Build faster strategy

By Clayton

What the Incremental build is? - Clean build

Build

SamplePoint.swift

```
struct SamplePoint {

    var x,y: Double

    init(x: Double, y: Double) {
        self.x = x
        self.y = y
    }
}
```

Build

ViewController.swift

```
let point = SamplePoint(x: 1.0, y: 2.0)
```

What the Incremental build is? - Body changed

Build

SamplePoint.swift

```
struct SamplePoint {

    var x,y: Double

    init(x: Double, y: Double) {
        assert(x > 0.0)
        assert(y > 0.0)
        self.x = x
        self.y = y
    }
}
```

Not Build

ViewController.swift

```
let point = SamplePoint(x: 1.0, y: 2.0)
```

Changes in function bodies do not affect other files

What the Incremental build is? - Outside body result in

Build

SamplePoint.swift

```
struct SamplePoint {

    var x,y: Double
    var name: String

    init(x: Double, y: Double) {
        assert(x > 0.0)
        assert(y > 0.0)
        self.x = x
        self.y = y
        self.name = “TEST”
    }
```

Build

ViewController.swift

```
let point = SamplePoint(x: 1.0, y: 2.0)
```

Unreleated changes outside function bodies can still result in rebuilding

Qanda’s Incremental build state

Prepare build
Workspace QandaStudent | Scheme QandaStudent | Destination iPhone
Using new build system
Building targets in parallel
Planning build
Analyzing workspace
Using build description from memory
Build preparation complete

Build target QandaStudent
Project QandaStudent | Configuration Debug | Destination iPhone | SDK iOS 14.5
Run custom shell script 'SwiftGen' 0.5 seconds
Not writing the file as content is unchanged
Not writing the file as content is unchanged
Not writing the file as content is unchanged
Run custom shell script 'Setup Firebase Environment GoogleService-Info.plist' 0.1 seconds
Looking for GoogleService-Info.plist in /Users/clayton/Desktop/Qanda/ios-qanda-student/QandaStudent/Resources/SupportingFiles/Beta/GoogleService-Info.plist
Looking for GoogleService-Info.plist in /Users/clayton/Desktop/Qanda/ios-qanda-student/QandaStudent/Resources/SupportingFiles/Release/GoogleService-Info.plist
Will copy GoogleService-Info.plist to final destination: /Users/clayton/Library/Developer/Xcode/DerivedData/QandaStudent-gasghcdwxhccpngeufcfawcmoiwk/Build/Products/Debug-iphoneos/QandaStudent.app
Using /Users/clayton/Desktop/Qanda/ios-qanda-student/QandaStudent/Resources/SupportingFiles/Release/GoogleService-Info.plist
Run custom shell script 'Remove TemporaryItems on carthage' 0.1 seconds
Compile Swift source files (arm64) 48.0 seconds
Precompile bridging header (arm64)
Compile Networking.swift (arm64)
Merge swiftmodule (arm64)
Copy QandaStudent.swiftmodule (arm64) 0.1 seconds
Copy QandaStudent.swiftsourceinfo (arm64) 0.1 seconds
Copy QandaStudent.swiftsourceinfo (arm64) 0.1 seconds
Link QandaStudent (arm64) 17.3 seconds
Copy QandaStudent.swiftmodule (arm64) 0.1 seconds
Copy Settings.bundle 0.1 seconds
Run custom shell script 'Setup Firebase Crashlytics' 0.1 seconds
Run custom shell script 'Acknowledgements' 1.3 seconds
Run custom shell script 'Find unused codes' 0.1 seconds
Run custom shell script 'Integrate Reveal Server' 0.1 seconds
Reveal Server not loaded: Cannot find a compatible Reveal app.
Copy Swift standard libraries into QandaStudent.app 2.0 seconds
Sign QandaStudent.app 1.9 seconds
Validate QandaStudent.app 0.1 seconds
Build succeeded 2021/07/22 10:08 AM 73.0 seconds
41 warnings

Qanda’s Long single task

Build Timing Summary
Workspace QandaStudent | Scheme QandaStudent | Destination iPhone

- CompileSwiftSources (1 task) 46.212 seconds
- Ld (1 task) 17.734 seconds
- CodeSign (1 task) 1.922 seconds
- PhaseScriptExecution (7 tasks) 1.918 seconds
- Ditto (4 tasks) 0.048 seconds

Build succeeded 2021/07/22 10:30 AM 70.7 seconds
41 warnings

Qanda’s Long single task

What is Ld ?

Build Timing Summary
Workspace QandaStudent | Scheme QandaStudent | Destination iPhone

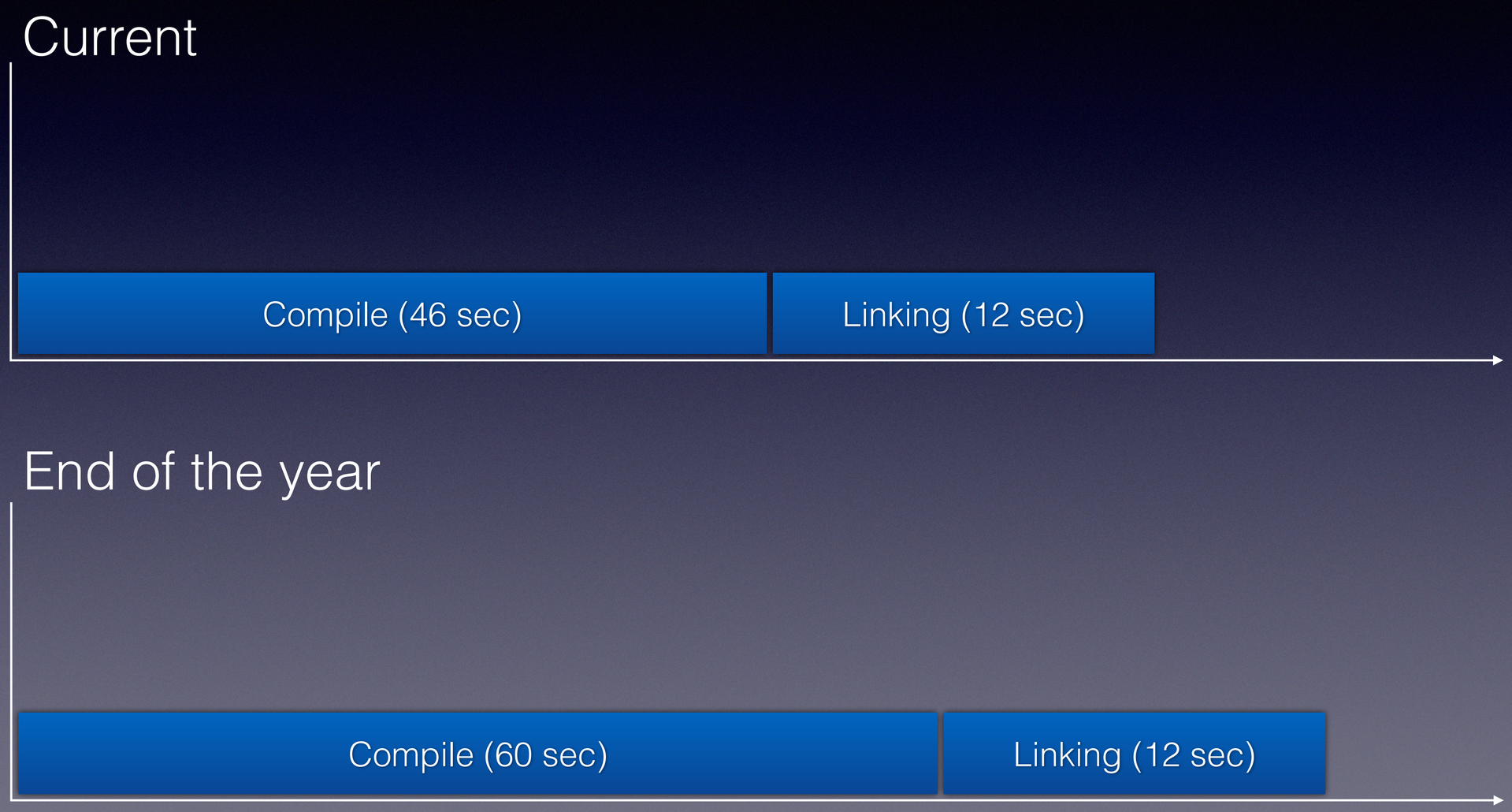
- CompileSwiftSources (1 task) 46.212 seconds
- Ld (1 task) 17.734 seconds
- CodeSign (1 task) 1.922 seconds
- PhaseScriptExecution (7 tasks) 1.918 seconds
- Ditto (4 tasks) 0.048 seconds

Build succeeded 2021/07/22 10:30 AM 70.7 seconds
41 warnings

Qanda’s Long single task

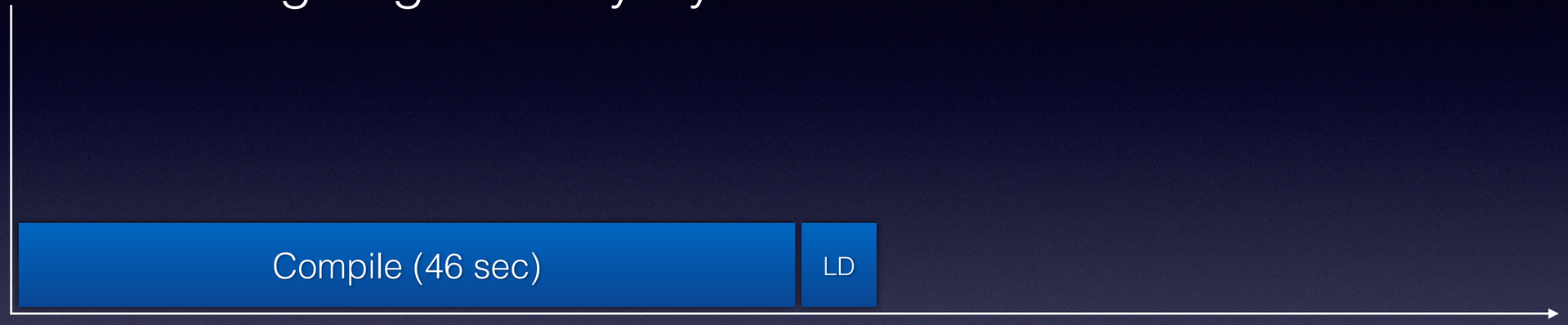
Compile AuthMainRouter.swift (arm64) 18.7 seconds
Compile PremiumPaymentRouter.swift (arm64) 11.5 seconds
Compile InAppAdMediation.swift (arm64) 9.2 seconds
Compile CustomerCenterComponent+HelpCenter.swift (arm64) 7.6 seconds
Compile QandaOriginalVideoLastViewRecordObject.swift (arm64) 7.6 seconds
Compile PassTouchEventToSubLabel.swift (arm64) 7.9 seconds
Compile TeacherChannelComponent+VideoSolutionPlayerAdapter.swift (arm64) 10.3 seconds
Compile FindPasswordAuthViewController.swift (arm64) 9.8 seconds
Compile FBAnalyticsLoggingModel.swift (arm64) 7.8 seconds
Compile FeedTeacherBriefInfoViewController.swift (arm64) 11.7 seconds
Compile MyInfoRetentionSectionSource.swift (arm64) 10.0 seconds
Compile TimerService.swift (arm64) 9.2 seconds
Compile LoadingIndicator.swift (arm64) 9.4 seconds
Compile BadgeListRouter.swift (arm64) 17.1 seconds
Compile QuizQuizWaitingSceneComponent+ShopContainerAdapter.swift (arm64) 12.8 seconds
Compile CoinMissionRouter.swift (arm64) 17.0 seconds
Compile SaveRecentHistory.swift (arm64) 7.7 seconds
Compile StaticValueService.swift (arm64) 8.3 seconds
Compile TranslateQuestionImageCell.swift (arm64) 7.7 seconds
Compile PremiumMembershipPaymentCompletionViewController.swift (arm64) 8.7 seconds
Compile UNUserNotificationCenter+Reactive.swift (arm64) 5.8 seconds
Compile RootViewController.swift (arm64) 8.2 seconds
Compile QLearningNavigationBuilder.swift (arm64) 8.3 seconds
Compile ToolTipMessageType.swift (arm64) 8.8 seconds
Compile VideoDetailWebMessage.swift (arm64) 7.4 seconds
Compile InAppAdMoyaTarget.swift (arm64) 9.2 seconds
Compile HomePopUpComponent+PagerPopUp.swift (arm64) 8.8 seconds
Compile SolvingTrackSectionController.swift (arm64) 11.2 seconds
Compile WriteFeedComponent+SelectCategory.swift (arm64) 5.6 seconds
Compile DailySchoolMealInfoBuilder.swift (arm64) 7.4 seconds
Compile TimerHeaderView.swift (arm64) 9.1 seconds
Compile CustomerCenterBuilder.swift (arm64) 7.6 seconds
Compile CopyLabel.swift (arm64) 6.3 seconds
Compile QPlayQuestionSourceView.swift (arm64) 8.6 seconds
Compile FeedbackSupportInteractor.swift (arm64) 8.0 seconds
Compile CommunityCategoryBuilder.swift (arm64) 17.1 seconds
Compile FindPasswordResetBuilder.swift (arm64) 9.6 seconds
Compile PaymentDelegate.swift (arm64) 7.9 seconds
Compile CommunityCategoryListRouter.swift (arm64) 17.1 seconds
Compile FeedTeacherDetailReviewsPresenter.swift (arm64) 11.6 seconds
Compile OriginalSeriesDetailComponent+OriginalPurchase.swift (arm64) 10.4 seconds
Compile VideoSolutionPlayerComponent+TeacherChannelAdapter.swift (arm64) 7.6 seconds
Compile TranslationContentEditorRouter.swift (arm64) 7.7 seconds
Compile FeedQuestionDetailTimeHeader.swift (arm64) 9.6 seconds
Compile GoogleSpreadsheetRepository.swift (arm64) 8.9 seconds
Compile HistoryAlbum.swift (arm64) 10.5 seconds
Compile ImageQuestionUploadBuilder.swift (arm64) 11.7 seconds
Compile ImageUploadService.swift (arm64) 9.3 seconds
Compile MainTabBarListener.swift (arm64) 7.9 seconds
Compile HomeWidgetDataRepository.swift (arm64) 11.1 seconds
Compile EventNoticeBuilder.swift (arm64) 9.2 seconds
Compile AbstractQuestionUploadPresentableInteractor.swift (arm64) 18.9 seconds
Compile SeriesDetailWorkflow.swift (arm64) 8.2 seconds
Compile TimerUserGroupNoticeViewController.swift (arm64) 8.2 seconds
Compile QandaTimerCompareGraphTitleButton.swift (arm64) 9.1 seconds
Compile MyTracksRouter.swift (arm64) 9.0 seconds
Compile CoinMembershipWorkflow.swift (arm64) 17.7 seconds
Compile QuizQuizBannerView.swift (arm64) 9.0 seconds
Compile RankTeachersInteractor.swift (arm64) 9.4 seconds
Compile CoreNavigationComponent+HelpCenter.swift (arm64) 6.3 seconds
Compile SolvedTracksRouter.swift (arm64) 10.2 seconds
Compile MyViewPartnershipMapViewController.swift (arm64) 7.6 seconds
Compile EnglishImageQuestionUploadViewController.swift (arm64) 9.2 seconds
Compile HistoryAlbumDetailPresenter.swift (arm64) 10.5 seconds
Compile QPlayStudyType.swift (arm64) 9.7 seconds

Qanda's build state for current and future

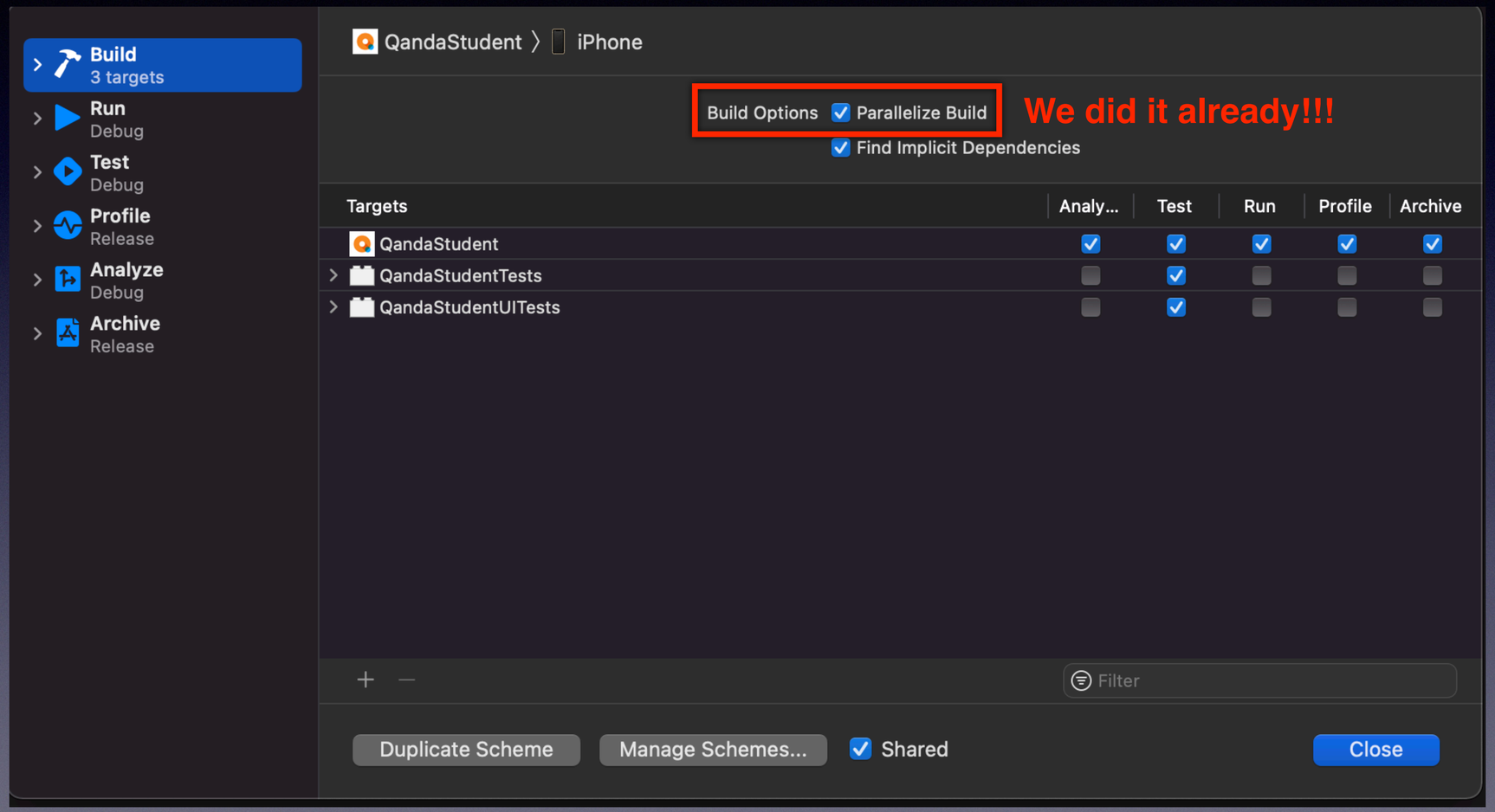


Qanda's build state for current and future

After linking bug fixed by Ryan

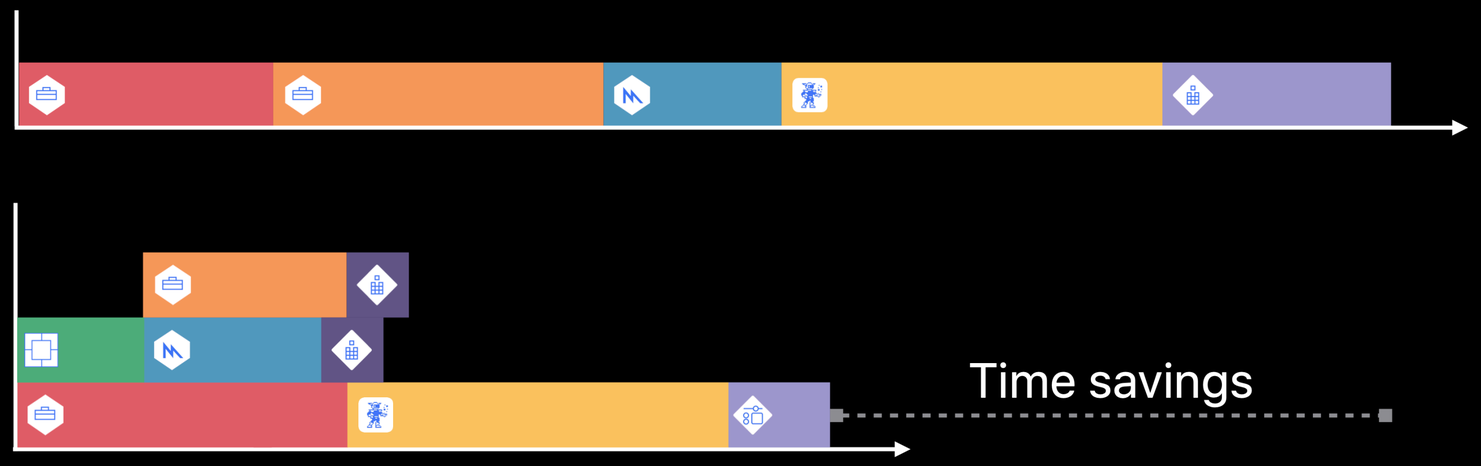


Apple’s suggestion for build - Parallelized



Apple’s suggestion for build - Parallelized

Parallelized Build Timeline

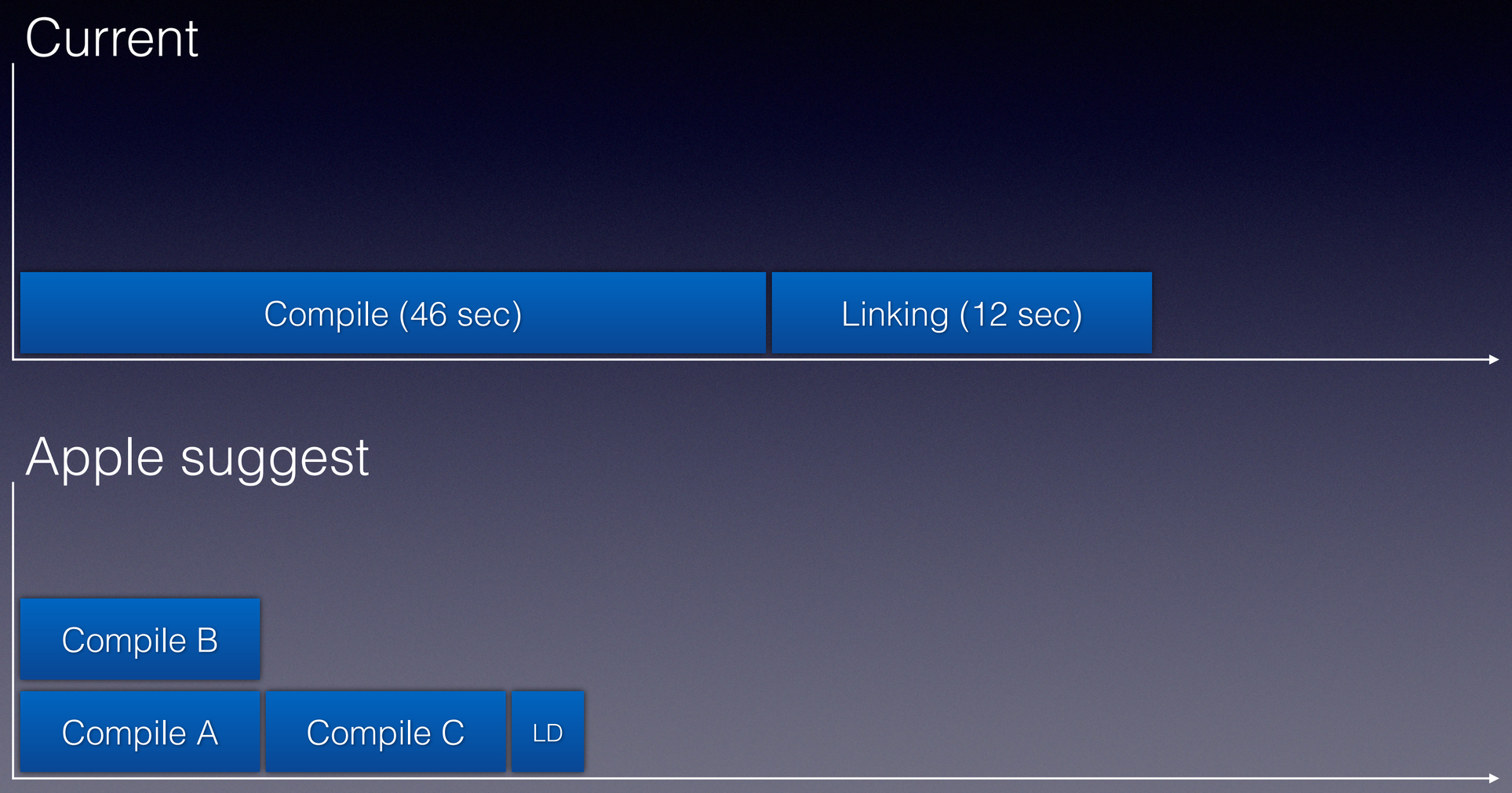


Amount of work did not change

Time to build decreased

Increased hardware utilization

Compare between apple's suggest and Qanda



Apple’s suggest with incremental build

Compare build time

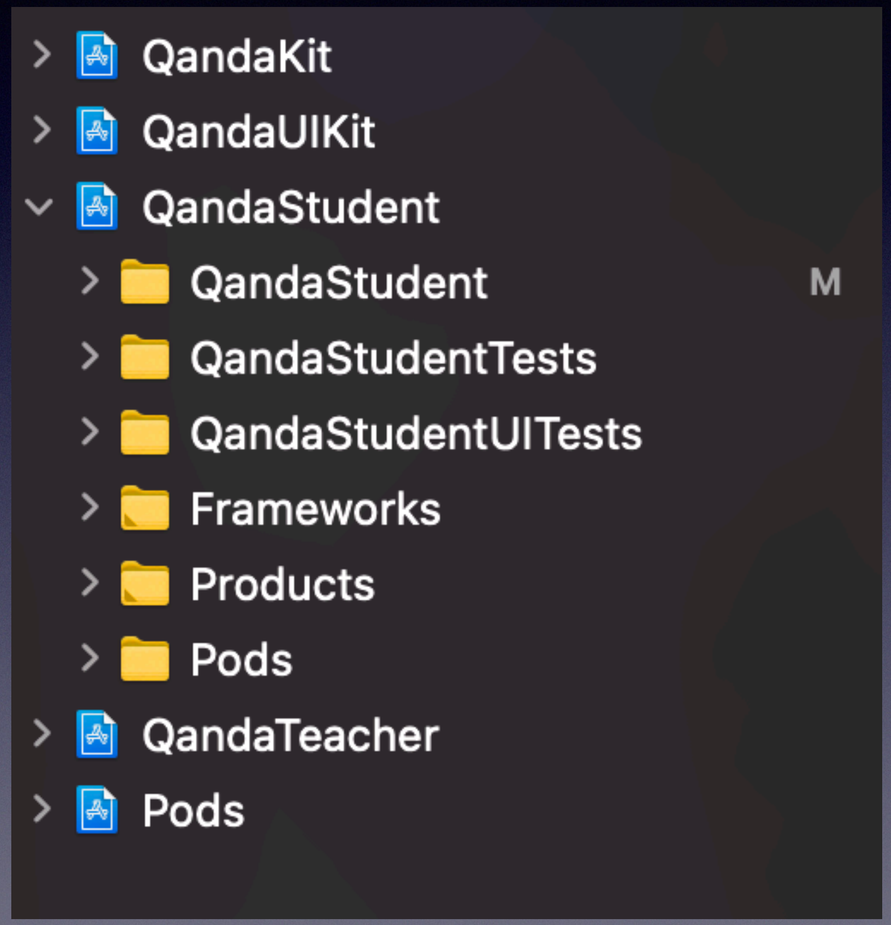
Current

- Waiting for building once: About 70 sec per build
- About 50 times try for build per day
- 70 sec * 50 = 3500 sec = 58 min waiting for build

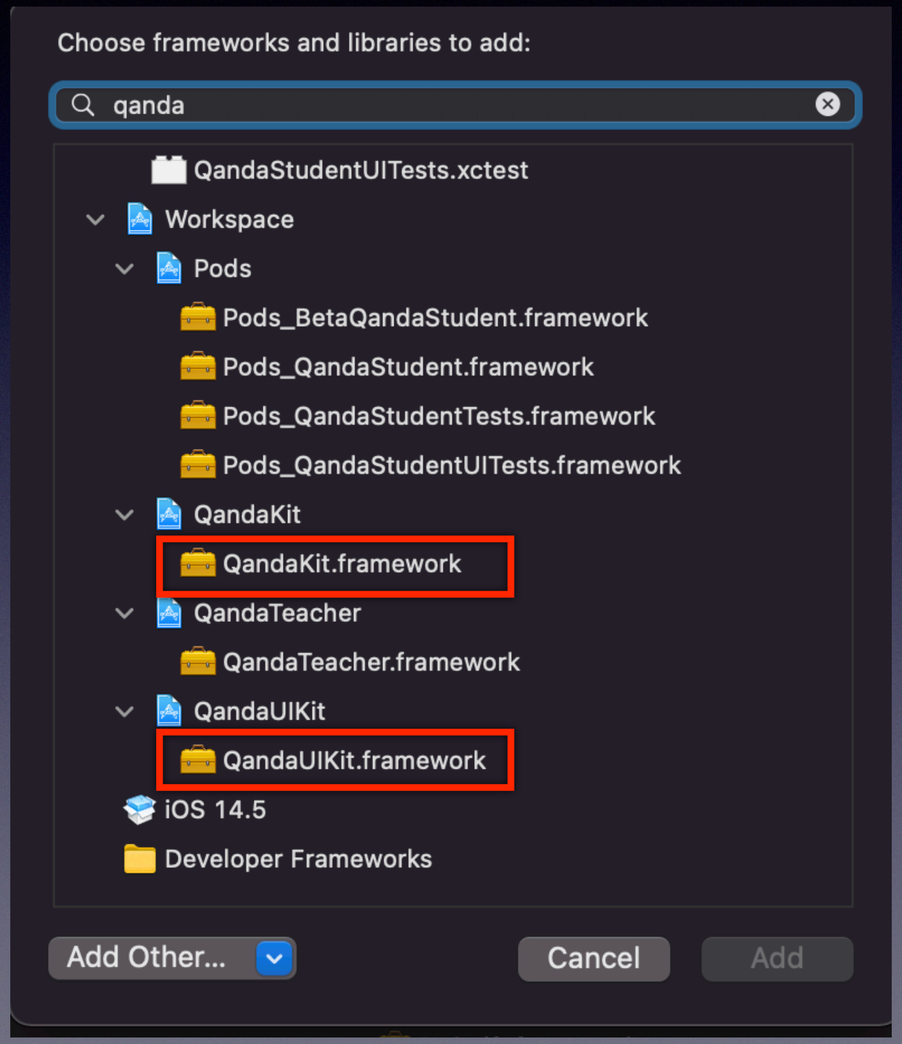
Goal

- Waiting for building once: About 5 sec per build
- About 50 times try for build per day
- 5 sec * 50 = 250 sec = 4 min waiting for build
- About 1 Hour save

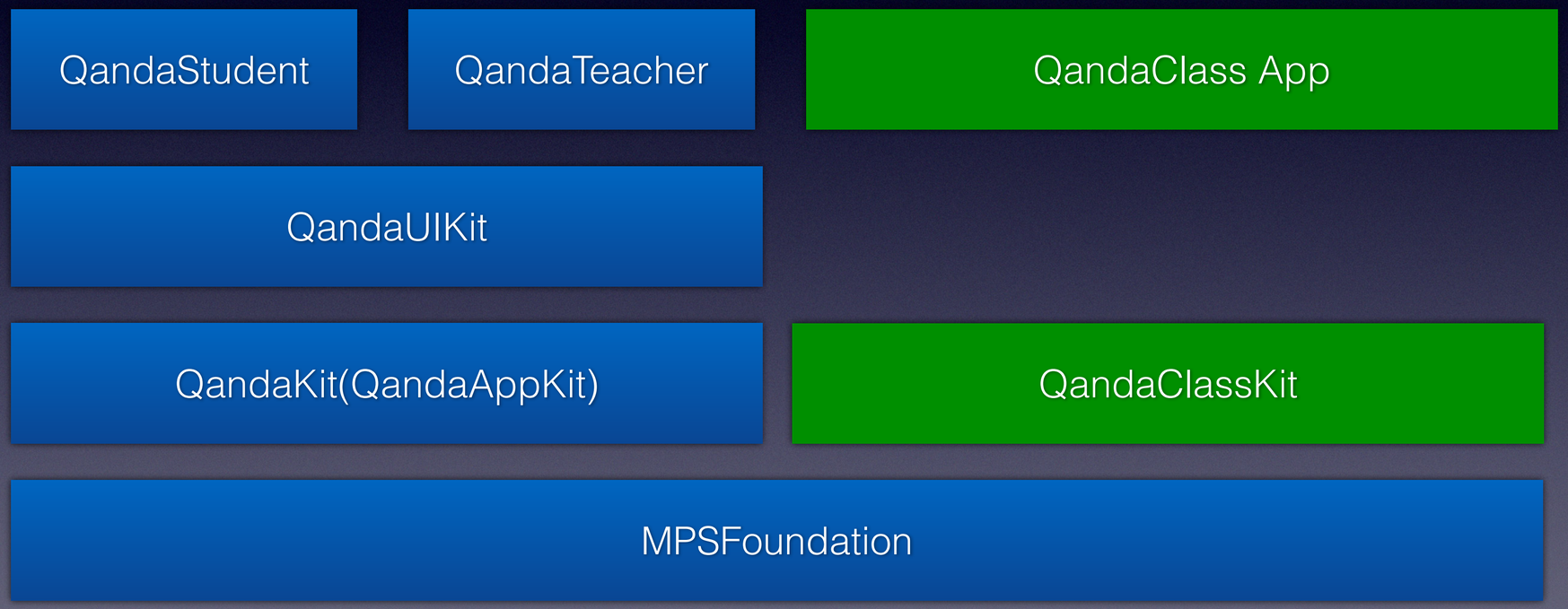
Goal: Target Separation



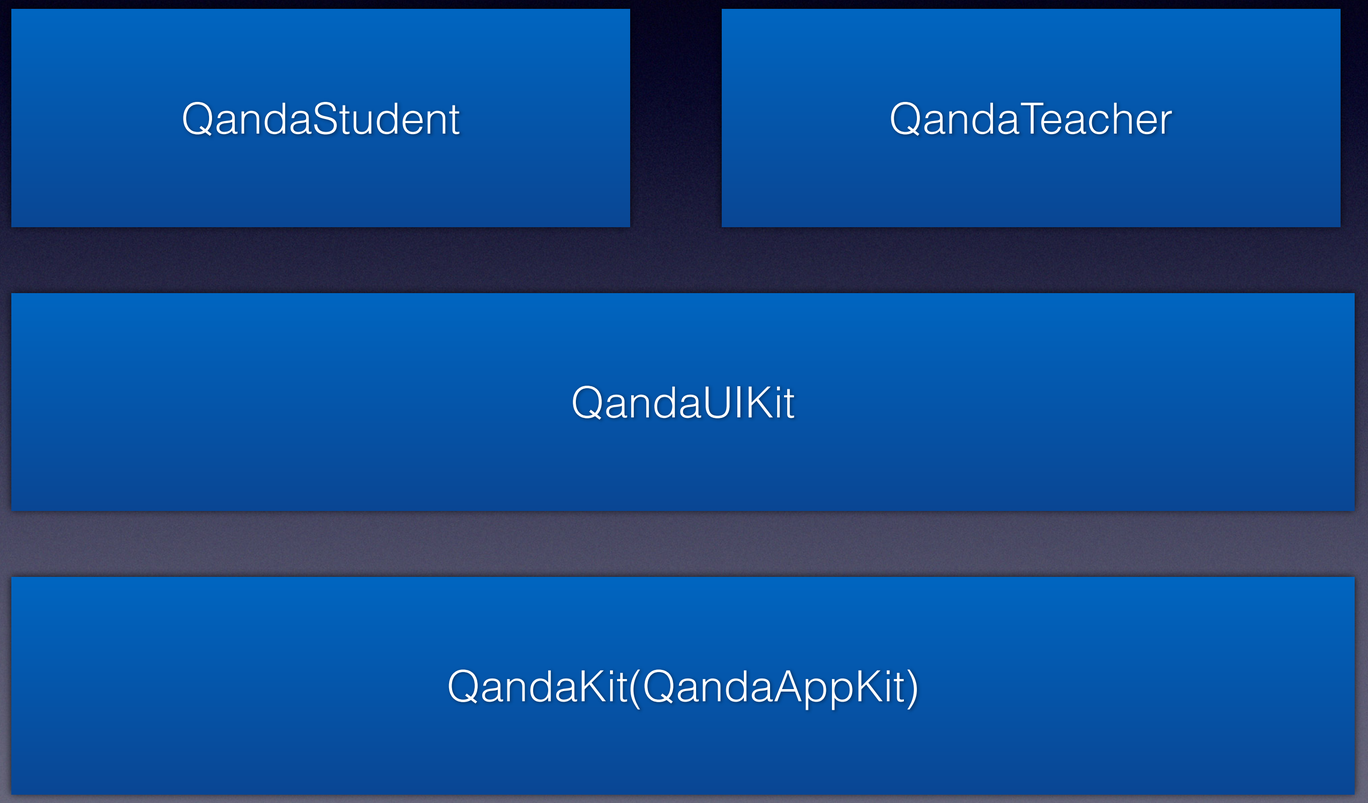
Goal: Target Separation



Goal: Target Separation Map



Goal: Target Separation Map Step #1



Goal: Target Separation Map Step #1

QandaKit(QandaAppKit)

Components

- Network, DB Module
- Massive Business Logic
- A/B Test Reuse Component
- Data Model
- Parser Model
- Queue
- etc…

Goal: Target Separation Map Step #1

QandaUIKit

Components

- QDS UI Components
- Common UIViewController, UITableViewController, UICollectionViewController
  => Life cycle management(Reload, Paging, Error handling…)
- Common Loading View Controller
  => Common Error Handling
- Animation Module
- etc…

References

- Behind the Scenes of the Xcode Build Process
  https://developer.apple.com/videos/play/wwdc2018/415
- Building Faster in Xcode
  https://developer.apple.com/videos/play/wwdc2018/408
- Improving the Speed of Incremental Builds
  https://developer.apple.com/documentation/xcode/improving-the-speed-of-incremental-builds