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Make it fast

Denis Nek
Google Developer Expert
@nekdenis

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AndroidDev Podcast

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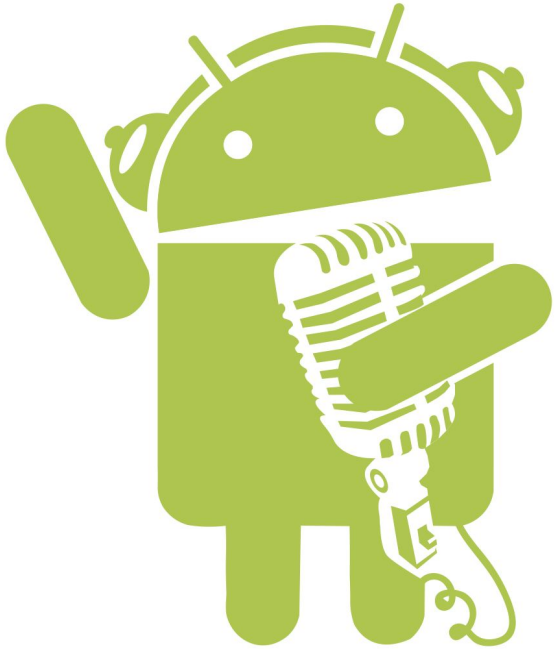
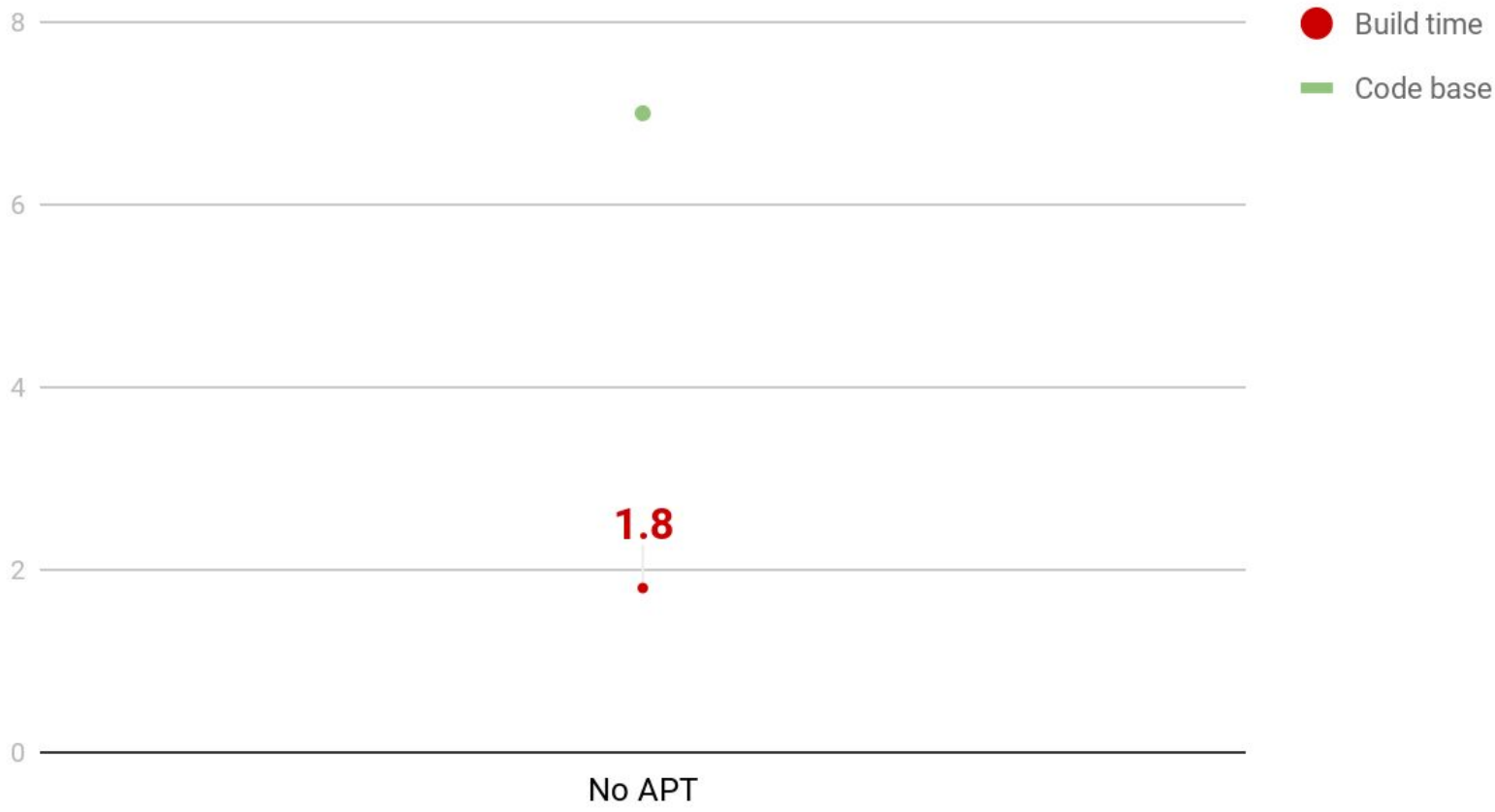
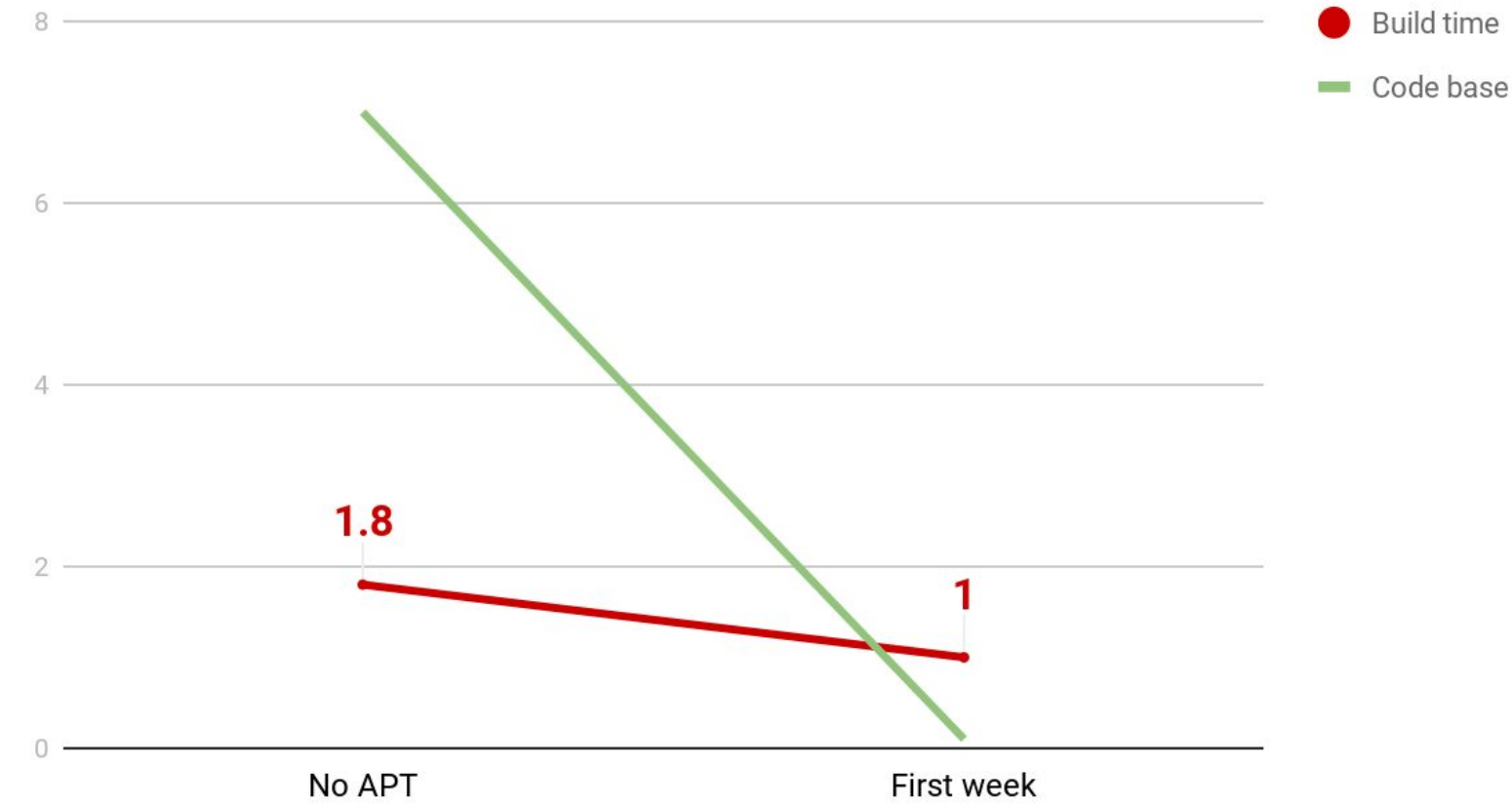


#AndroidDevPodcast

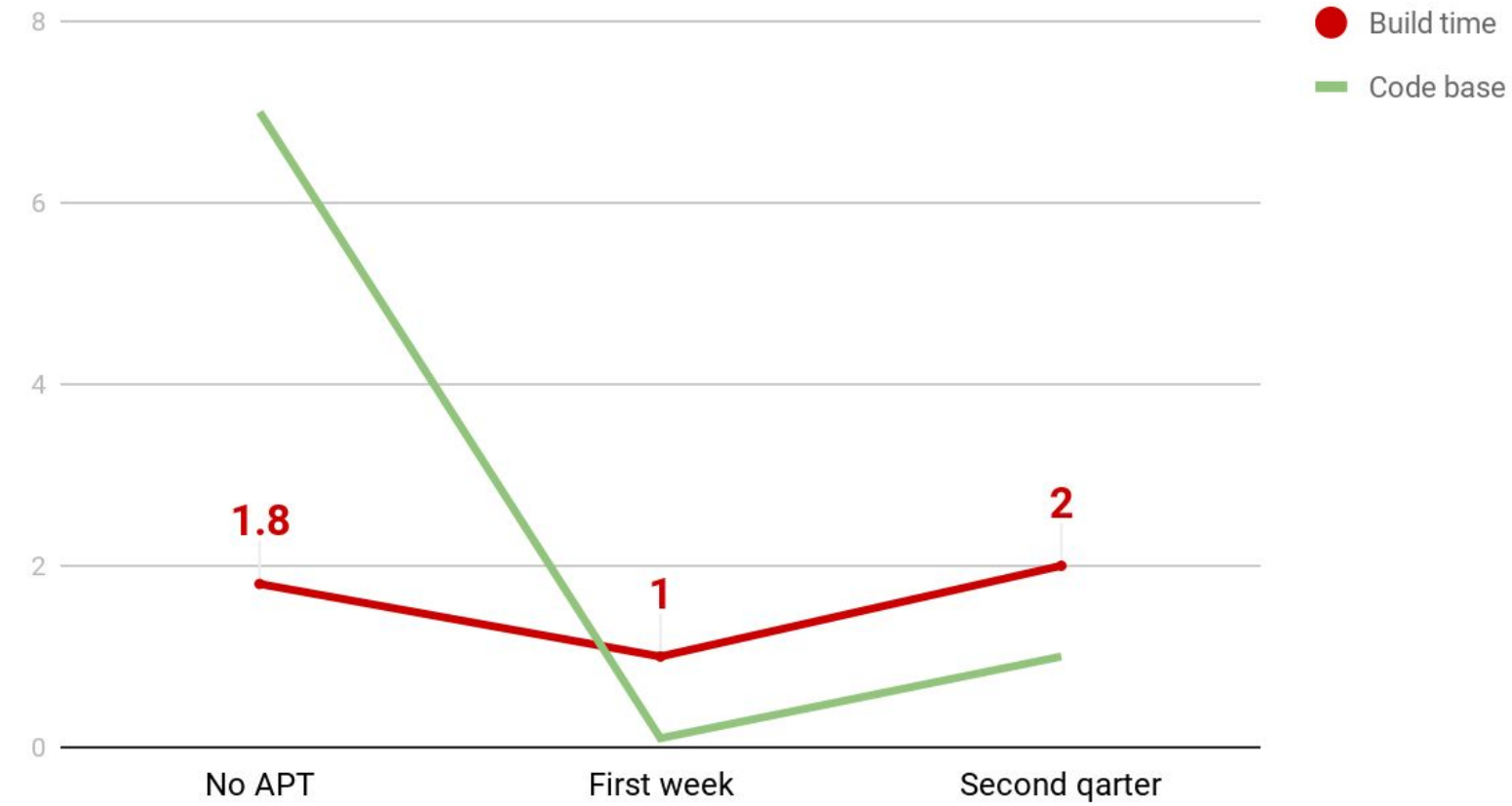
Clean build time minutes



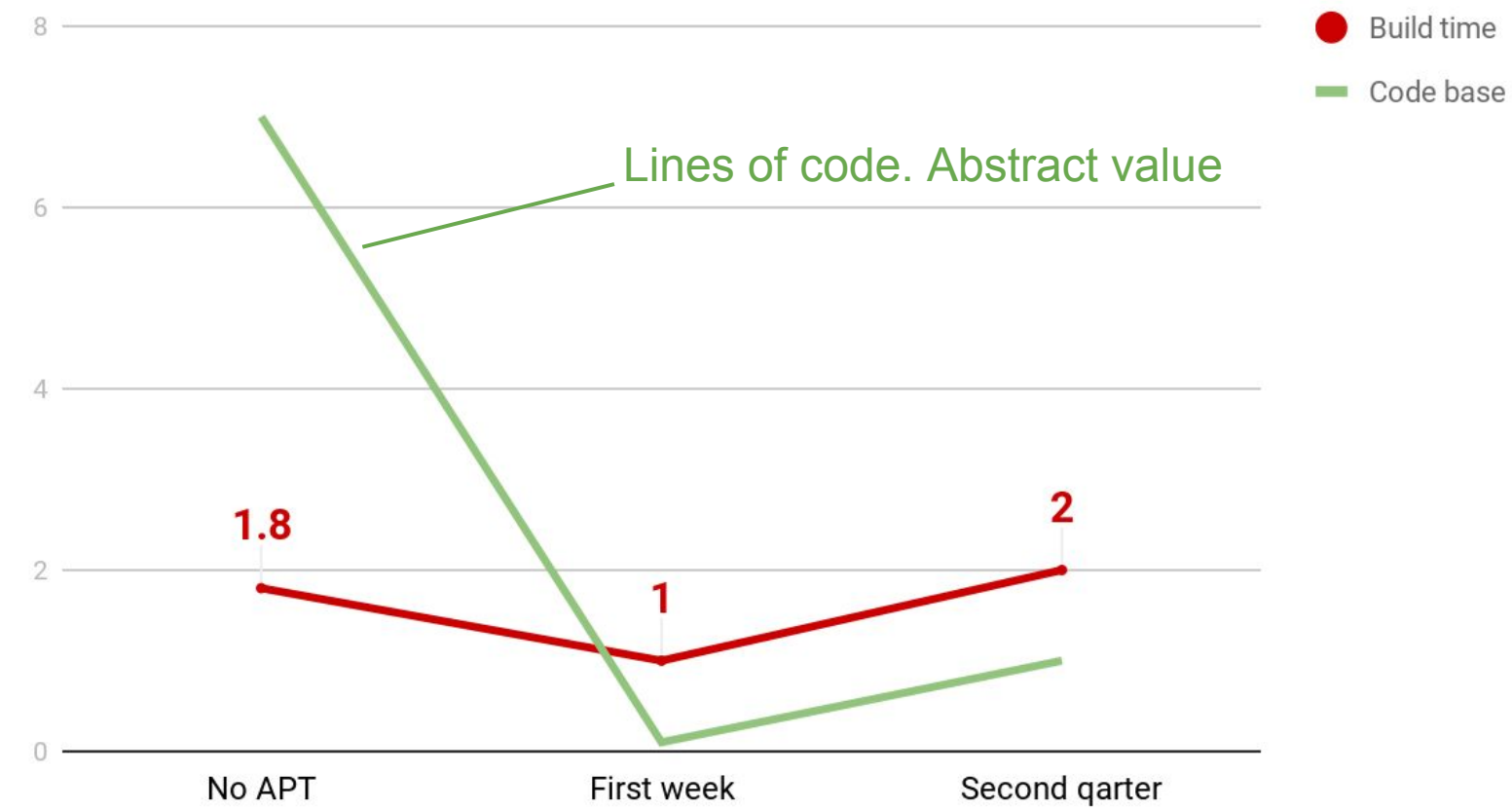
Clean build time minutes



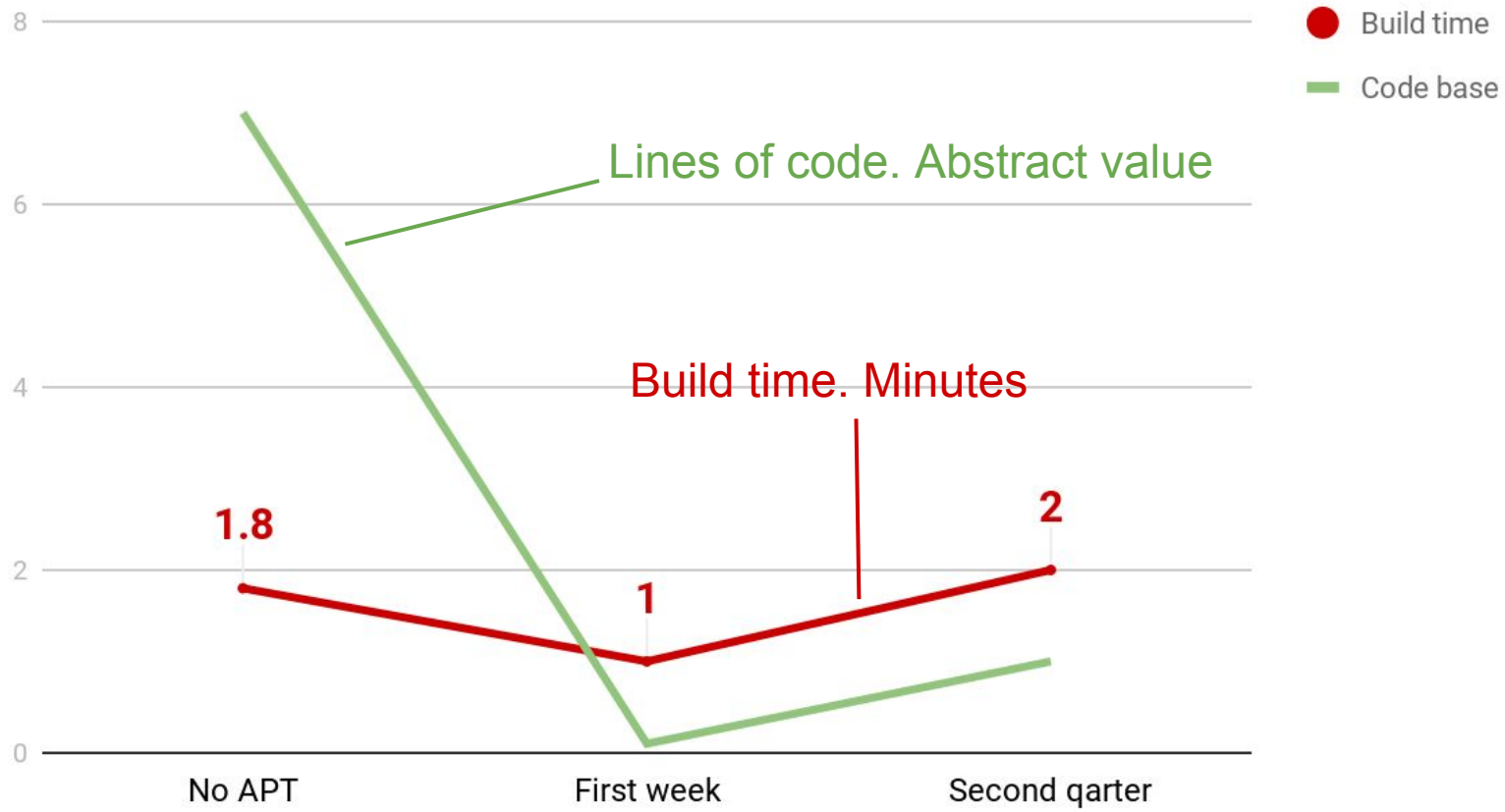
Clean build time minutes



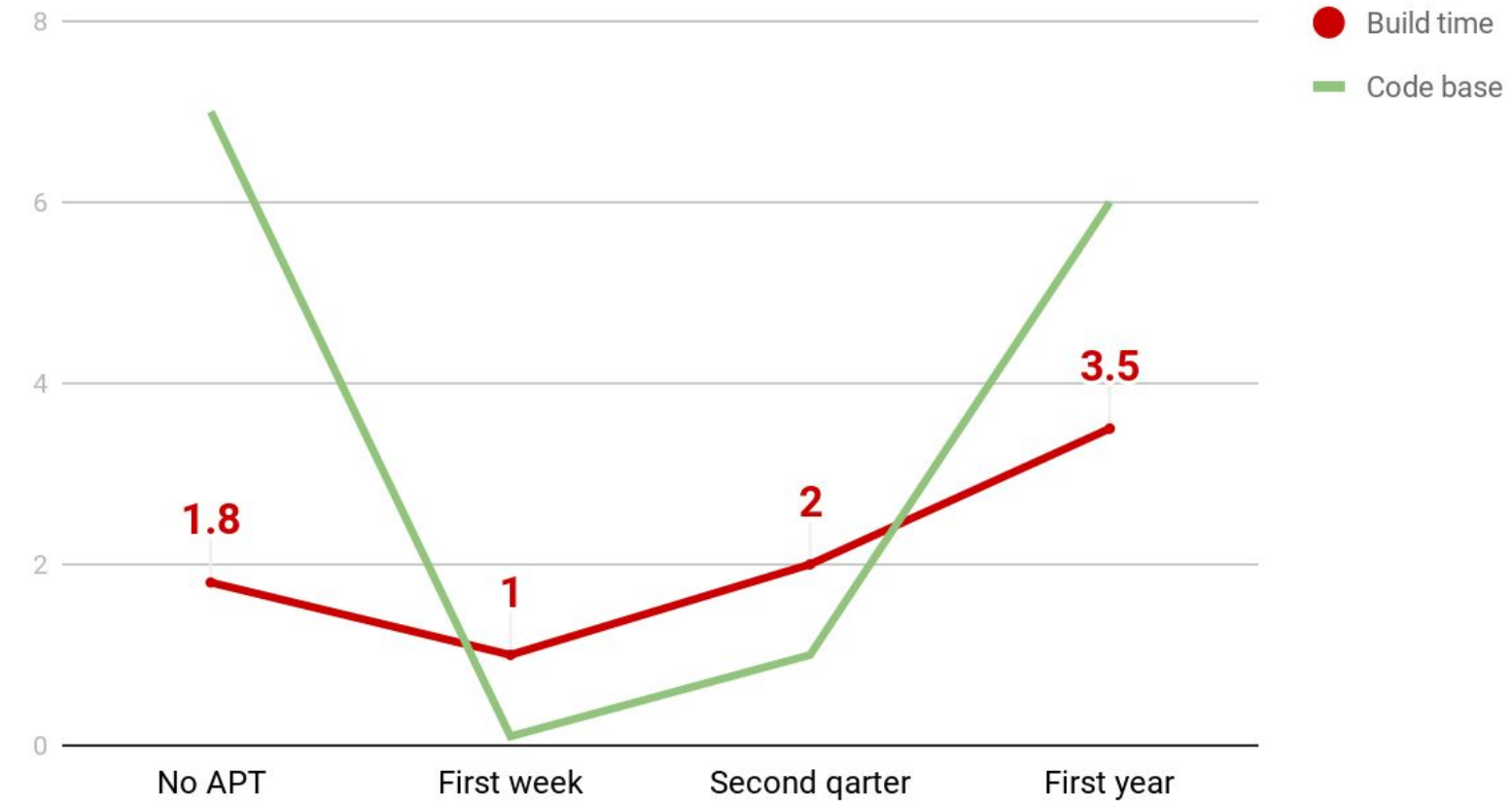
Clean build time minutes



Clean build time minutes



Clean build time minutes



Clean build time **before APT**: 1.8 min

What’s common?

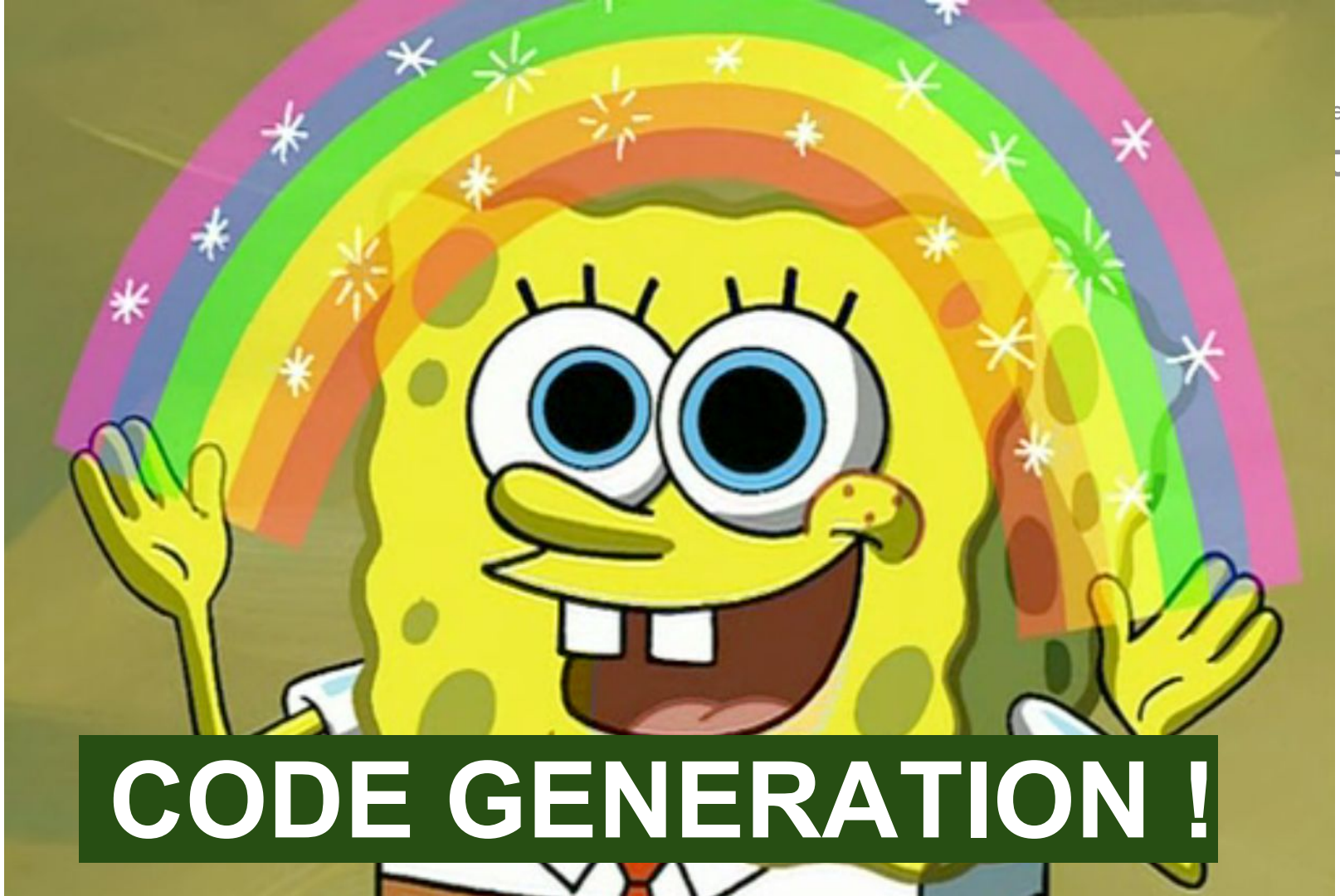
Dagger 2

Butter Knife

DataBinding

Room

APT and KAPT


CODE GENERATION !

APT benefits

- Less code
- Easy to read
- Tested
- Hipsterish

Plain Java way

lopers

S

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Clean build time **before APT**: 1.8 min

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Clean build time **with APT**: 3.5 min

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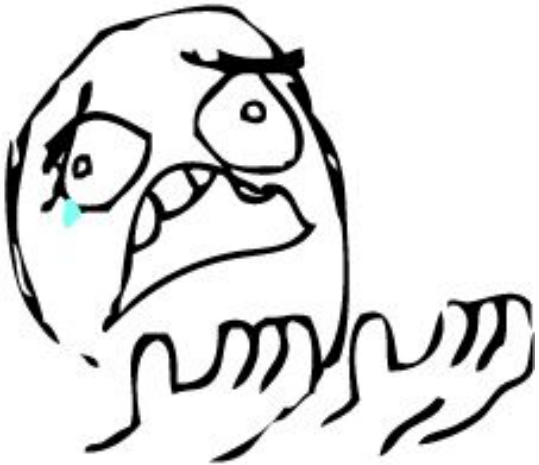
Incremental change of
one line of code:
3.5 min



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Annotation processing is not INCREMENTAL

Single module architecture:

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Single module architecture:

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Several modules architecture:

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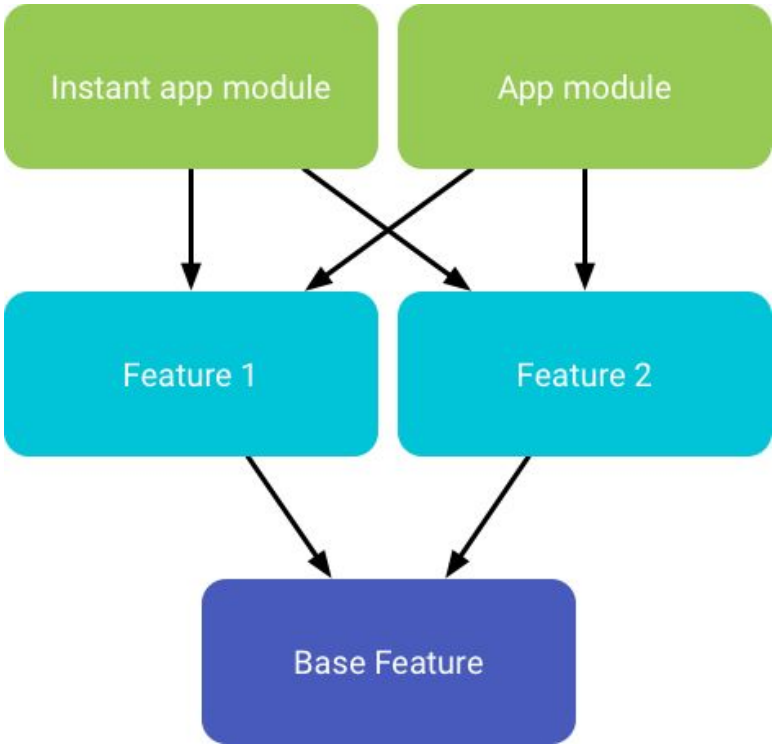
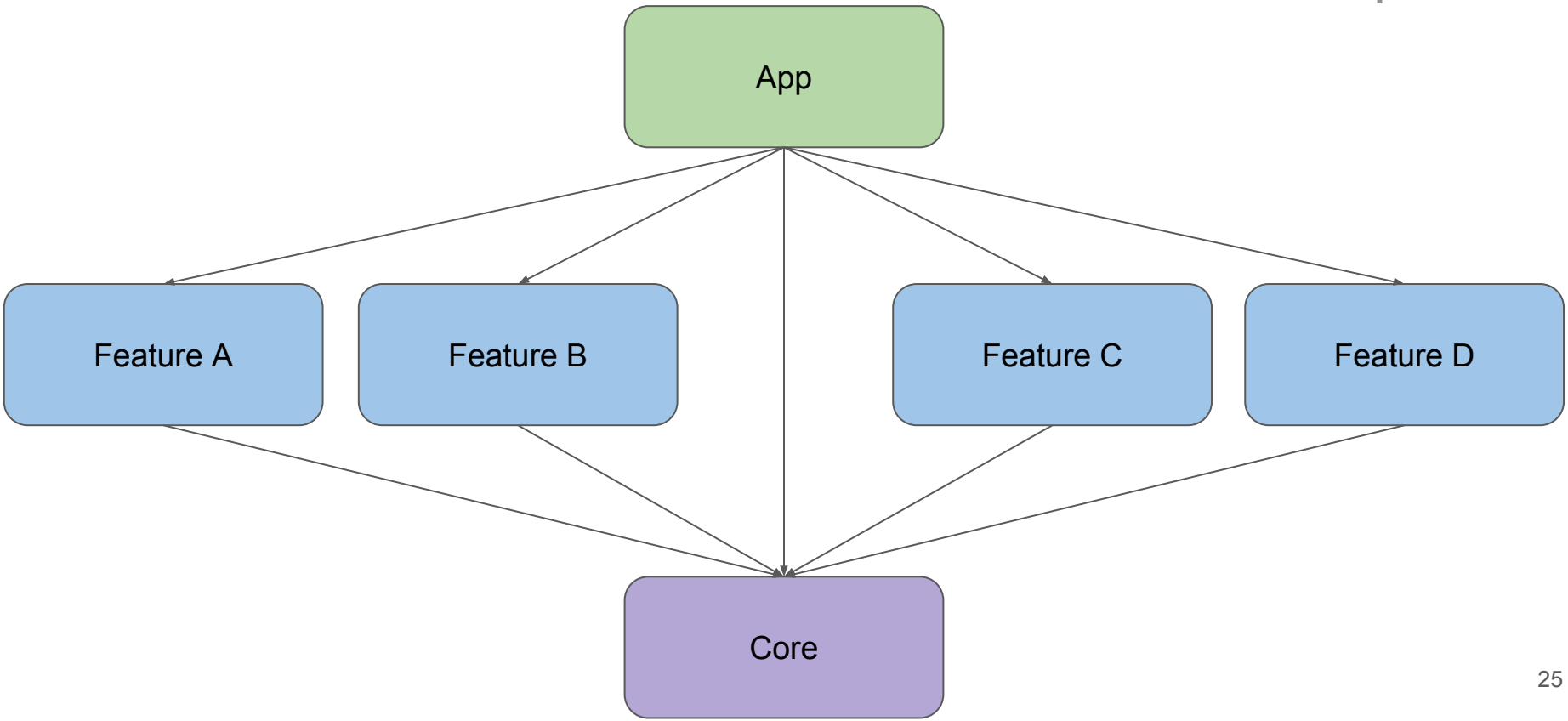


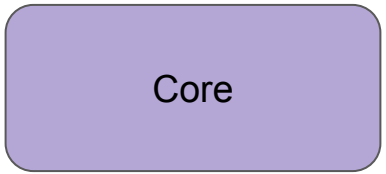
Several modules architecture:

Google Developers Experts



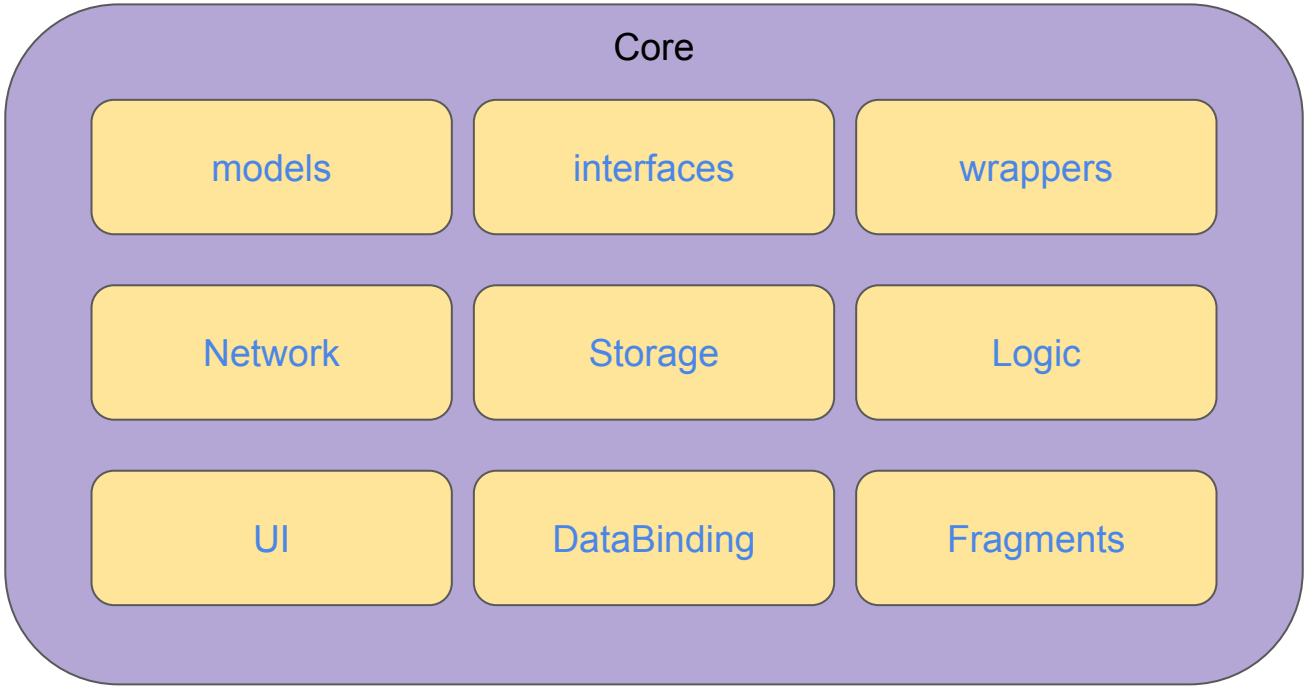
Several modules architecture:

Google Developers Experts



Several modules architecture:

Google Developers Experts



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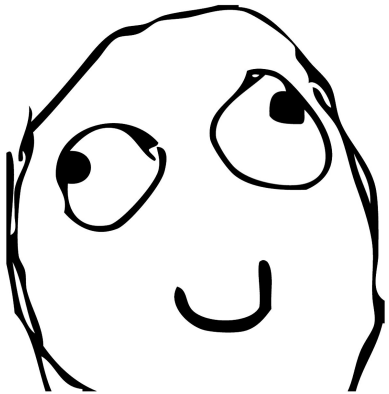
Incremental change of one line of code **in feature**: 3 min



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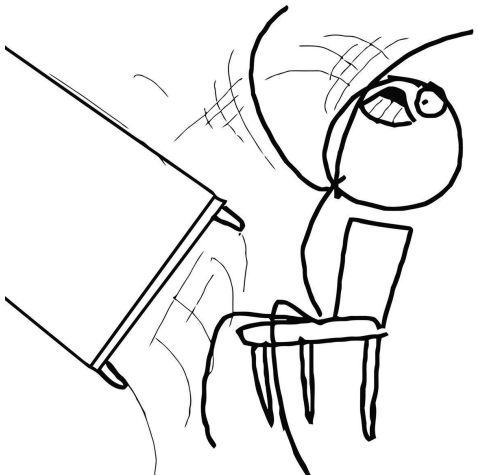
Incremental change of one line of code **in core**:

7.5 min



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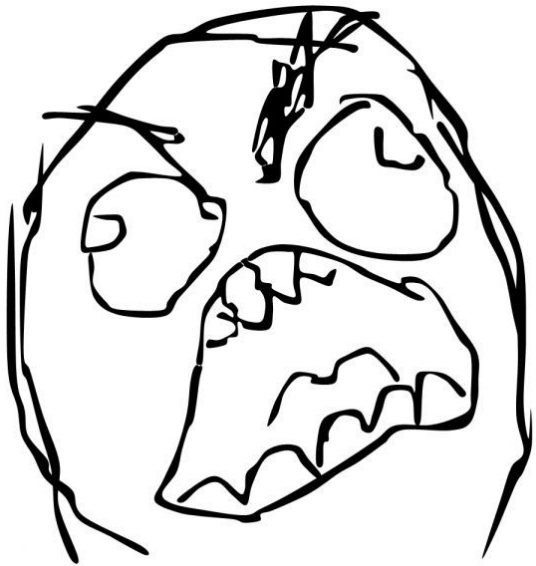

in core:

7.5 min

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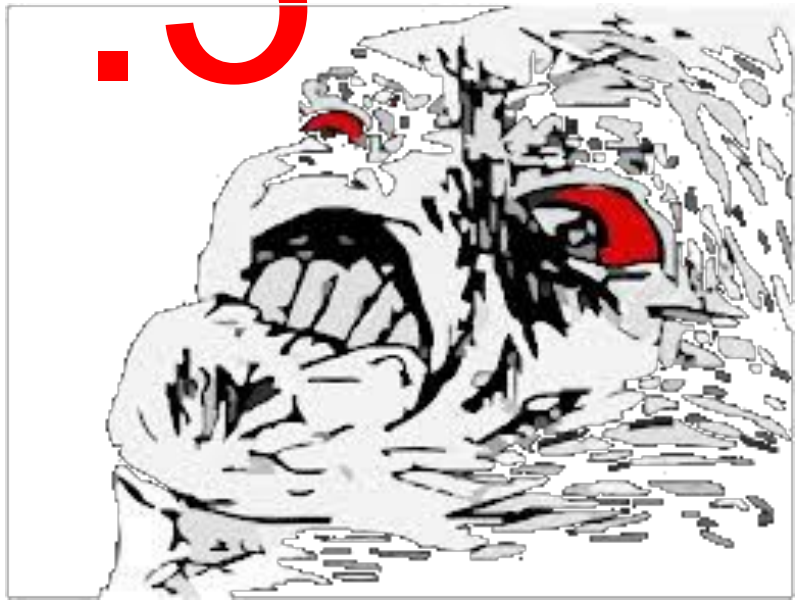
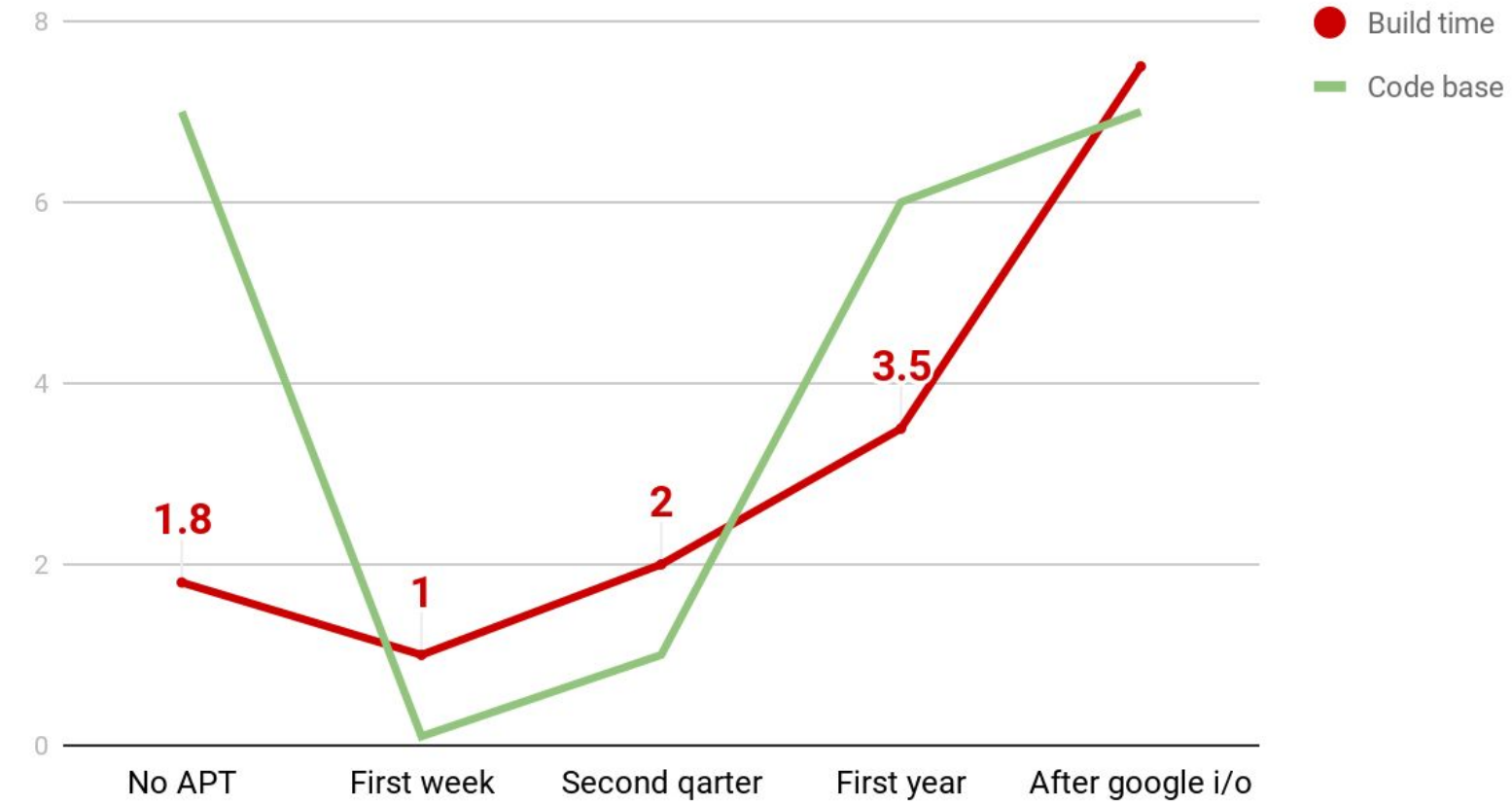
7.5



Clean build time minutes



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Why that happened?

Several modules architecture:

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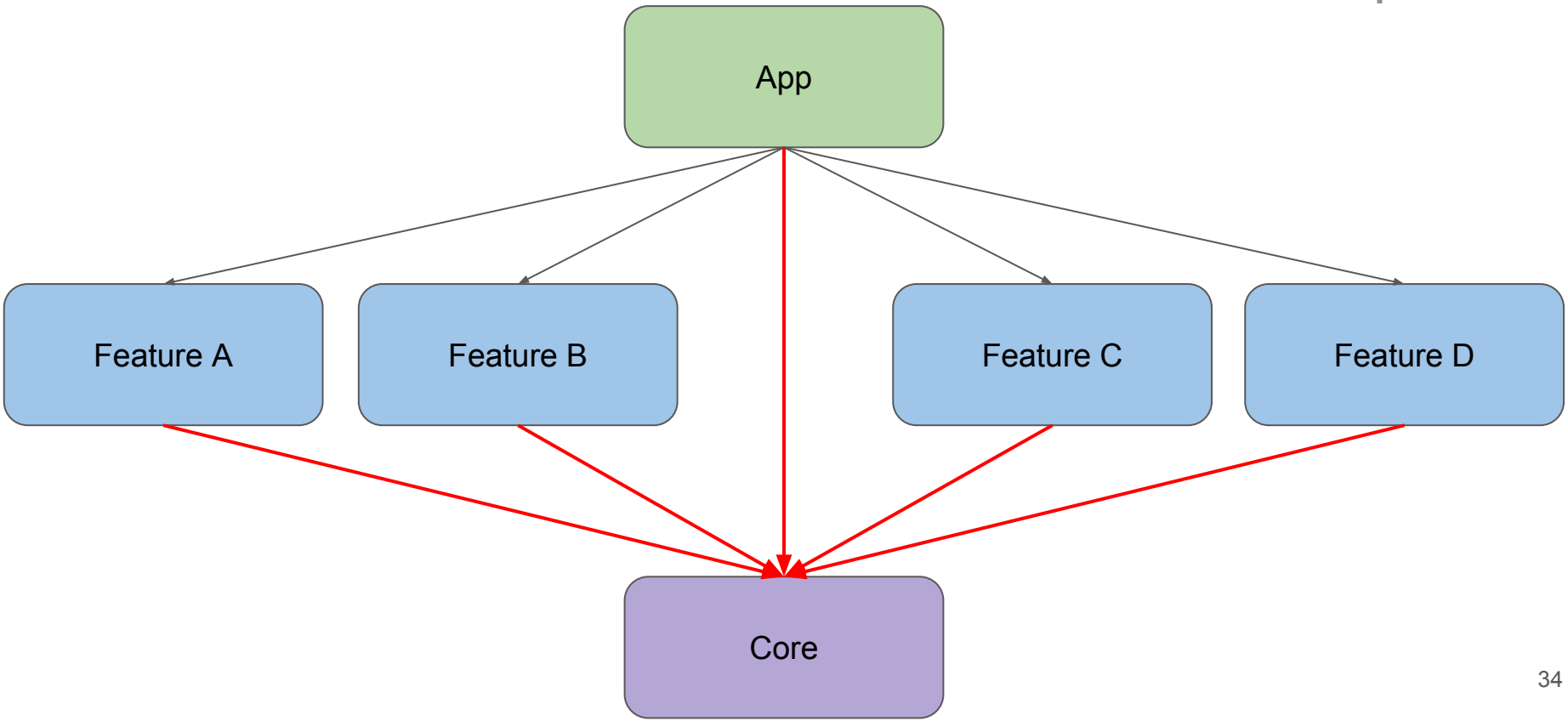

Modules without APT:

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Annotation processing is not INCREMENTAL

Life has no more sense

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Small refactoring

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Non revertable refactoring

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Almost new project

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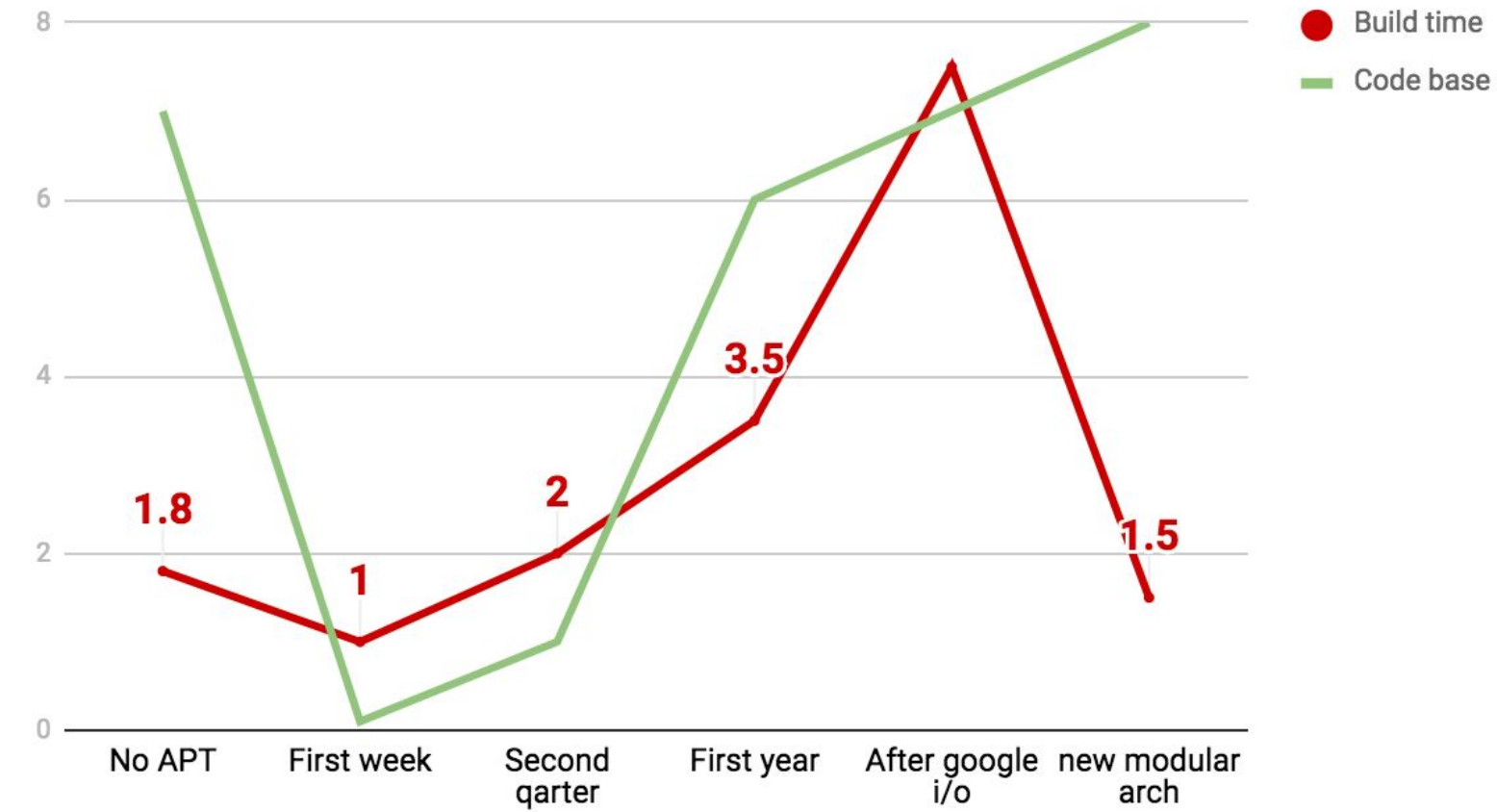
Clean build time minutes



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Investigation

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Gradle

Gradle --scan

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./gradlew clean assembleDebug --scan

Gradle --scan

Google Developers Experts

./gradlew clean assembleDebug --scan

Build Scan d ✓ 90Seconds_fixes cl clBC assDD Mar 17, 2018 10:45:34 PM +08

- Summary
- Console log
- Timeline
- Performance
- Projects
- Dependencies
- Plugins
- Switches
- Infrastructure

Started today at 10:45:34 PM +08, finished today at 10:53:06 PM +08
Gradle 4.4-rc-3, Build scan plugin 1.10.3, Android Gradle plugin 3.0.0

Explore console log

259 tasks executed in **7 projects** in **7m 17.766s**

:app:compileDevDebugKotlin	1m 2.069s
:app:kaptDevDebugKotlin	47.606s
:core:compileDevDebugKotlin	41.240s

Explore timeline

7 min 32 sec total build time

Initialization and configuration	14.007s
Task execution	7m 17.766s

Explore performance

Tasks count

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Path	Started after	Duration
:appinjector:clean	0.000s	6.713s
:auth:clean	0.000s	0.749s
:clean	0.000s	0.018s
:core:clean	0.000s	7.410s
:coreui:clean	0.001s	4.587s
:creator-signup:clean	0.001s	0.019s
:linkedin-sdk:clean	0.001s	0.344s
:location:clean	0.001s	3.591s
:login:clean	0.020s	4.631s
:navigation:clean	0.021s	3.175s
:network:clean	0.346s	1.468s
:repo:clean	0.749s	1.438s
:settings:clean	1.814s	4.138s
:splash:clean	2.187s	3.496s
:test-tools:clean	3.197s	0.028s
:tools:clean	3.227s	1.798s
:upload:clean	3.592s	1.087s
:user-profile:clean	4.589s	2.889s
:workflow:clean	4.658s	1.480s

Original build (incremental)

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259 tasks executed in **7 projects** in **7m 17.766s**

:app:compileDevDebugKotlin	1m 2.069s
:app:kaptDevDebugKotlin	47.606s
:core:compileDevDebugKotlin	41.240s

Original build

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7 projects

90Seconds_fixes +6

- activities
- app
- core
- package-order
- project-details
- settings

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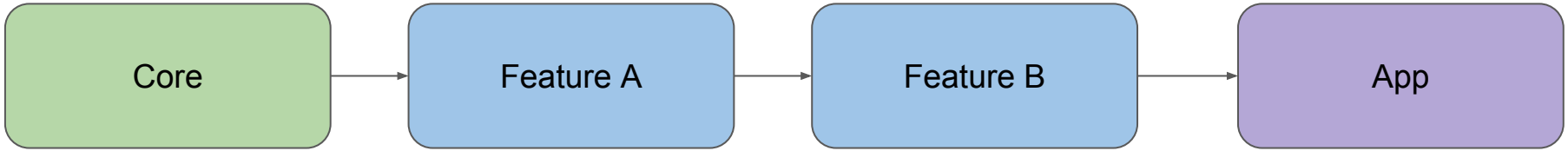

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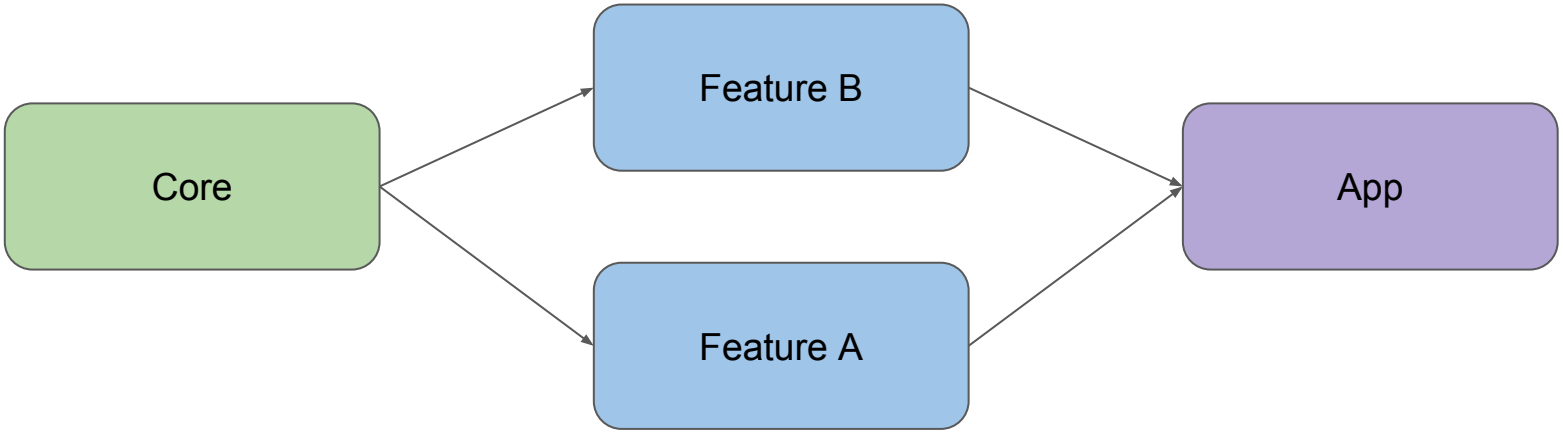
org.gradle.parallel=true



Parallel original build (incremental)

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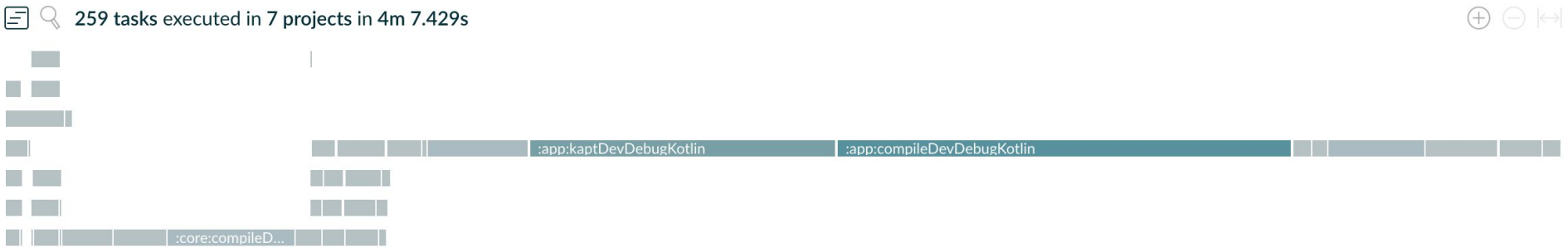
org.gradle.parallel=true



Parallel original build (clean)

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org.gradle.parallel=true

parallel features build

Parallel original build (clean)

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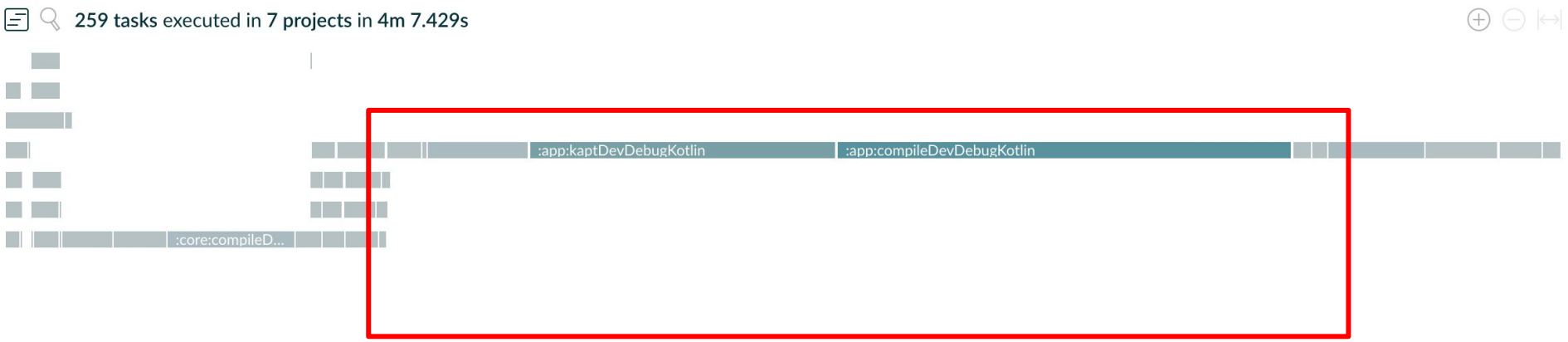
org.gradle.parallel=true



fat app module looooooong running build


STAR WARS
EPISODE IV
A NEW HOPE

Four ROOT PROBLEMS:

Annotation processing everywhere

Wrong module dependency

Application module DataBinding and Dagger generation

Fat core and application modules

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Solution?

Several modules architecture:

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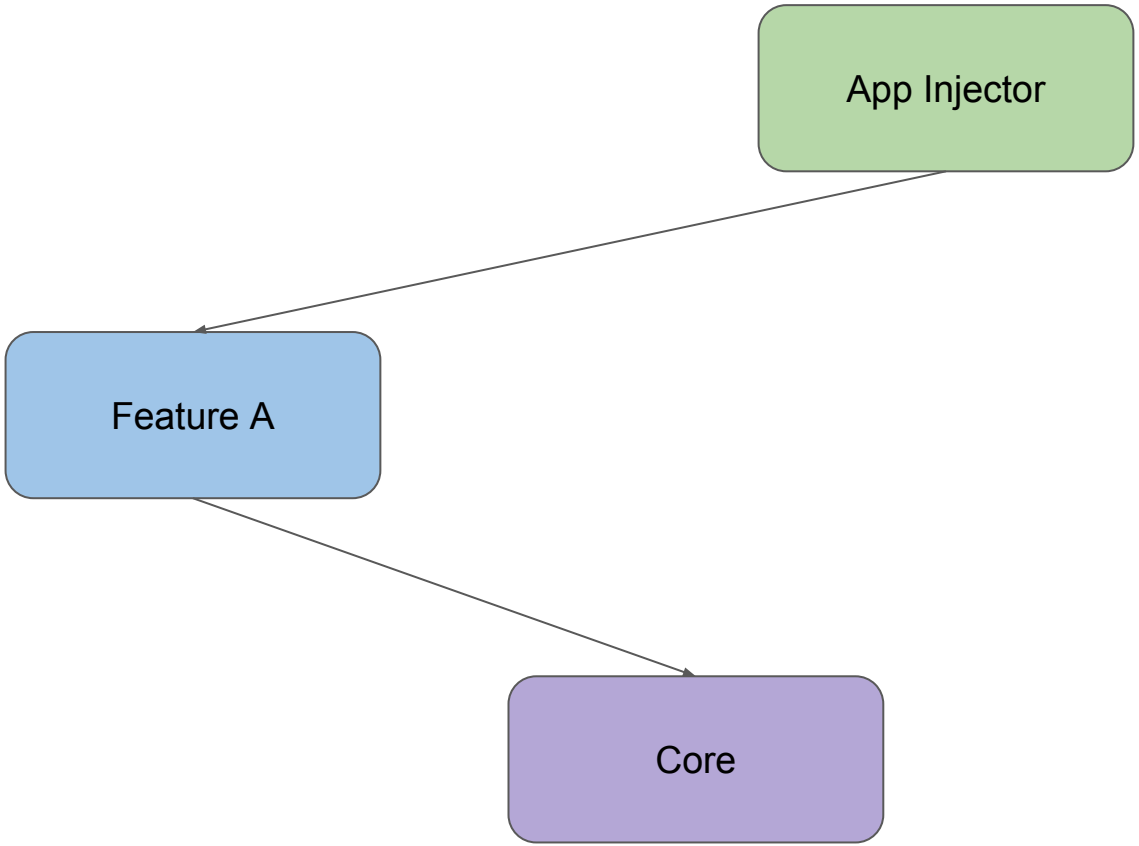
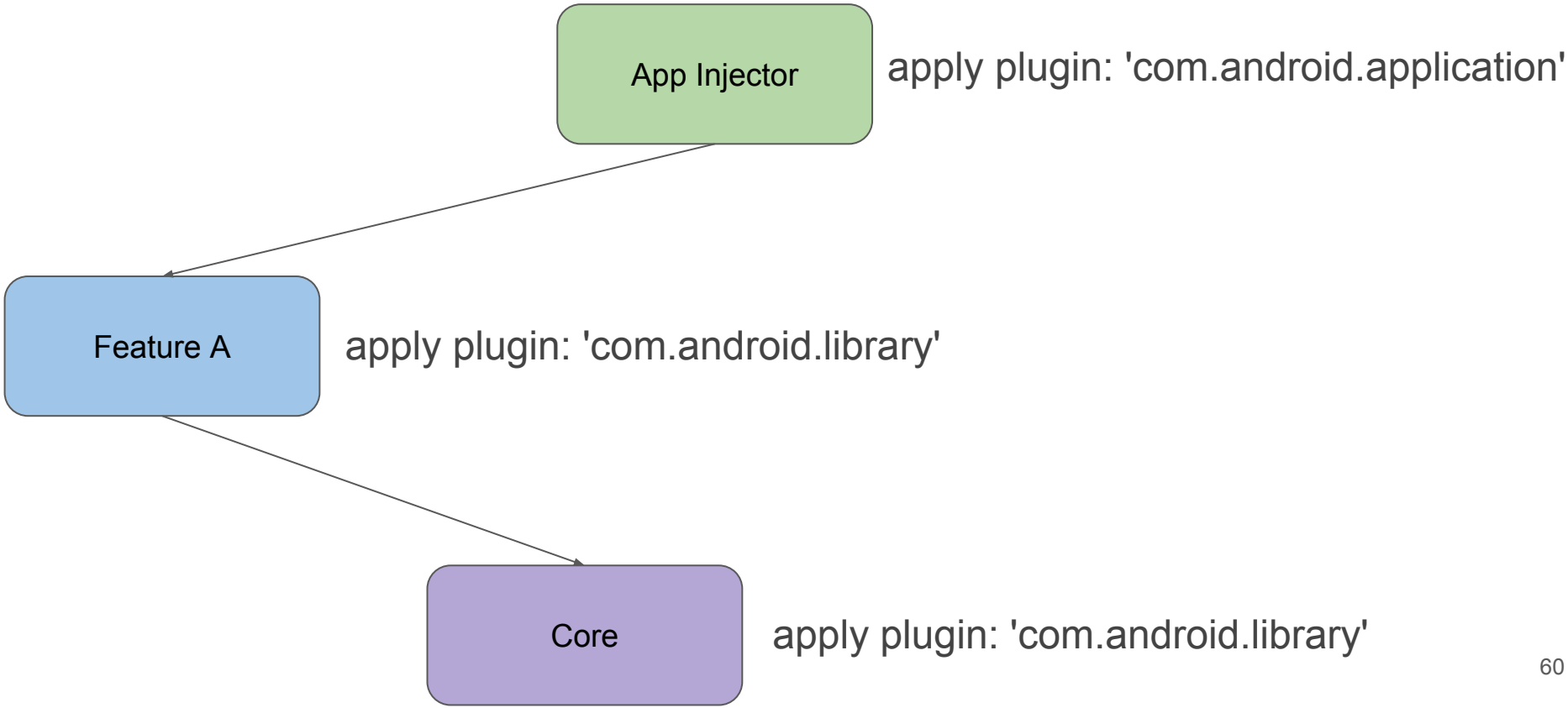
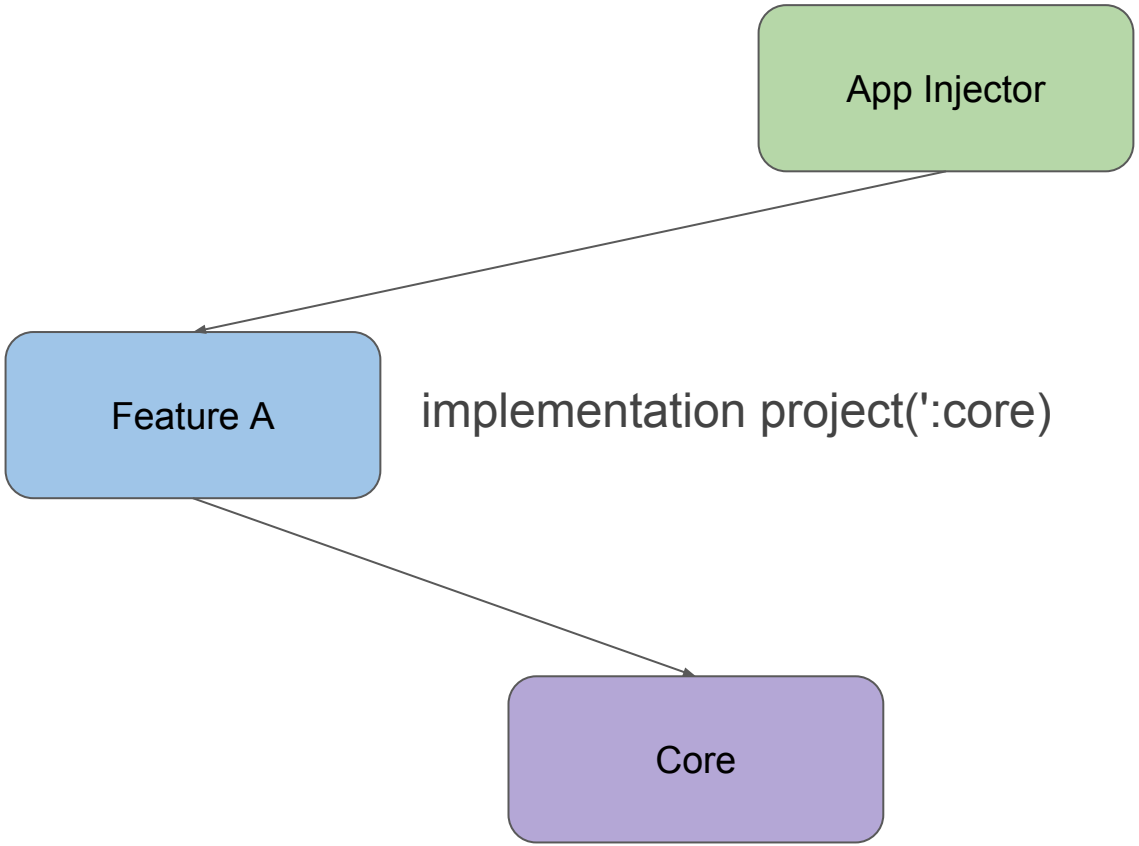


Several modules architecture:

Google Developers Experts



Several modules architecture:



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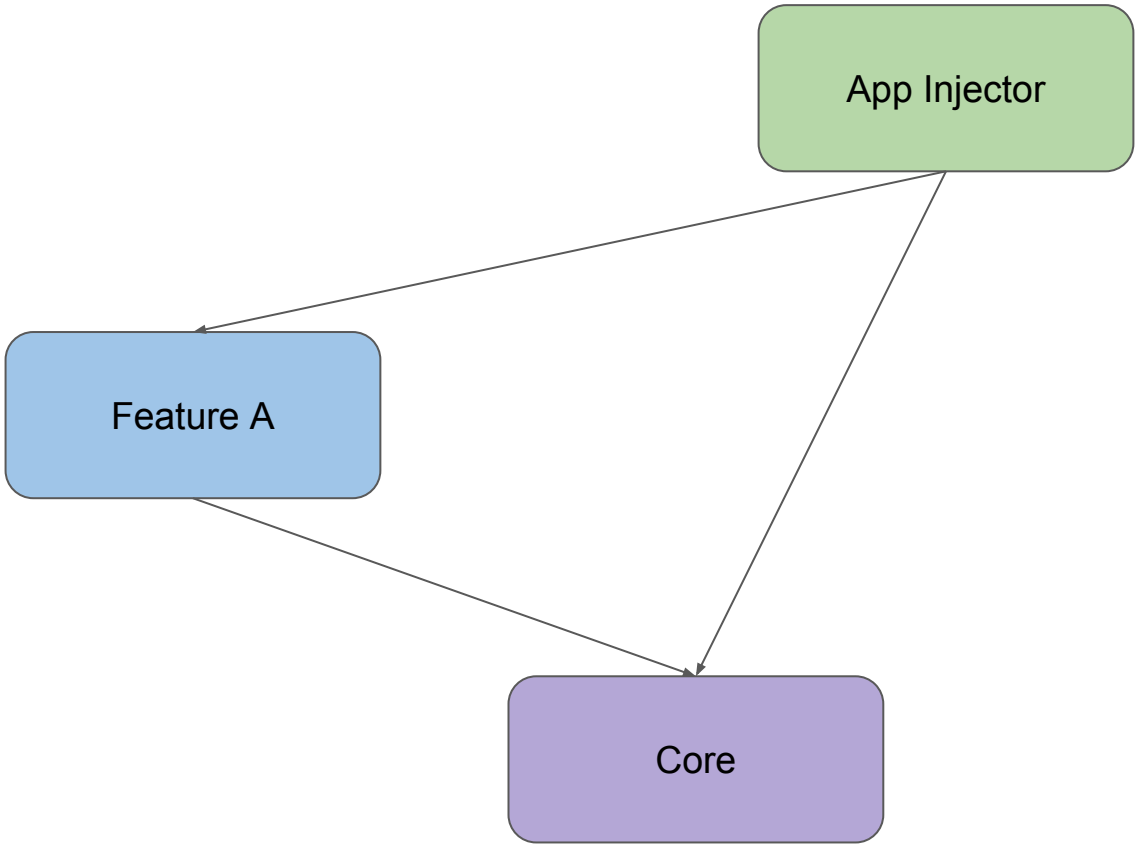

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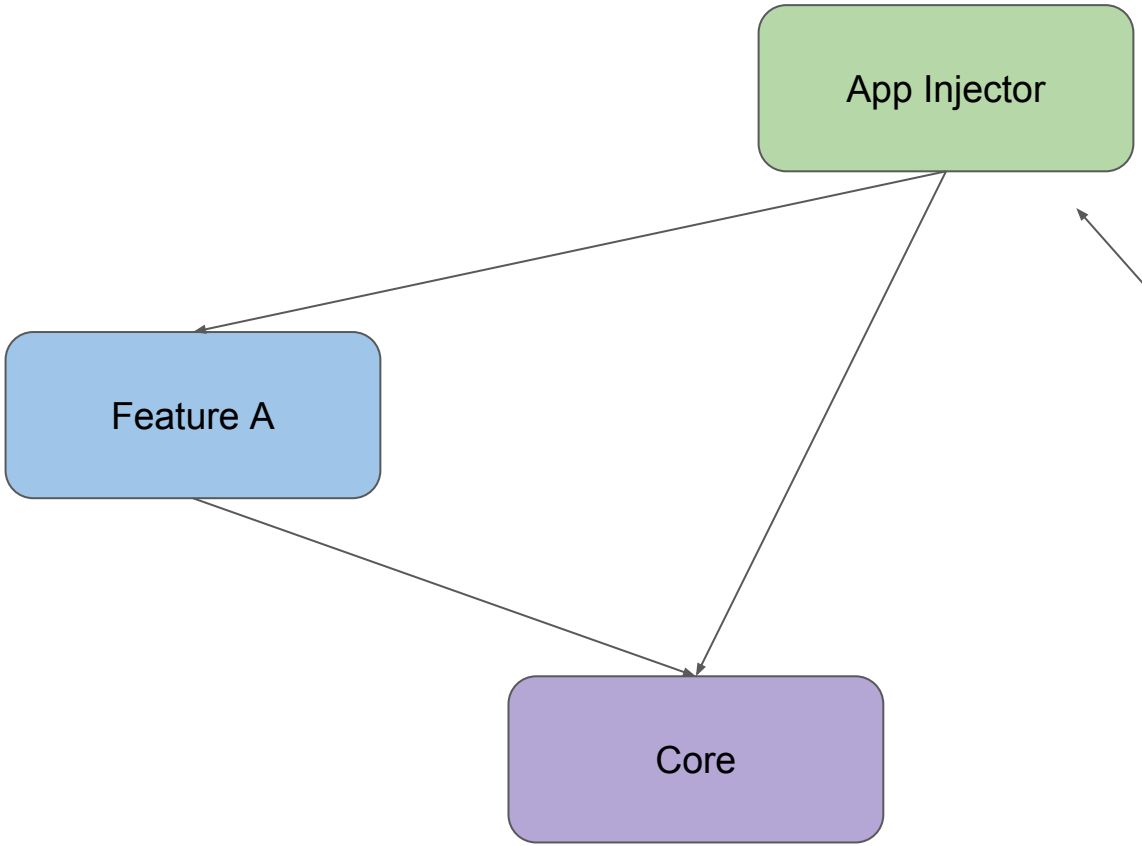

nothing but DI

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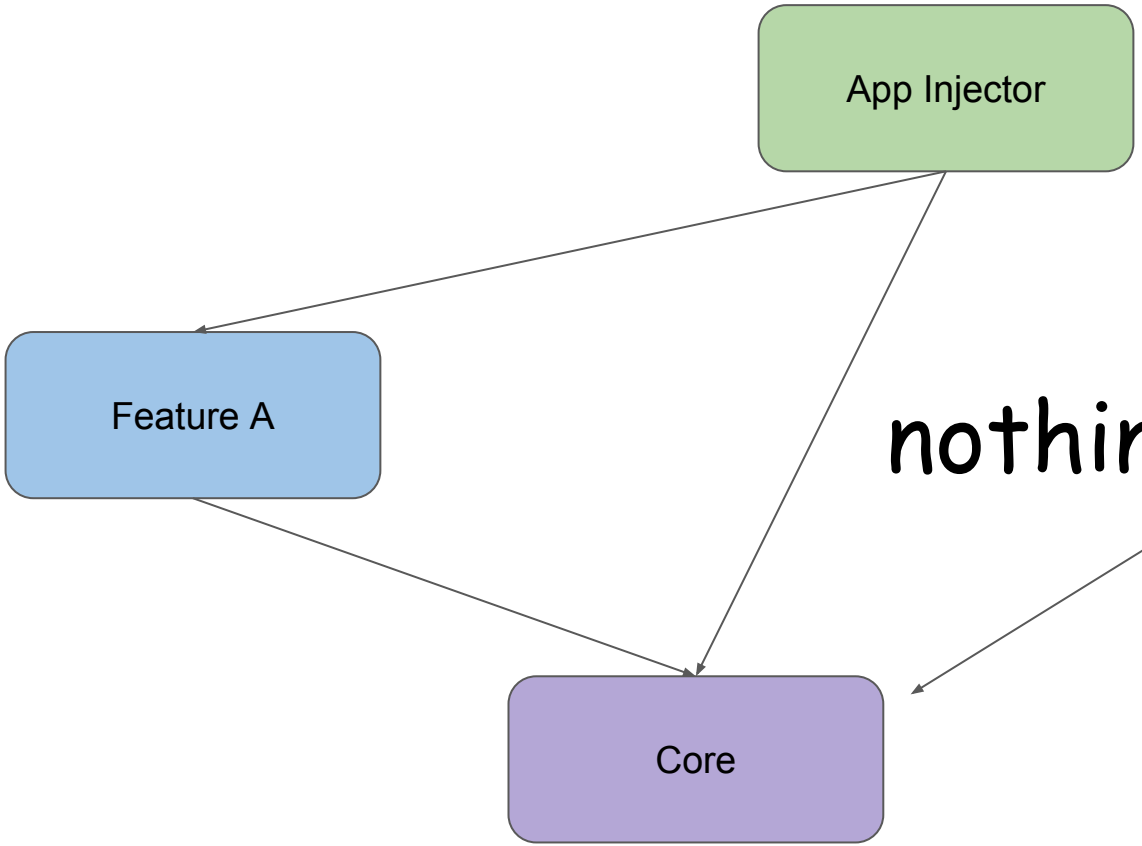

nothing but interfaces and POJO

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Where is common UI logic?

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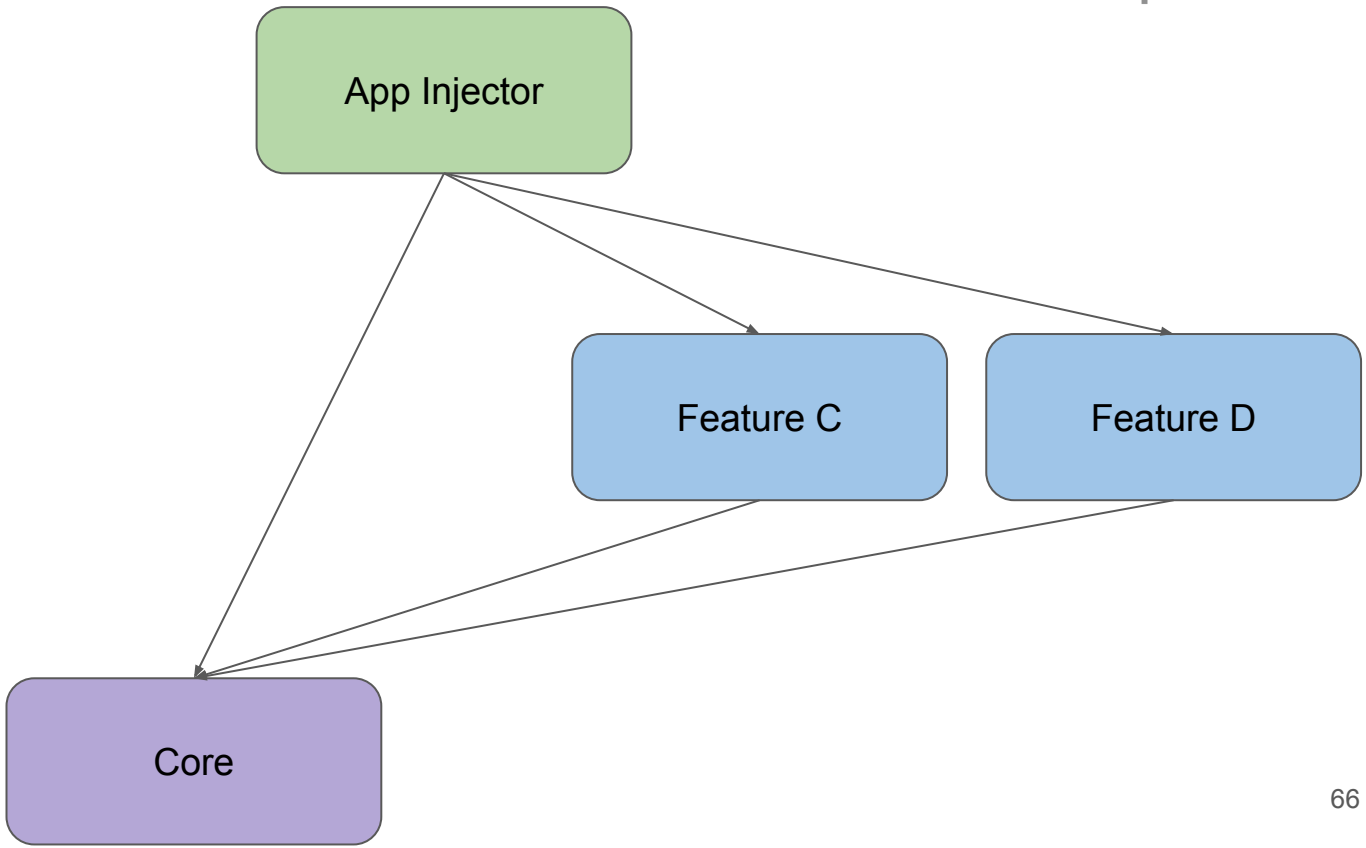
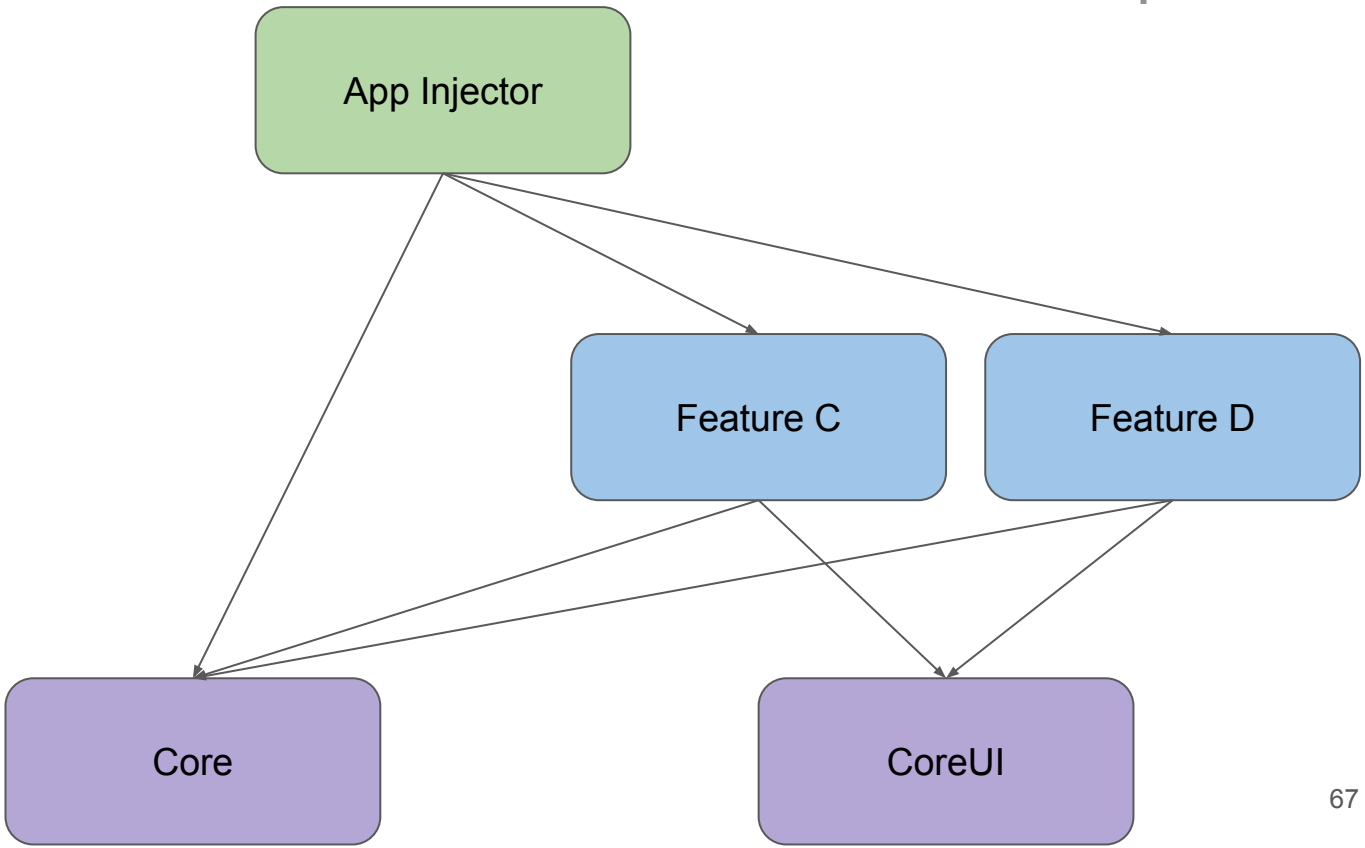
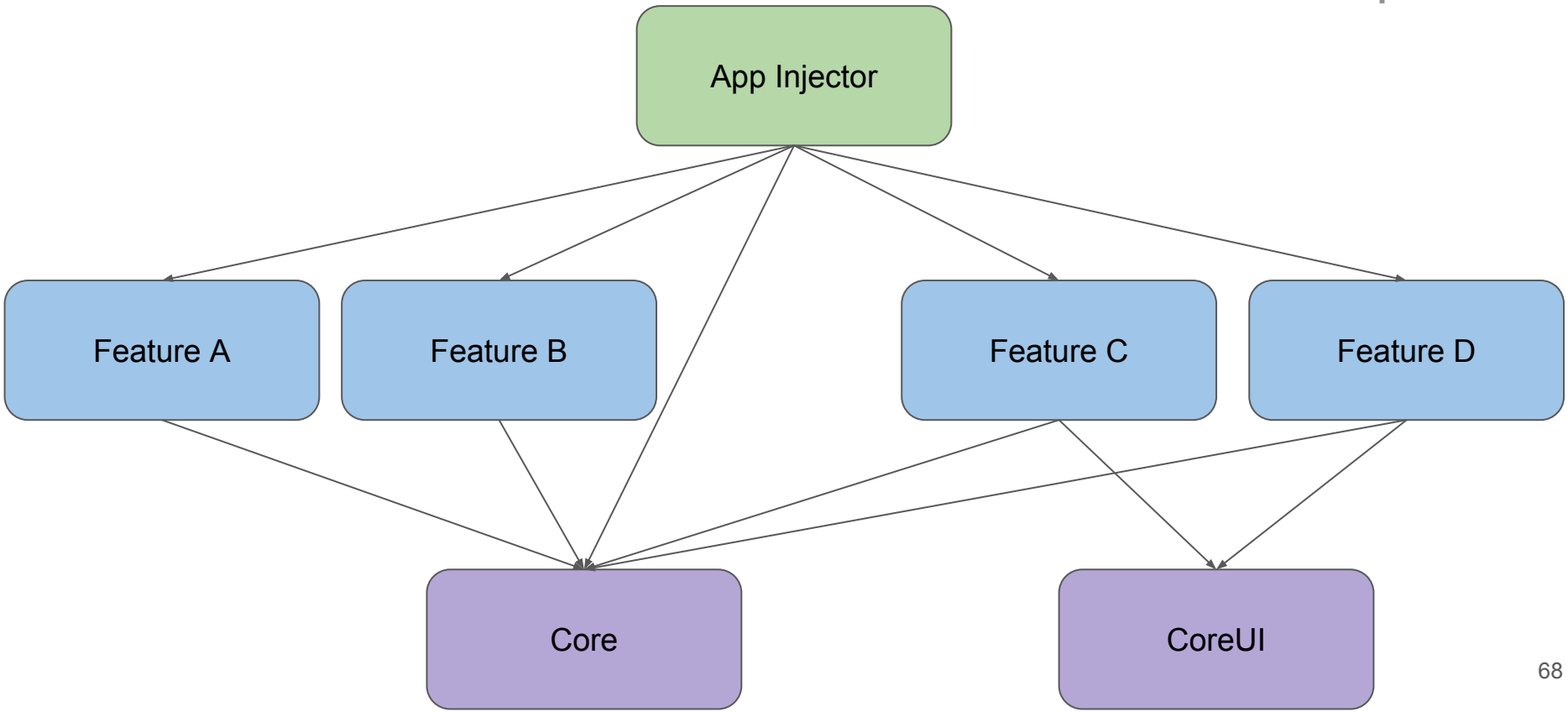


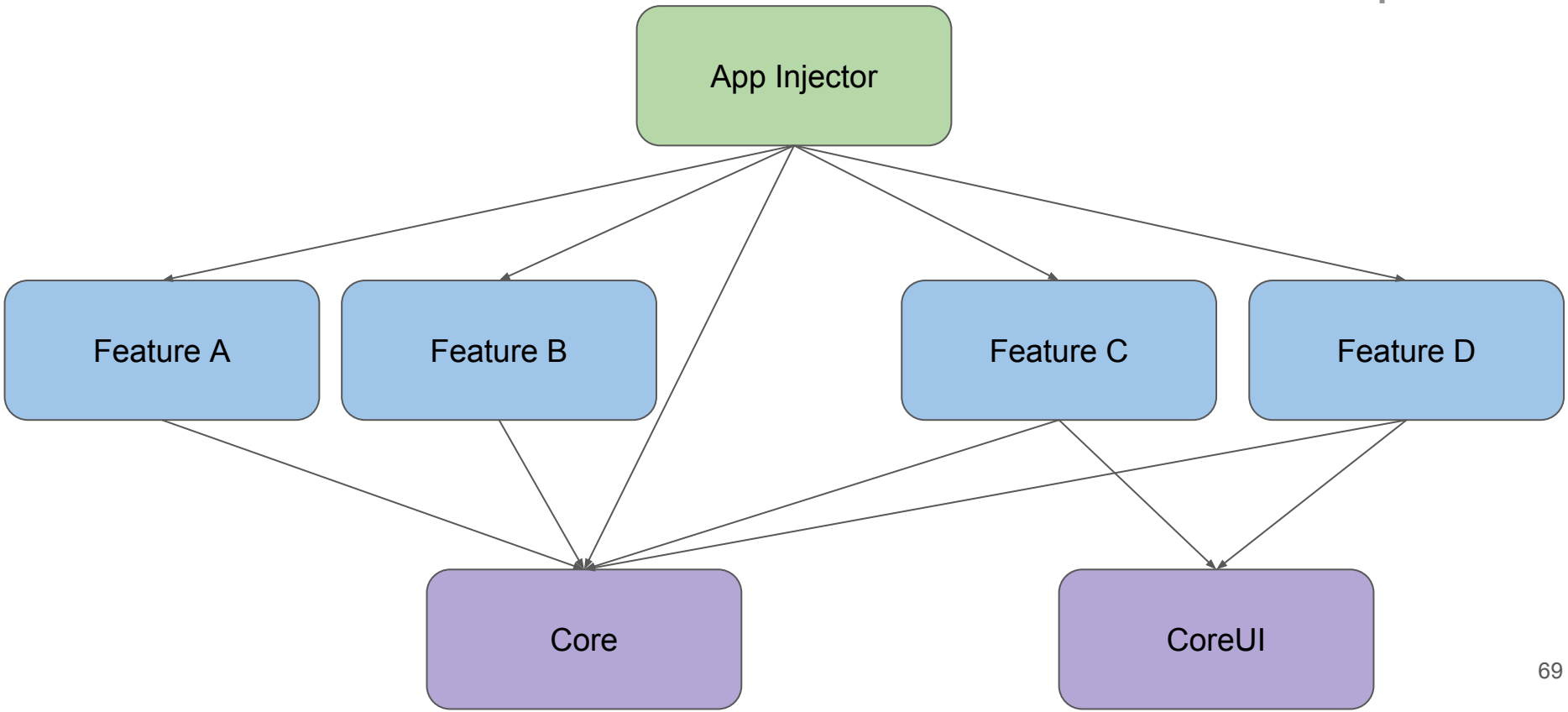
Google Developers Experts



Google Developers Experts



Google Developers Experts



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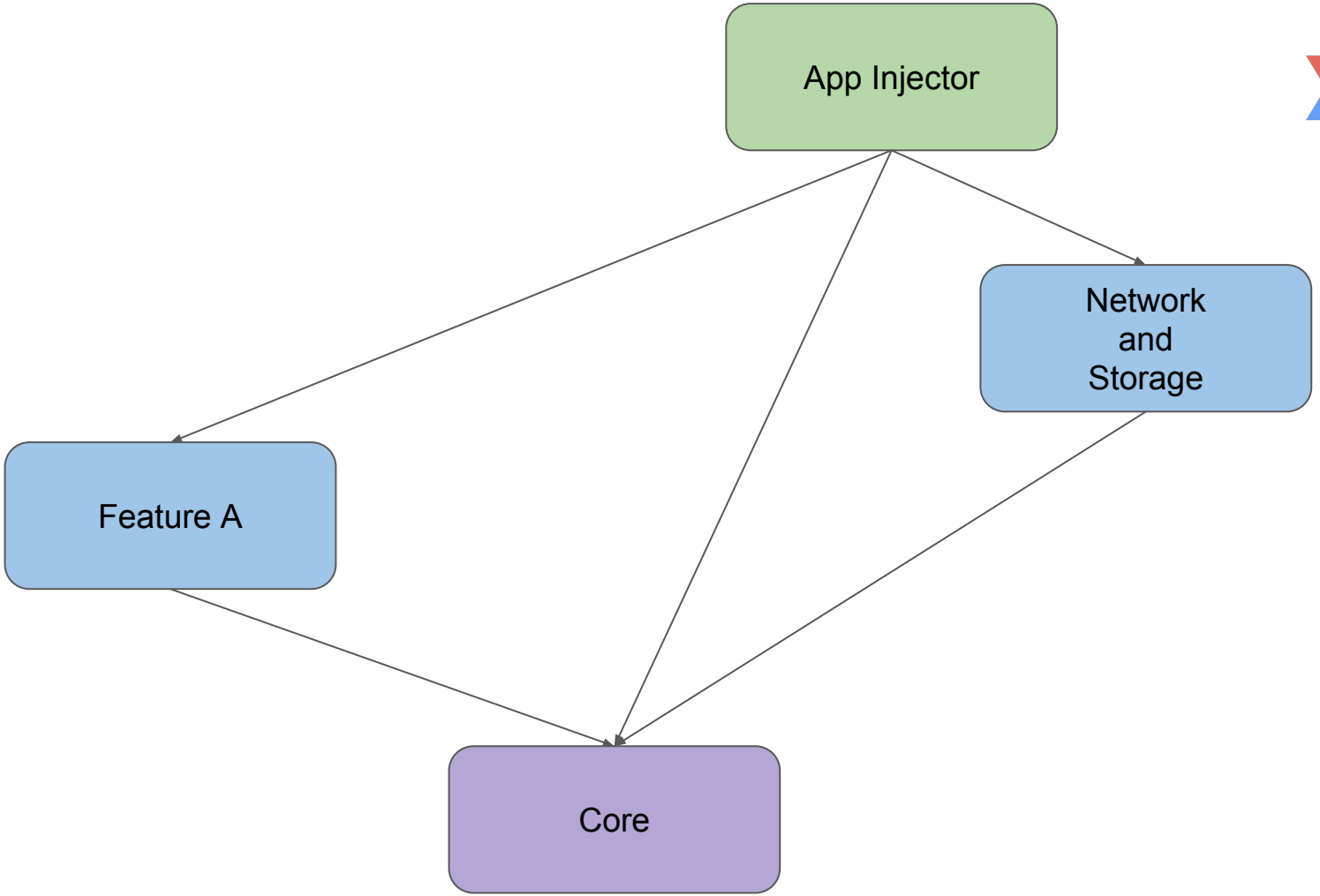
Where is common network and storage?



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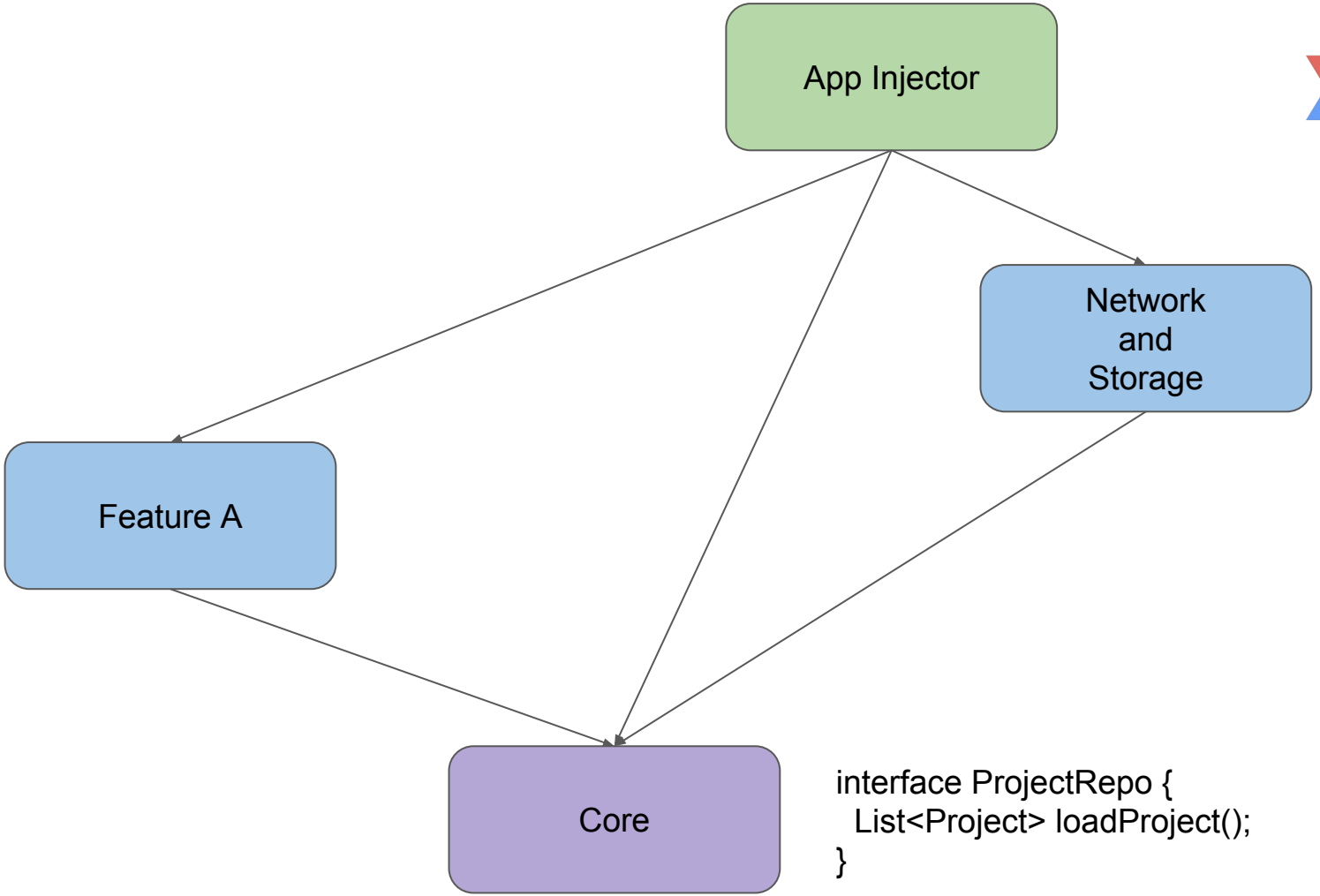

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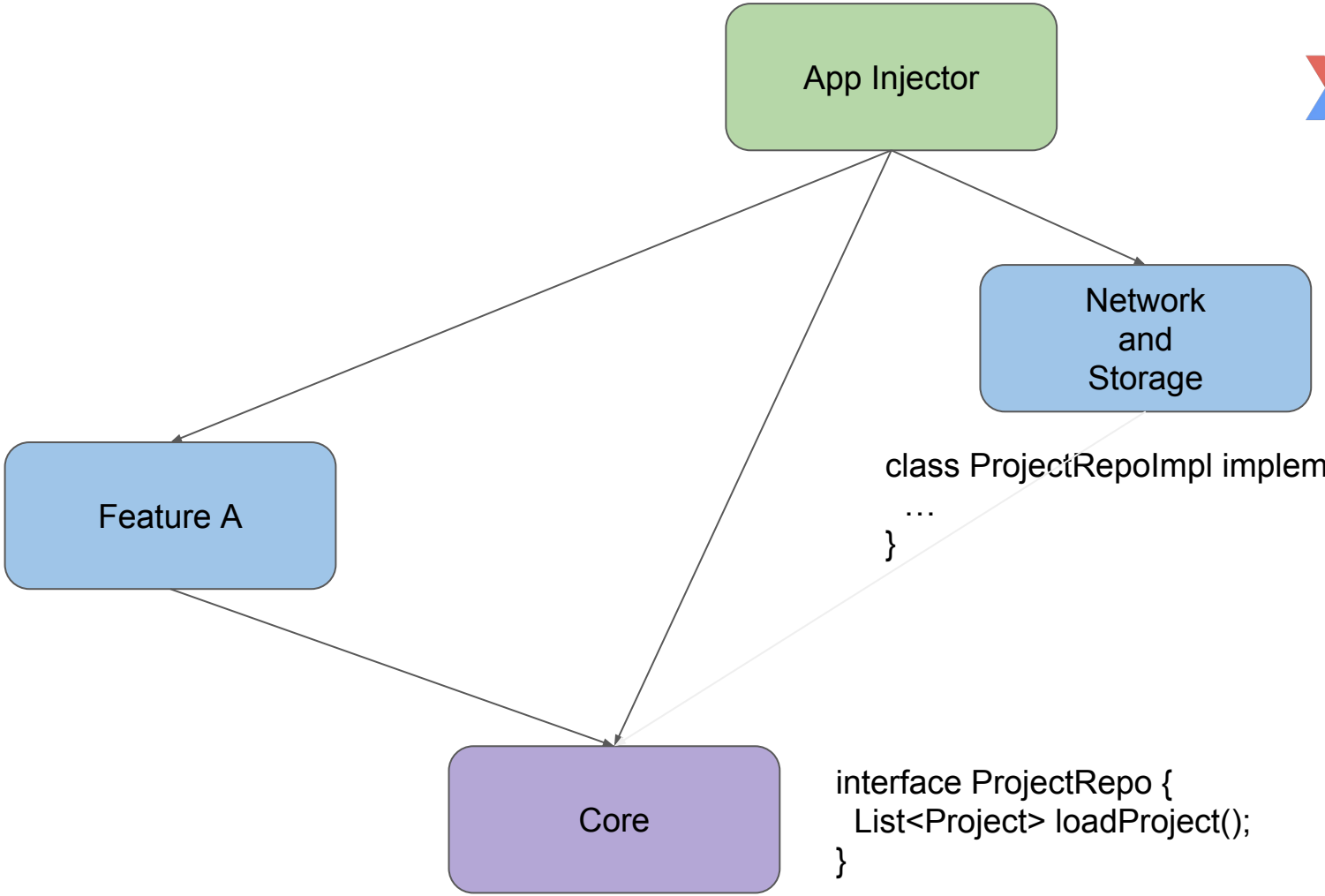
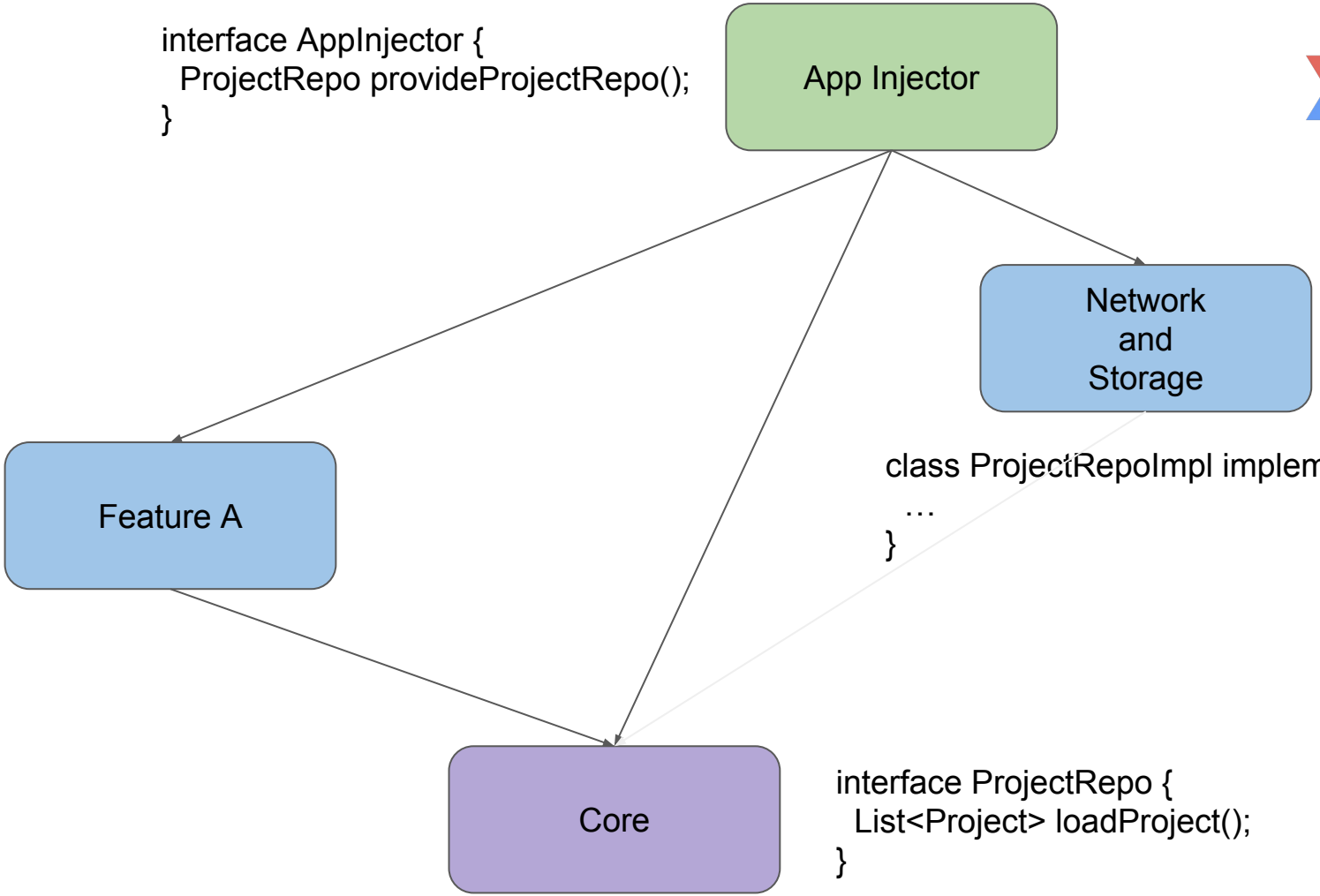
```
interface ProjectRepo {
  List<Project> loadProject();
}
```



Google Developers Experts

```
interface AppInjector {
  ProjectRepo provideProjectRepo();
}
```

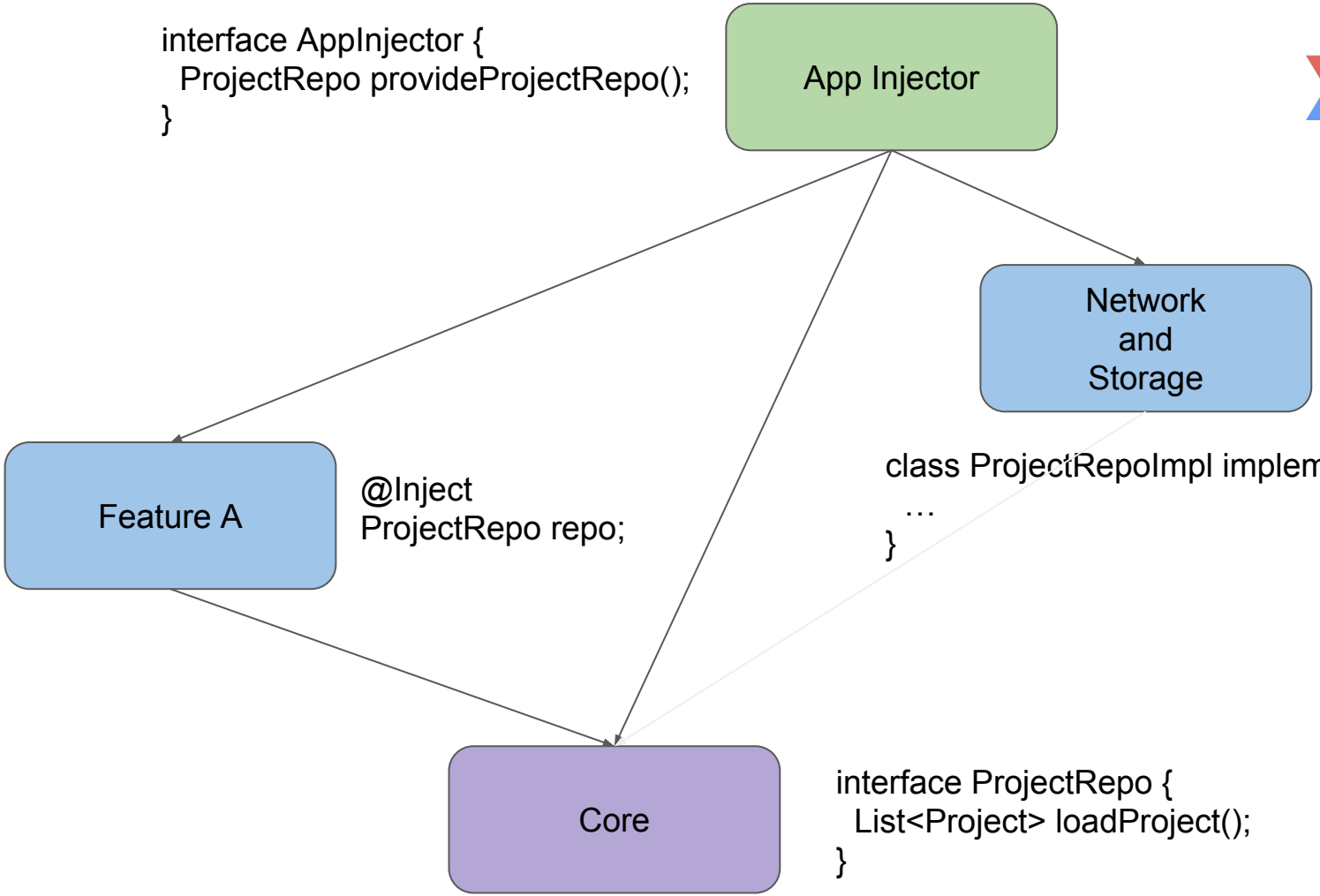



```
class ProjectRepoImpl implements ProjectRepo {
  …
}
```

```
interface ProjectRepo {
  List<Project> loadProject();
}
```

Google Developers Experts

```
interface AppInjector {
  ProjectRepo provideProjectRepo();
}
```



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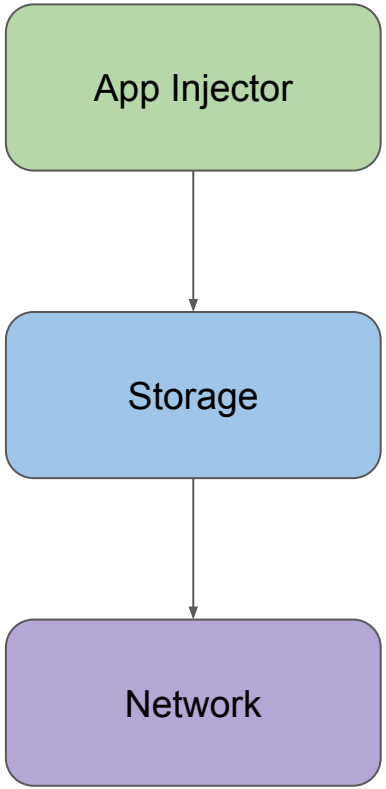
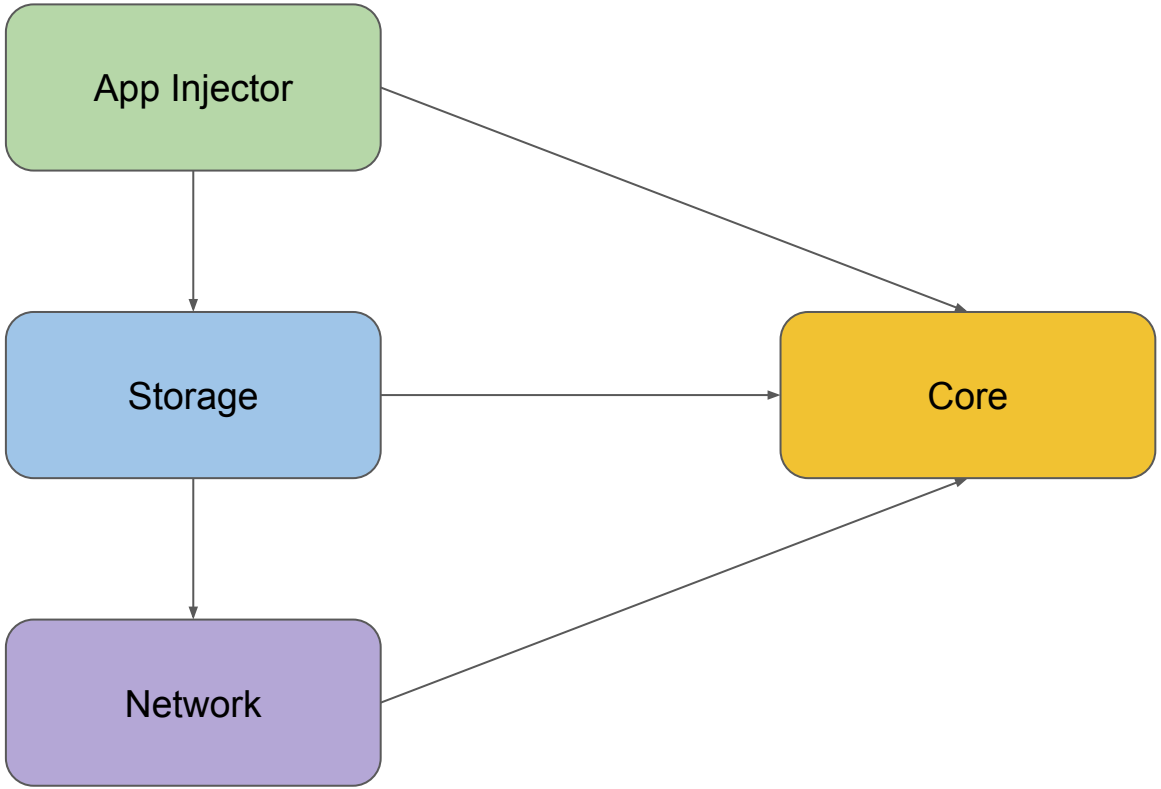
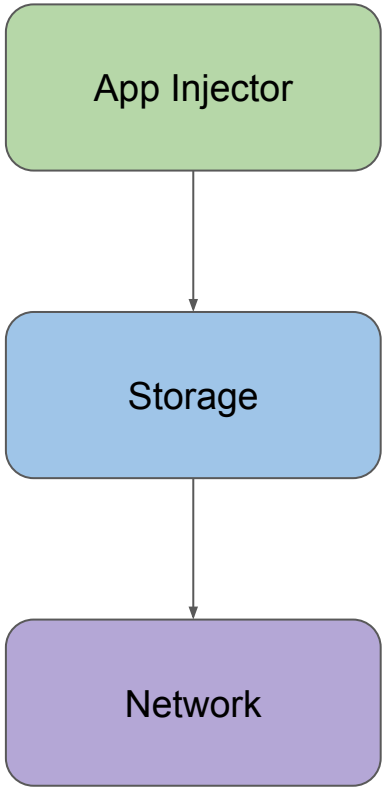
Let’s improve data layer


App Injector
Storage
Network

Google Developers Experts





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Gradle *implements* vs *api*

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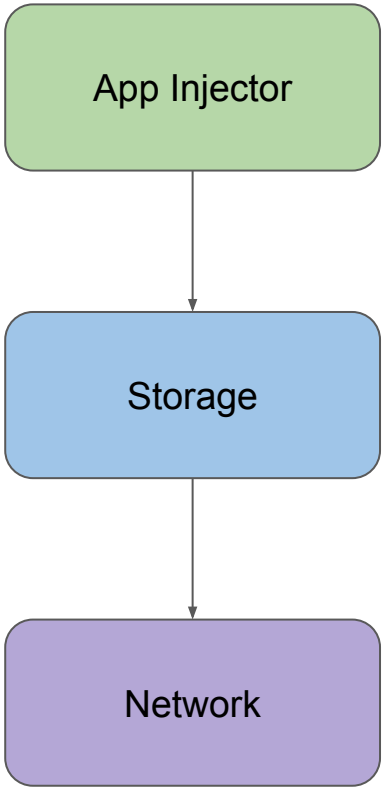
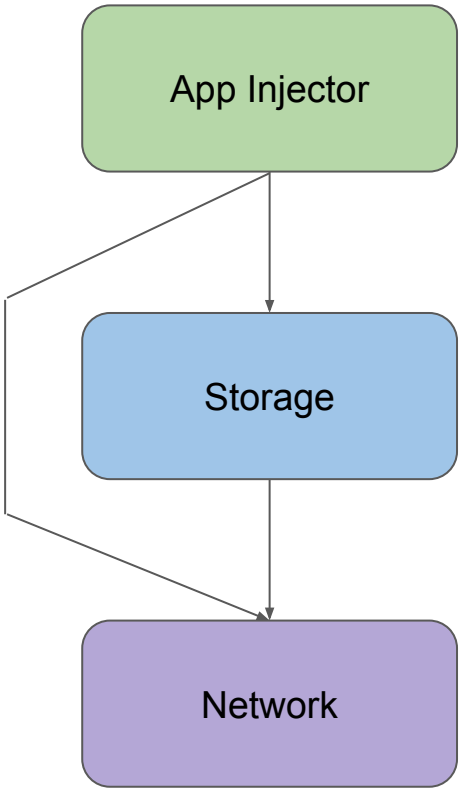
Gradle < 4	Gradle 4+
compile	implements, api



api project(':storage')

api project(':network)



api project(':storage')

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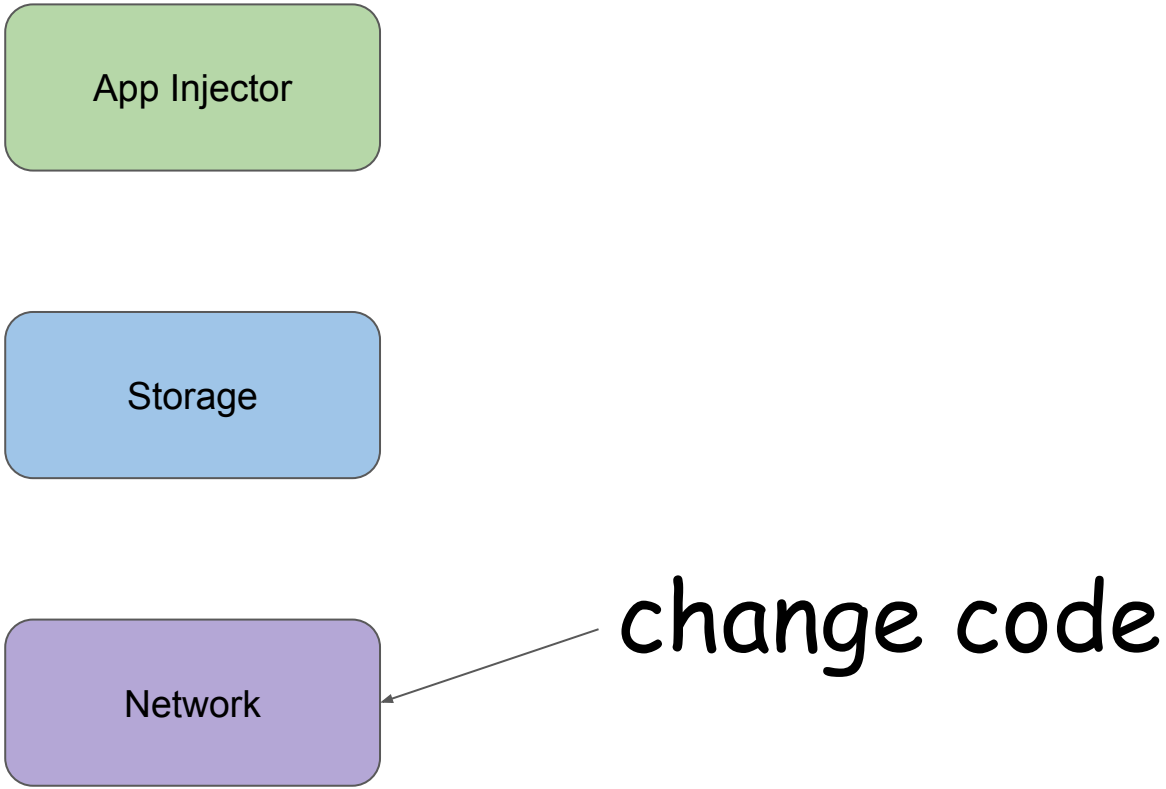

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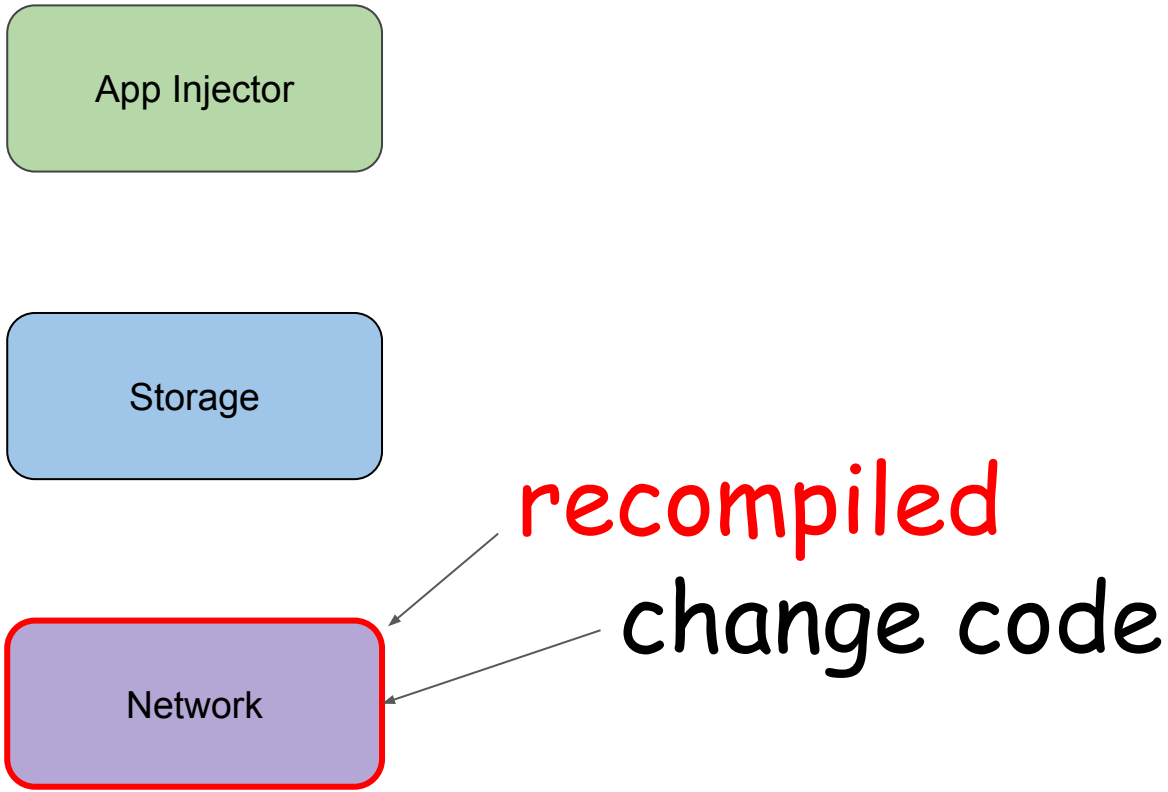

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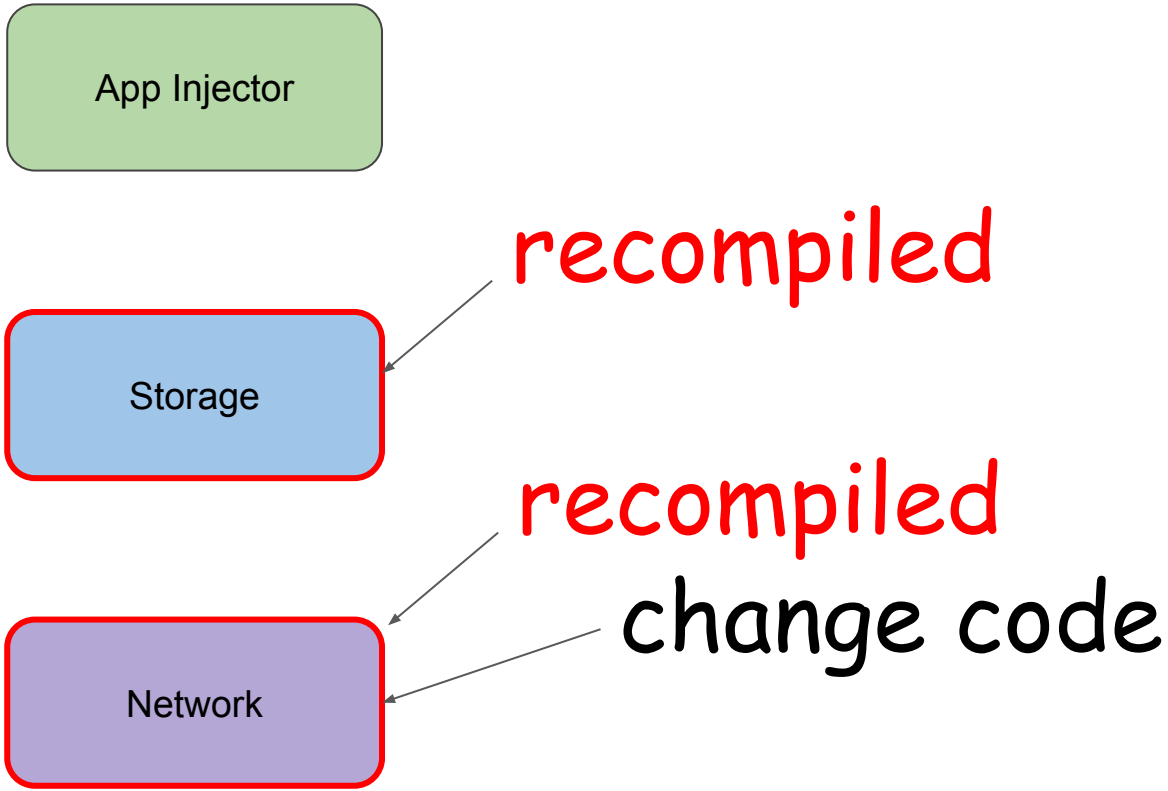
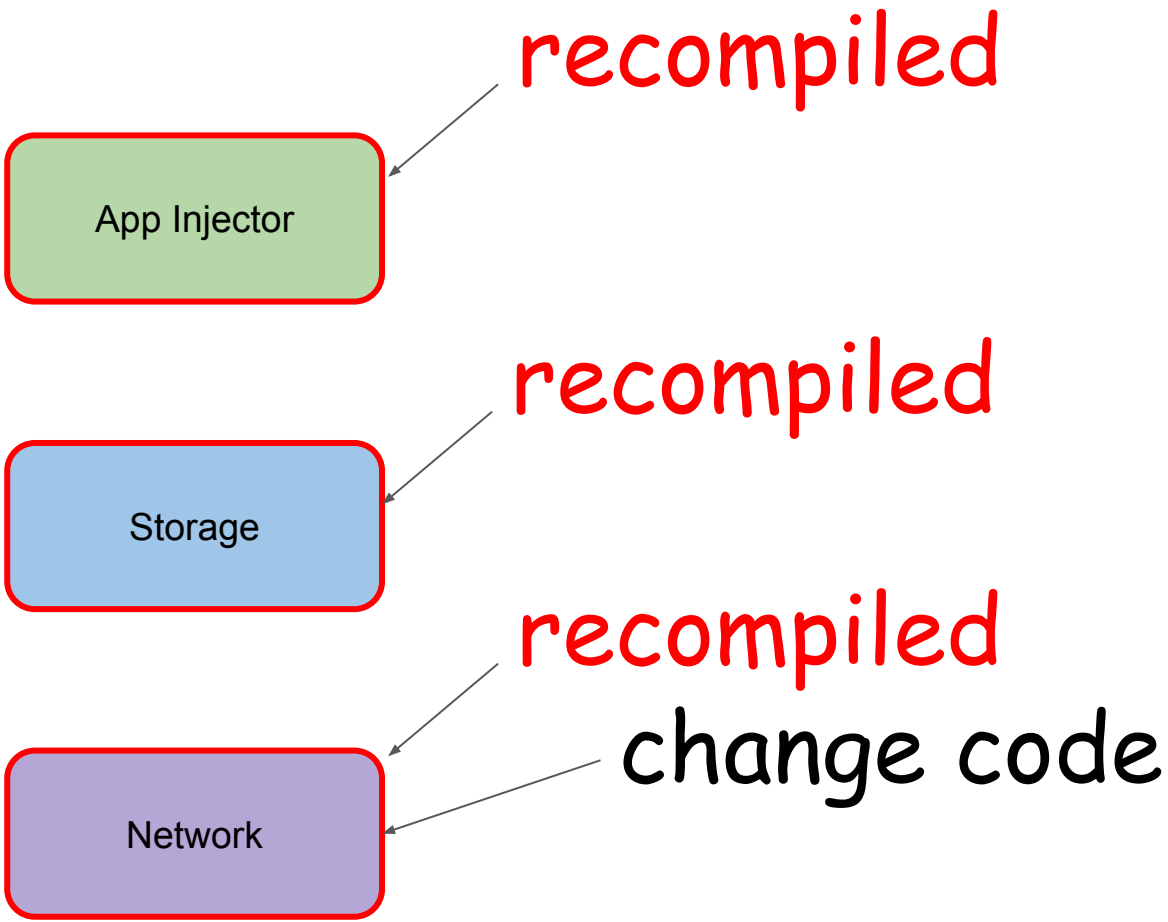
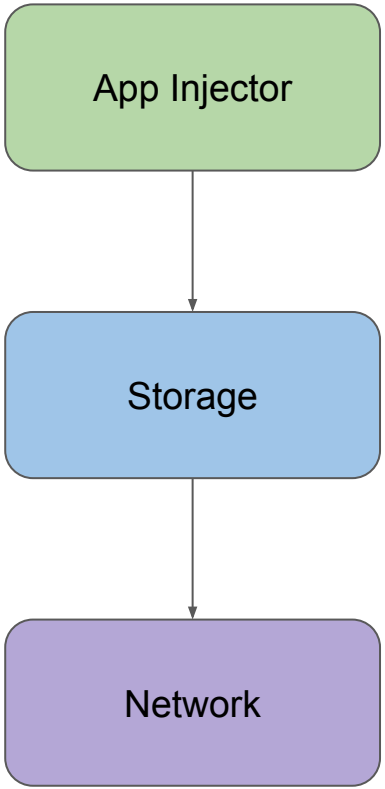




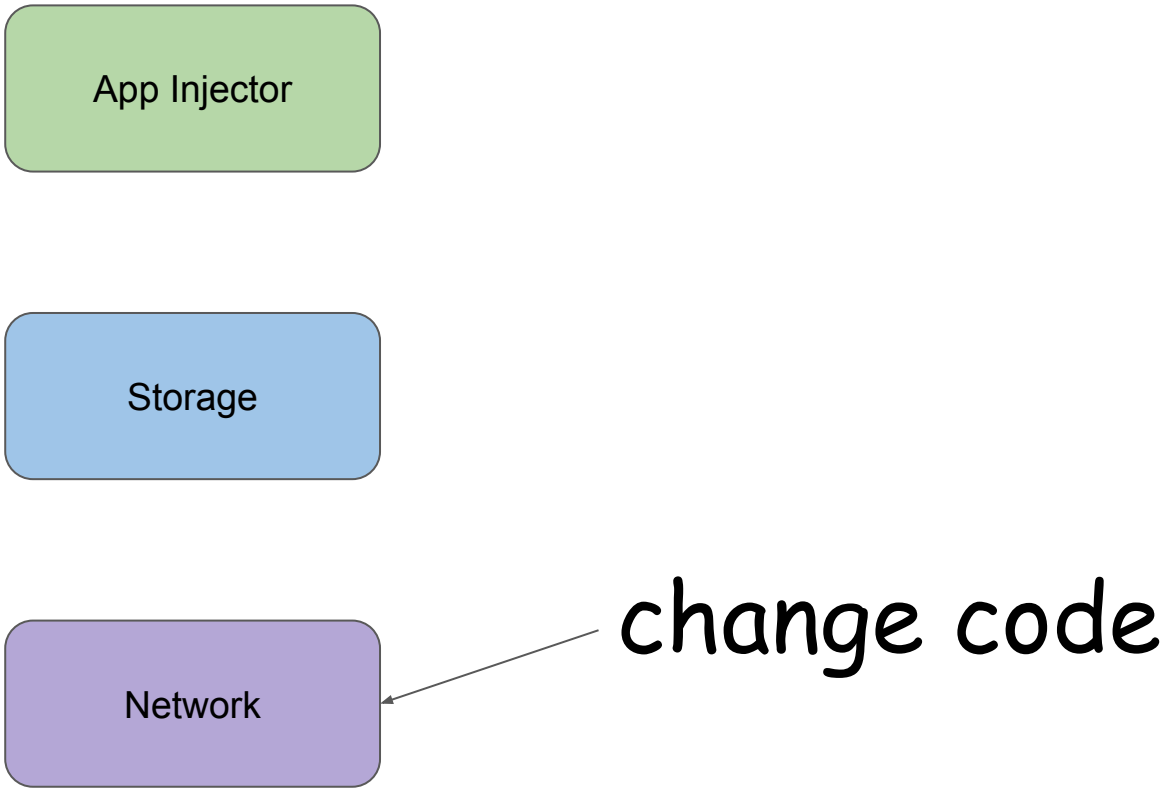
Google Developers Experts



implementation project(':storage')

implementation project(':network)

Google Developers Experts



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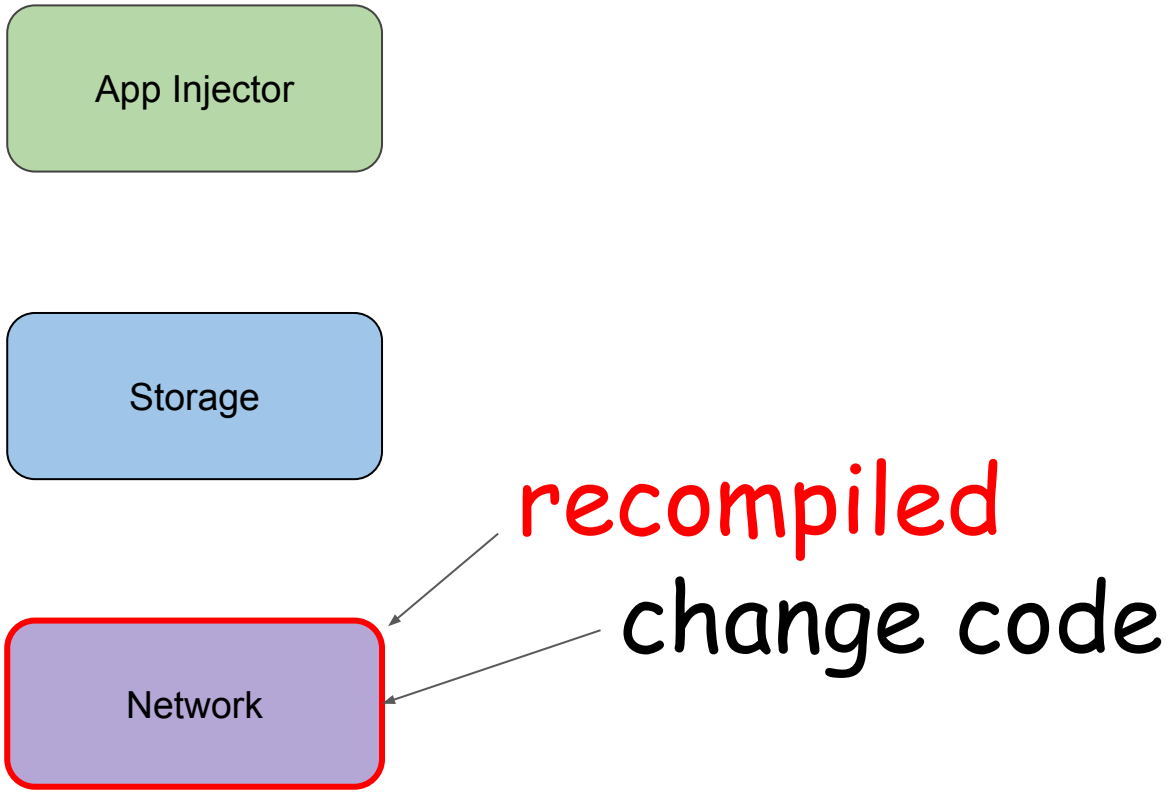
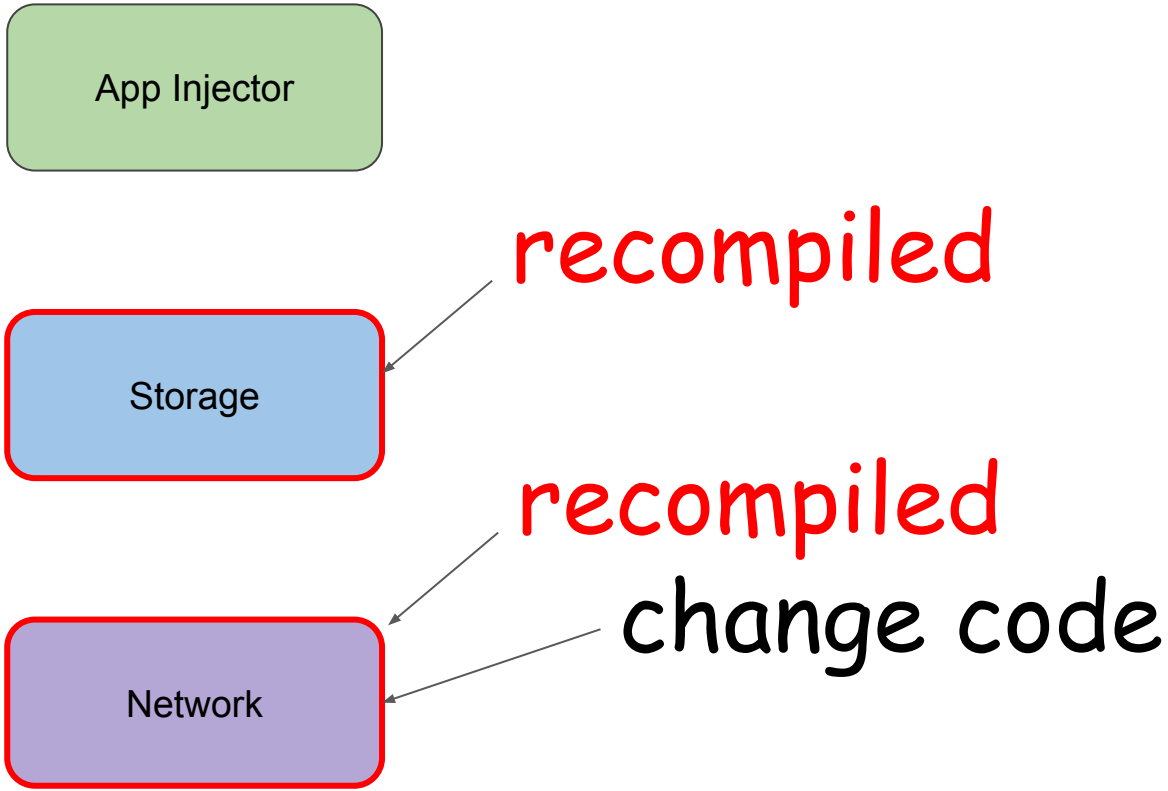
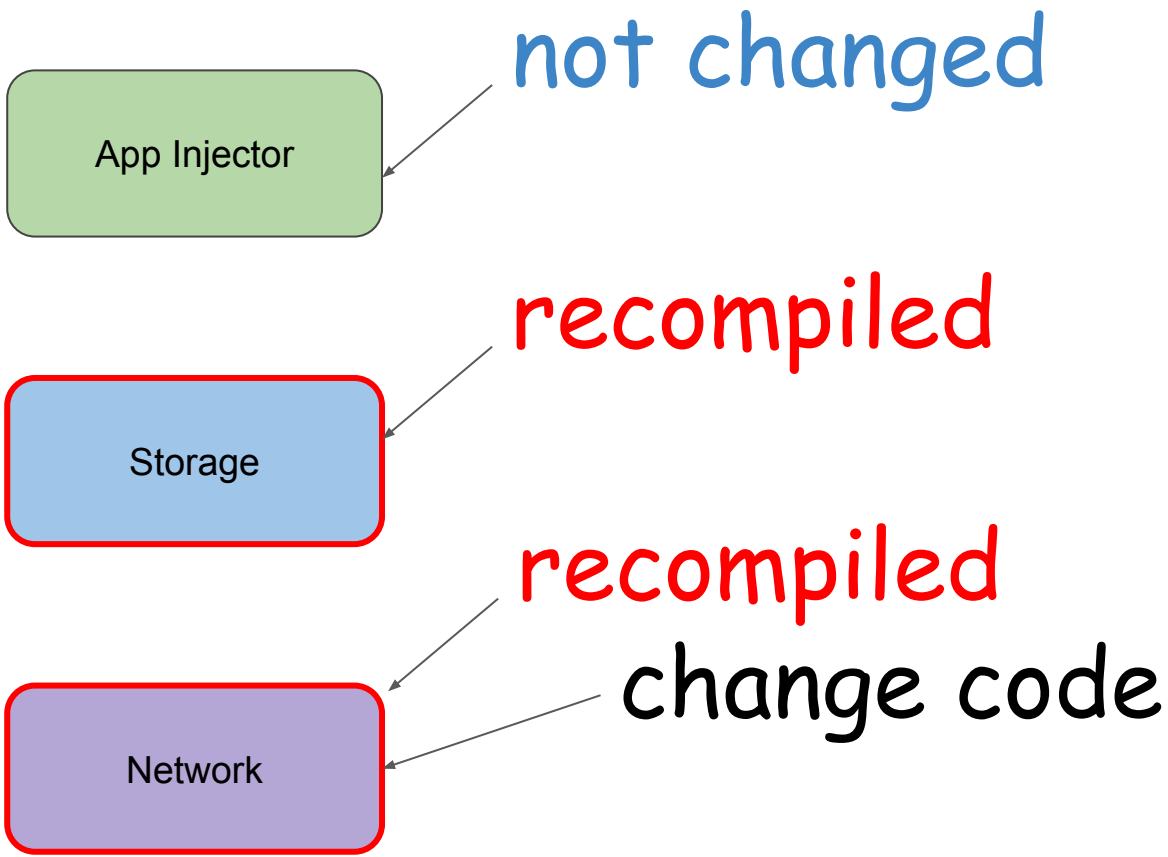


Google Developers Experts





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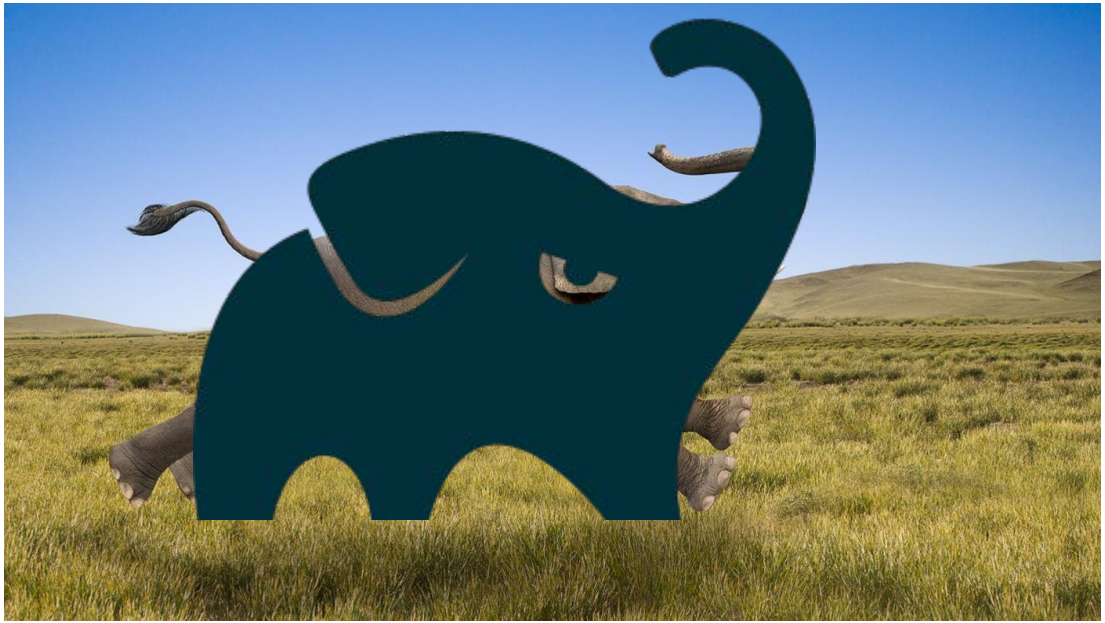
Google Developers Experts

One line change: 30 sec



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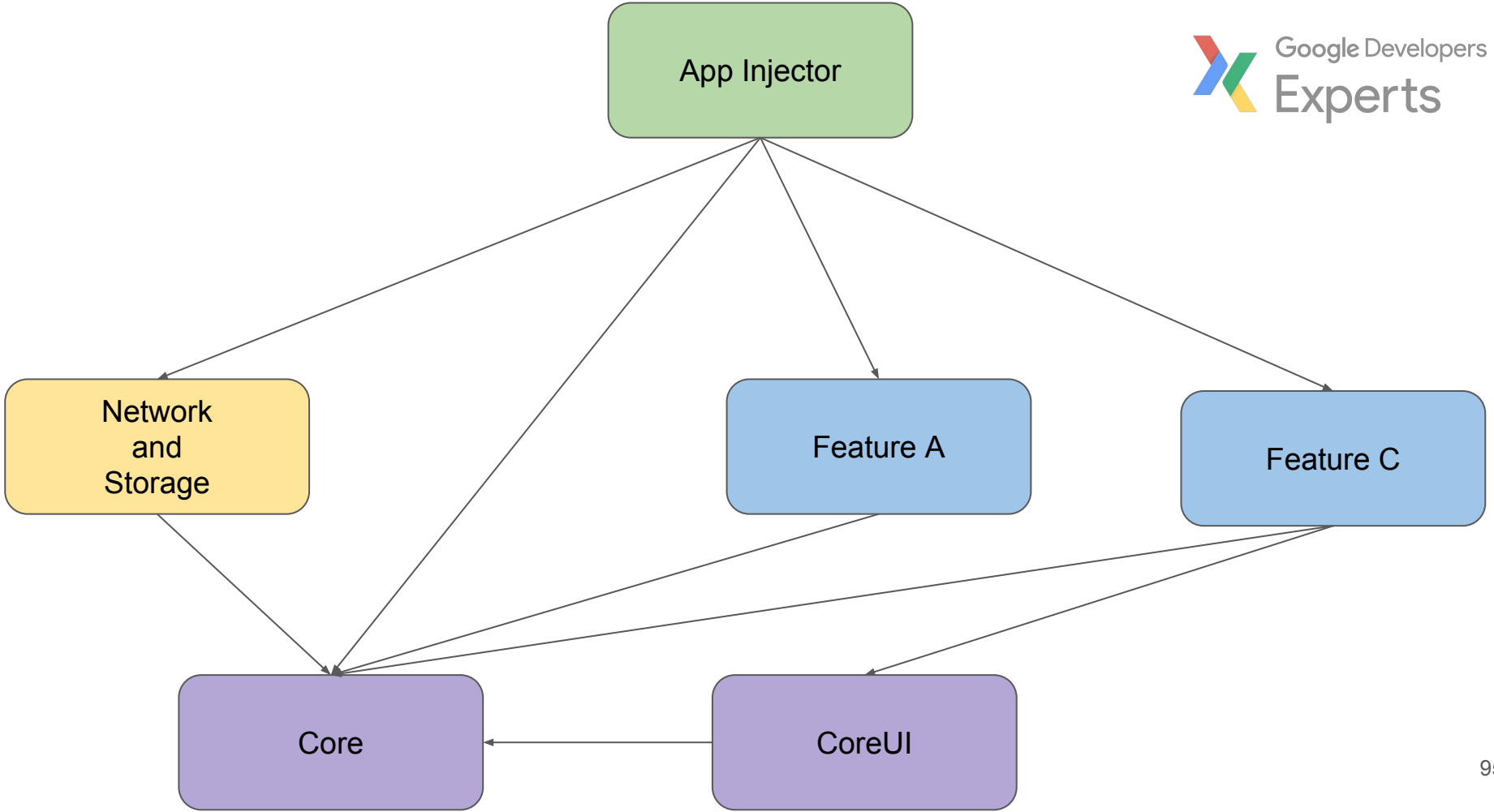
One line change in Core: 2.5 min



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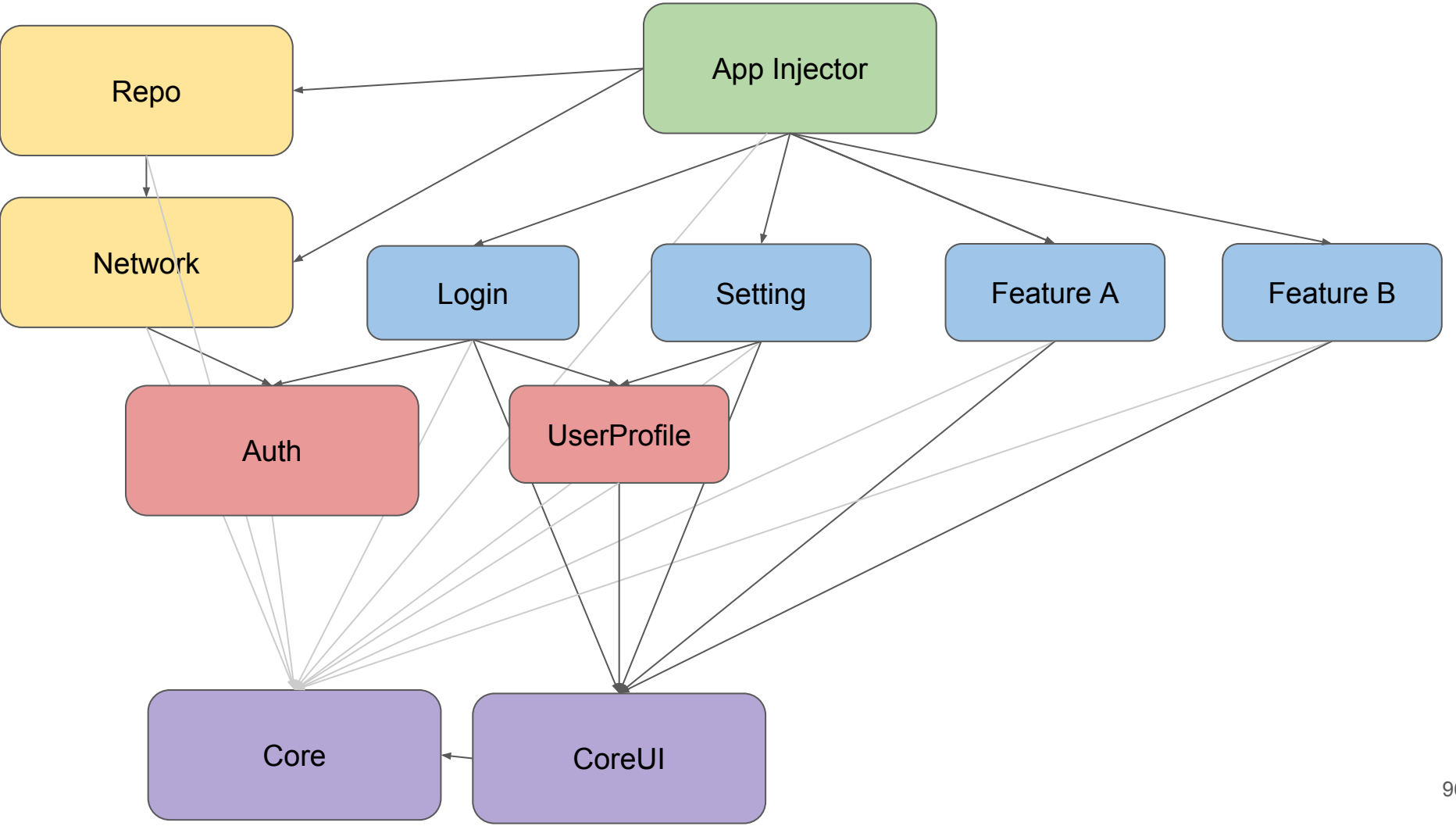
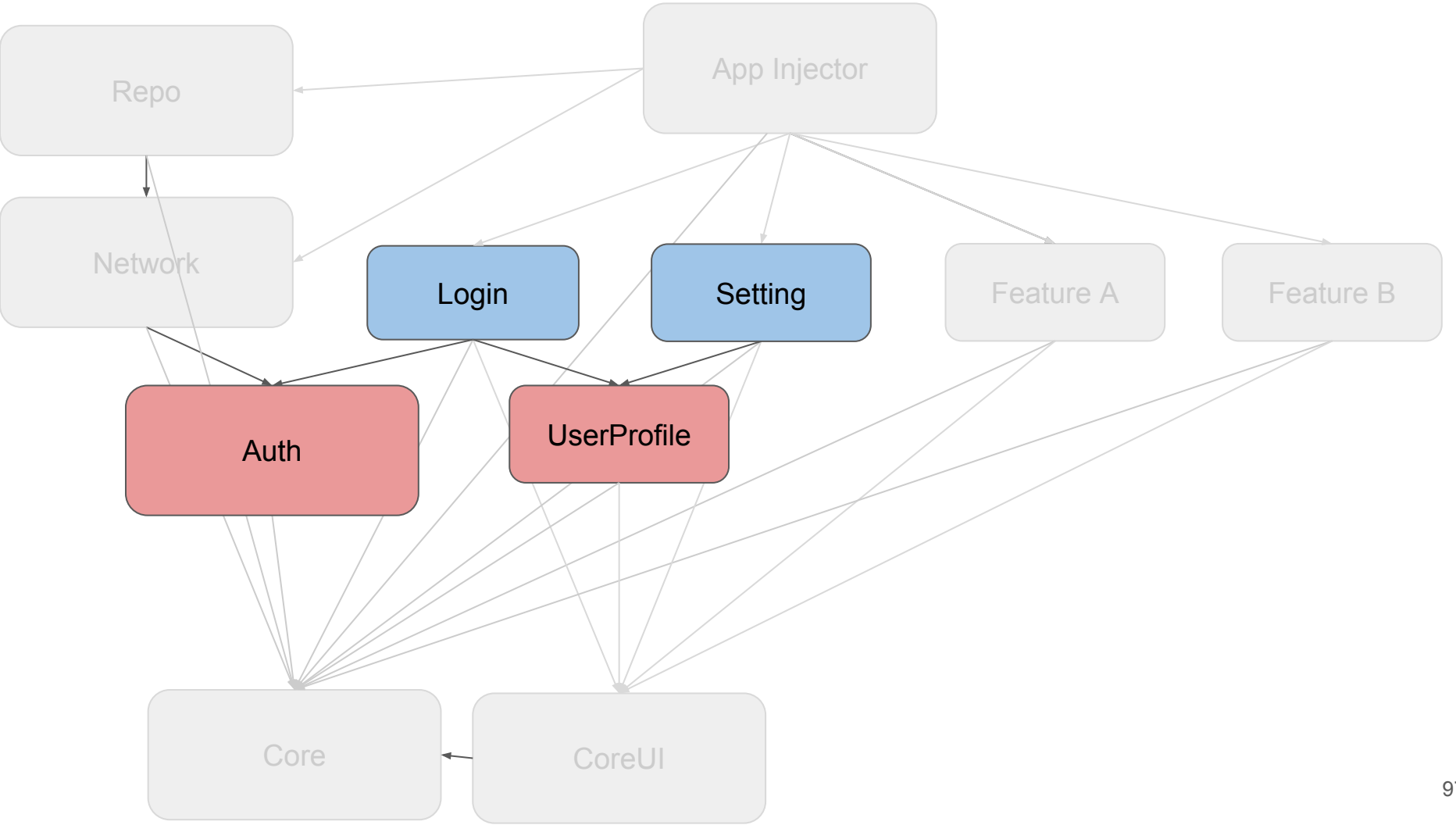

Repo
App Injector
Network
Login
Setting
Feature A
Feature B
Auth
UserProfile
Core
CoreUI


Repo
App Injector
Network
Login
Setting
Feature A
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UserProfile
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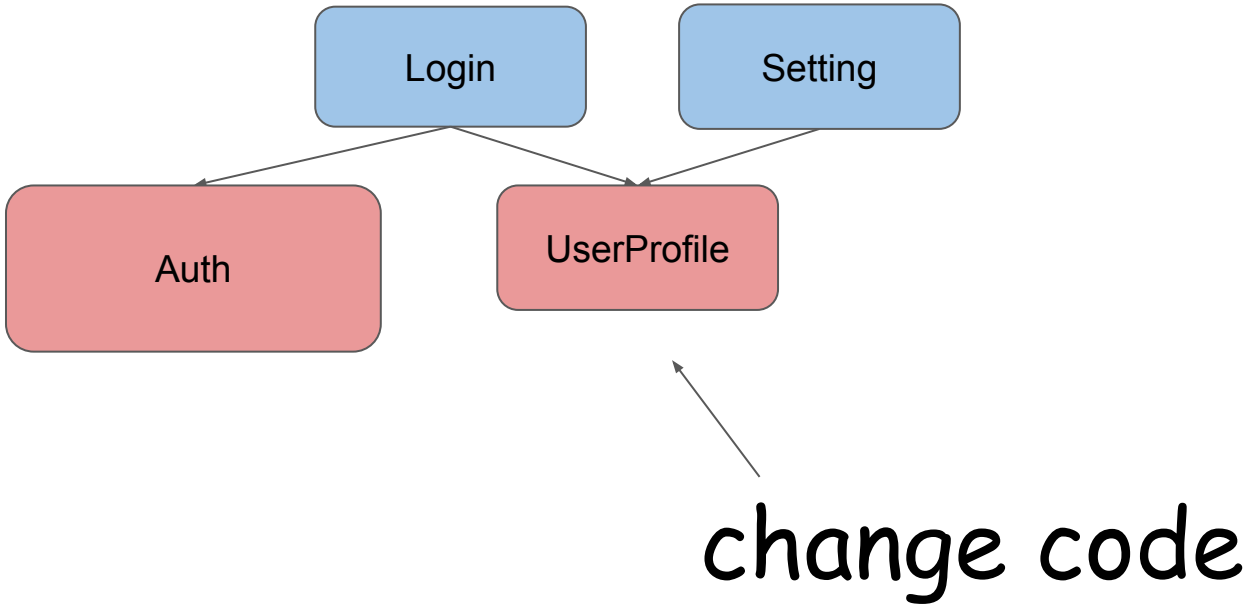
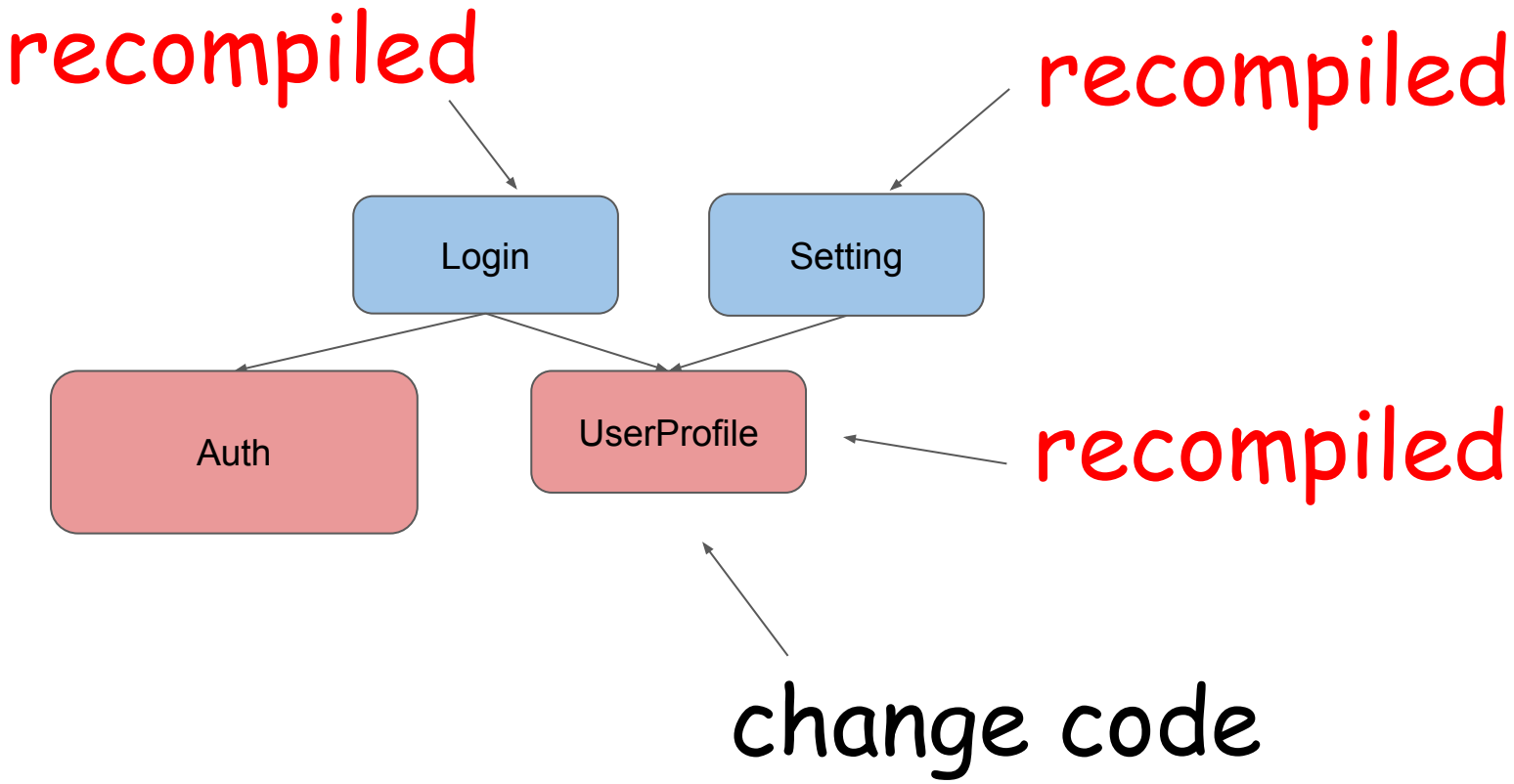

Login
Setting
Auth
UserProfile
change code

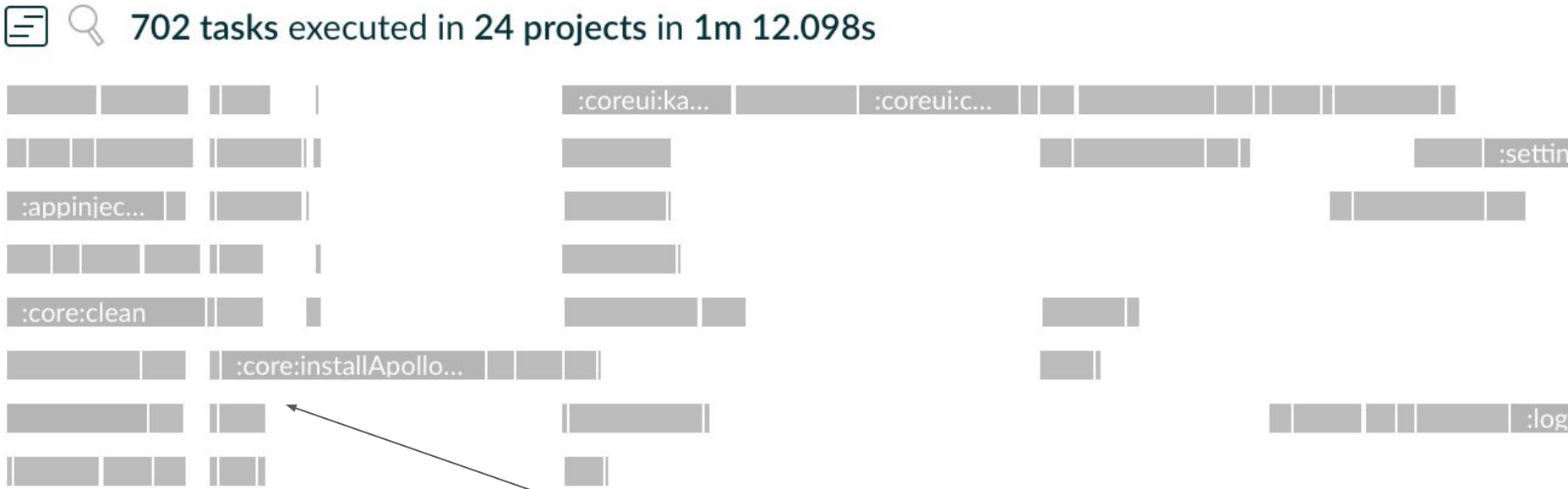

recompiled
recompiled
Login
Setting
Auth
UserProfile
recompiled
change code

Final build (clean)

Google Developers Experts

Final build

Google Developers Experts



prepare resources

Final build

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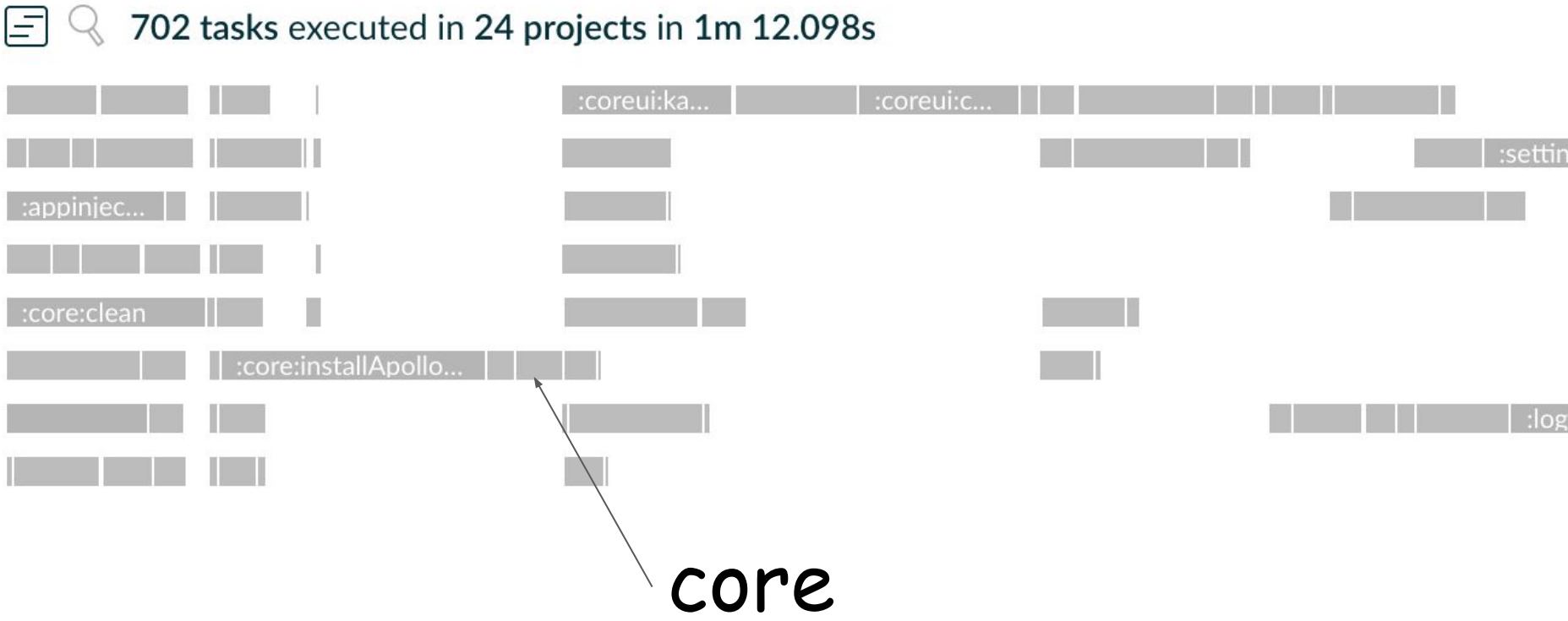


Final build

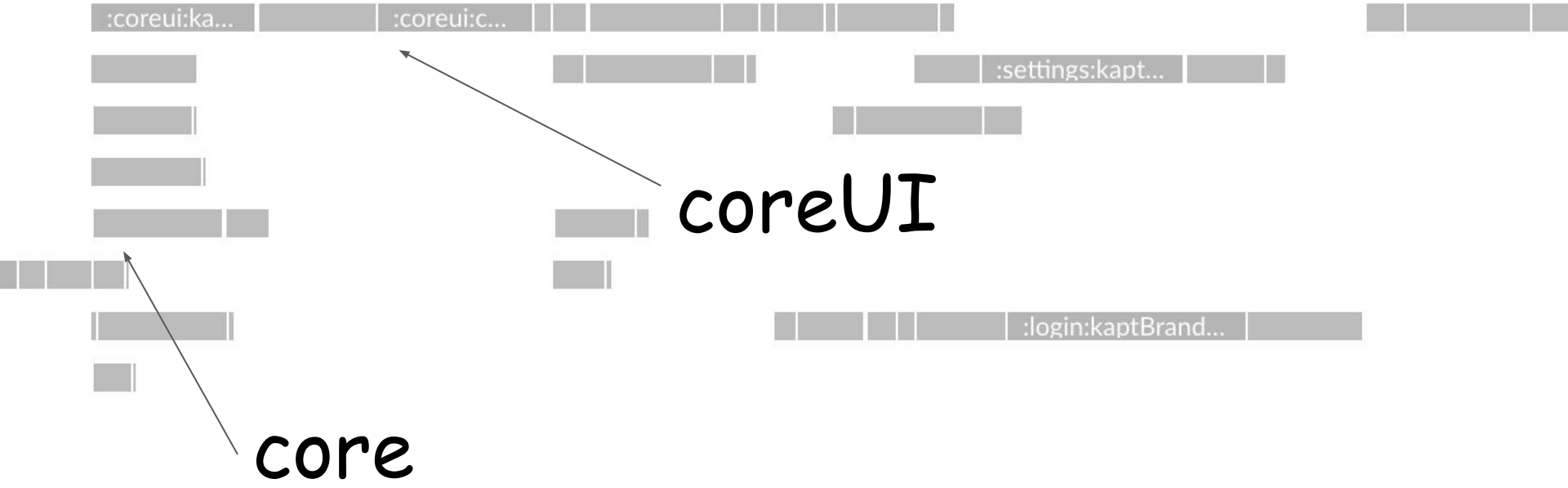
Google Developers Experts

24 projects in 1m 12.098s

Final build

Google Developers Experts

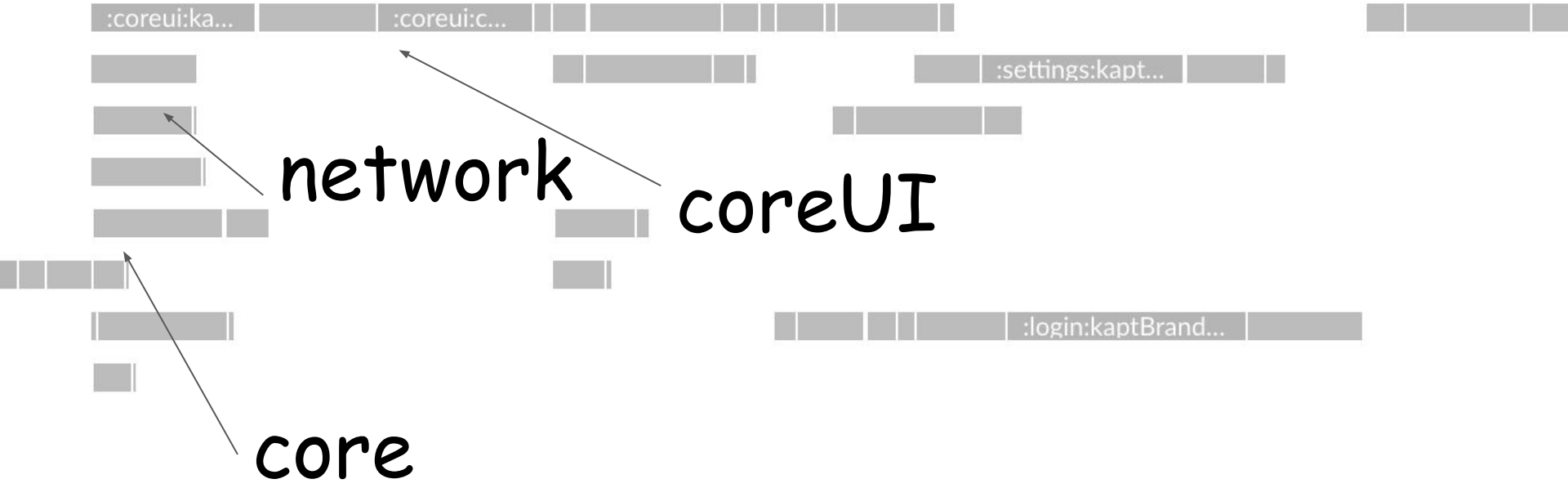
24 projects in 1m 12.098s



Final build

Google Developers Experts

24 projects in 1m 12.098s



Final build


:appinjector:transformClasses...
:settings:kapt...
rk
coreUI
appinjector
:login:kaptBrand...

Final build (clean). Bottlenecks

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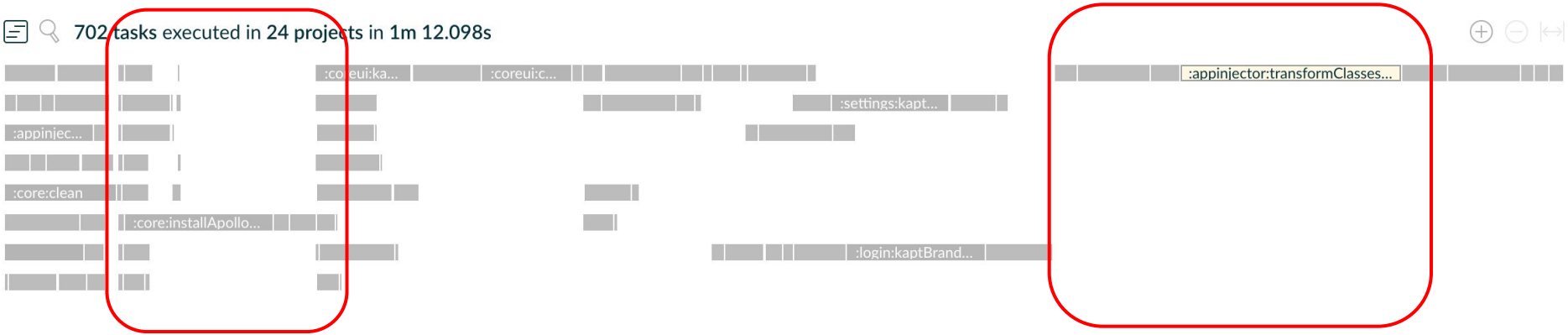

Original build (clean)

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259 tasks executed in **7 projects** in **7m 17.766s**

:app:compileDevDebugKotlin	1m 2.069s
:app:kaptDevDebugKotlin	47.606s
:core:compileDevDebugKotlin	41.240s

Final build (clean) ~1.5 min

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Final build (incremental). ~30 sec

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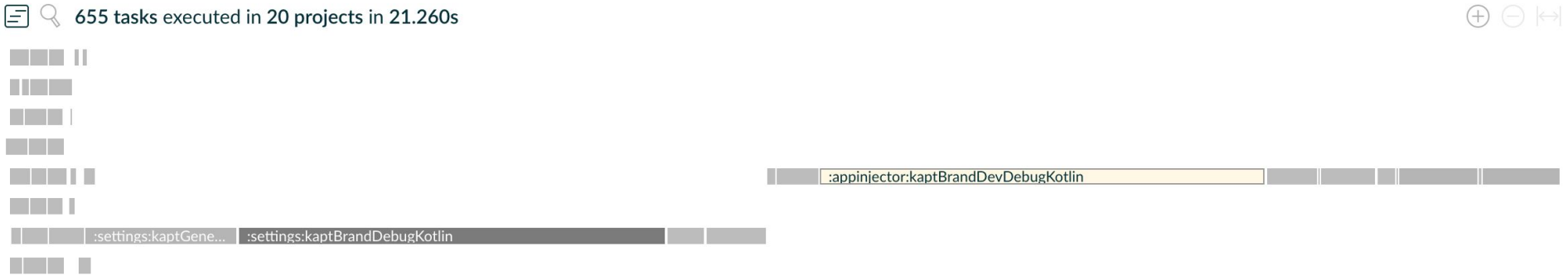

Rules of happy life

- Keep Core as thin as possible (interfaces only)

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- Avoid APT in modules if possible

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Rules of happy life

- Keep Core as thin as possible (interfaces only)
- Avoid APT in modules if possible
- Share code between several modules not all
- Keep modules independent
- Do not interact between modules by direct calls
- Prefer *implements* over *api*

Is that all what I need to know?

Dagger 2

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Dagger-Android

Do not use it!

more info:
https://github.com/google/dagger/issues/1092

Dagger Subcomponents

Dagger Subcomponents are initialized inside parent Component

Dagger Subcomponents

Dagger Subcomponents are initialized inside parent Component

And it becomes huge!

Dagger Android

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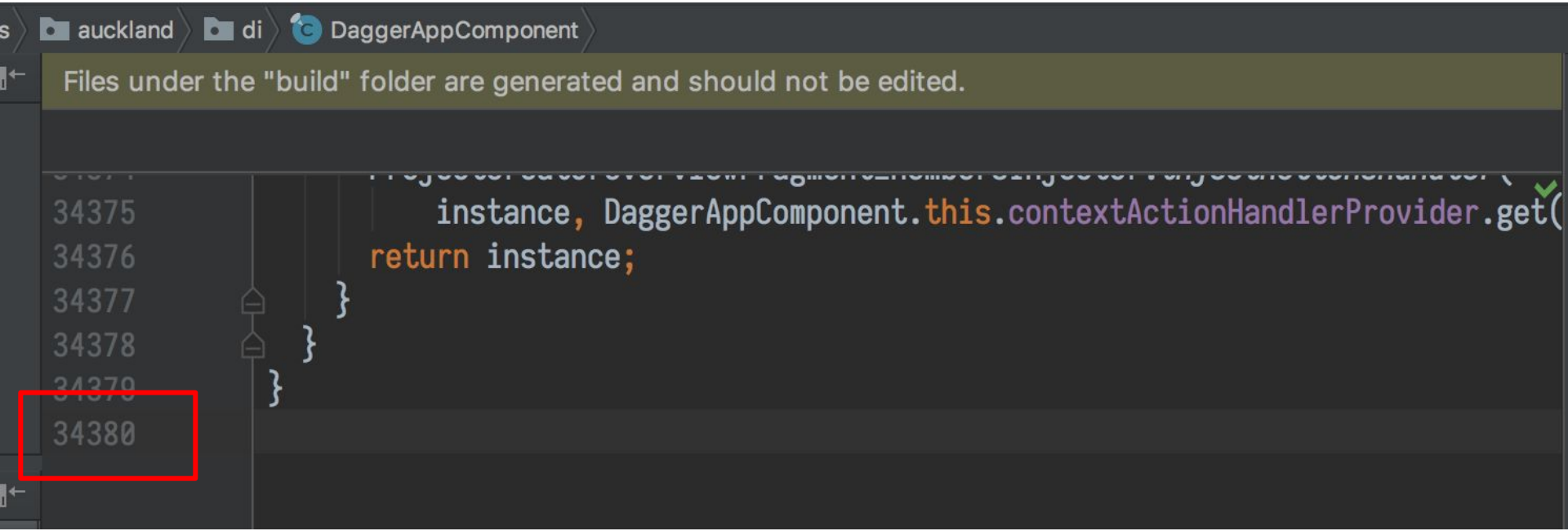

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One Gradle module
One Dagger component


FeatureActivityComponent

FeatureActivityComponent

@Inject val toaster:Toaster
@Inject val projectRepo: ProjectRepo

FeatureActivityComponent

@Inject val toaster:Toaster
@Inject val projectRepo: ProjectRepo

AppComponent:
AppProvider

FeatureActivityComponent

@Inject val toaster:Toaster
@Inject val projectRepo: ProjectRepo

AppComponent:
AppProvider

interface AppProvider: RepoProvider, MainToolsProvider

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FeatureActivityComponent

```
@Inject val toaster:Toaster
@Inject val projectRepo: ProjectRepo
```

AppComponent:
AppProvider

```
interface AppProvider: RepoProvider, MainToolsProvider
```

```
interface RepoProvider{
        fun projectRepo()
}
```

FeatureActivityComponent

```
@Inject val toaster:Toaster
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```
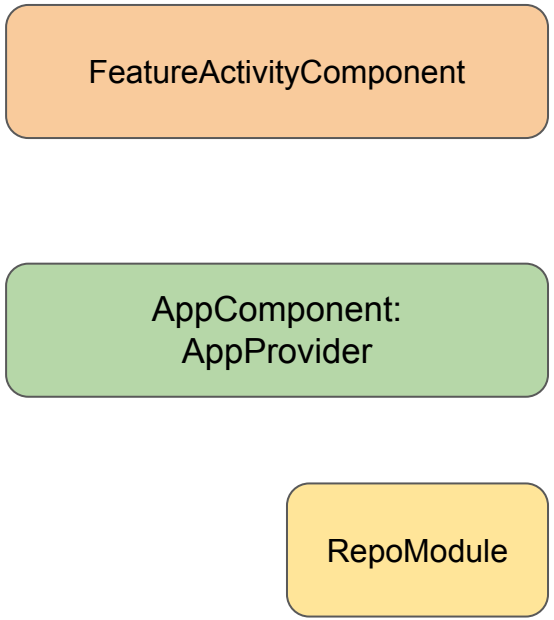

AppComponent:
AppProvider

```
interface AppProvider: RepoProvider, MainToolsProvider
```

```
interface RepoProvider{
        fun projectRepo()
}

interface MainToolsProvider{
        fun toaster()
}
```



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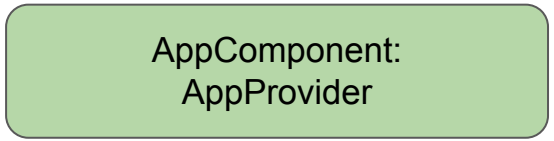
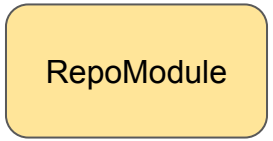
@Inject val toaster:Toaster
@Inject val projectRepo: ProjectRepo



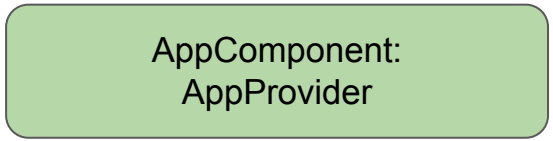
interface AppProvider: RepoProvider, MainToolsProvider



@Provides projectRepo(): ProjectRepo = ProjectRepoImpl()

Google Developers Experts

@Inject val toaster:Toaster
@Inject val projectRepo: ProjectRepo



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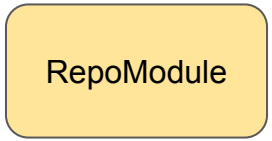

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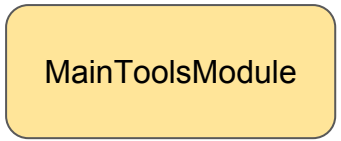
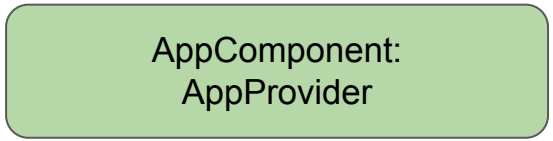


@Inject val toaster:Toaster
@Inject val projectRepo: ProjectRepo



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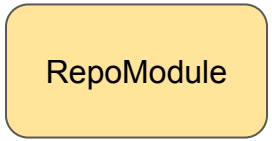

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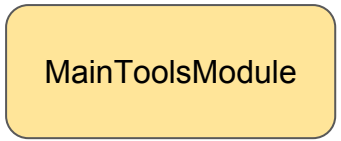
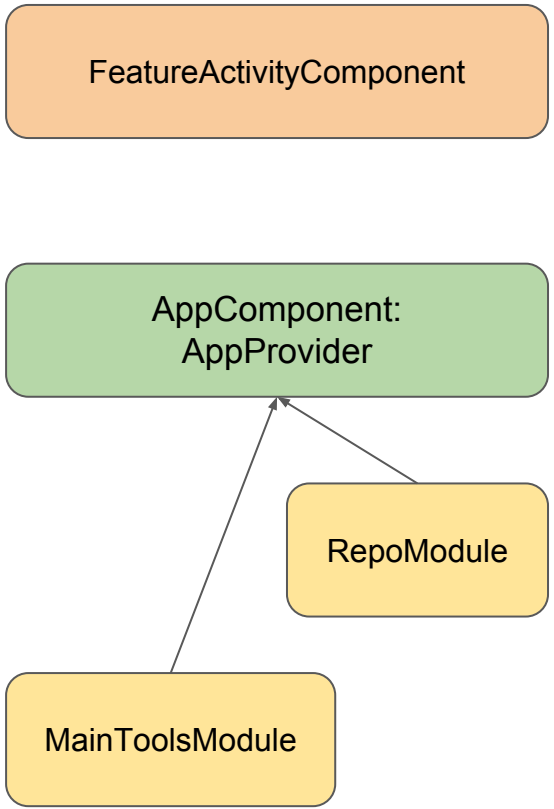


@Provides toaster(): Toaster = ToasterImpl()



@Inject val toaster:Toaster
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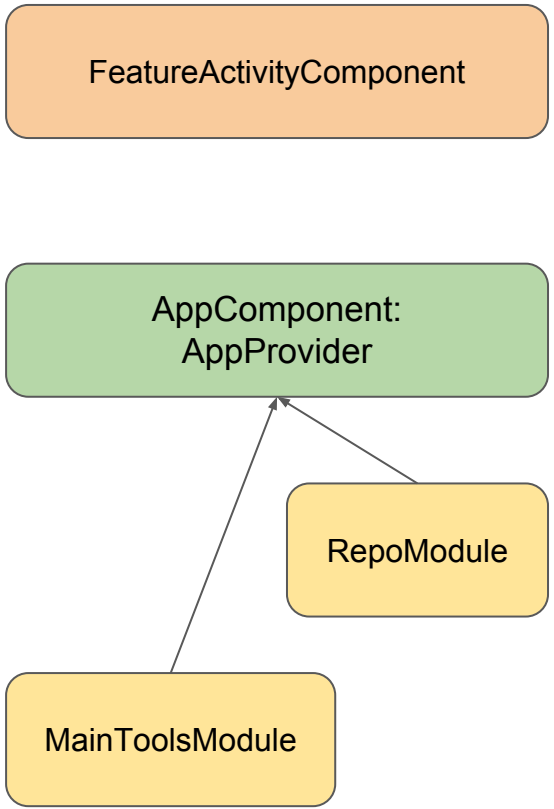


```
@Inject val toaster:Toaster
@Inject val projectRepo: ProjectRepo
```

```
@Component(modules=[
                                MainToolsModule::class,
                                RepoModule::class
                                ])
interface AppCompoment AppProvider
```

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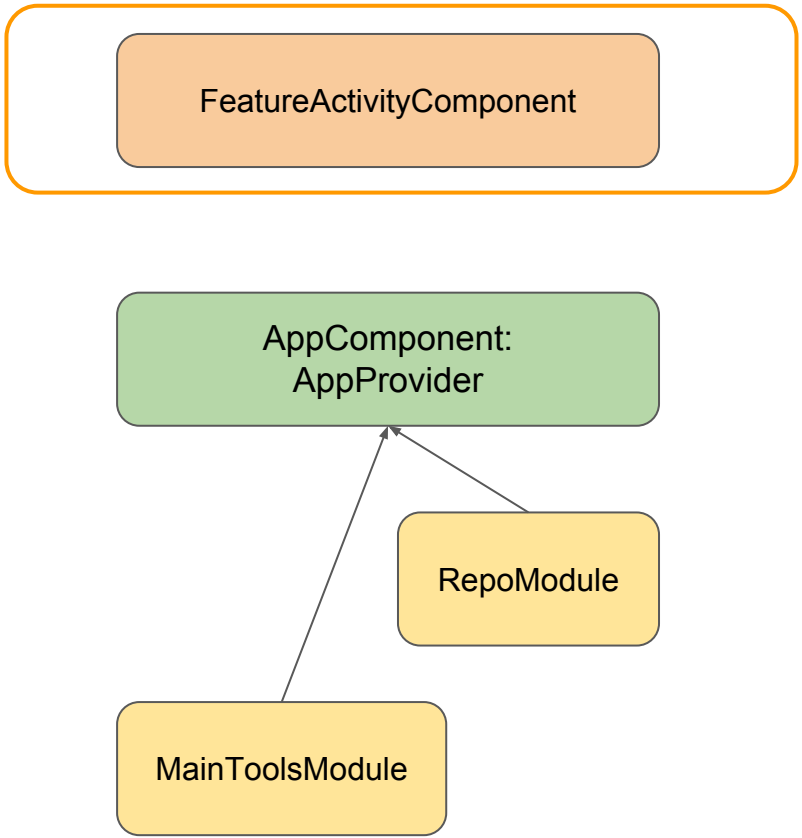

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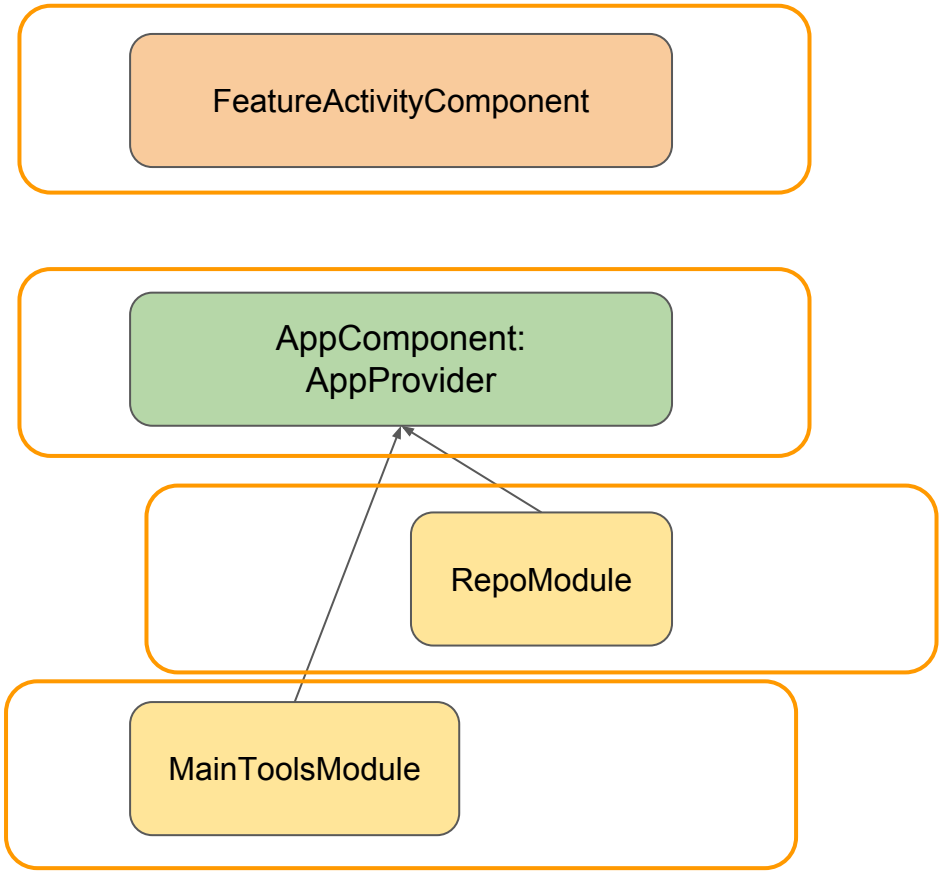
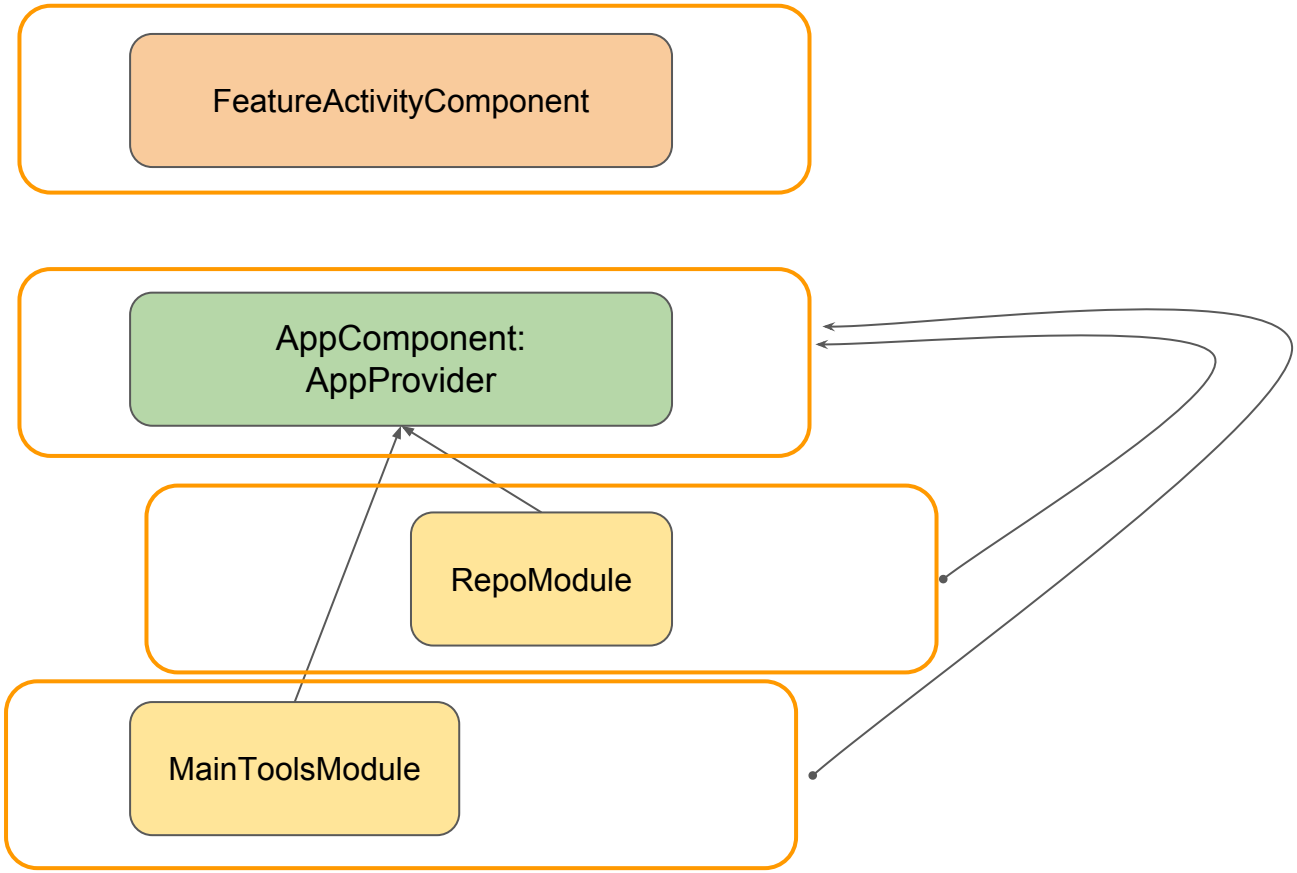
Experts



Google Developers
Experts



Providers generated in AppComponent

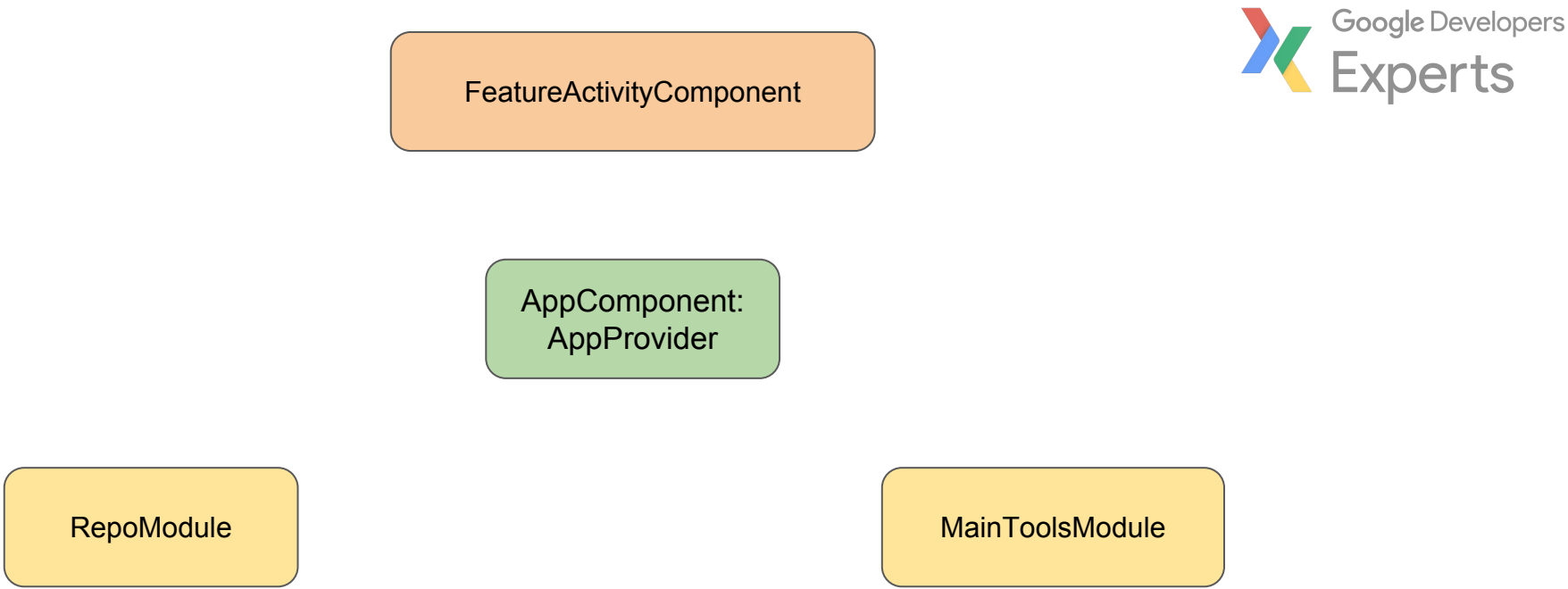
What is wrong?

Modules are generating in AppComponent gradle module (AppInjector)

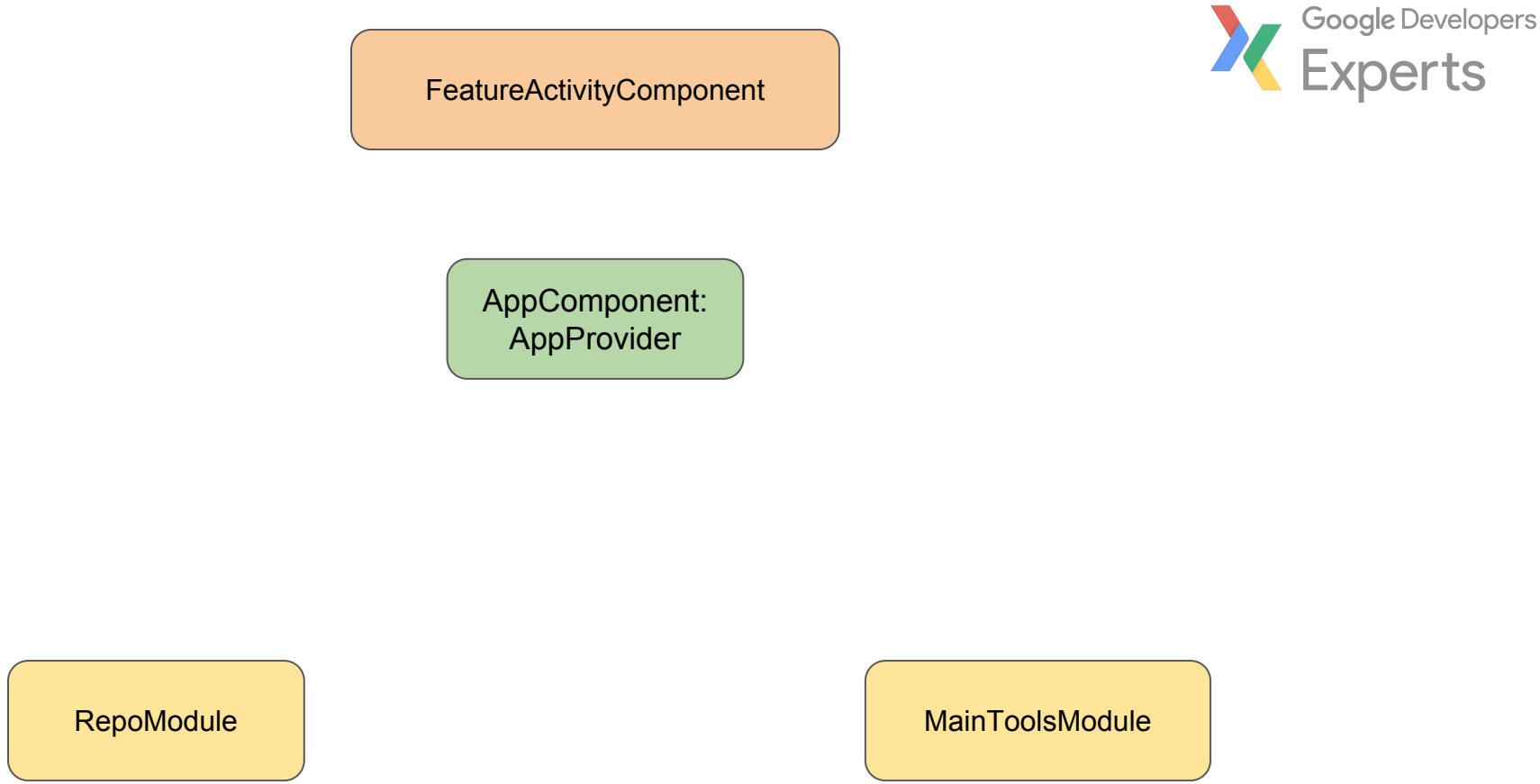
What is wrong?

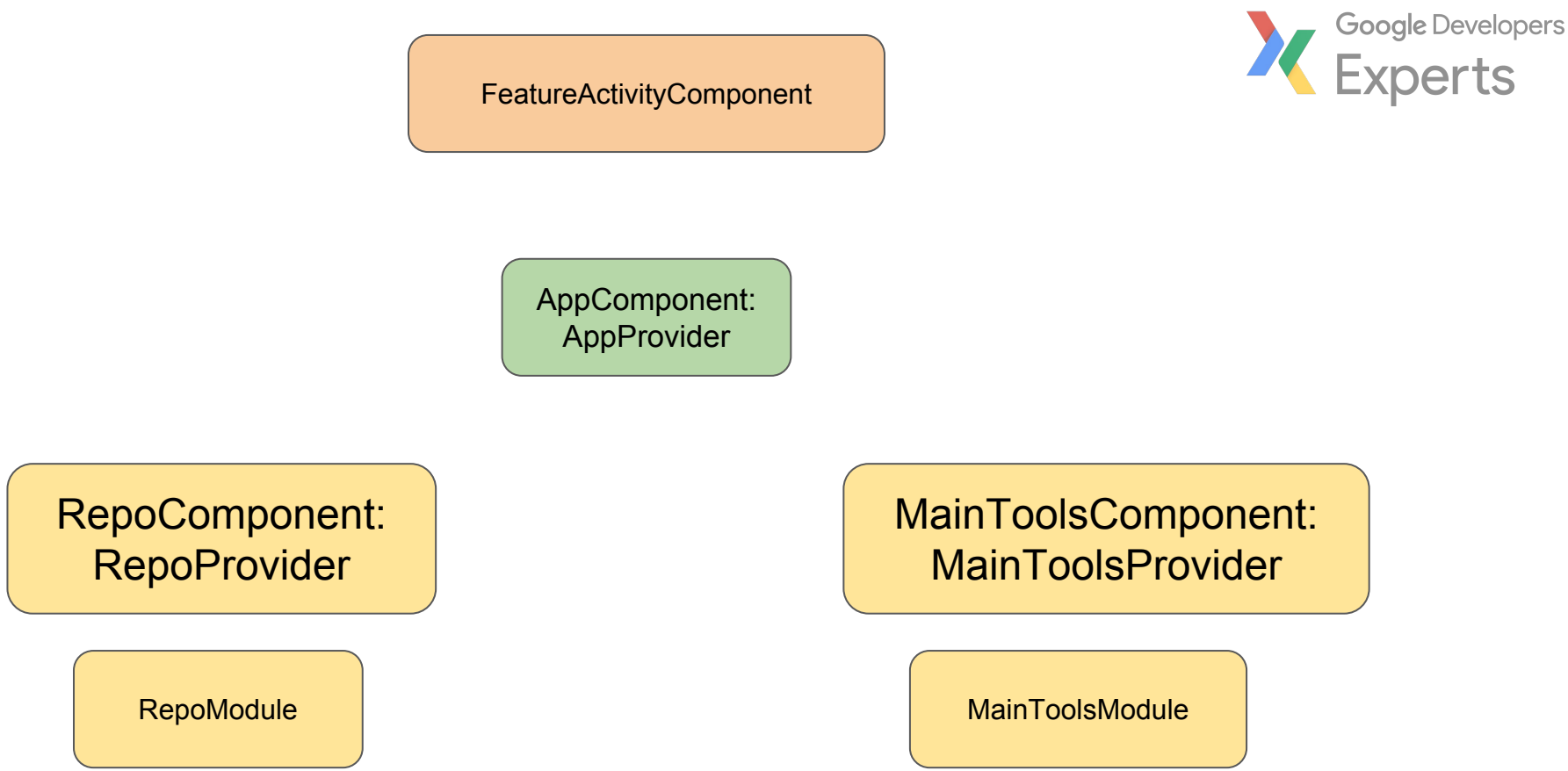
Modules are generating in AppComponent’s gradle module

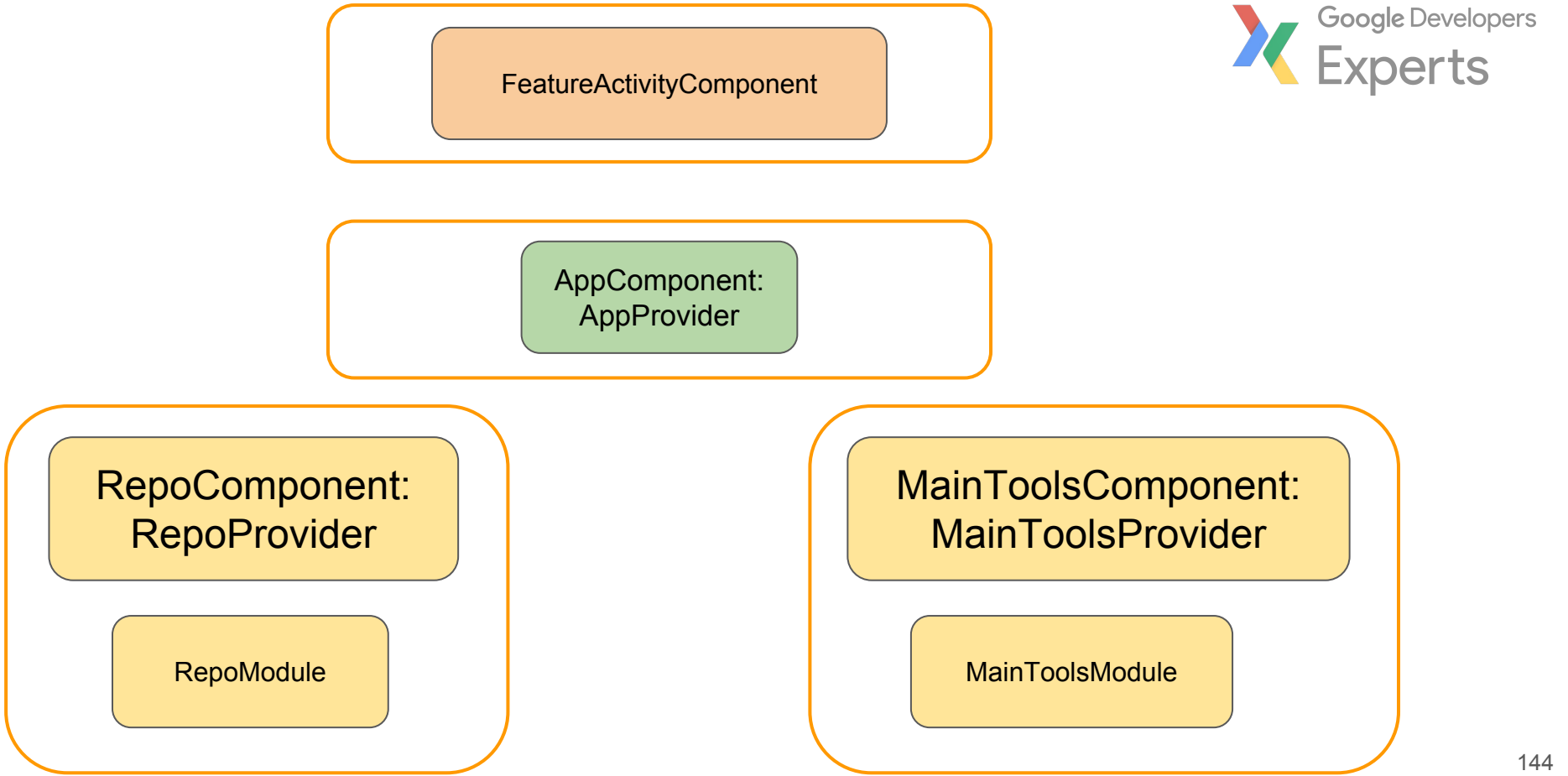
AppComponent knows about each dependency implementation



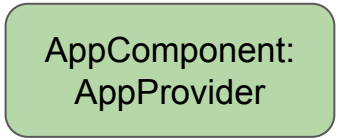
Google Developers
Experts


FeatureActivityComponent
AppComponent:
AppProvider
RepoModule
MainToolsModule


FeatureActivityComponent
AppComponent:
AppProvider
RepoComponent:
RepoProvider
MainToolsComponent:
MainToolsProvider
RepoModule
MainToolsModule


FeatureActivityComponent
AppComponent:
AppProvider
RepoComponent:
RepoProvider
RepoModule
MainToolsComponent:
MainToolsProvider
MainToolsModule

Holds reference to AppProvider



Holds reference to AppProvider

FeatureActivityComponent

Holds reference to RepoProvider and MainToolsProvider

AppComponent: AppProvider

RepoComponent: RepoProvider

MainToolsComponent: MainToolsProvider

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Holds reference to AppProvider

FeatureActivityComponent

Holds reference to RepoProvider and MainToolsProvider

AppComponent: AppProvider

RepoComponent: RepoProvider

MainToolsComponent: MainToolsProvider

implements RepoProvider

implements RepoProvider

Benefits

AppComponent becomes lightweight

AppComponent knows about each dependency implementation

Benefits

AppComponent becomes lightweight

AppComponent does not know about dependencies implementations

Dynamic module switching

settings.gradle

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```
include ':core'
project(':core').projectDir = new File(rootDir, 'sources/base/core')
include ':injector'
project(':injector').projectDir = new File(rootDir, 'sources/base/injector')
include ':repo'
project(':repo').projectDir = new File(rootDir, 'sources/base/repo')
include ':network'
project(':network').projectDir = new File(rootDir, 'sources/base/network')

include ':notifications'
project(':notifications').projectDir = new File(rootDir,'sources/features/notifications')

include ':githubbrowser'
project(':githubbrowser').projectDir = new File(rootDir, 'sources/features/githubbrowser')
include ':mainscreen'
project(':mainscreen').projectDir = new File(rootDir, 'sources/features/mainscreen')
```

settings.gradle


```
include ':notifications'
project(':notifications').projectDir = new File(rootDir,'sources/features/notifications')
```

settings.gradle

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```
include ':notifications'
project(':notifications').projectDir = new File(rootDir,'sources/features/notifications/notifications-fake')
```

Benefits?

Each module take up to 30 seconds on clean build.
After changing to fake it takes around 5 seconds.

For incremental in most cases it does not make sense

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Other solutions for fast build

Mainframer?

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https://github.com/gojuno/mainframer

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Buck or Bezel?

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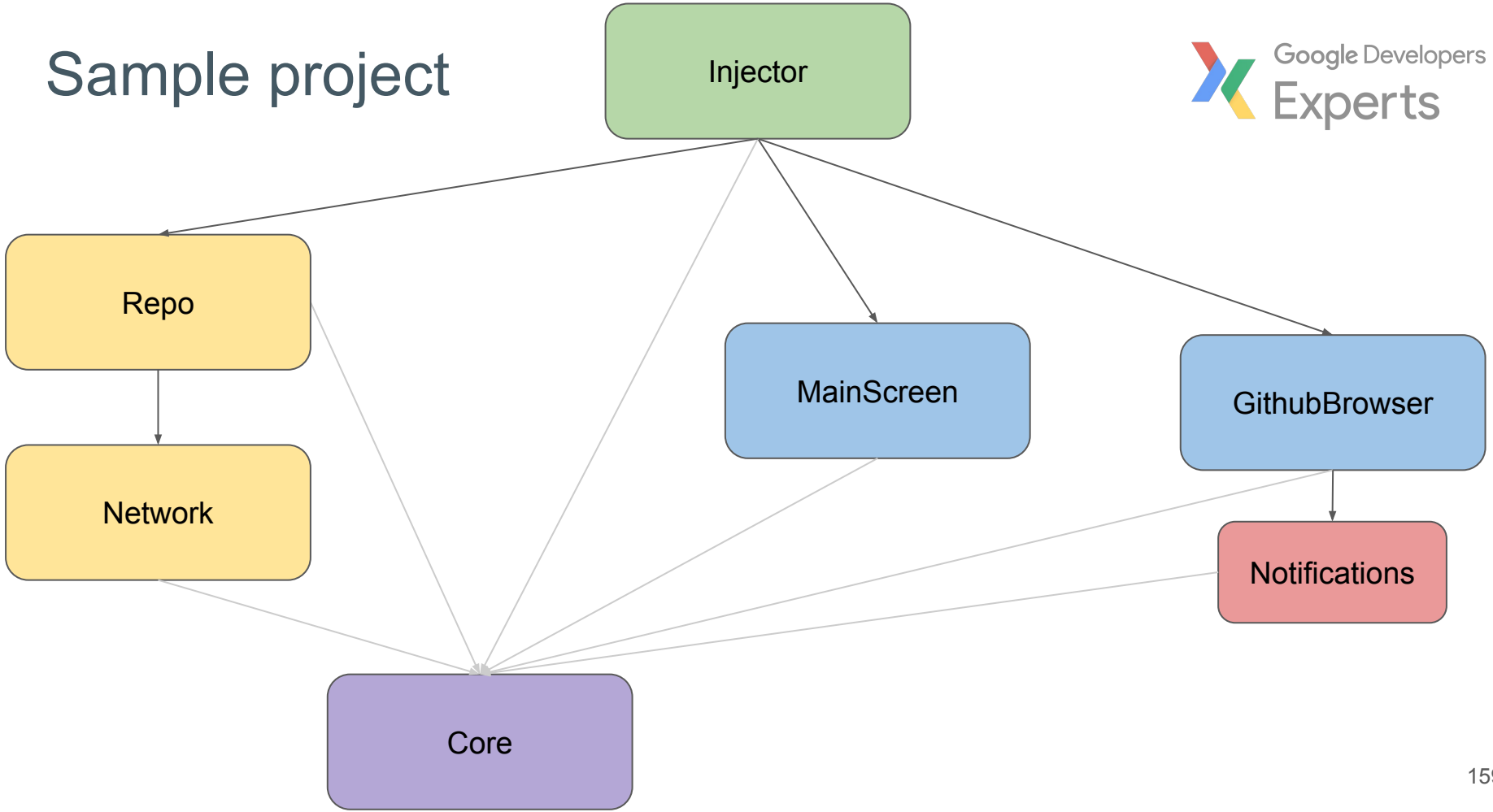
Sample project

Sample project



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Sample project:

github.com/kotlinsg/modular

To read:

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atscaleconference.com/videos/app-modularization-and-module-lazy-loading/ - модуляризация в Instagram

medium.com/@manuelvicnt/dagger-android-thoughts-dependency-injection-in-android-d50e799affe3 - почему dagger-android не идеален

guides.gradle.org/performance/ - превосходный материал по профилированию сборки Gradle

Thank You!

Google Developers Experts

Denis Nek
Google Developer Expert
@nekdenis

Большой вклад в проект внесли:

Степан Гончаров
Кирилл Бояршинов
Андрей Мищенко

Сергей Боиштян