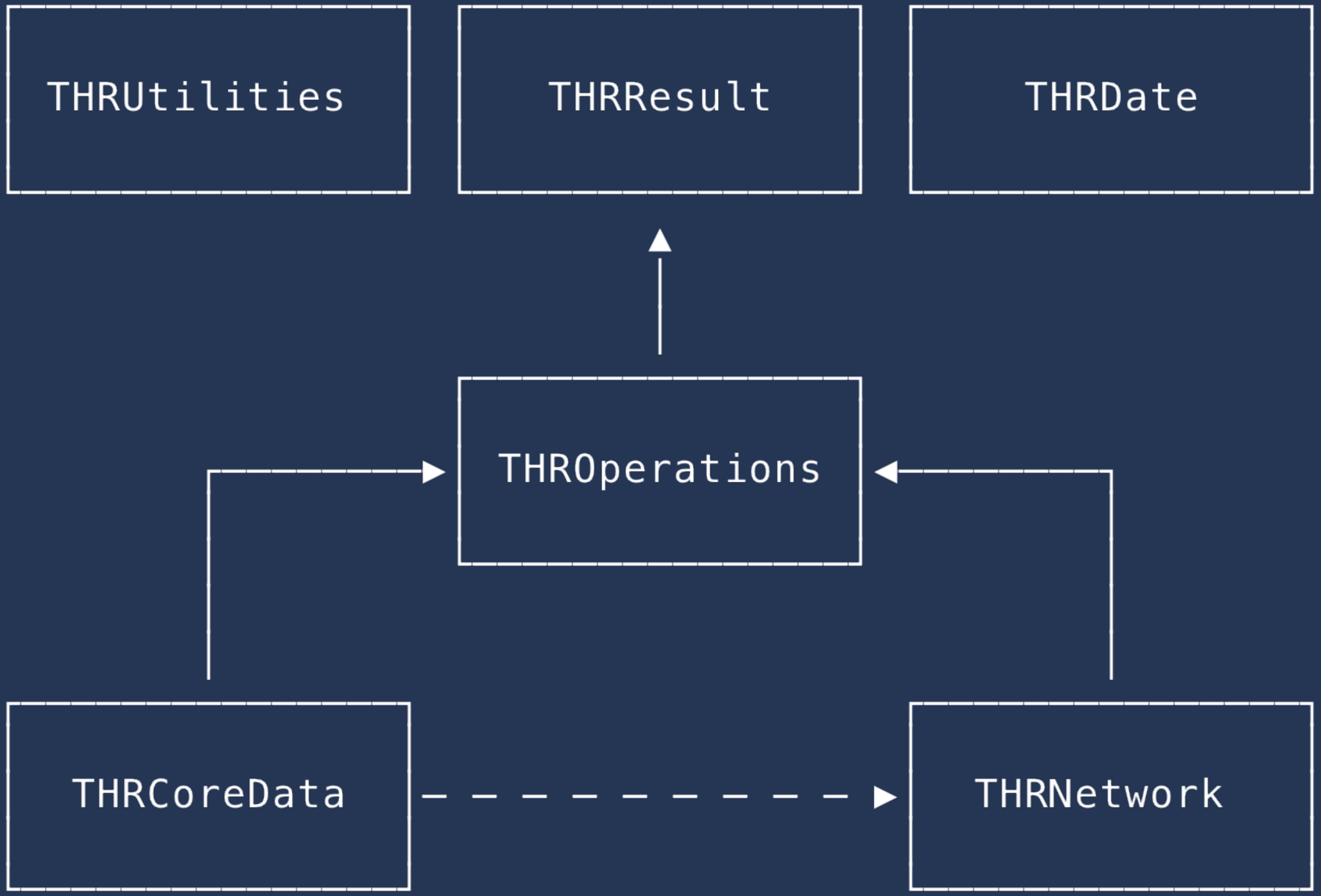
THRUtilities
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`THRResult`

- Models success and failure
- Extends the familiar `Result` type to work with do-catch error handling
- Powerful, flexible and expressive
- Credit to
  - https://github.com/antitypical/Result
  - Olivier Halligon "Asynchronous error handling"

```
enum Result<T> {
    case success(T)
    case failure(Error)
}
```

```
enum Result<T> {
    case success(T)
    case failure(Error)
}

// Using a switch:
switch result {
case .success(let value):
    // process success value
case .failure(let error):
    // handle failure error
}
```

```swift
enum Result<T> {
    case success(T)
    case failure(Error)

    init(_ throwingExpr: () throws -> T) {
        do {
            let value = try throwingExpr()
            self = .success(value)
        } catch {
            self = .failure(error)
        }
    }

    func resolve() throws -> T {
        switch self {
        case .success(let value): return value
        case .failure(let error): throw error
        }
    }
}
```

```
let successResult = Result { return value }
let failureResult = Result { throw ImportError.invalidData }
```

```swift
let successResult = Result { return value }
let failureResult = Result { throw ImportError.invalidData }

// Using do-catch:
do {
    let value = try result.resolve()
    // Process value
}
catch {
    // Handle error
}
```

```swift
let successResult = Result { return value }
let failureResult = Result { throw ImportError.invalidData }

// Using if let
if let value = try? result.resolve() {
    // Process value
}

// or
let value = try! result.resolve()
```

`THROperations`

- Preferred method for threading
- Helpful subclasses of `Operation`
- Expressive syntax for combining operations
- Uses `THRResult` to report success and failure
- Credit to
  - https://github.com/ProcedureKit/ProcedureKit

```
protocol ProducesResult: class {
    associatedtype Output
    var output: Result<Output> { get set }
}
```

```
extension ProducesResult where Self: Operation {
    func addResultBlock(block: @escaping (Result<Output>) -> Void) {
        if let existing = completionBlock {
            completionBlock = {
                existing()
                block(self.output)
            }
        }
        else {
            completionBlock = {
                block(self.output)
            }
        }
    }
}
```

Example

Let's build an operation to extract a top level domain (TLD) from a URL string

```
typealias TopLevelDomain = String
typealias URLString = String
```

```
class ExtractTopLevelDomainOperation: Operation, ProducesResult {
    // ProducesResult
    var output: Result<TopLevelDomain> = Result {
        throw ResultError.noResult
    }
    // TopLevelDomainOperation
    let urlString: URLString
    init(urlString: URLString) {
        self.urlString = urlString
    }
    override func main() {
        super.main()
        extractTopLevelDomain(from: urlString)
    }
    // ...
}
```

```
// ...continued
func extractTopLevelDomain(from urlString: URLString) {
    guard urlString.characters.count > 0 else {
        output = Result { throw TopLevelDomainError.invalidURL }
        return
    }

    let parts = urlString.components(separatedBy: ".")

    guard parts.count > 1, let topLevelDomain = parts.last else {
        output = Result { throw TopLevelDomainError.none }
        return
    }

    output = Result { return topLevelDomain }
}
```

```
let operation = ExtractTopLevelDomainOperation(urlString: "apple.com")

operation.addResultBlock { result in
    switch result {
    case .success(let value):
        // process TLD
    case .failure(let error):

        switch error {
        case TopLevelDomainOperation.none:
            // handle no TLD
        case TopLevelDomainOperation.invalidURL:
            // handle invalid URL
        }
    }
}

operation.enqueue()
```

```
let operation = ExtractTopLevelDomainOperation(urlString: "apple.com")

operation.addResultBlock { result in
    do {
        let topLevelDomain = try result.resolve()
        // process TLD
    }
    catch {
        switch error {
        case TopLevelDomainOperation.none:
            // handle no TLD
        case TopLevelDomainOperation.invalidURL:
            // handle invalid URL
        }
    }
}

operation.enqueue()
```

```
let operation = ExtractTopLevelDomainOperation(urlString: "apple.com")

operation.addResultBlock { result in
    if let topLevelDomain = try? result.resolve() {
        // process TLD
    }
}

operation.enqueue()
```

Combining Operations

- Often the output from one operation is the input to another
- We want to pass the `Result` onwards
- Combining many simple operations can produce complex logic

```
protocol ProducesResult: class {
    associatedtype Output
    var output: Result<Output> { get set }
}

protocol ConsumesResult: class {
    associatedtype Input
    var input: Result<Input> { get set }
}
```

```
class ExtractTopLevelDomainOperation: BaseOperation,
                                      ProducesResult,
                                      ConsumesResult {
    // ProducesResult
    var output: Result<TopLevelDomain> = Result {
        throw ResultError.noResult
    }
    // ConsumesResult
    var input: Result<URLString> = Result {
        throw ResultError.noResult
    }

    // ...
}
```

```
// ...continued
override func main() {
    super.main()
    do {
        let urlString = try input.resolve()
        extractTopLevelDomain(from: urlString)
    }
    catch {
        output = Result { throw error }
    }
}
```

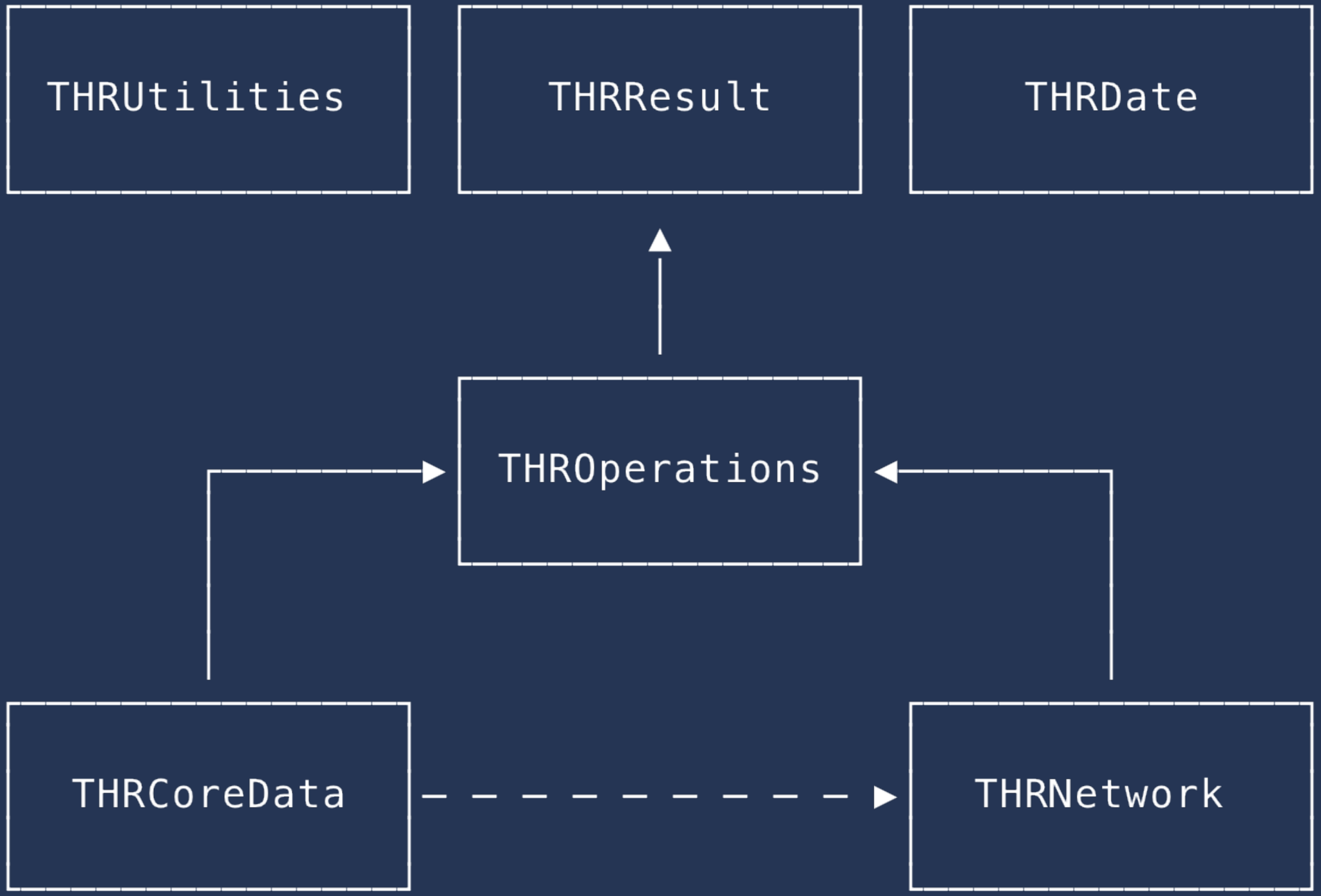
```
// Output: URLString
let getURLString = RequestURLStringOperation()

// Input: URLString, Output: TopLevelDomain
let extractTLD = ExtractTopLevelDomainOperation()

// Input: TopLevelDomain, Output: Bool
let validate = ValidateTopLevelDomainOperation()

validate.addResultBlock { result in
    if let isValid = try? result.resolve(), isValid == true {
        // TLD is valid
    }
}

getURLString
    .passesResult(to: extractTLD)
    .passesResult(to: validate)
    .enqueue()
```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4. Modernise & Standardise

Modernise & Standardise

- Handle errors and unhappy paths (`THRResult`)
- Perform work asynchronously (`THROperations`)
- Build complex logic from smaller units (`THROperations`)
- Request data over a network, then parse into core data (`THRNetwork` & `THRCoreData`)
- Use storyboard segues with type safety (`THRUtilities`)
- Parse dates to and from a web API (`THRDate`)

Did We Meet Our Goals?

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1. Train the mobile team in Swift
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Recommendations

1. Learn as a Team

2. Gain Support from Business Management

3. Make Space for Experimentation

4. Expect to make Mistakes

Our Plan for The Future

How do we stop writing Objective-C in existing apps?

Every line of Objective-C written now is Technical Debt

Swift alongside Objective-C

- Understand the limitations of Obj-C/Swift interoperability
  - No `structs`
  - No associated values with enums
  - No protocol extensions
- Identify new features that can be written in Swift without *too much* difficulty

Swift alongside Objective-C

- Replace existing standalone Obj-C classes, methods etc with Swift implementation
  - `NSPredicate` generation
  - Simple / isolated `UIViewControllers`
- Replace existing Obj-C structures with `THR` frameworks
  - e.g. rewrite data synchronisation subsystem

A Swift Journey

Luke Stringer

Any Questions? 

References

- http://alisoftware.github.io/swift/async/error/2016/02/06/async-errors/
- https://github.com/antitypical/Result
- https://github.com/ProcedureKit/ProcedureKit