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Divide and Conquer:

The Power of iOS Modularization

w/ Edis Hasanov

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Hello 👋

- Senior iOS engineer @ Paysafe 👩‍💻
- Manchester United fan ⚽
- Likes all kinds of music 🎶
- Travelling ✈️
- Hiking ⛰️

(Contains AI generated content)

Agenda

- What is modularisation?
- When should we modularise?
- How do we modularise?
- Why should we modularise?

Project sizing idea

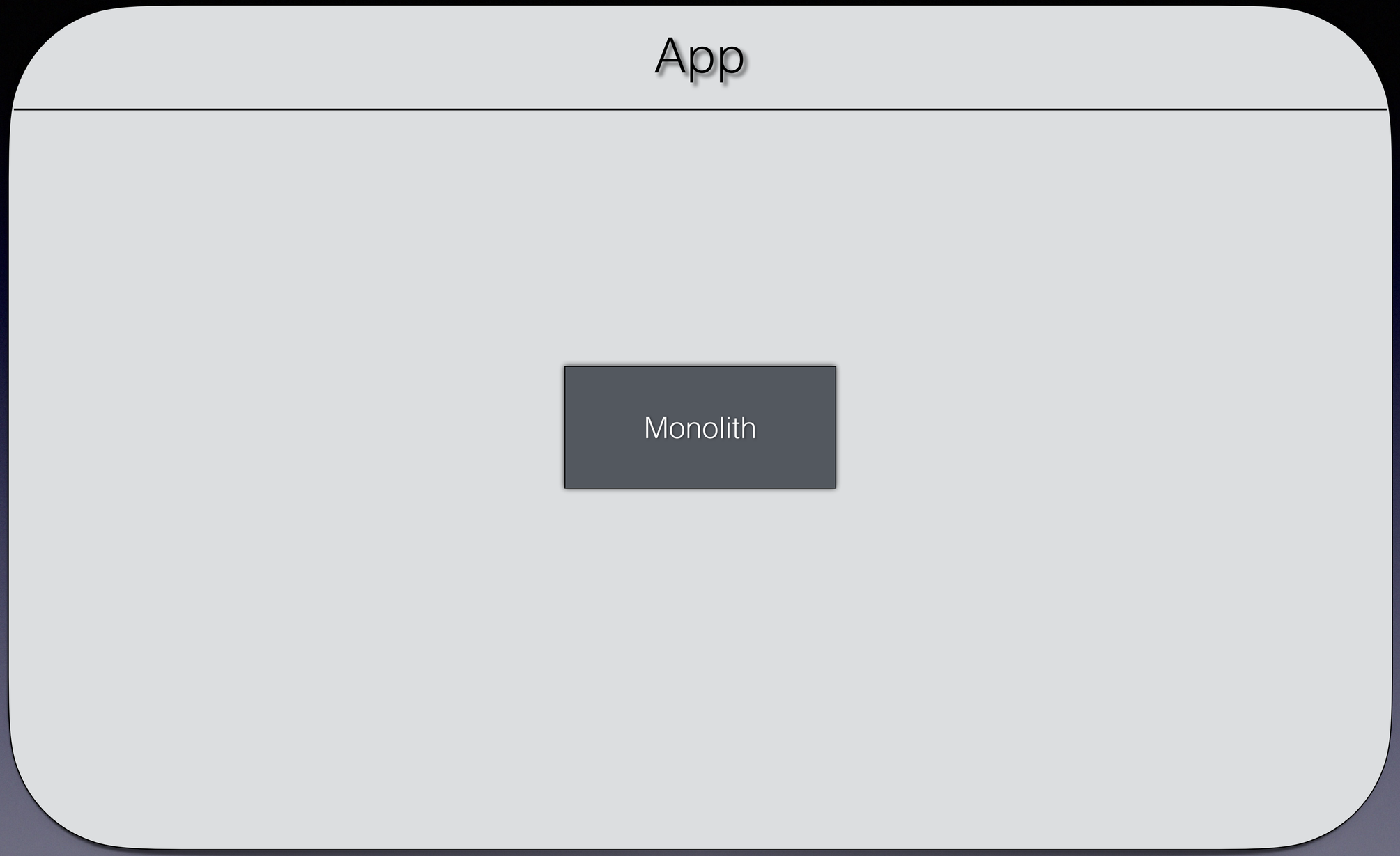
- 300+ screens
- 16 000+ unit tests
- 600+ UI tests
- 115 modules (30 first/third parties frameworks and libraries)

What is modular programming?

Modular programming is a general programming concept where developers separate program functions into independent pieces. These pieces then act like building blocks, with each block containing all the necessary parts to execute one aspect of functionality.

When the blocks, or modules, are put together, they make up the executable program.

How it all starts


App
Monolith

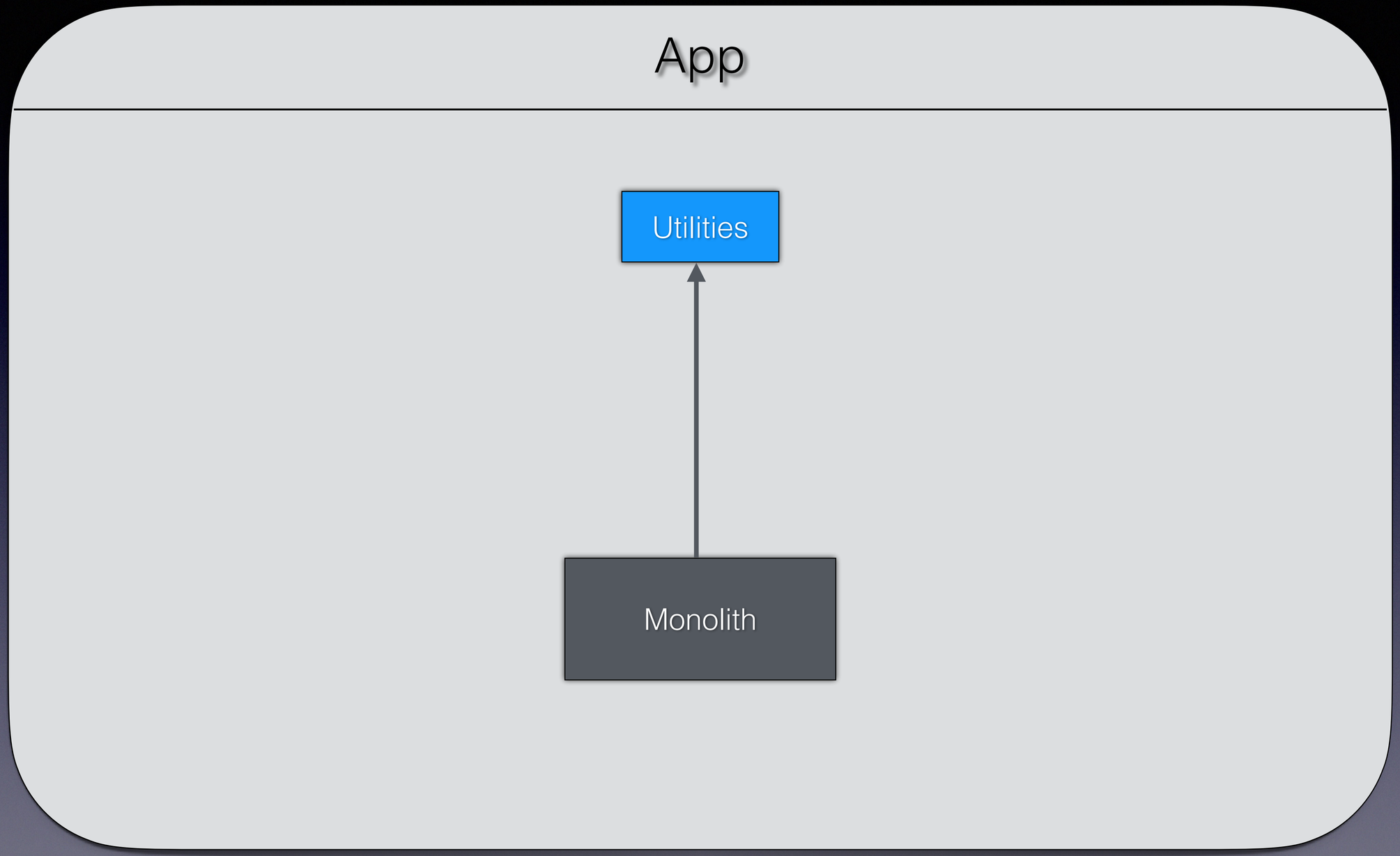
When to modularise?

Things to consider

- Complexity of code
- Development speed
- Team collaboration
- Scalability
- Maintenance and updates
- Code Reusability

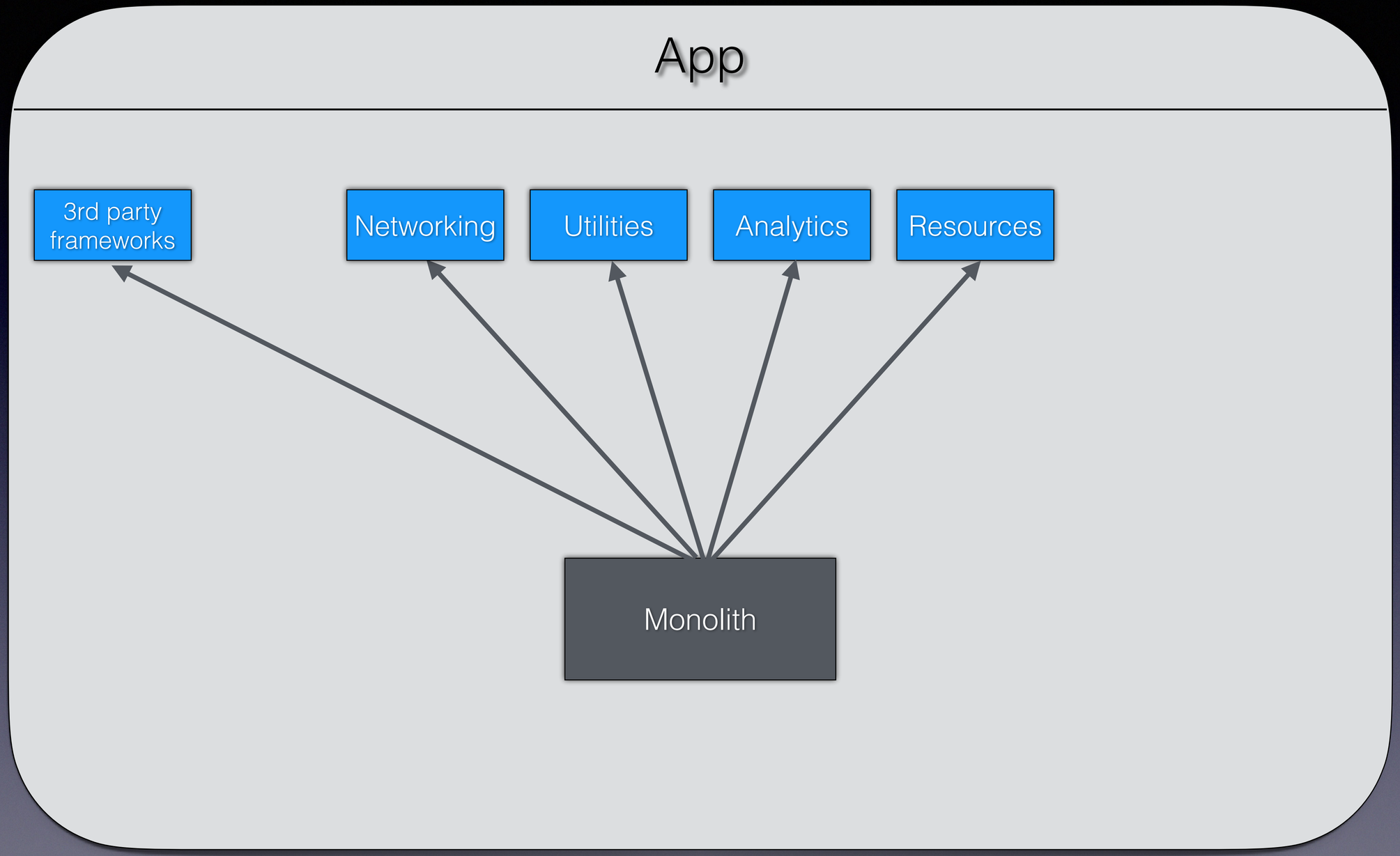
How to modularise

```
let package = Package(
    name: "Utilities",
    platforms: [.iOS(.v14)],
    products: [
        .library(
            name: "Utilities",
            targets: ["Utilities"]),
    ],
    dependencies: [
    ],
    targets: [
        .target(
            name: "Utilities",
            dependencies: [
            ],
            path: "Sources/Utilities"
        )
    ]
)
```


App
Utilities
Monolith

Infrastructure (Low) level modules

- Utilities
- Networking
- Analytics
- Data storage
- Resources
- Etc


App
3rd party frameworks
Networking
Utilities
Analytics
Resources
Monolith

High level (Feature) modules

22:14

News

For you | Latest | Transfers | Leagues

Trending

Man Utd & Tottenham learn controversial referee appointment for Europa League final

90min - 2 hours ago

'There's no doubt' - Jamie Carragher makes Mikel Arteta sack prediction

90min - 1 hour ago

'Deal with it' - Virgil van Dijk delivers firm response to Trent Alexander-Arnold boos

90min - 3 hours ago

Bruno Fernandes Fires Europa

Matches | News | Leagues | Following | More

22:14

Atalanta 1 - 0 Roma

28:22

Lookman 9'

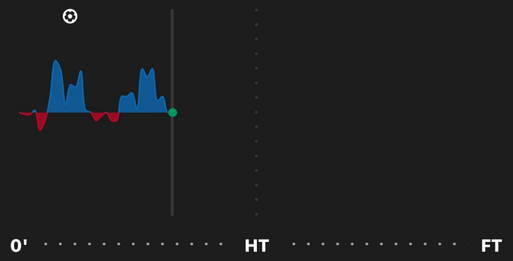
Facts | Commentary | Lineup | Table | Stats

Who will win?

Bet | 1 1,40 | x 4,33 | 2 8,00

9' Ademola Lookman (1 - 0)
Assist by Charles De Ketelaere

Momentum



Ball possession

Matches | News | Leagues | Following | More

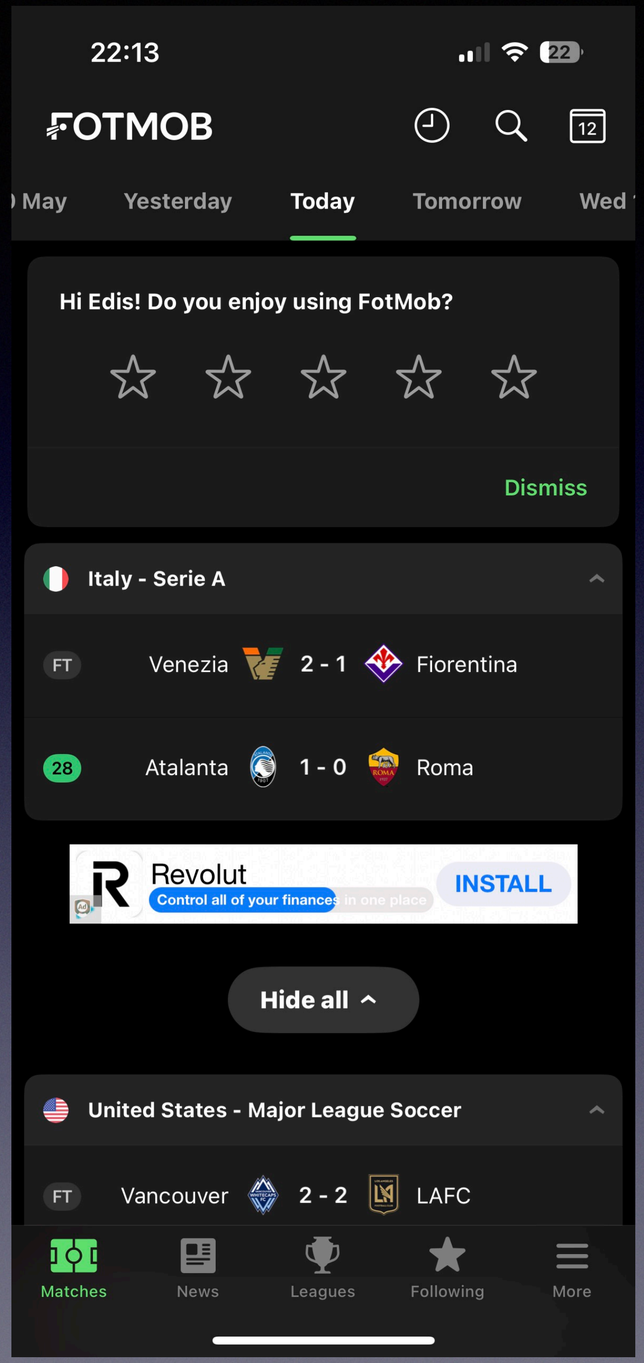
22:14

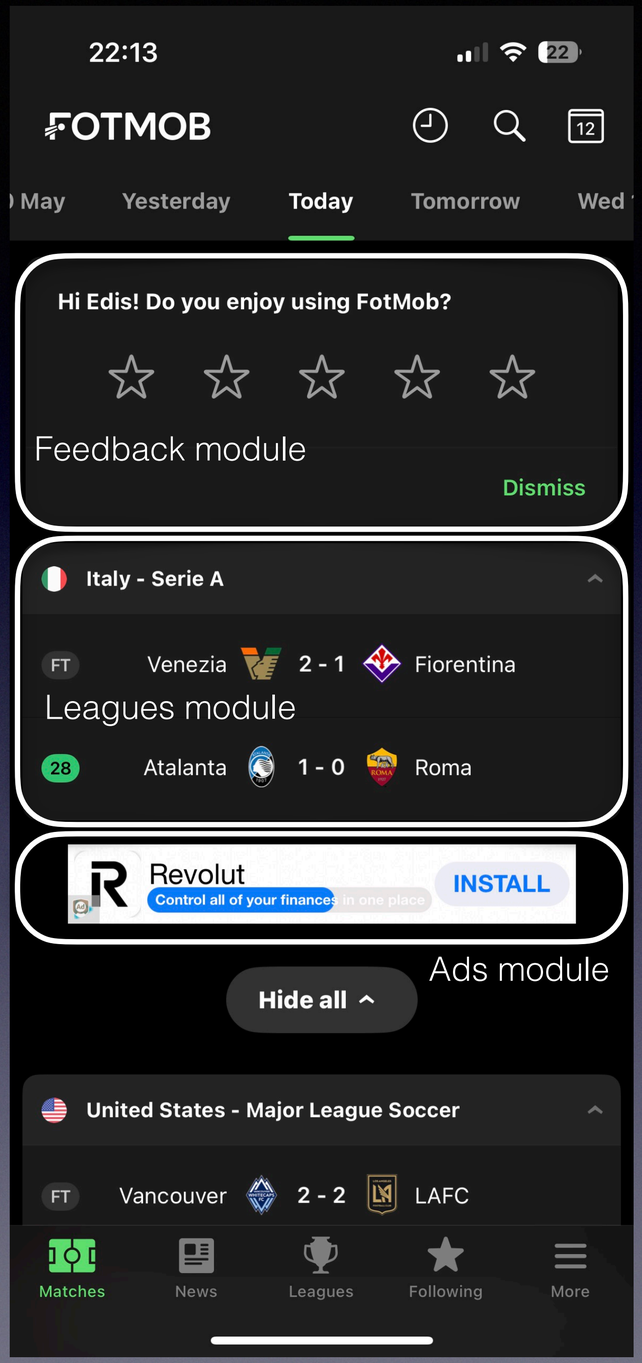
2024/2025 Premi... Following

Table | Fixtures | News | Player stats | Tea

#	Team	PL	W	D	L	+/-	GD	PTS
1	Liverpool	36	25	8	3	83-37	+46	83
2	Arsenal	36	18	14	4	66-33	+33	68
3	Newcastle	36	20	6	10	68-45	+23	66
4	Man City	36	19	8	9	67-43	+24	65
5	Chelsea	36	18	9	9	62-43	+19	63
6	Aston Villa	36	18	9	9	56-49	+7	63
7	Nottm Forest	36	18	8	10	56-44	+12	62
8	Brentford	36	16	7	13	63-53	+10	55
9	Brighton	36	14	13	9	59-56	+3	55
10	Bournemouth	36	14	11	11	55-43	+12	53
11	Fulham	36	14	9	13	51-50	+1	51
12	Crystal Palace	36	12	13	11	46-48	-2	49
13	Everton	36	9	15	12	39-44	-5	42

Matches | News | Leagues | Following | More


22:13
FOTMOB
May
Yesterday
Today
Tomorrow
Wed
Hi Edis! Do you enjoy using FotMob?
Dismiss
Italy - Serie A
FT
Venezia
2 - 1
Fiorentina
28
Atalanta
1 - 0
Roma
Revolut
Control all of your finances in one place
INSTALL
Hide all
United States - Major League Soccer
FT
Vancouver
2 - 2
LAFC
Matches
News
Leagues
Following
More


22:13
FOTMOB
May
Yesterday
Today
Tomorrow
Wed
Hi Edis! Do you enjoy using FotMob?
Feedback module
Dismiss
Italy - Serie A
FT
Venezia
2 - 1
Fiorentina
Leagues module
28
Atalanta
1 - 0
Roma
Revolut
Control all of your finances in one place
INSTALL
Ads module
Hide all
United States - Major League Soccer
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Following
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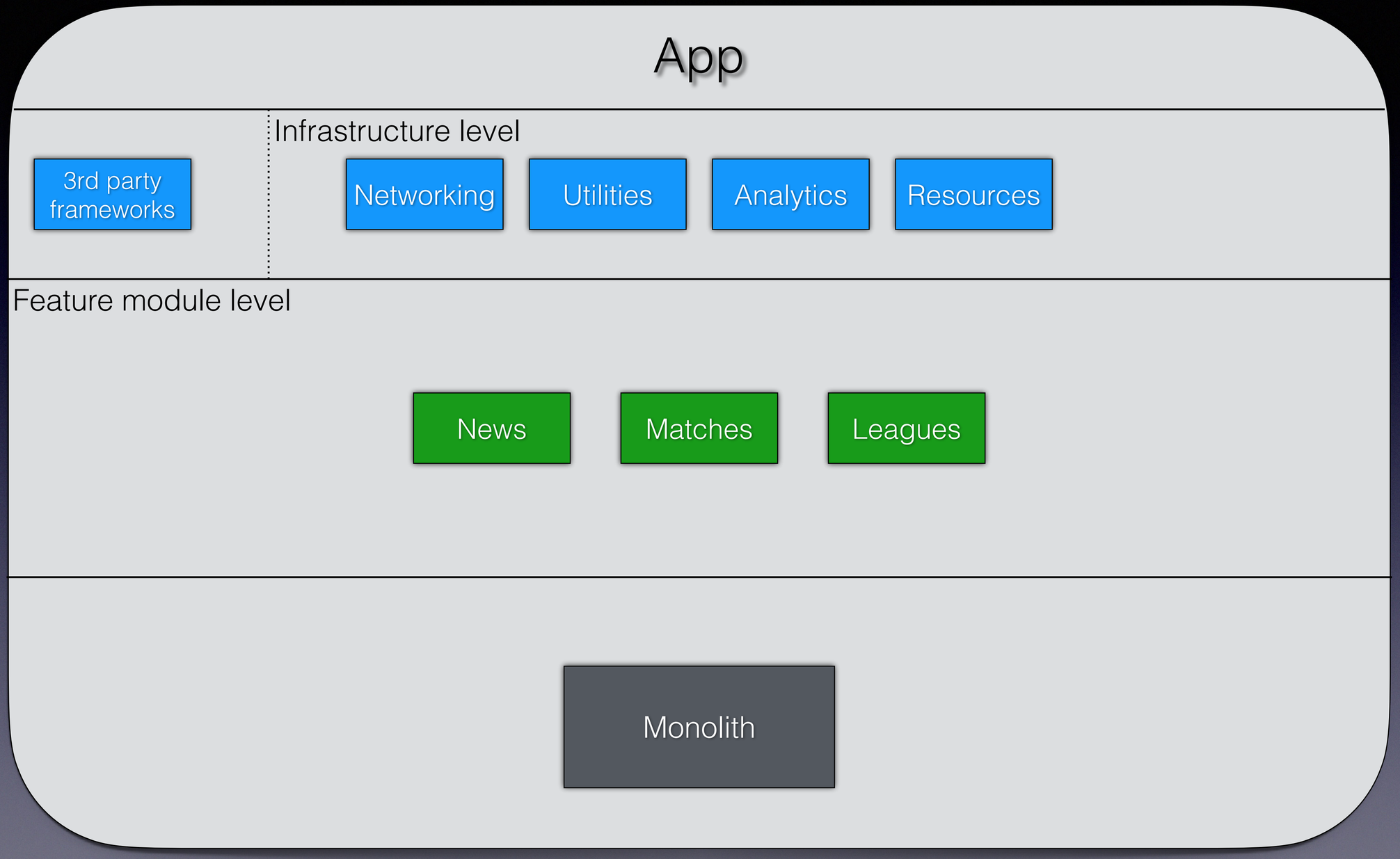
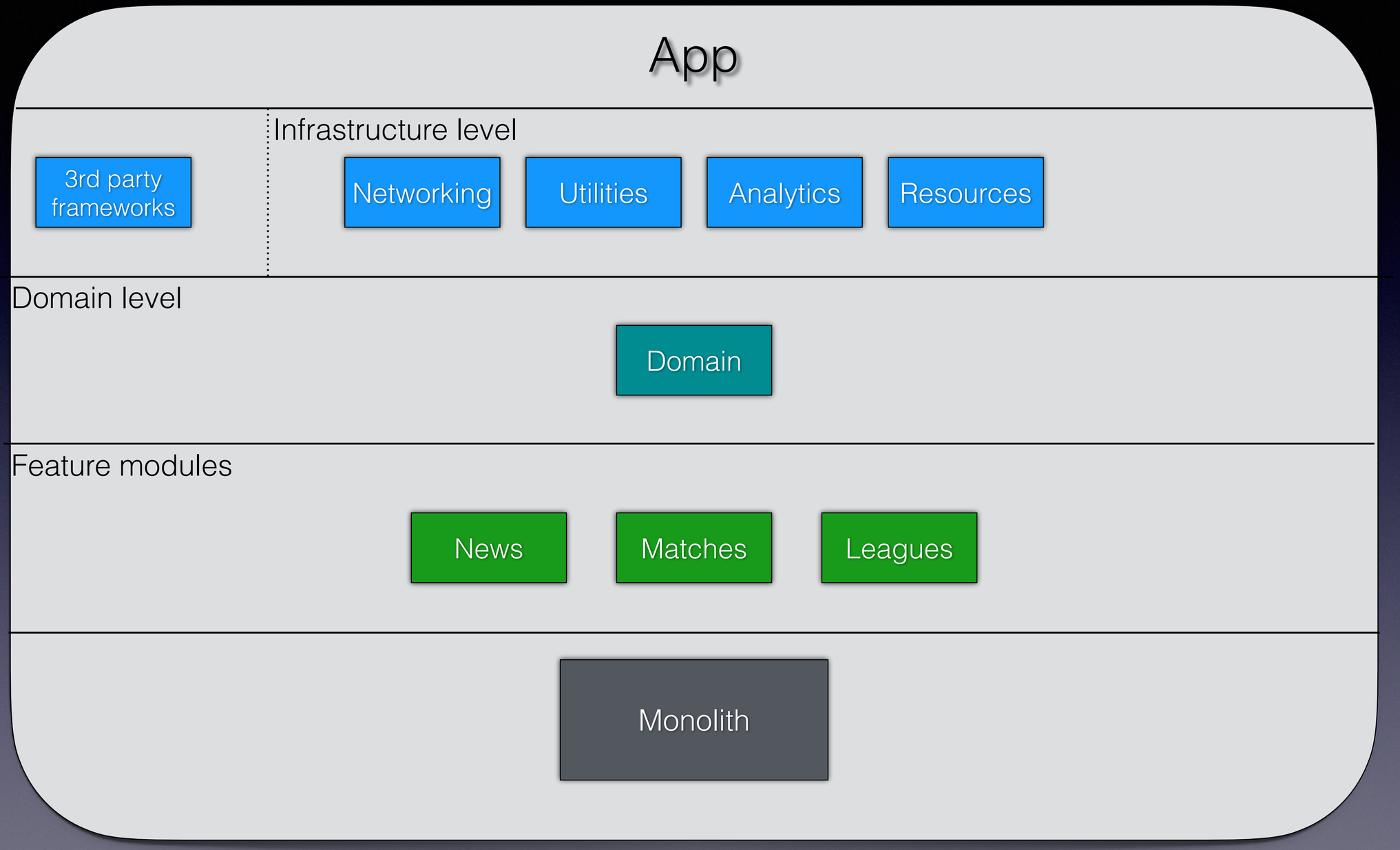

App
Infrastructure level
3rd party frameworks
Networking
Utilities
Analytics
Resources
Feature module level
News
Matches
Leagues
Monolith

Domain level module


App
Infrastructure level
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Domain level
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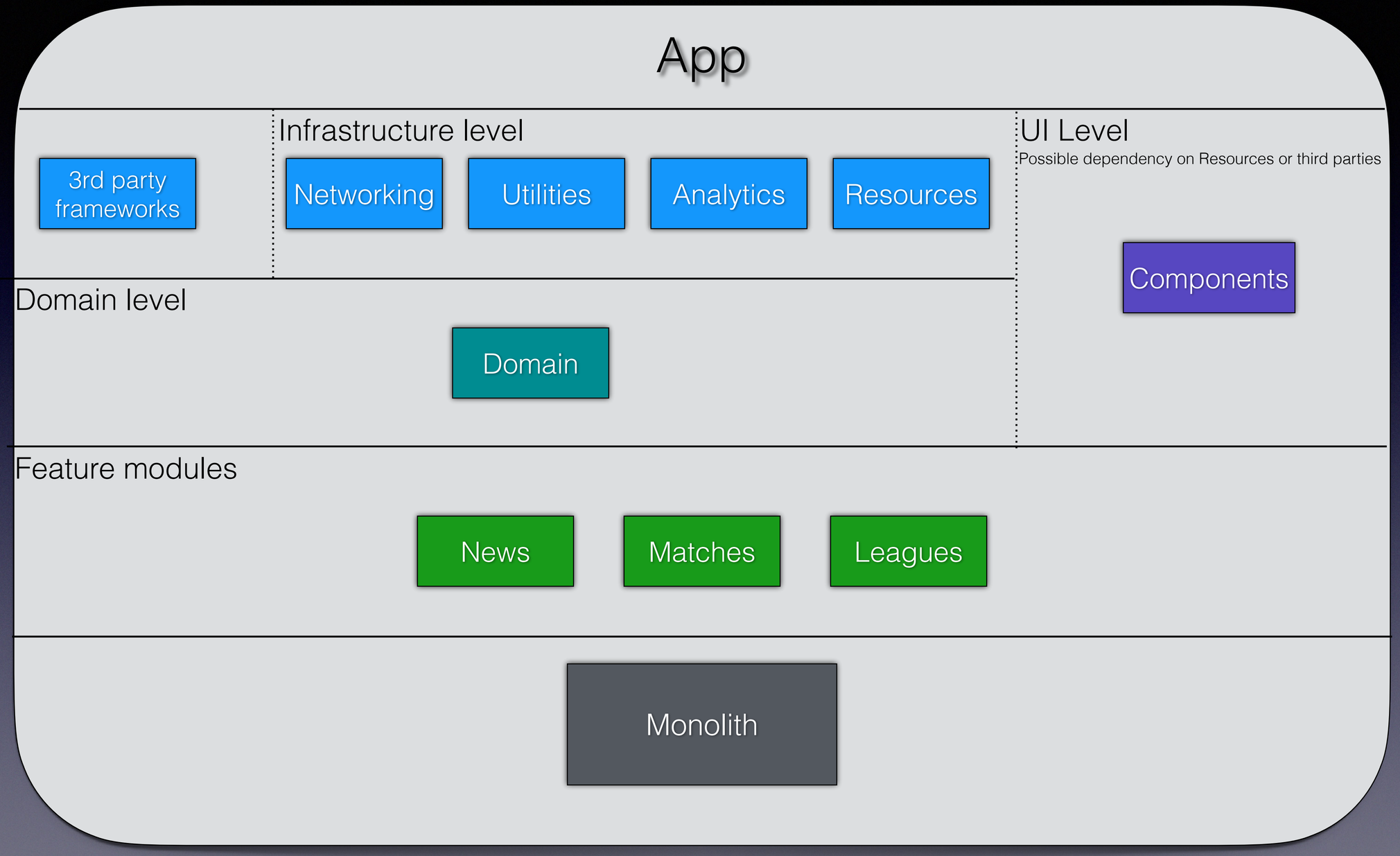
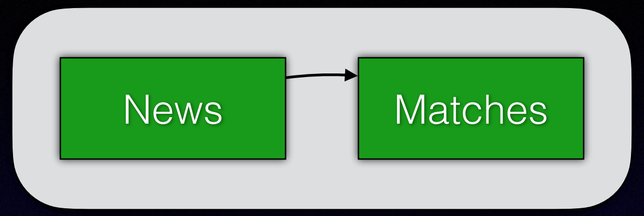
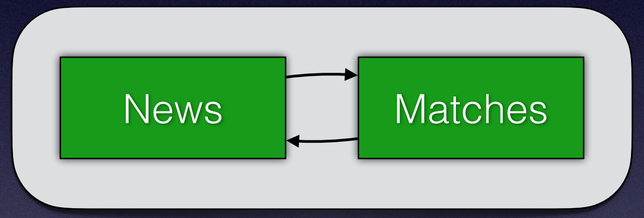
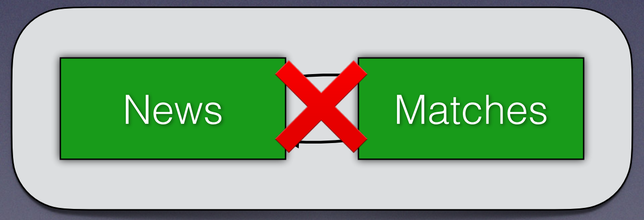
UI Level modules


App
Infrastructure level
UI Level
Possible dependency on Resources or third parties
3rd party frameworks
Networking
Utilities
Analytics
Resources
Components
Domain level
Domain
Feature modules
News
Matches
Leagues
Monolith


News
Matches


News
Matches


News
Matches

API modules

```
public protocol ProfileFlowProvidable {
    func getFlow() -> UINavigationController
}

public final class ProfileFlowProvider: ProfileFlowProvidable {
    public func getFlow() -> UINavigationController { ••• }
}
```

ProfileAPI

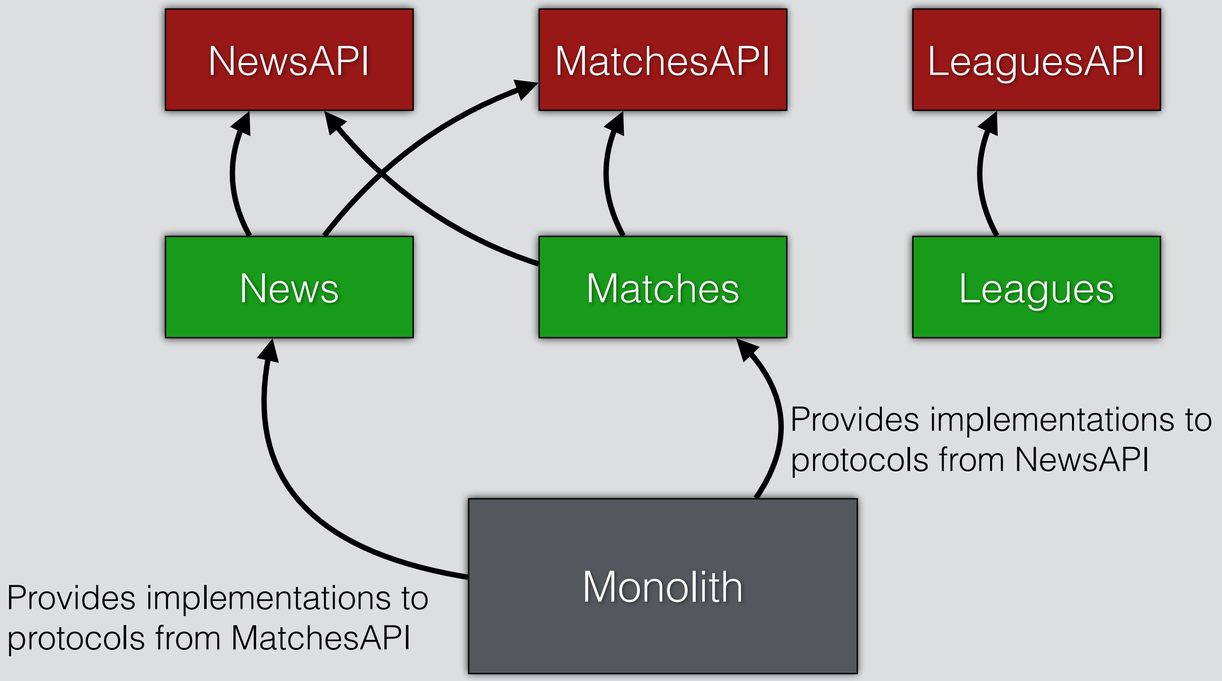
```
public protocol ProfileFlowProvidable {
    func getFlow() -> UINavigationController
}
```

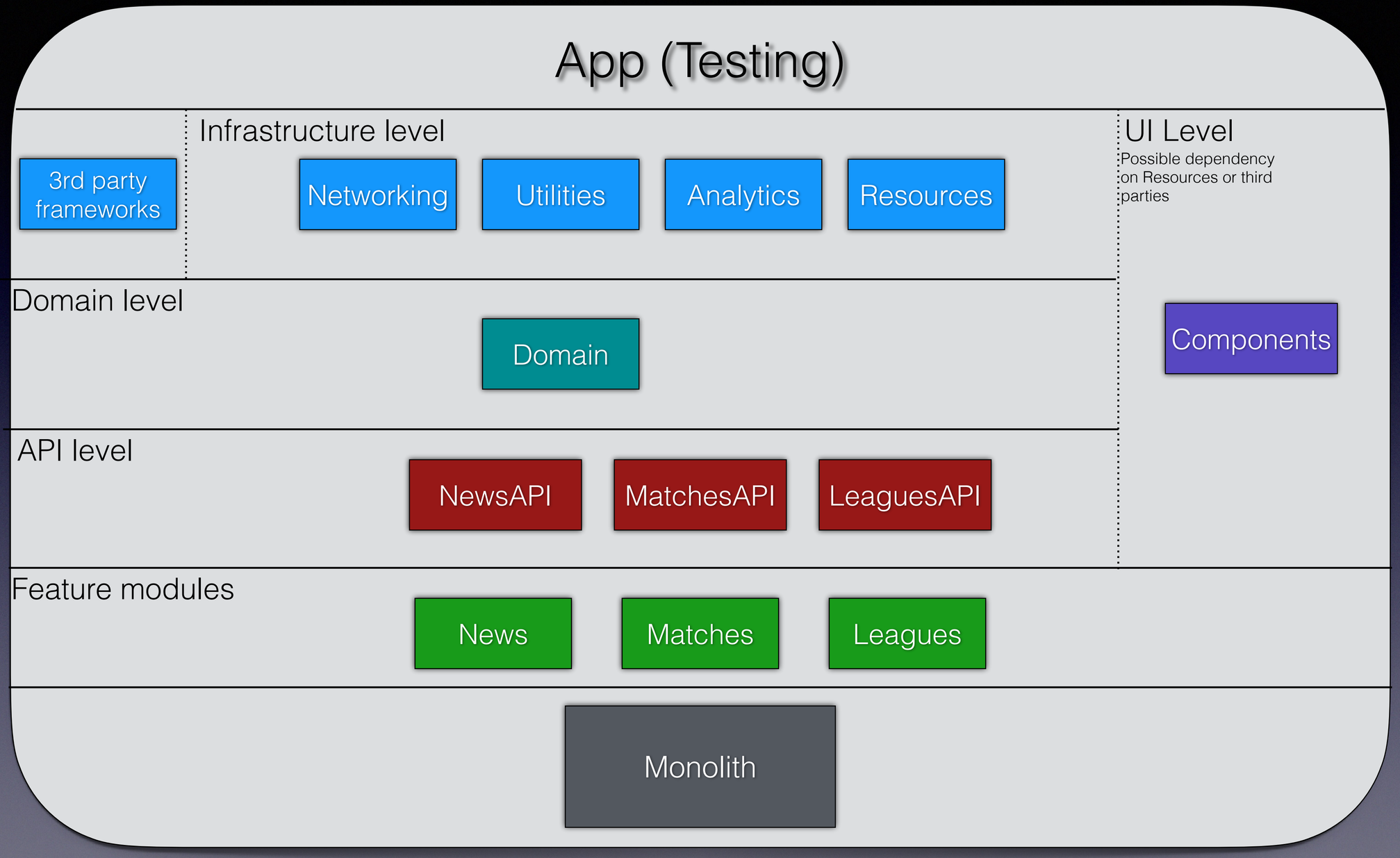
Profile (feature module)

```
import ProfileAPI

public final class ProfileFlowProvider: ProfileFlowProvidable {
    public func getFlow() -> UINavigationController { ••• }
}
```

API modules dependency




App (Testing)
Infrastructure level
3rd party frameworks
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UI Level
Possible dependency on Resources or third parties
Domain level
Domain
Components
API level
NewsAPI
MatchesAPI
LeaguesAPI
Feature modules
News
Matches
Leagues
Monolith

How do we test?

```
public protocol MatchStatusProviderProtocol {
    func getStatus(_ match: Match) -> MatchStatus
}
```

```
final class MatchStatusProviderProtocolMock: MatchStatusProviderProtocol {
    private(set) var getStatusCallCount = 0
    var getStatusHandler: ((Match) -> MatchStatus)?
```

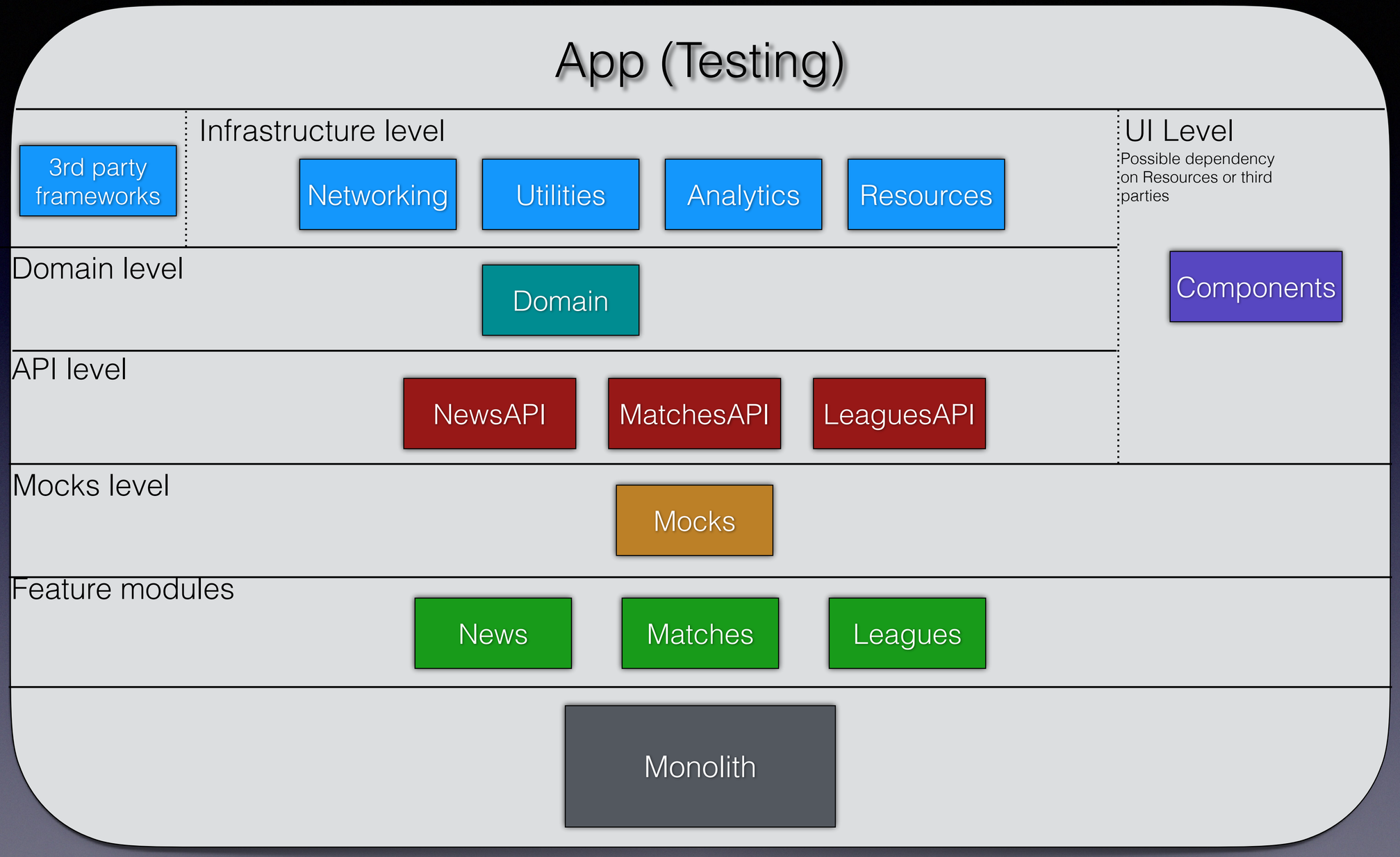
```
public protocol MatchStatusProviderProtocol {
    func getStatus(_ match: Mat  -> MatchStatu
    func hasMatchEnded(_ match  ) -> Bool
}

final class MatchStatusProviderProtoc  atchStatusProviderProtocol {
    private(set) var getS
    var getStatusHandler:
    func getStatus(_ matc
        getStatusCallCoun
        return getStatusHandler:  tch)
    }
}
```

Type 'Mat iderProtocolMock' does not conform to protoc iderProtocol'

  ps for co e Fix

```
    func getStatus(_ match: Mat  }
        getStatusCallCount += 1 }
        return getStatusHandler!(match)
    }
}
```

Mocks module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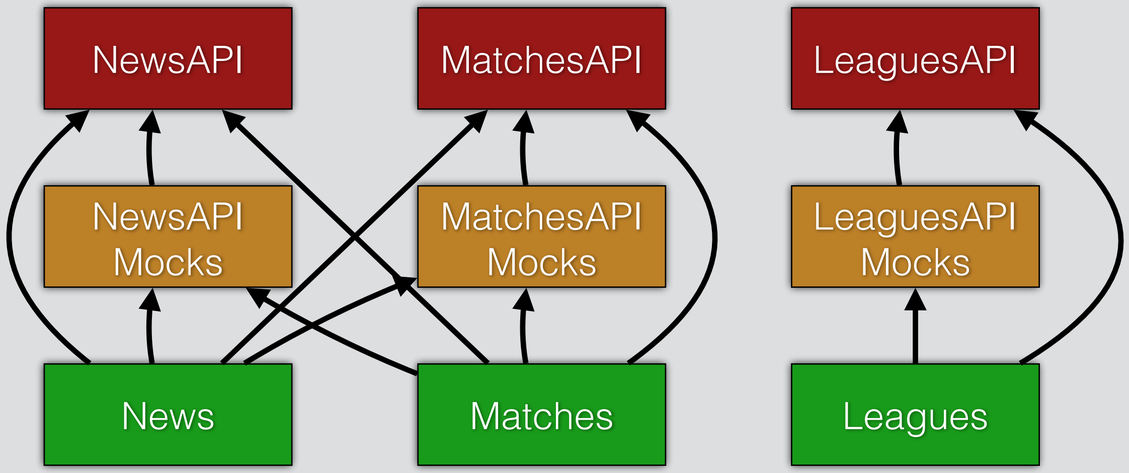
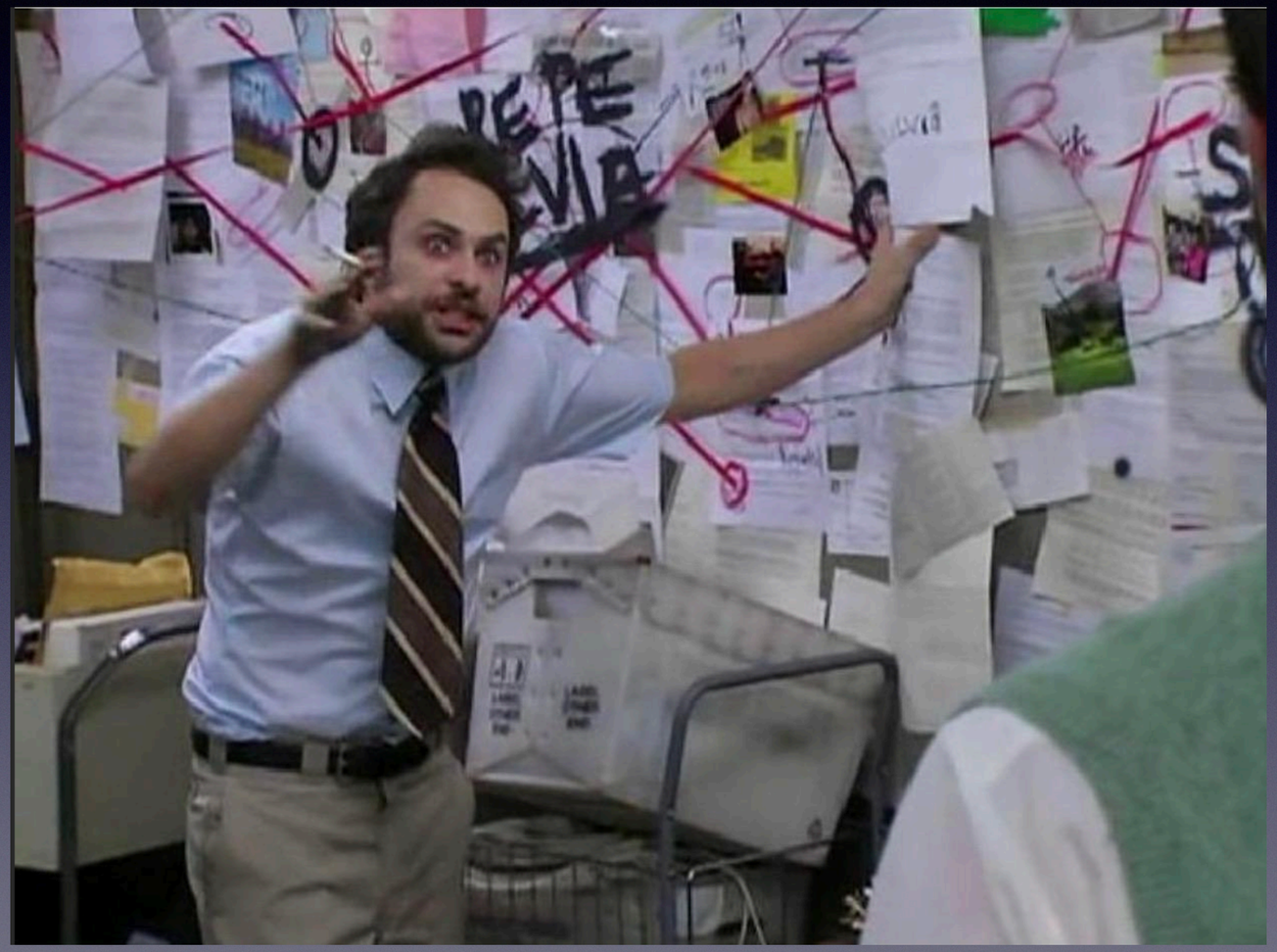
News
Matches
Leagues
Monolith

Module specific mocks modules

Testing with Mocks modules



Trying to follow all the arrows



Key intakes

- Encapsulation and Abstraction
- Clear dependencies
- Parallel development
- Decoupling independent layers
- Each module is a testing ground
- Code compilation?

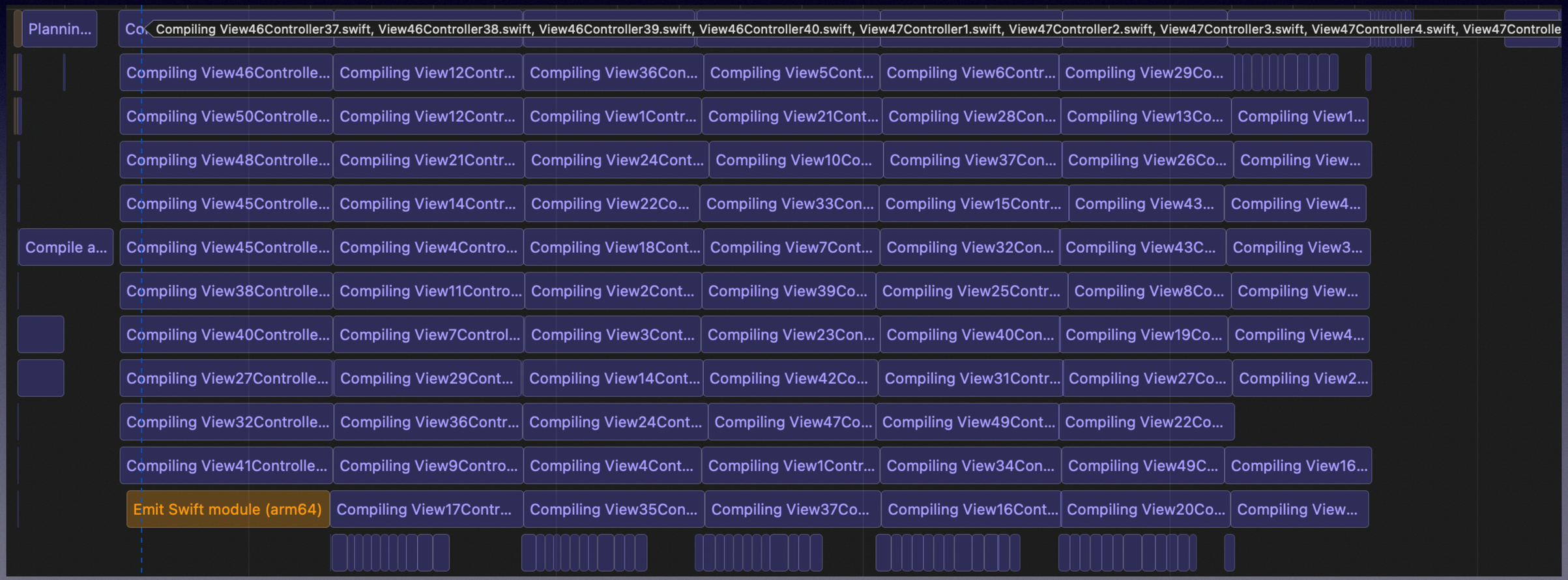
Code compilation comparison

- Incremental build
  - Public change
  - Internal change
- Clean build

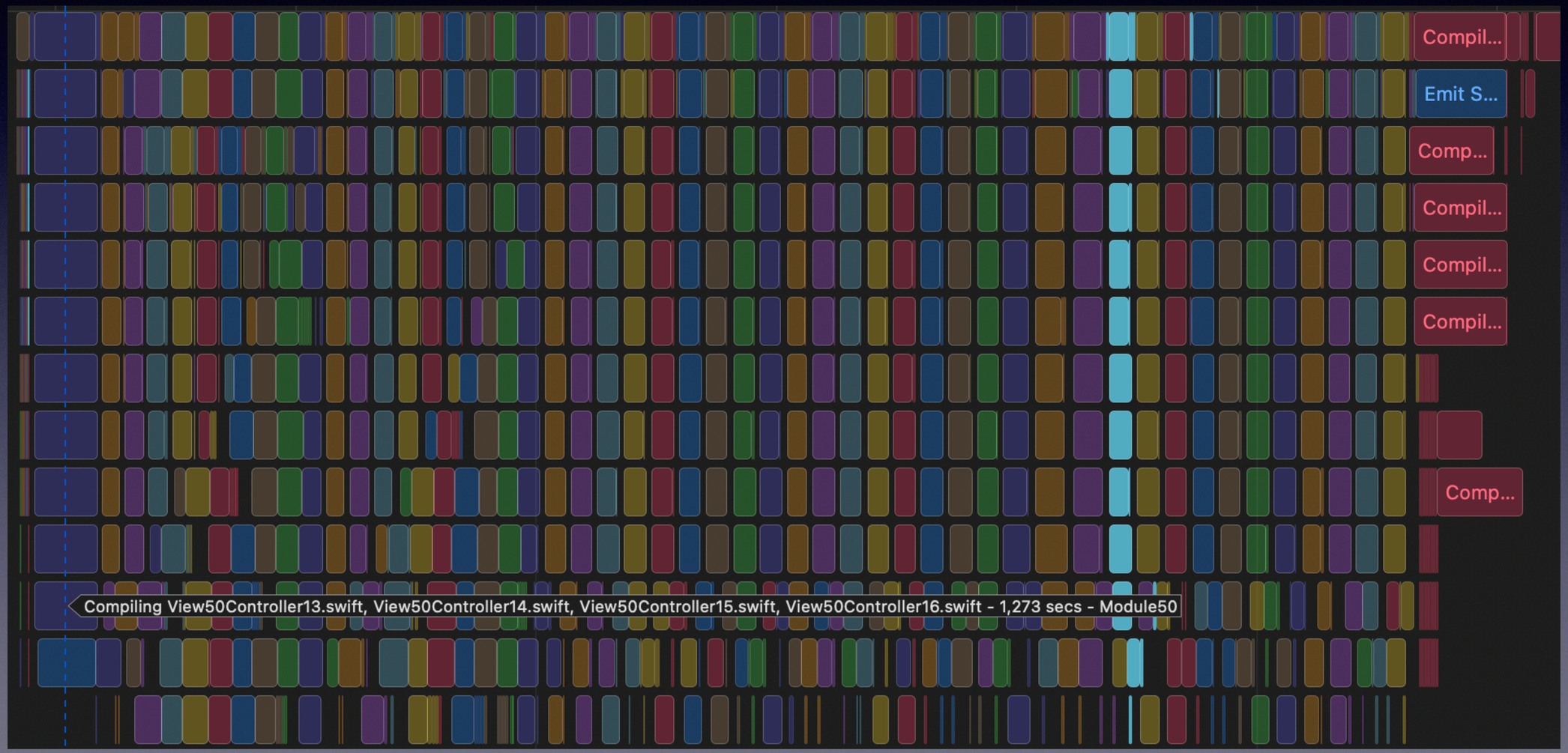
My experiment

Monolith with 2000 files	Modularised 50 independant modules 40 files each
Clean build	
~26,19 seconds	~33,22 seconds
Incremental build	
~10.3 seconds	~2.36 seconds

Monolith app build inspector



Modularised app build inspector



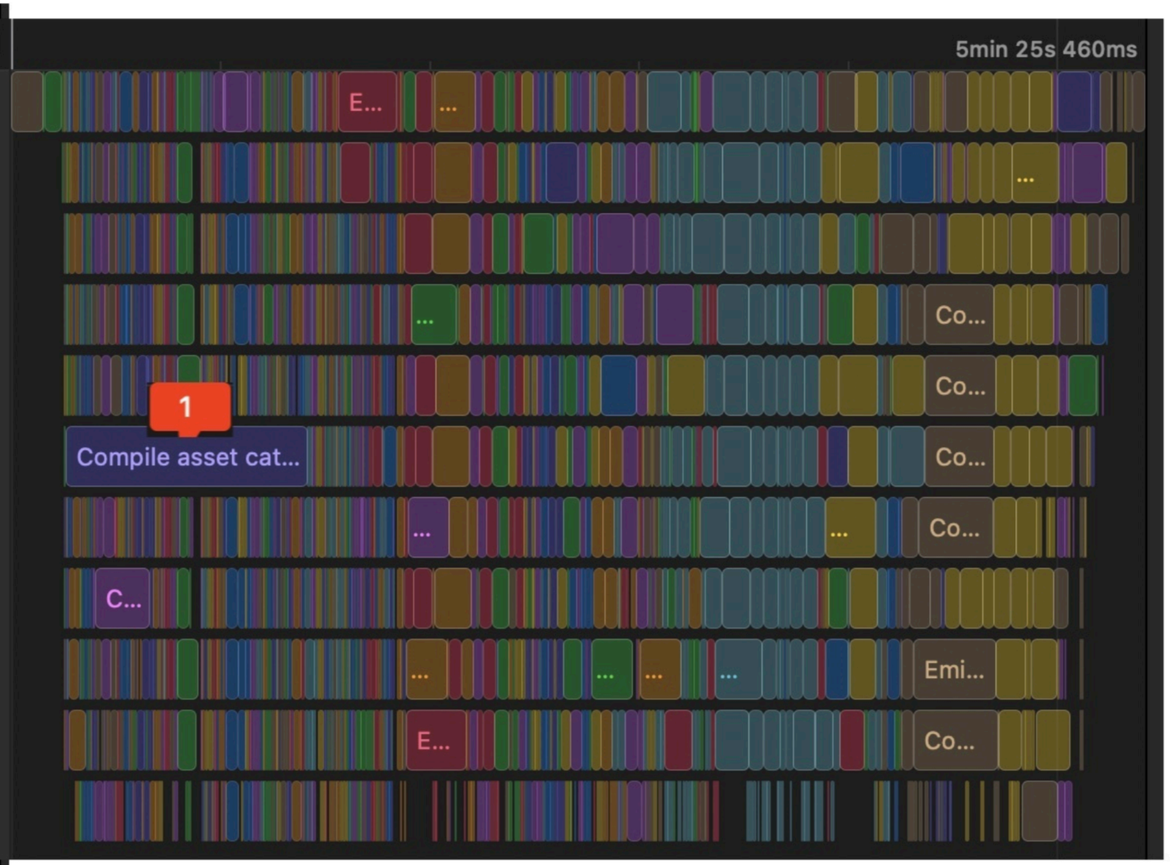
Inspect your builds

Before - Images.xcassets are compiled 21 times

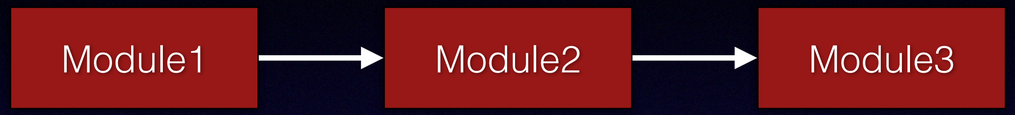
Before - 465 seconds to compile

After - Images.xcassets are compiled just once!

After - 325 seconds to compile 30% better!!!

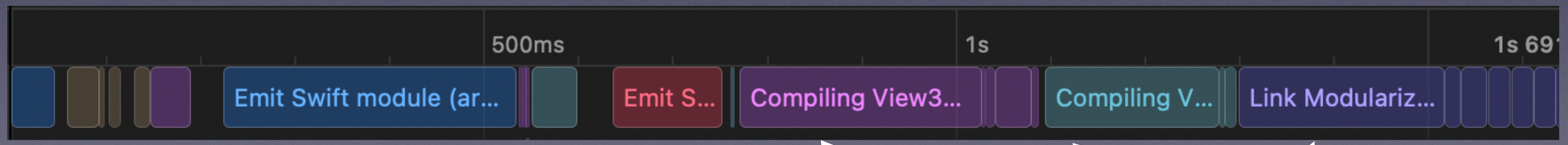


Incremental builds



For incremental builds with the depicted dependencies:

Public changes in Module3 and internal changes in Module2 do not lead to Module1 being recompiled.



Recompiling Module3 Recompiling Module2 Module linking

Questions?

Feedback

https://docs.google.com/forms/d/e/1FAIpQLSdOgm1w7XbGzXm6nXXcz0L-9cKs6euuVYod6eh0MlkXU9WeKA/viewform?usp=dialog

CODERS SOFIA

WWDC25 Watch Party

DATE

9 June 2025, Monday
19:30

VENUE

Barter Community Hub
47 Cherni Vrah Blvd, Sofia