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Lecture #14
Testing Frameworks & Exam Discussions

Mobile Applications 2020-2021

Types of Testing Software

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Smoke testing

System Integration Testing

Usability testing

Unit testing

User Acceptance testing

System Testing

Performance Testing

All Pairs testing

Security Testing

Regression Testing

Load Testing

Beta Testing

Ad-hoc testing

Soak Testing

Sanity Testing

Retesting

Black Box testing

Acceptance Testing

Risk-based Testing

Stress Testing

Glass box Testing

Backward Compatibility Testing

Accessibility Testing

Localization Testing

Static Testing

Boundary Value Testing

Agile Testing

Stability Testing

Negative Testing

API Testing

Big Bang Integration testing

Automated testing

Volume testing

Non-functional testing

Scalability Testing

Bottom up Integration testing

Branch Testing

Gorilla Testing

Pair Testing

Vulnerability Testing

Keyword-driven Testing

White box Testing

Browser compatibility Testing

Component Testing

Dynamic Testing

End-to-end Testing

Compatibility testing

Condition Coverage Testing

Internationalization Testing

Exploratory Testing

Happy path testing

Decision Coverage Testing

Integration Testing

Functional Testing

Fuzz Testing

Interface Testing

GUI (Graphical User Interface) testing

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GUI (Graphical User Interface) testing

https://www.testingexcellence.com/types-of-software-testing-complete-list/

Types of Testing Software

Software Testing can be broadly classified into two types:

- Manual Testing
- Automation Testing

Automation Testing Levels

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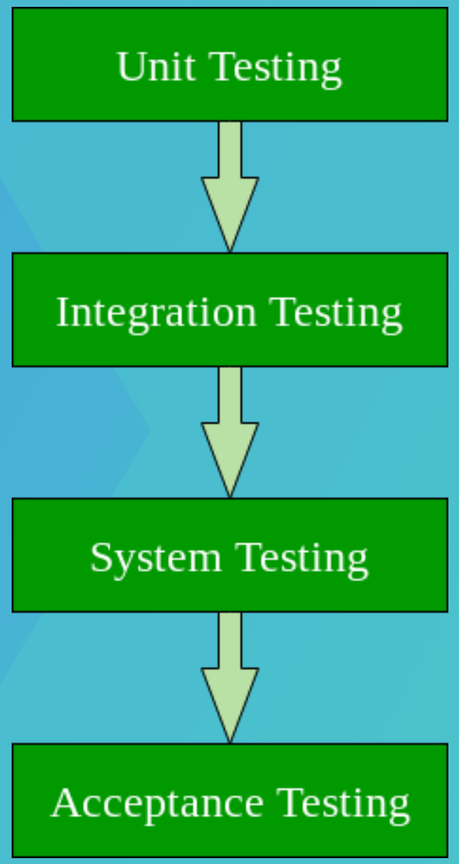

Advantages

- Rapid feedback.
- Early failure detection.
- Safer code refactoring.
- Stable development velocity.

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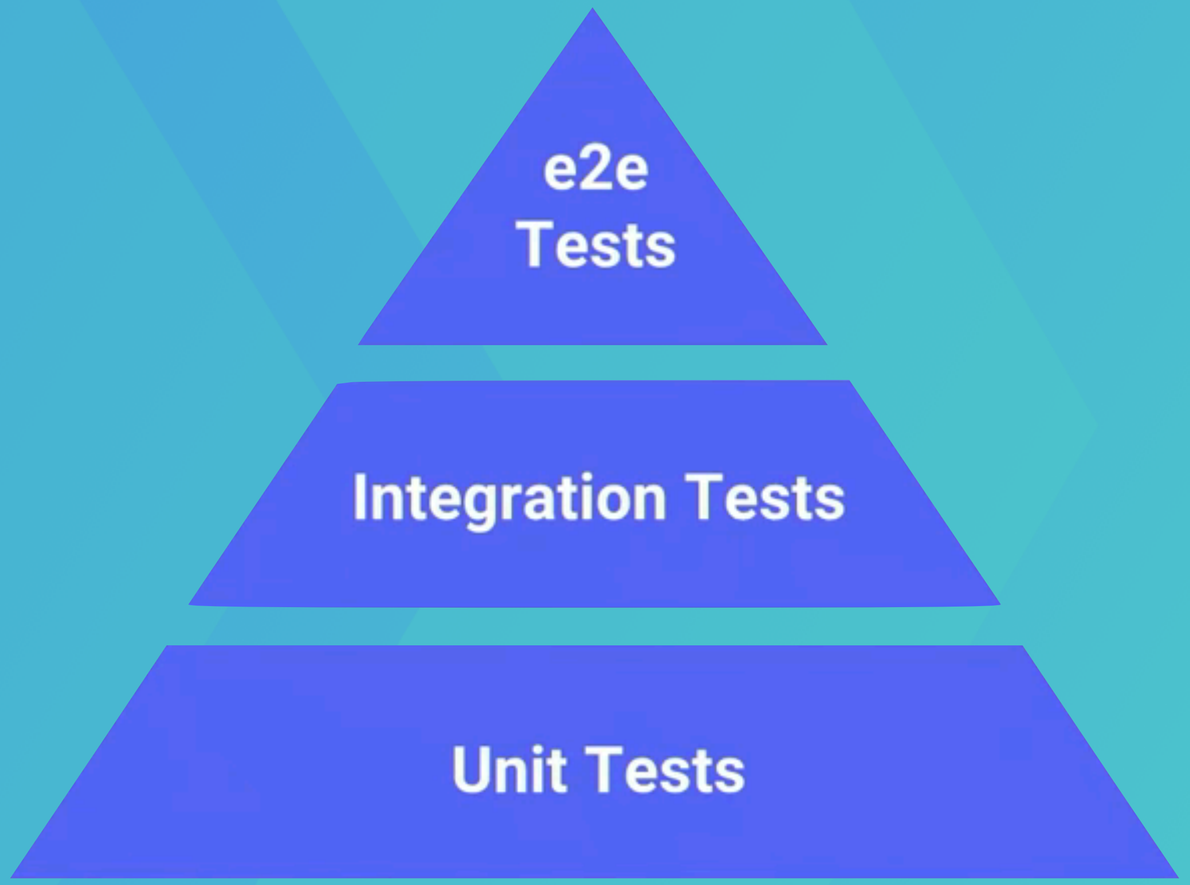

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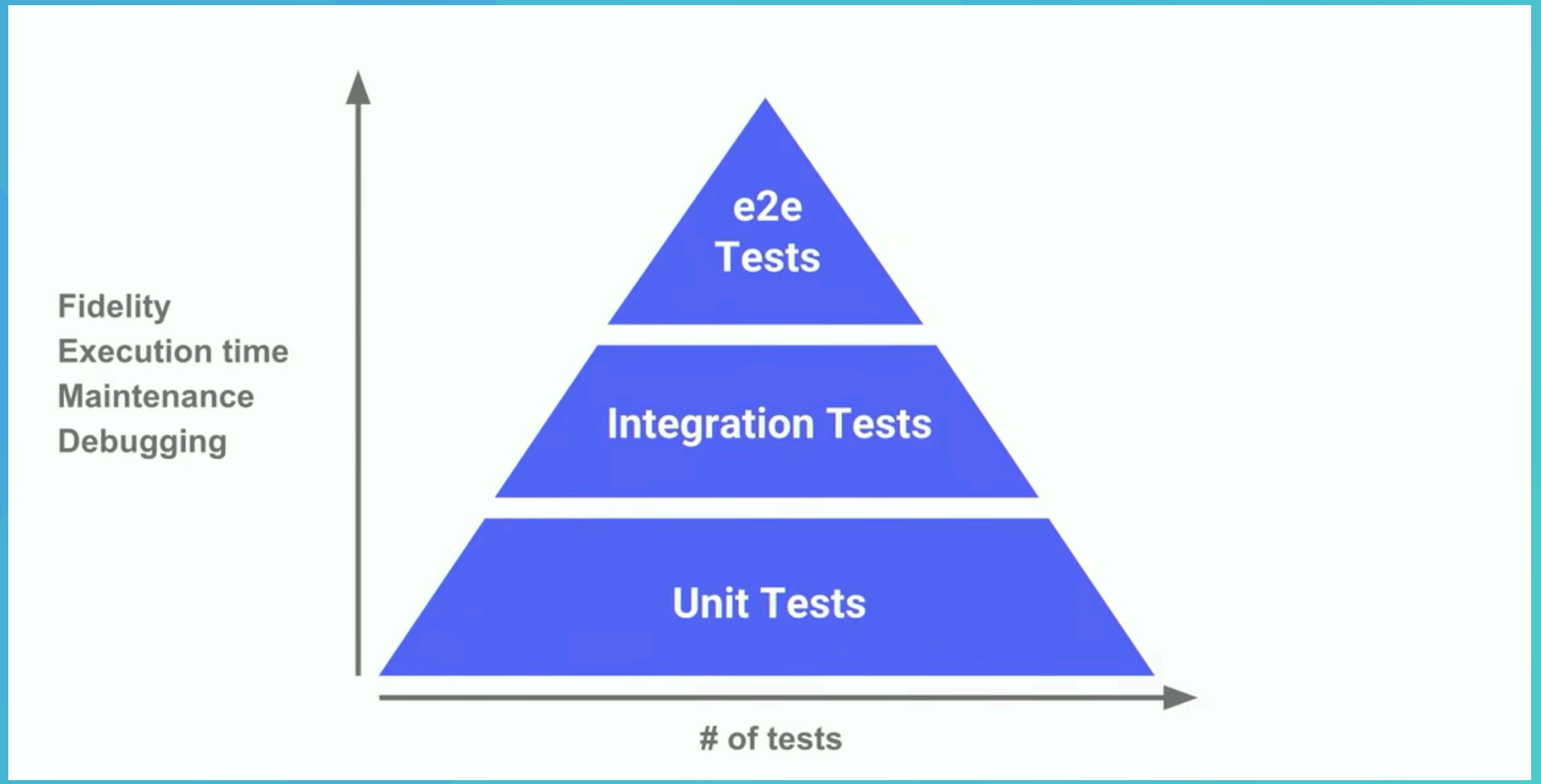

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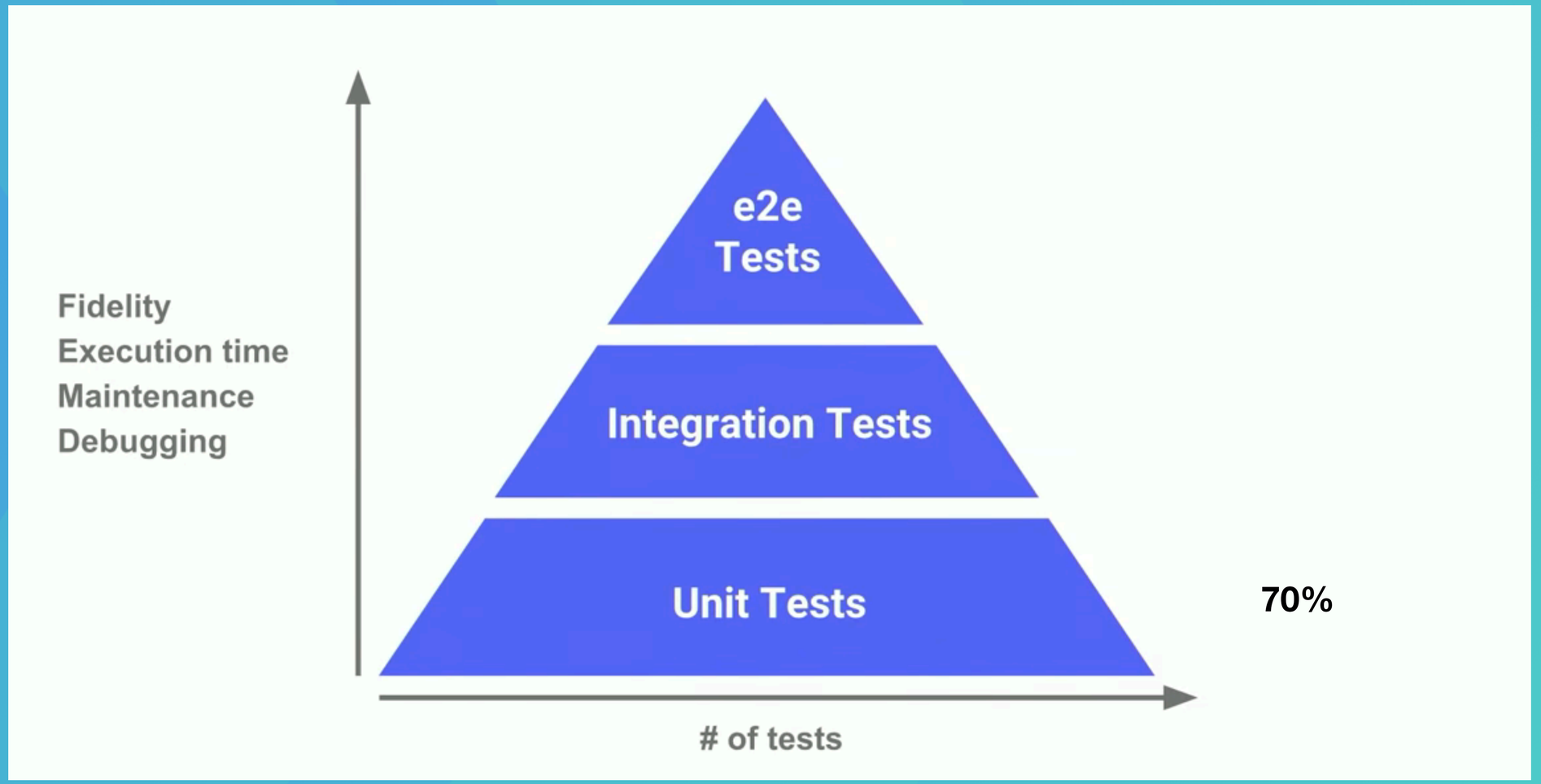

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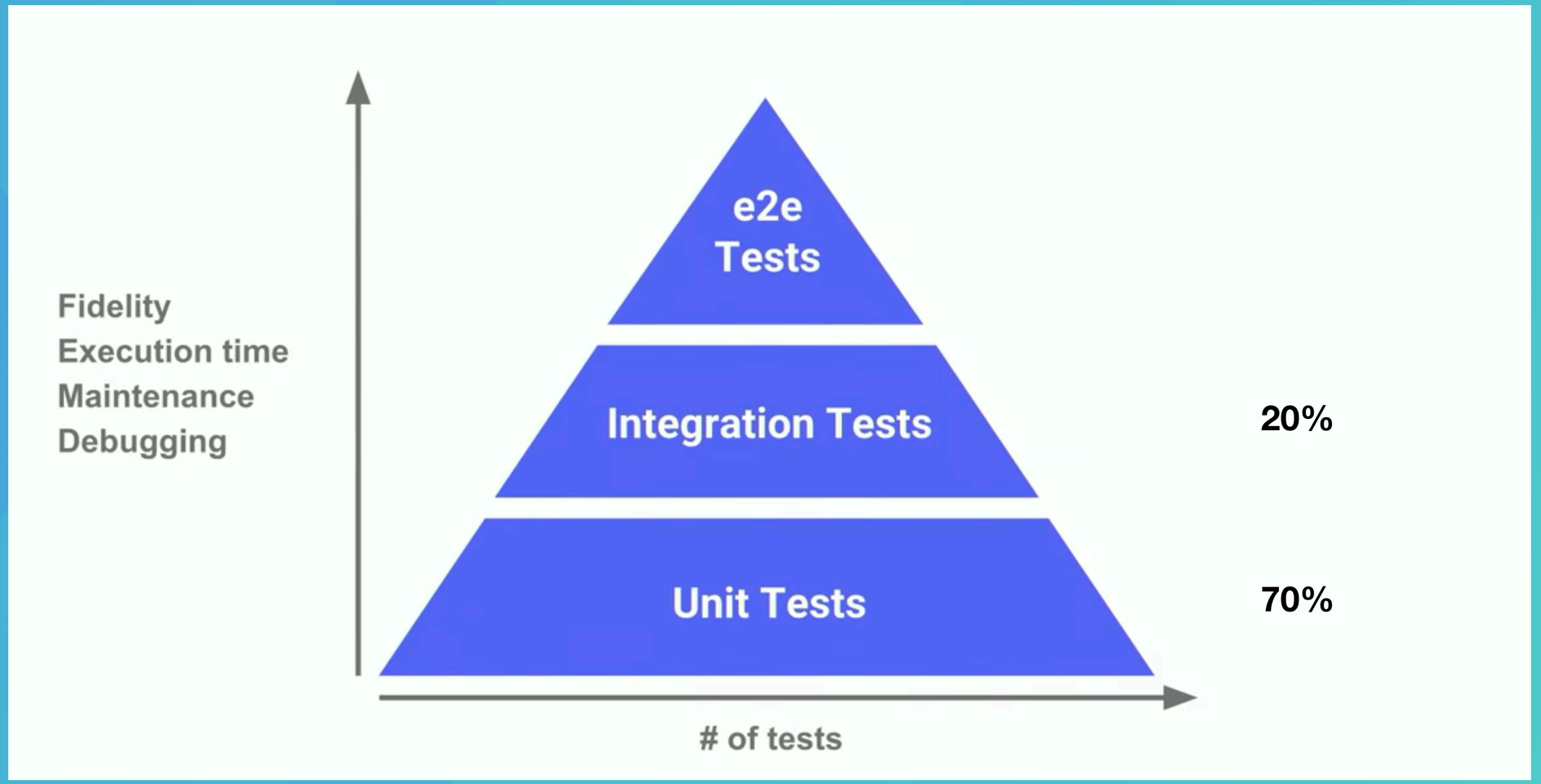

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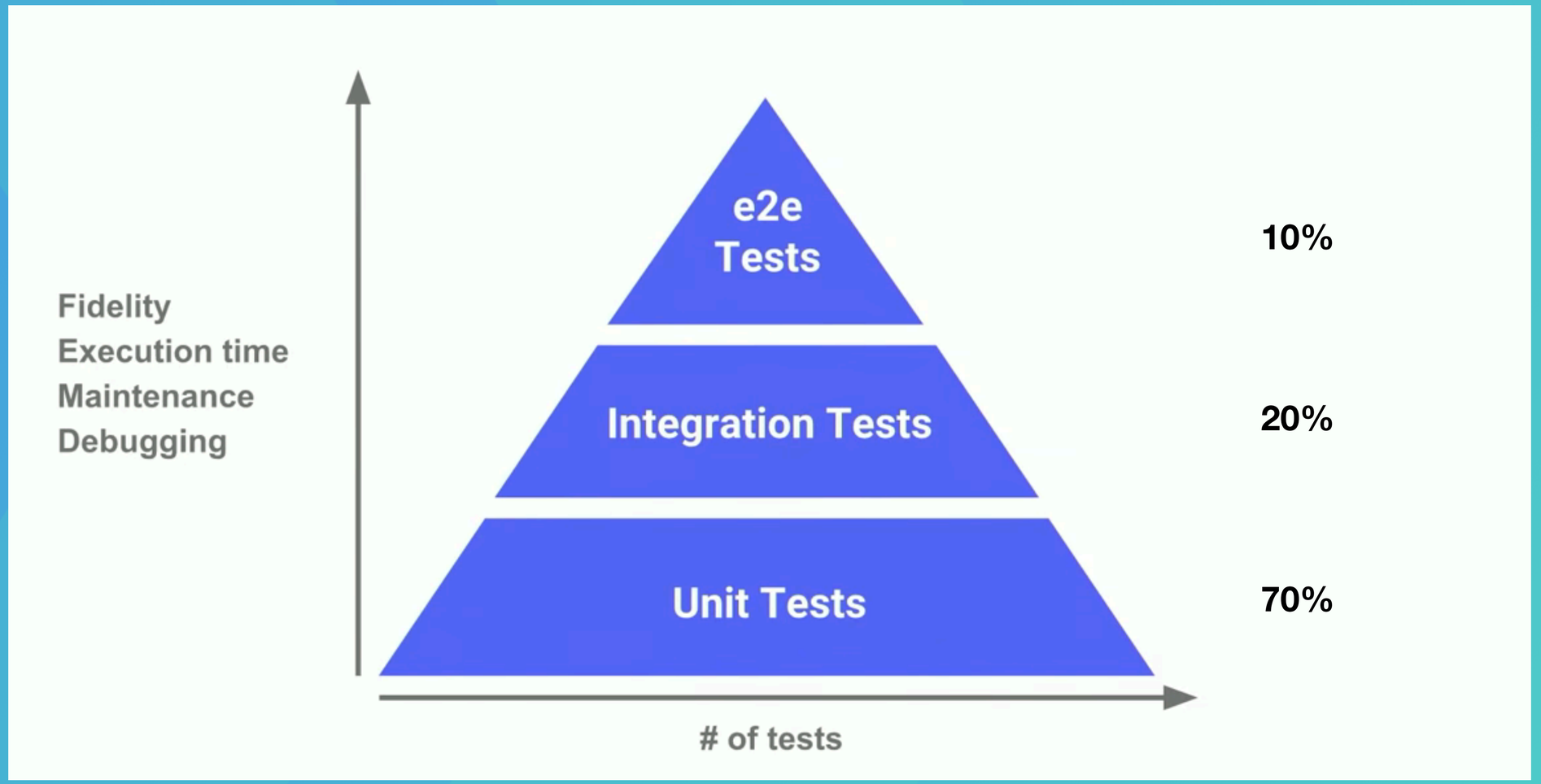

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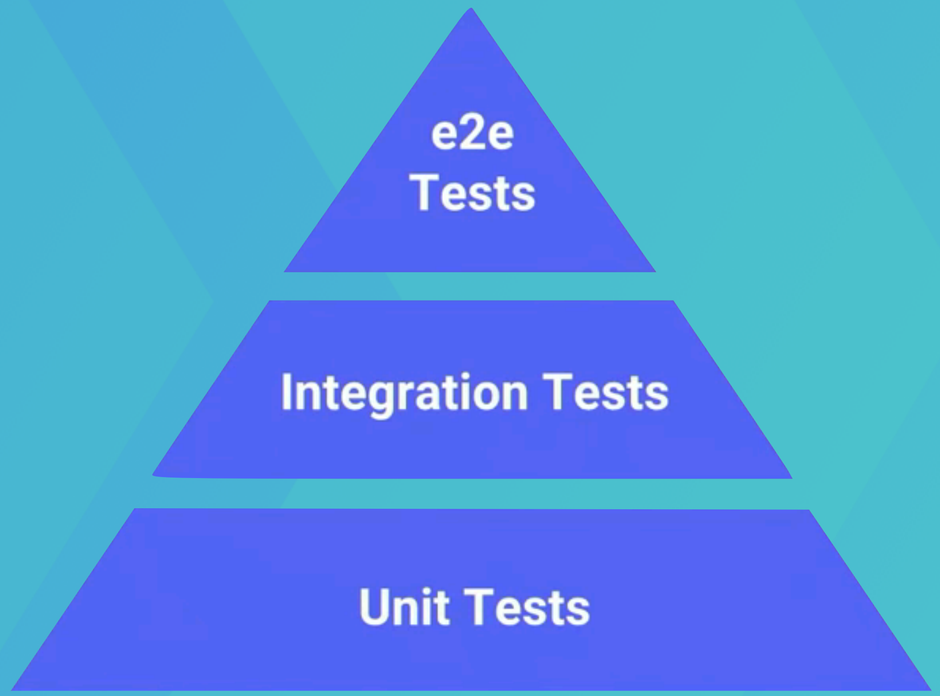

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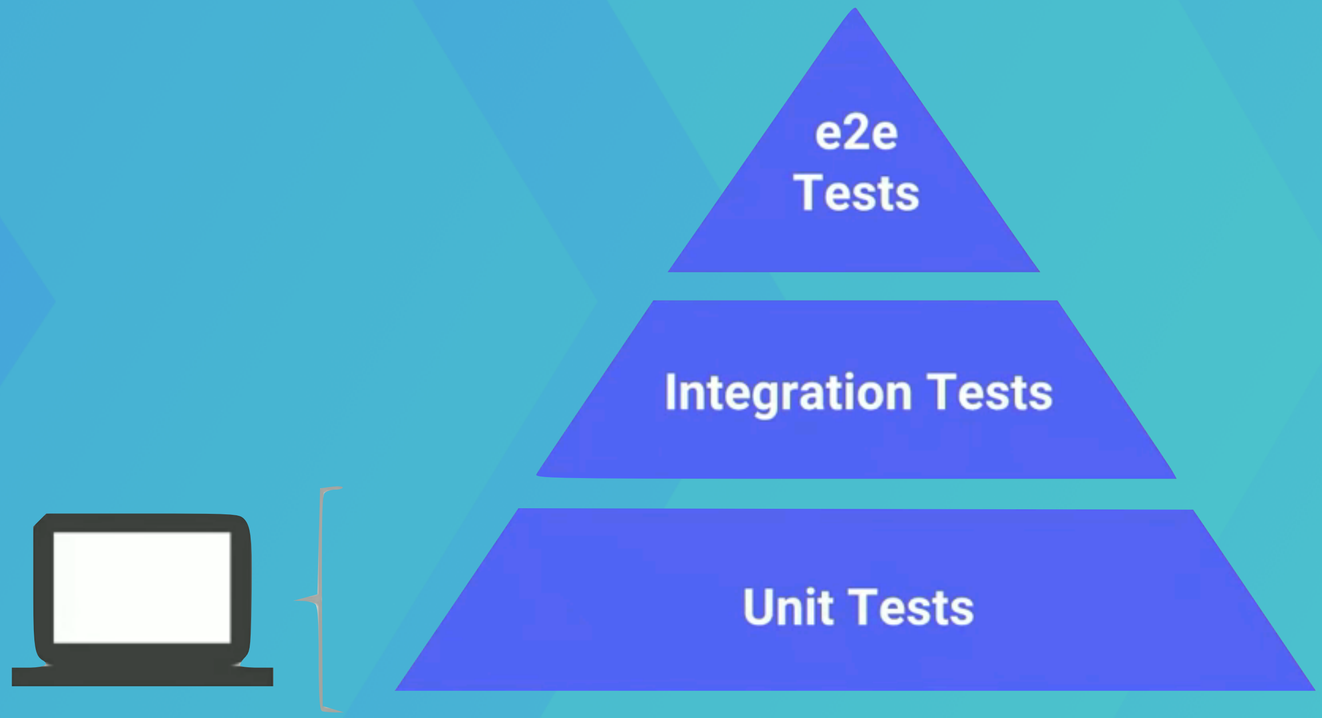

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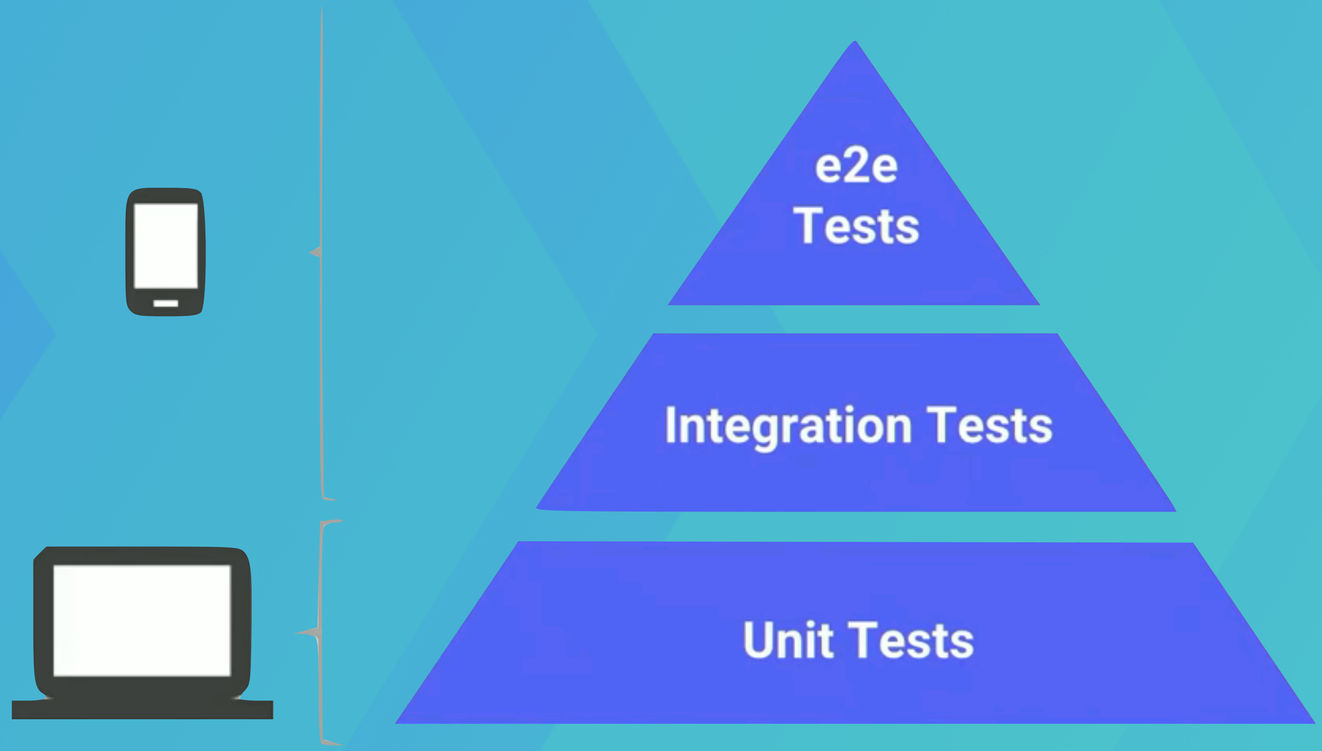

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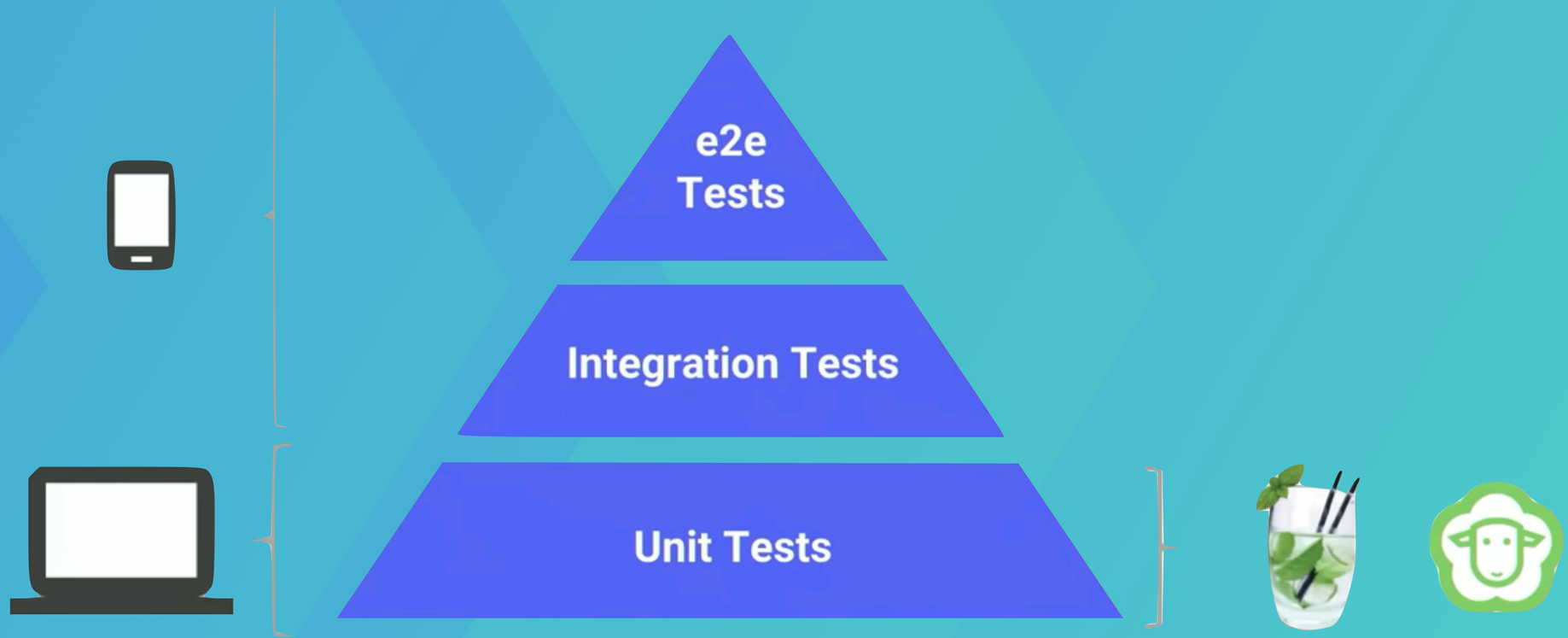

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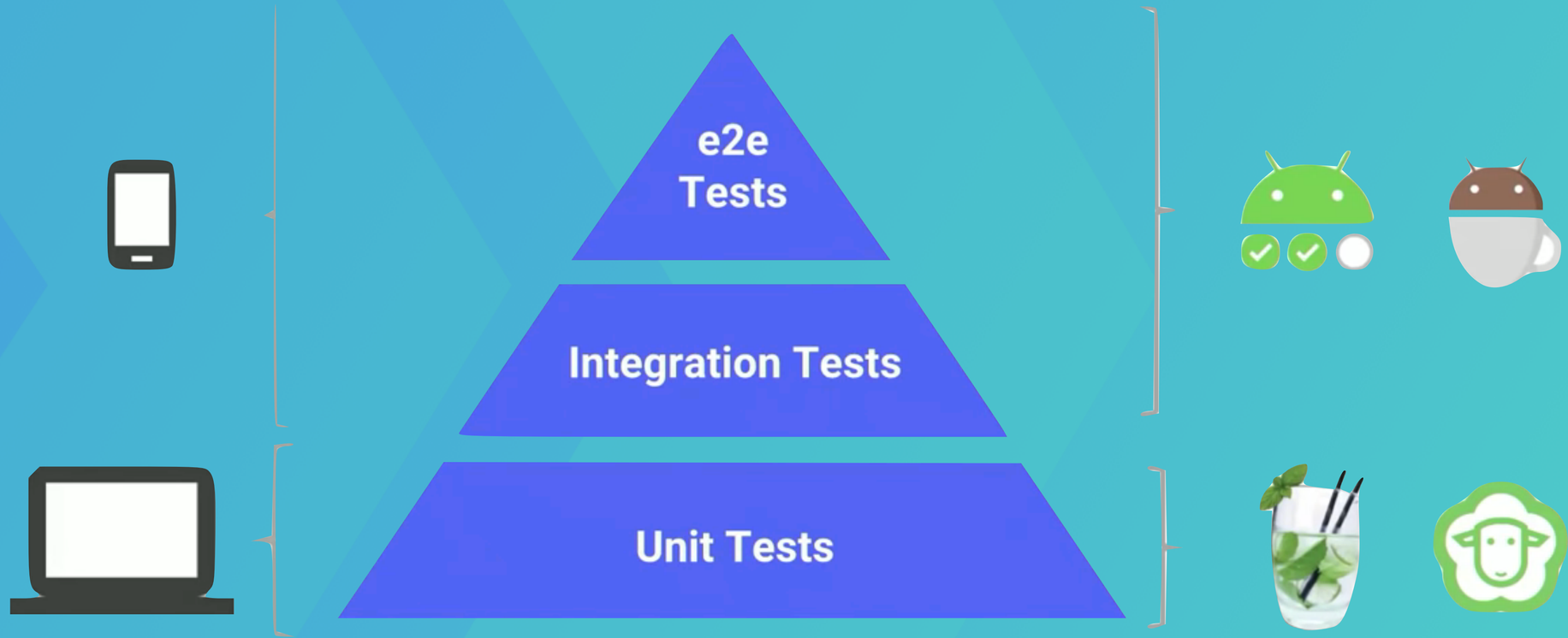

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Test writing crisis

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Test writing crisis

Test Structure


```
class WellStructuresTest{
  //..
  fun givenCondition_whenAction_thenShoulDo(){
     // GIVEN - Setup condition

     // WHEN - The tested action

     // THEN - An assertion to validate the action
  }
  //...
}
```

Test Structure


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- Focus on specific behavior.

Test Structure


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- Focus on specific behavior.
- Test behaviors independently.

Test Structure


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class WellStructuresTest{
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  fun givenCondition_whenAction_thenShoulDo(){
     // GIVEN - Setup condition

     // WHEN - The tested action

     // THEN - An assertion to validate the action
  }
  //...
}
```

- Focus on specific behavior.
- Test behaviors independently.
- LESS is MORE. Keep tests understandable and in isolation.

NoteListActivity

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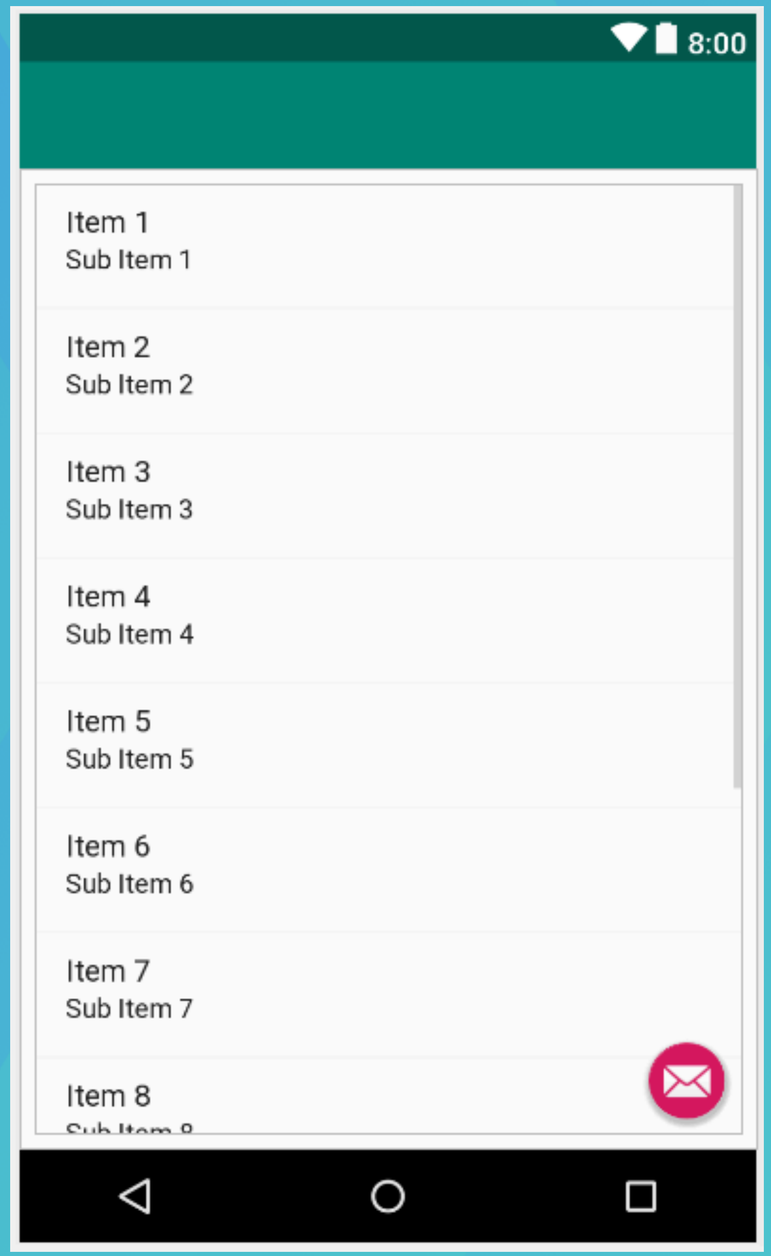
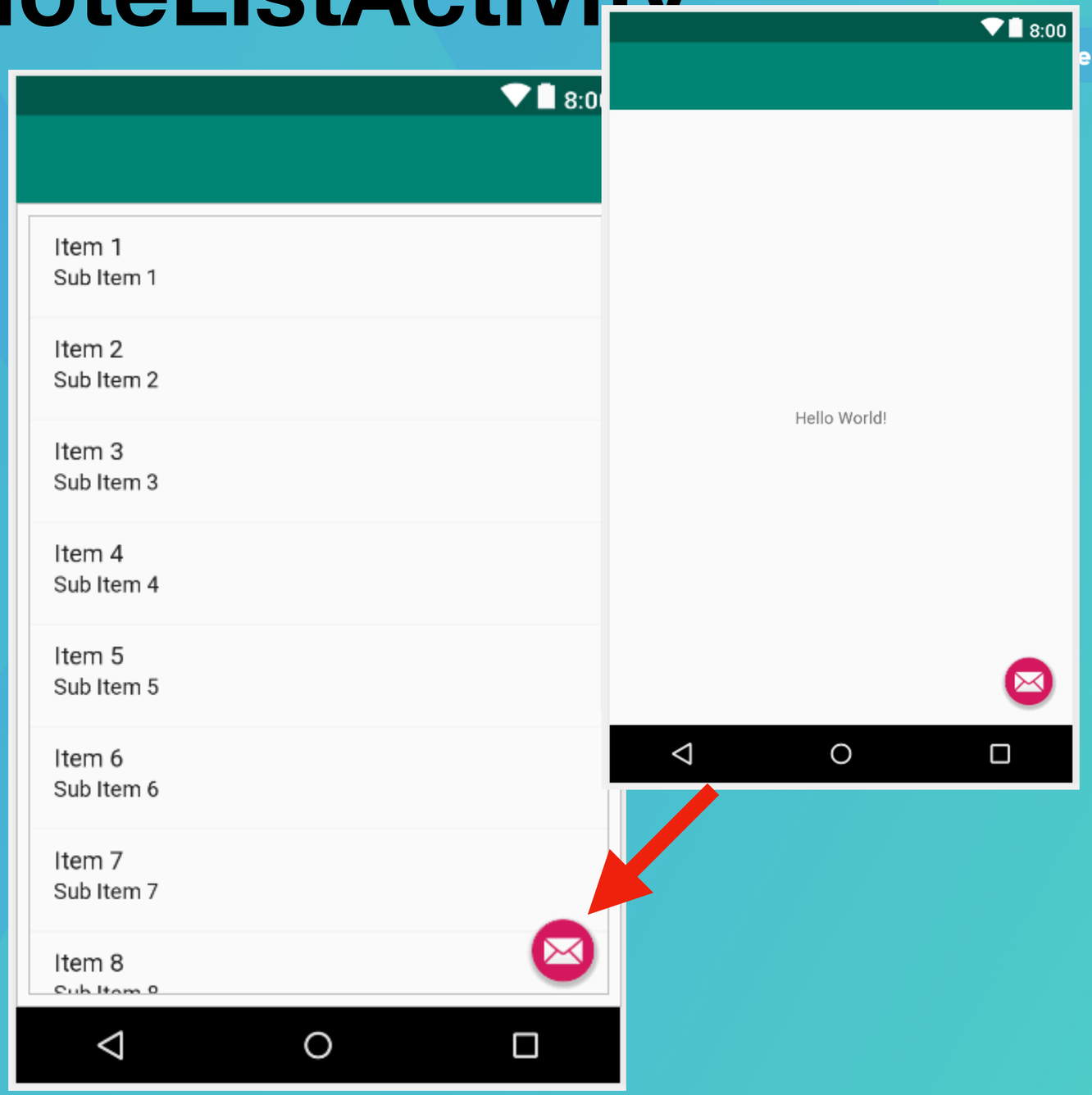


NoteListActivity



Mockito

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```
@RunWith(MockitoJUnitRunner::class)
class MockitoTest {
  @Spy var spyActivity = NoteListActivity()
  @Captor lateinit var intentCaptor: ArgumentCaptor<Intent>
  @Captor lateinit var clickCaptor:
                ArgumentCaptor<NoteListActivity.ClickHandler>

  fun testTitle() {
    `when`(spyActivity.findViewById(R.id.title))
       .thenReturn(mock<TextView>())

    clickCaptor.value.click()

    verify(spyActivity).startActivity(intentCaptor.capture())
  }
}
```

https://site.mockito.org

Mockito

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Robolectric

```
@RunWith(RobolecticTestRunner::class)
class RobolecticTest {

  @Test
  fun testTitle() {
    val activity =
      Roboelectic.setupActivity(NoteListActivity::class.java)

    ShadowView.clickOn(activity.findViewById(R.id.title))

    assertEquals(
       ShadowApplication.getInstance()
           .peekNextStartedActivity().action,
       "android.intend.action.EDIT"
    )
  }
}
```

http://robolectric.org

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@RunWith(RobolecticTestRunner::class)
class RobolecticTest {

  @Test
  fun testTitle() {
    val activity =
      Roboelectic.setupActivity(NoteListActivity::class.java)

    ShadowView.clickOn(activity.findViewById(R.id.title))

    assertEquals(
        ShadowApplication.getInstance()
            .peekNextStartedActivity().action,
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  }
}
```

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Espresso

```
@RunWith(AndroidJUnit4::class)
class OnDeviceTest {

  @get:Rule
  val rule = ActivityTestRule(NoteListActivity::class.java)

  @Test
  fun testTitle() {
    onView(withId(R.id.fab)).perform(click())

    intended(hasAction(equalTo("android.intent.action.EDIT")))
  }
}
```

https://developer.android.com/training/testing/espresso

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Android Test

Part of Jetpack

- Includes existing libraries.
- New APIs and Kotlin.
- Available on/off device.
- Open source.

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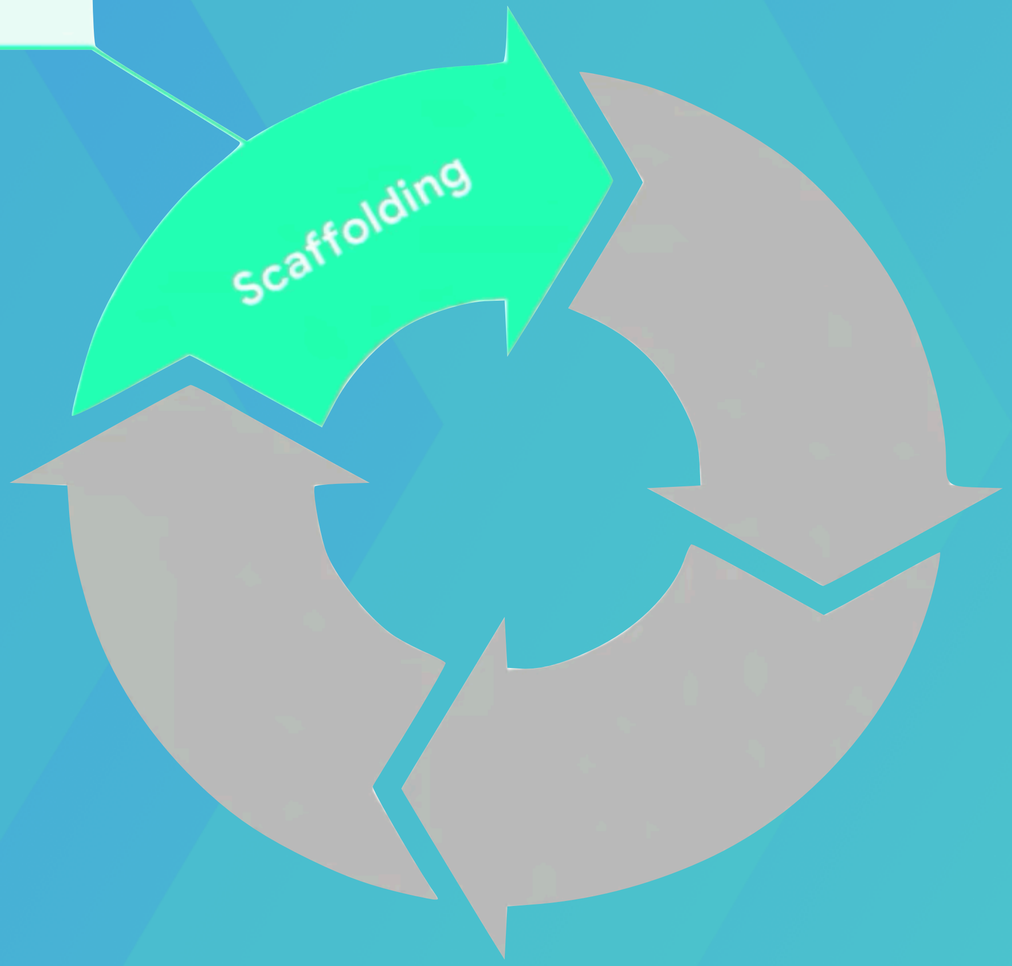
Test Runner

JUnit



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```
//SCAFFOLDING

@RunWith(AndroidJUnit4::class)
class SimpleUnifiedTest {
  @Before
  fun setup() {
    val context = InstrumentationRegistry.getTargetContext()
  }
}
```

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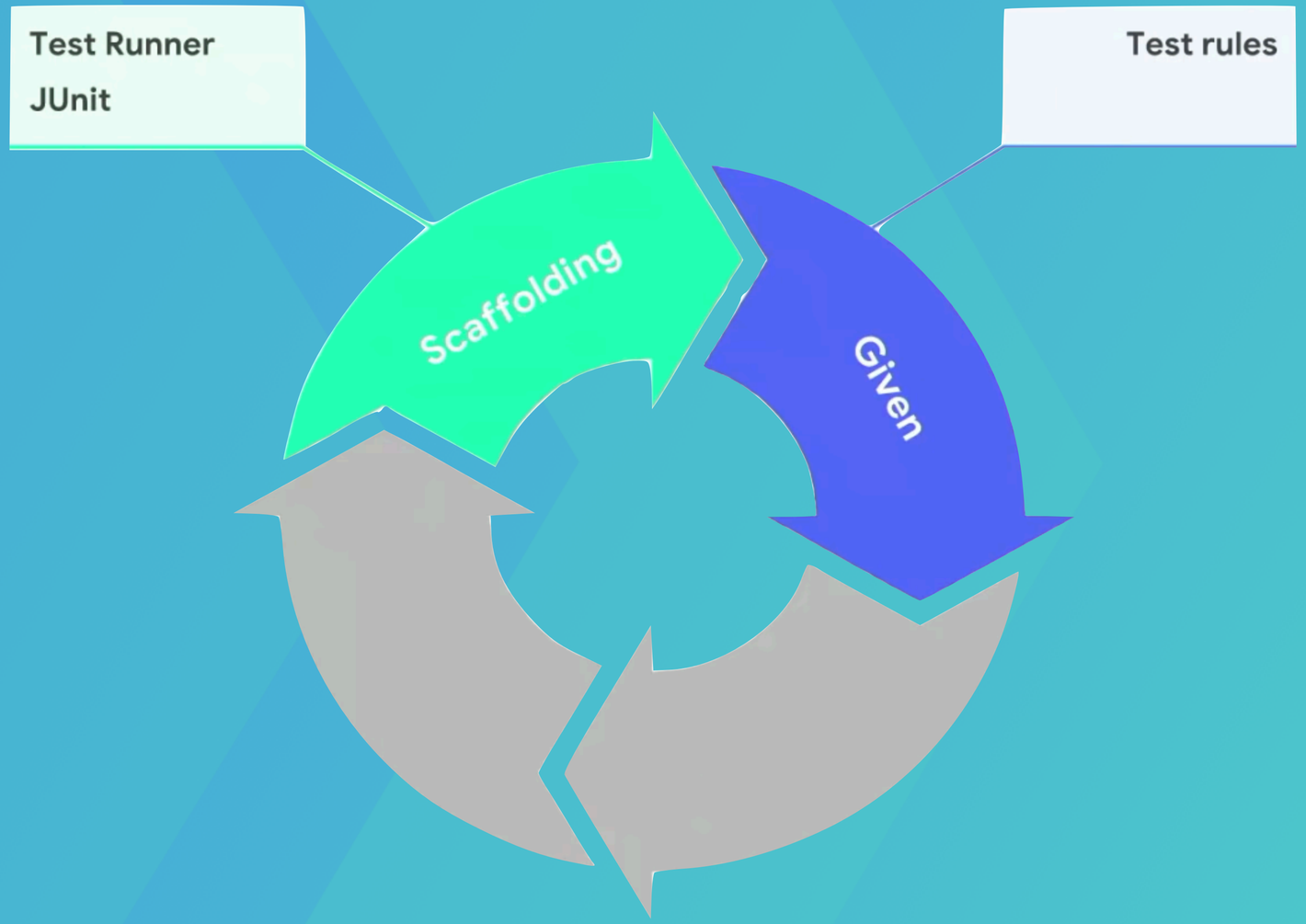

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```
//GIVEN

@RunWith(AndroidJUnit4::class)
class SimpleUnifiedTest {
  @get:Rule
  val rule = ActivityTestRule(NoteListActivity::class.java)
}
```

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```
//GIVEN

@RunWith(AndroidJUnit4::class)
class SimpleUnifiedTest {
  @Test
  fun testMotionEvents() {
    val motionEvent =
            buildMotionEvent().setAction(MotionEvent.ACTION_DOWN)
  }
}
```

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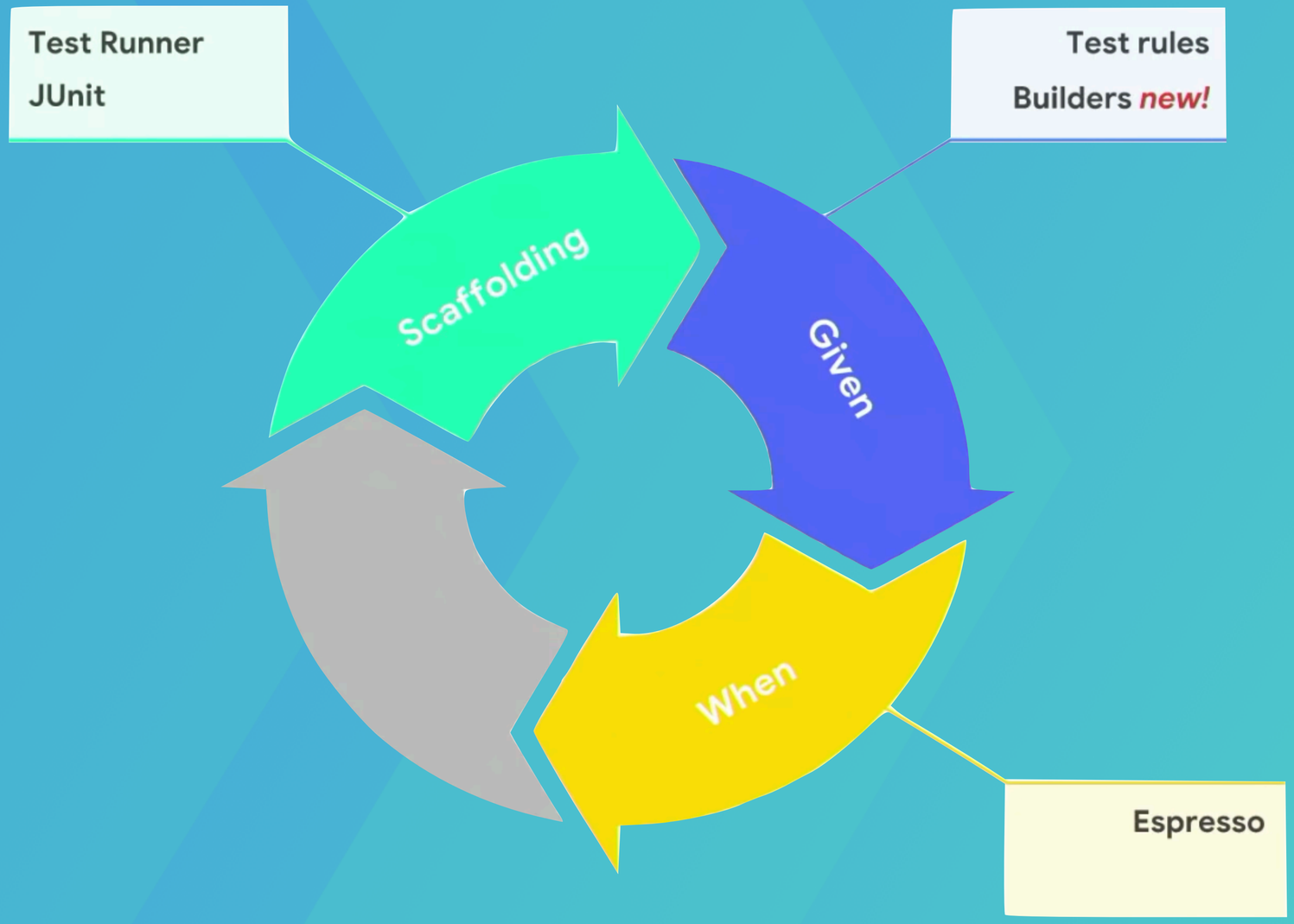

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```
//WHEN

@RunWith(AndroidJUnit4::class)
class SimpleUnifiedTest {
  @Test
  fun testButtonClickSendsIntent() {
    onView(withId(R.id.fab)).perform(click())
  }
}
```

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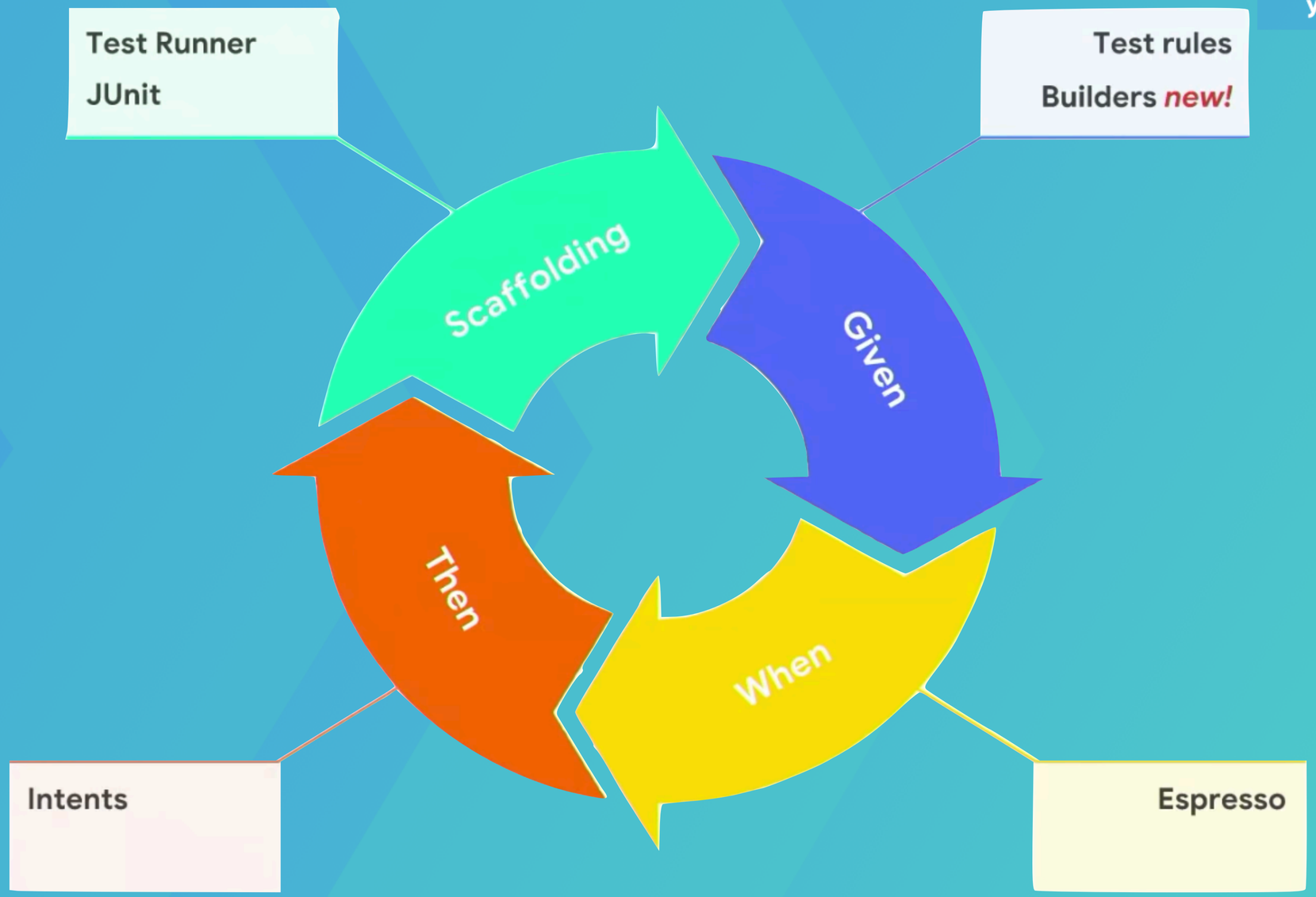

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```
//THEN

@RunWith(AndroidJUnit4::class)
class SimpleUnifiedTest {
  @Test
  fun testButtonClickSendsIntent() {
    onView(withId(R.id.fab)).perform(click())
    intended(hasAction(equalTo("android.intent.action.EDIT")))
  }
}
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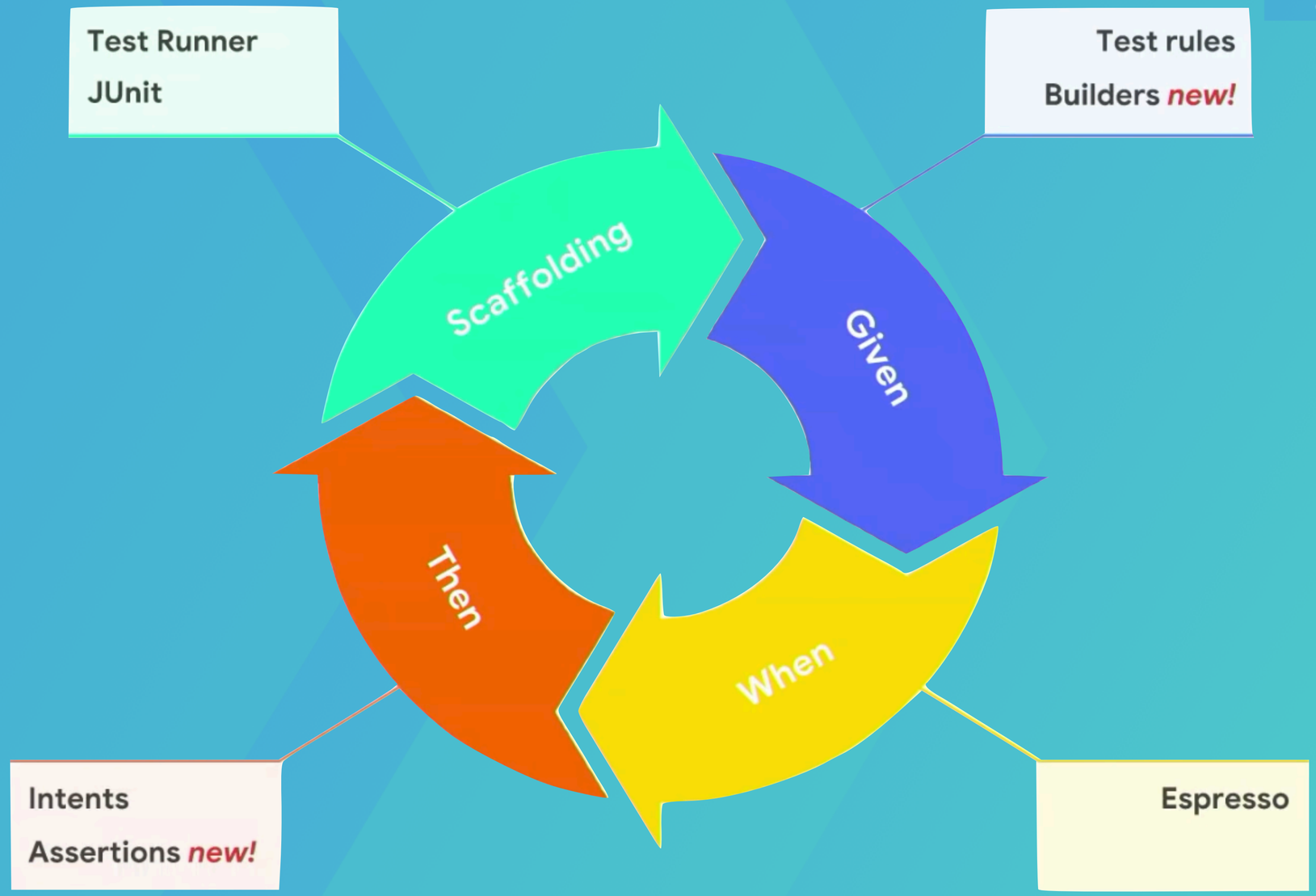
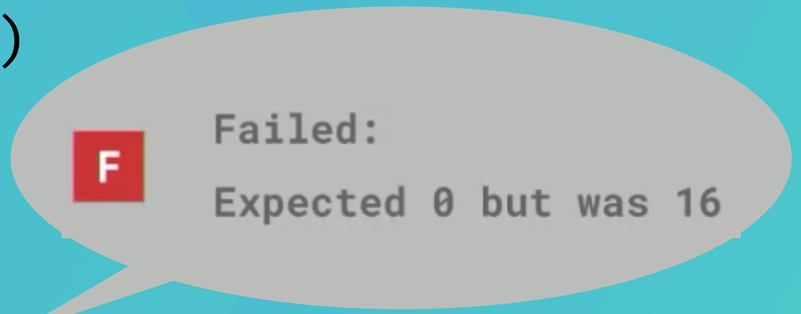


```
//THEN

@RunWith(AndroidJUnit4::class)
class SimpleUnifiedTest {
  @Test
  fun testVisibleView() {
    assertEquals(view.visibility, View.VISIBLE)
  }
}
```

```
//THEN

@RunWith(AndroidJUnit4::class)
class SimpleUnifiedTest {
  @Test
  fun testVisibleView() {
    assertEquals(view.visibility, View.VISIBLE)
  }
}
```



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```
//THEN

@RunWith(AndroidJUnit4::class)
class SimpleUnifiedTest {
  @Test
  fun testVisibleView() {
    assertThat(view).isVisible()
  }
}
```

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```
//THEN

@RunWith(AndroidJUnit4::class)
class SimpleUnifiedTest {
  @Test
  fun testVisibleView() {
    assertThat(view).isVisible()
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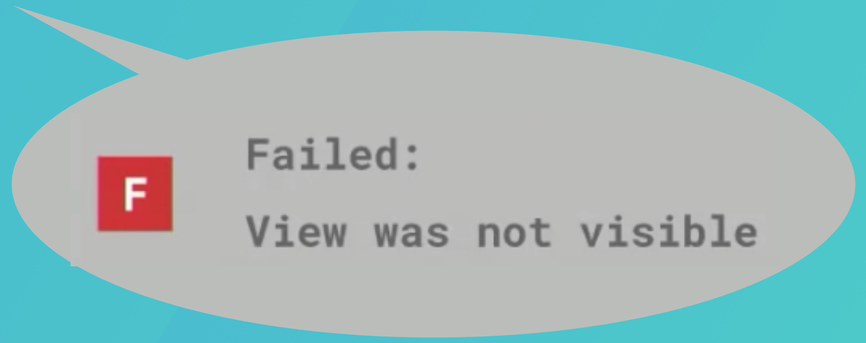

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Canonical APIs

Kotlin

Reduces Boilerplate

Cross Environment

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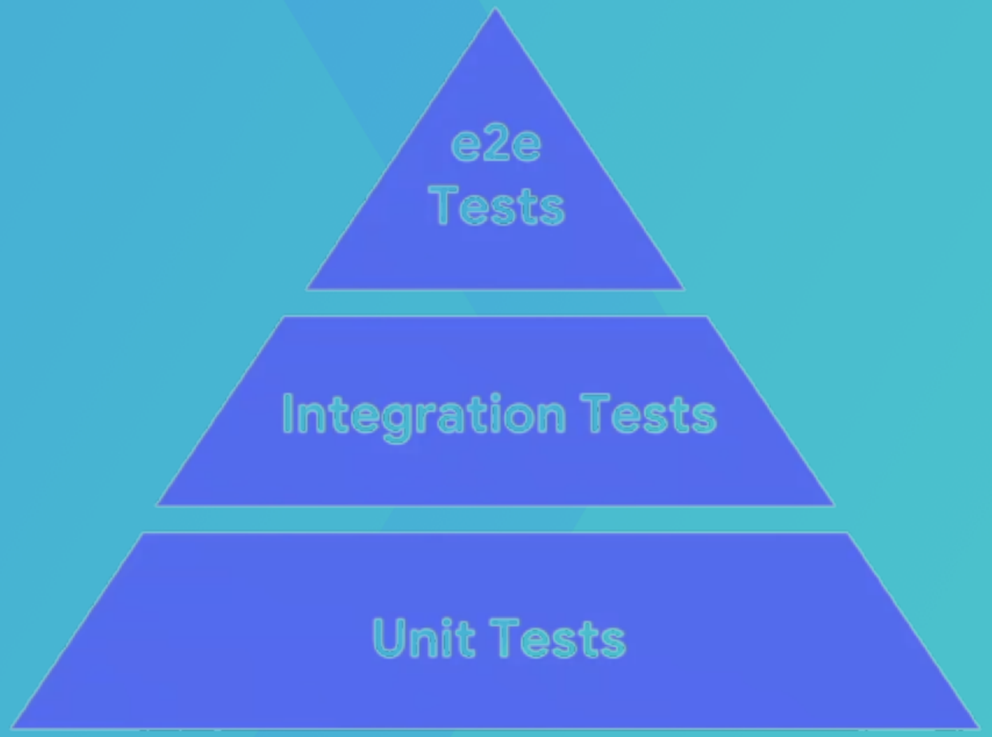

Android Test

Part of Jetpack

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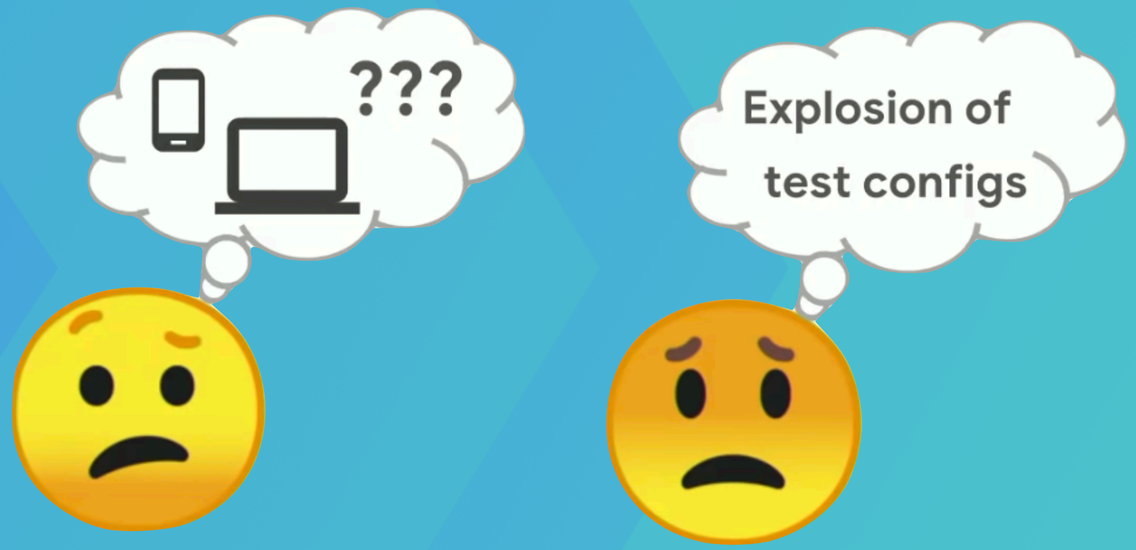
Test execution crisis

Test execution crisis



Test execution crisis

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Project Nitrogen

A single entry point for tests

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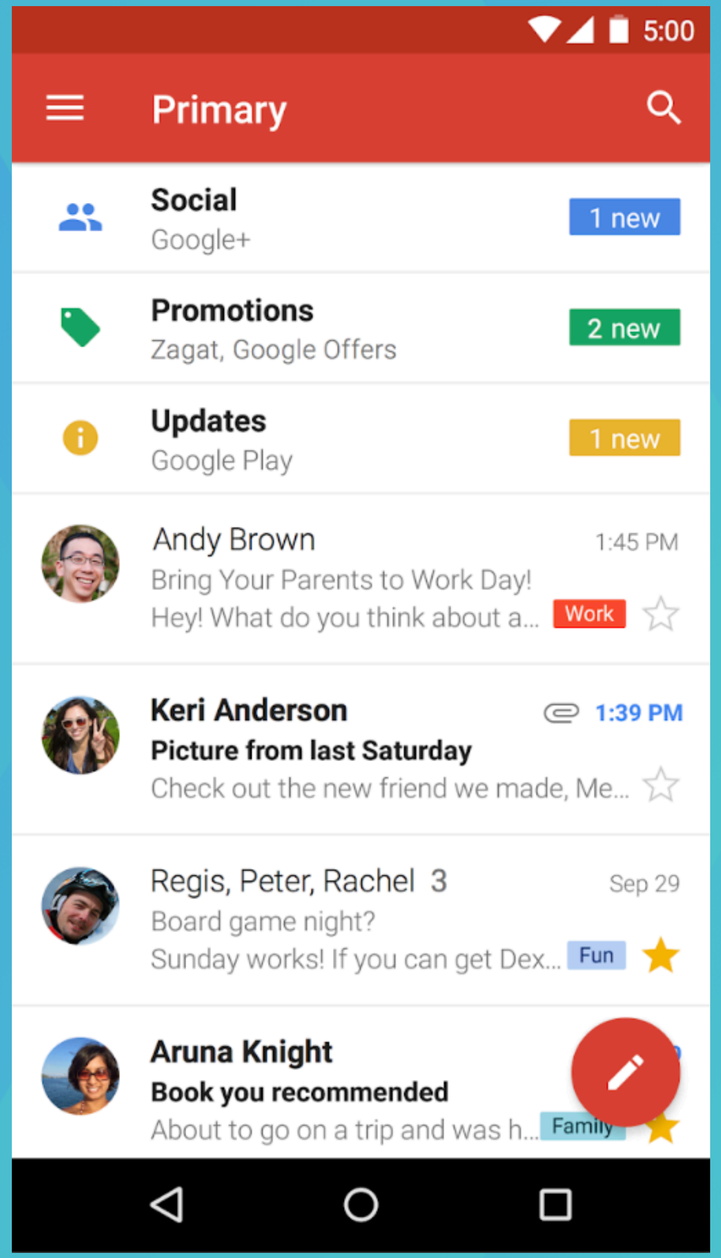

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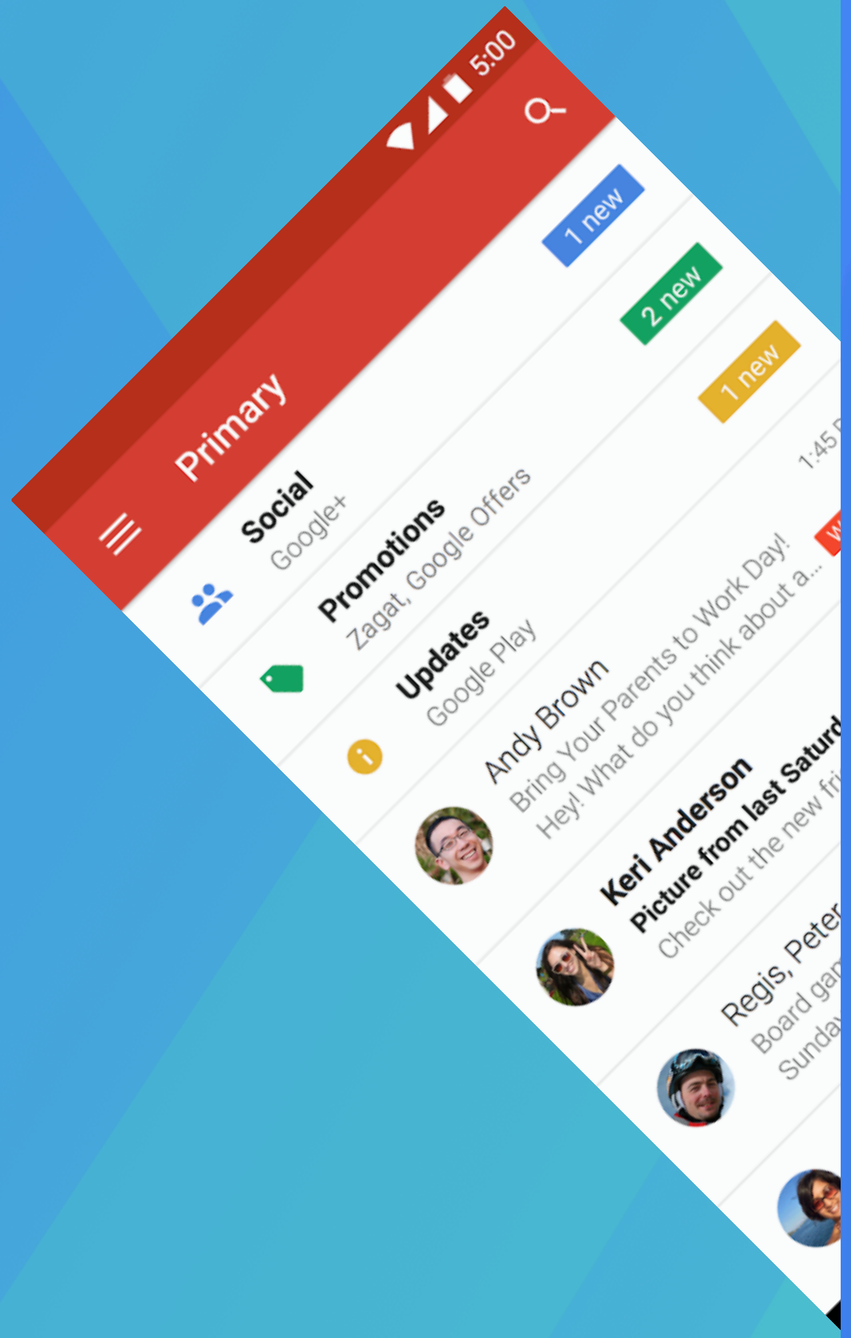

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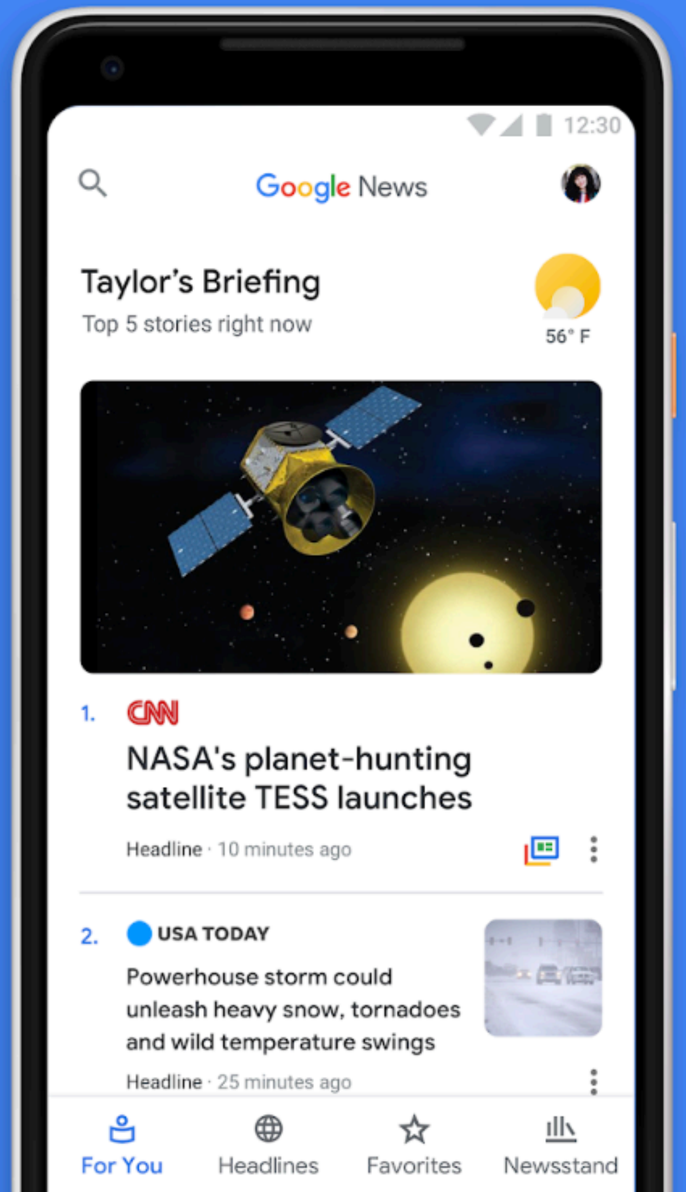

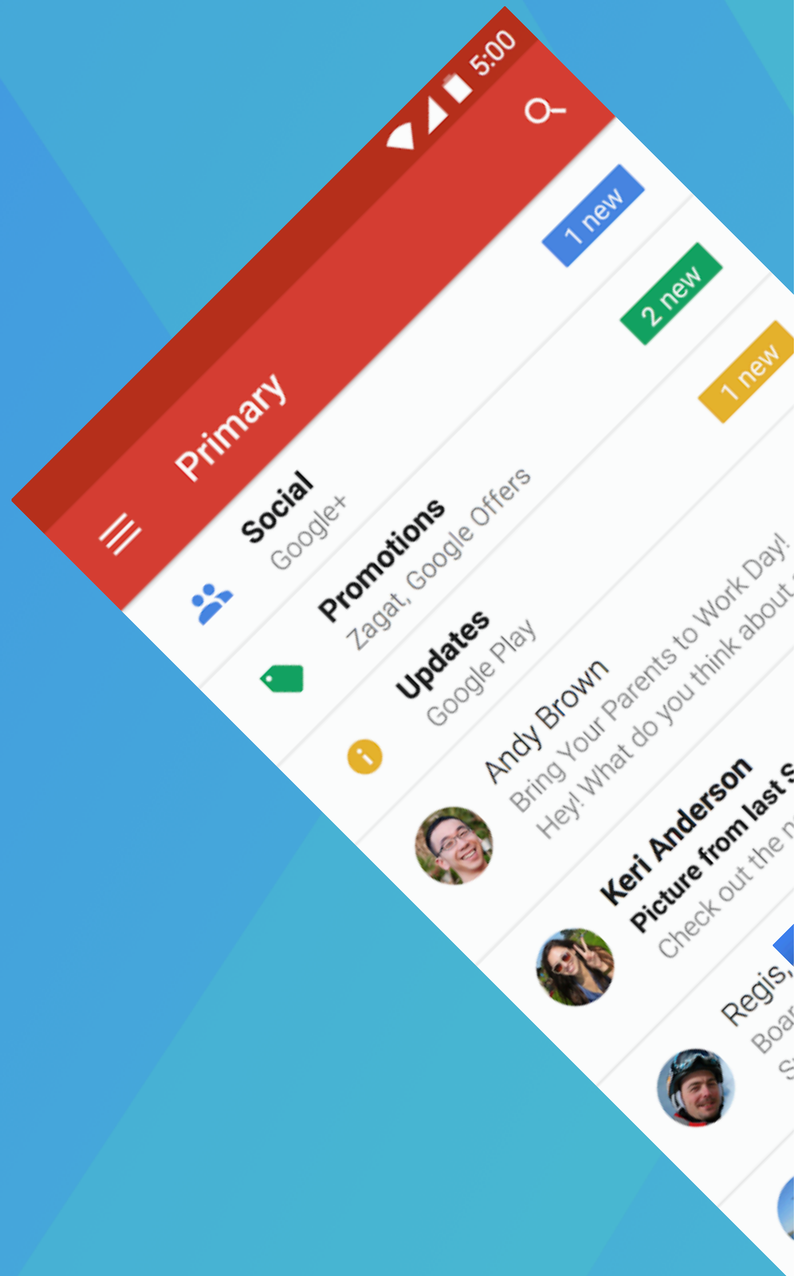

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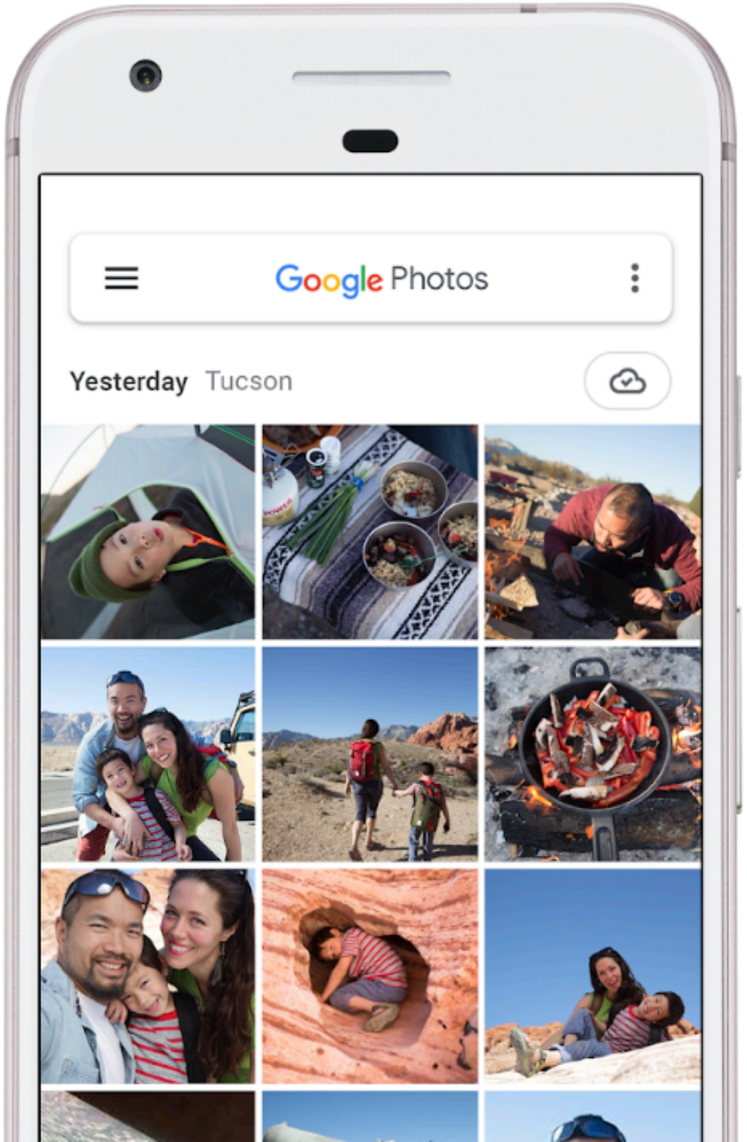

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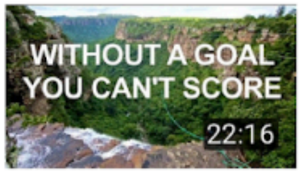

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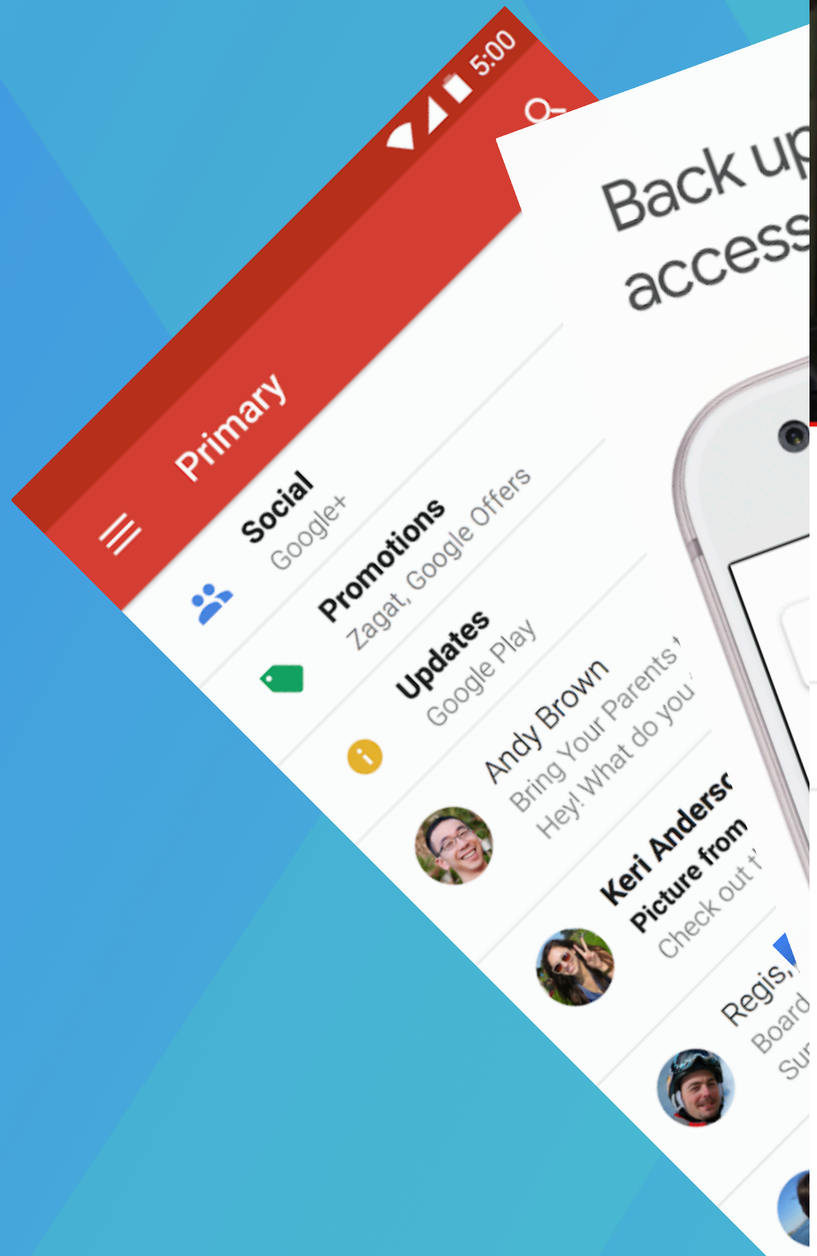

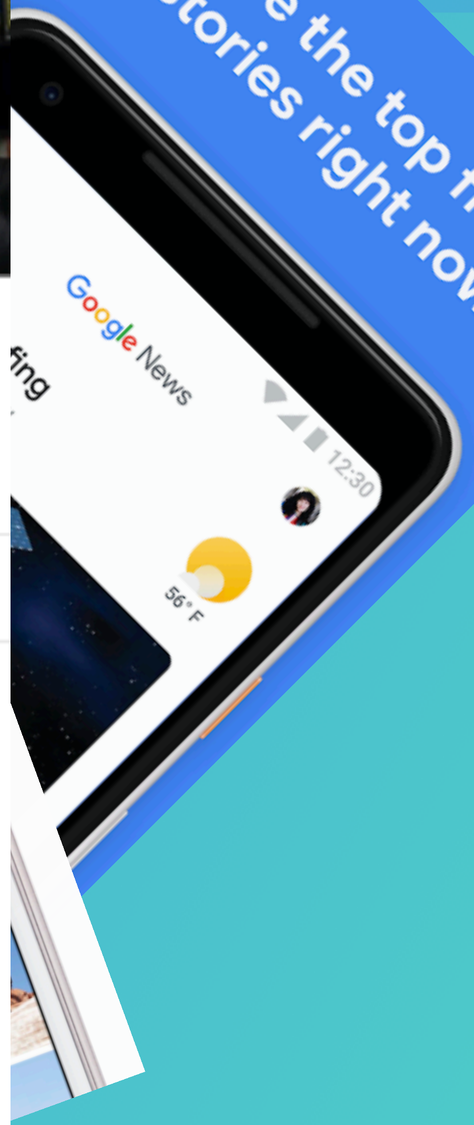

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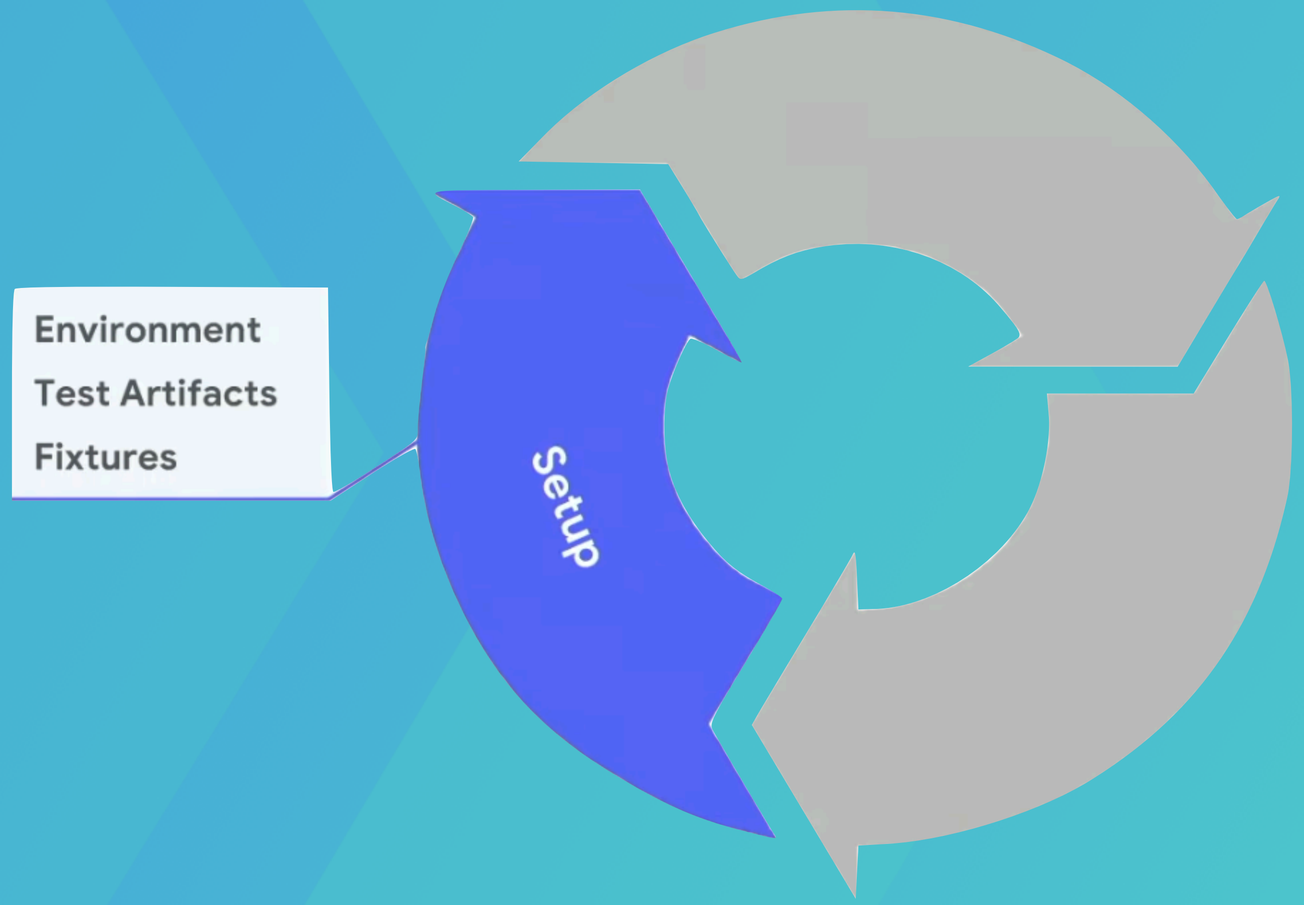

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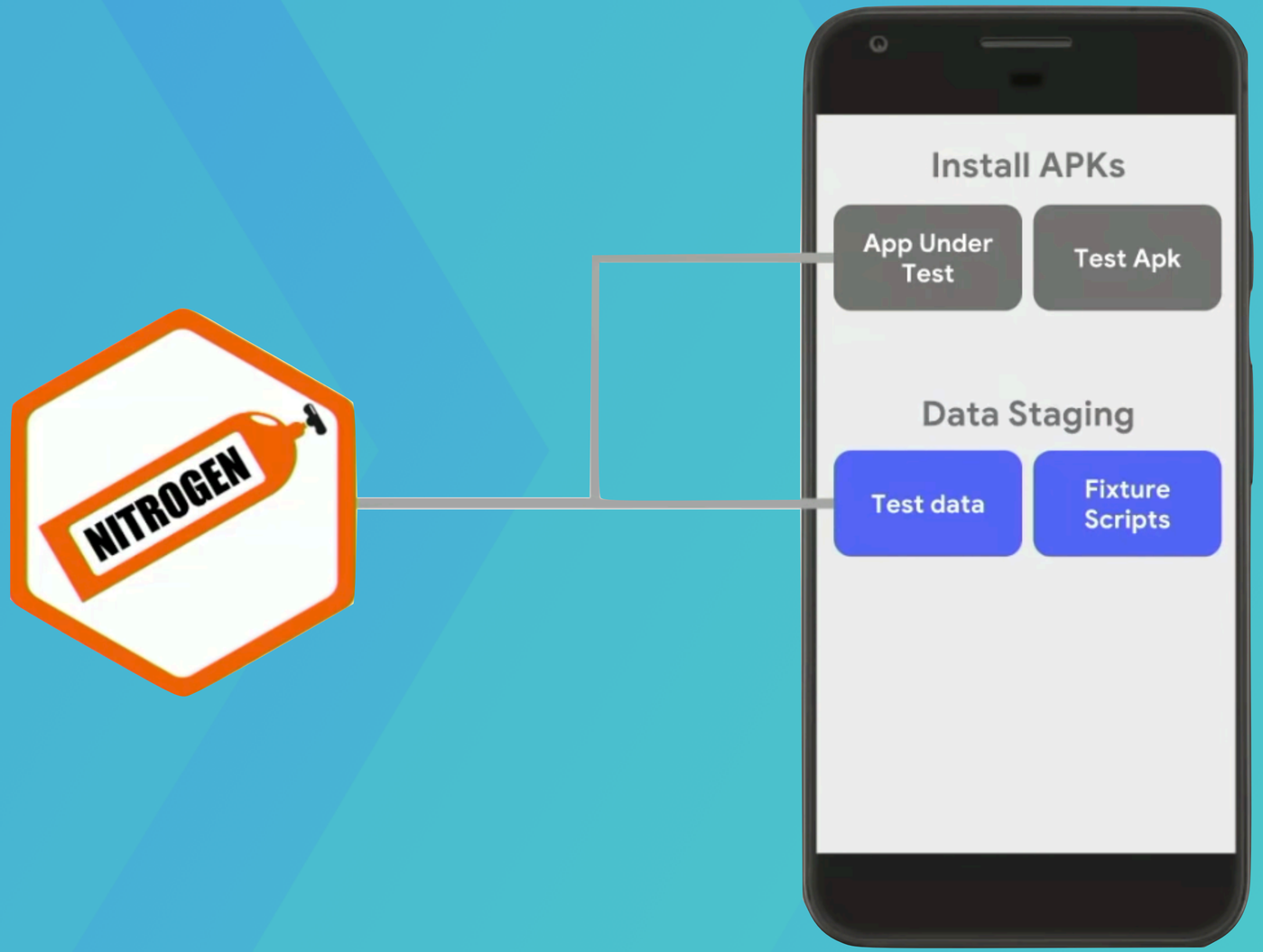

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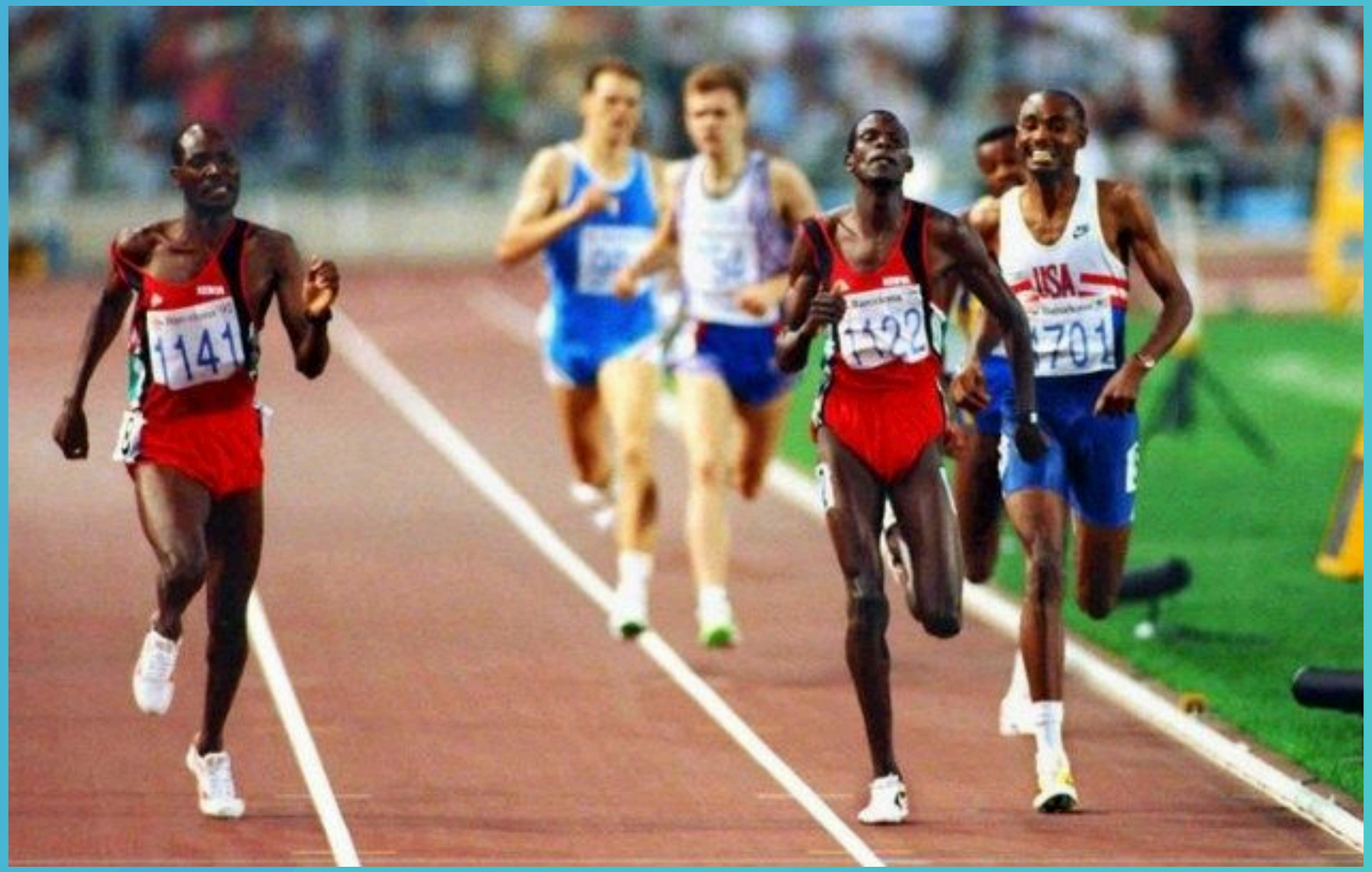

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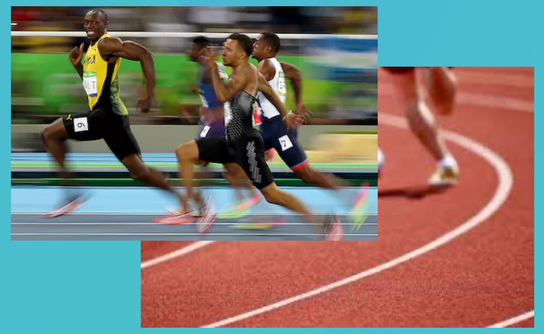

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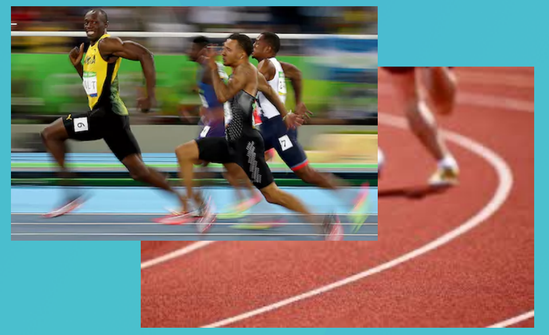

TestSuite

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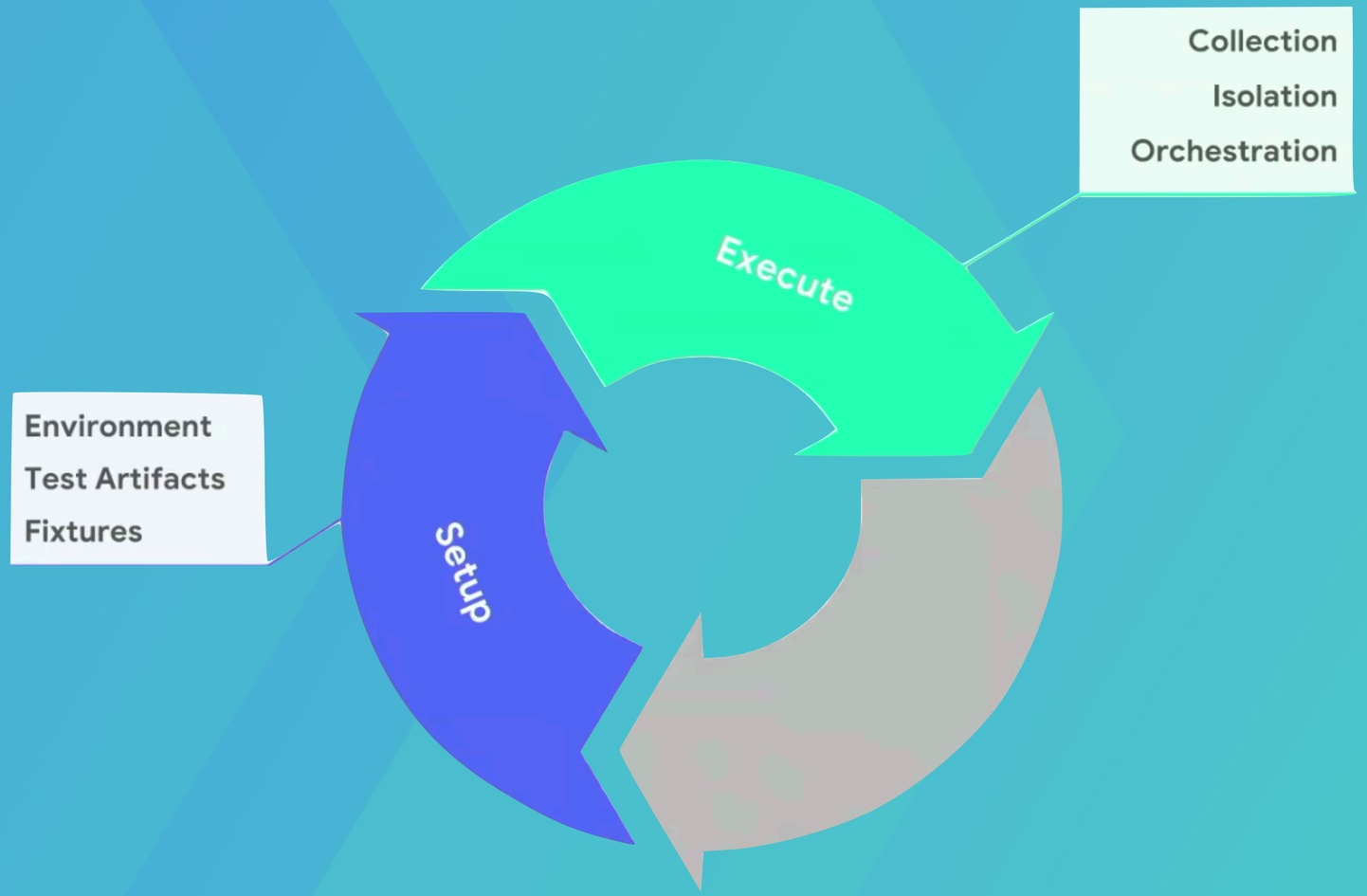

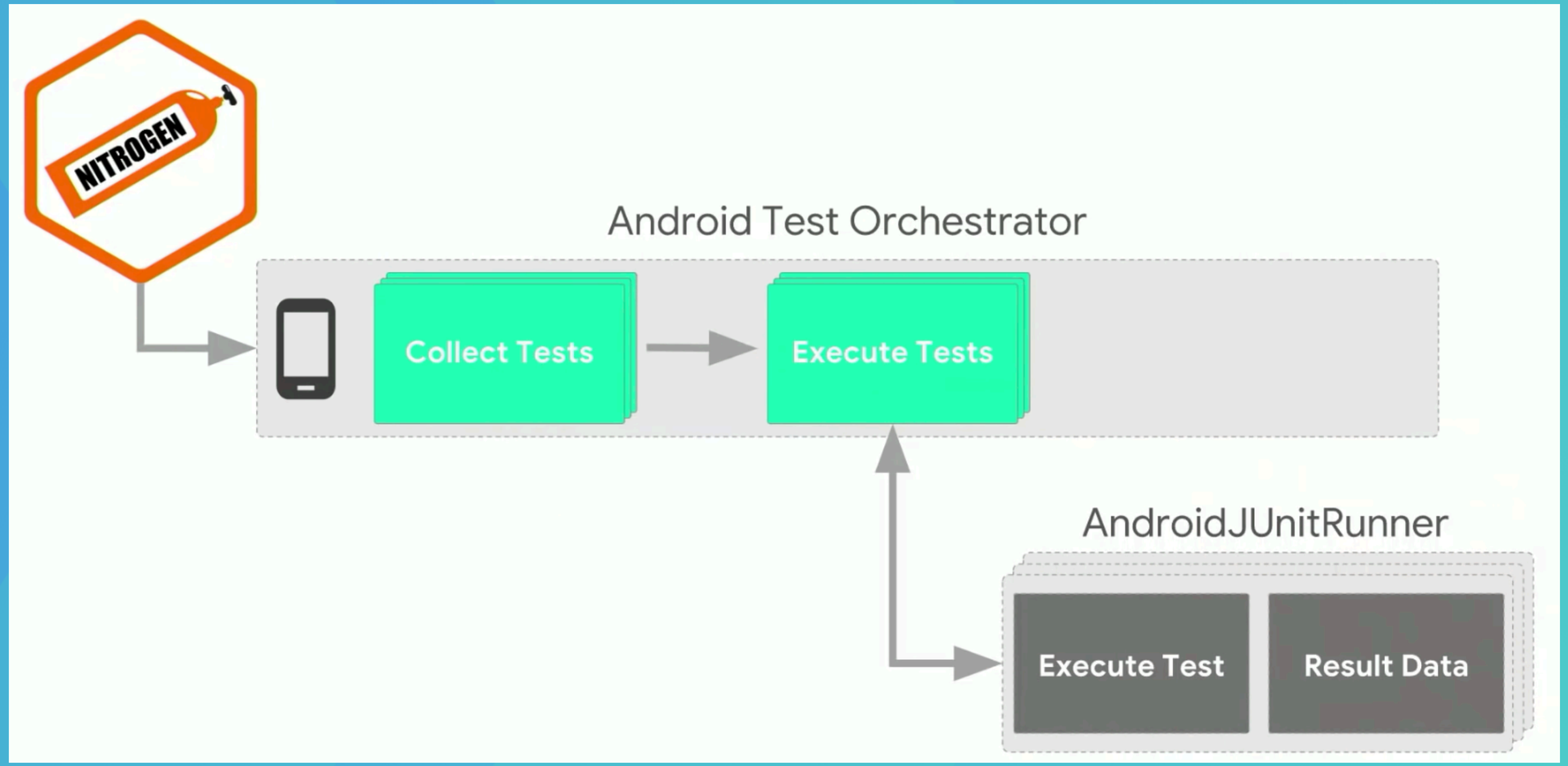
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AndroidJUnitRunner
Execute Test
Result Data

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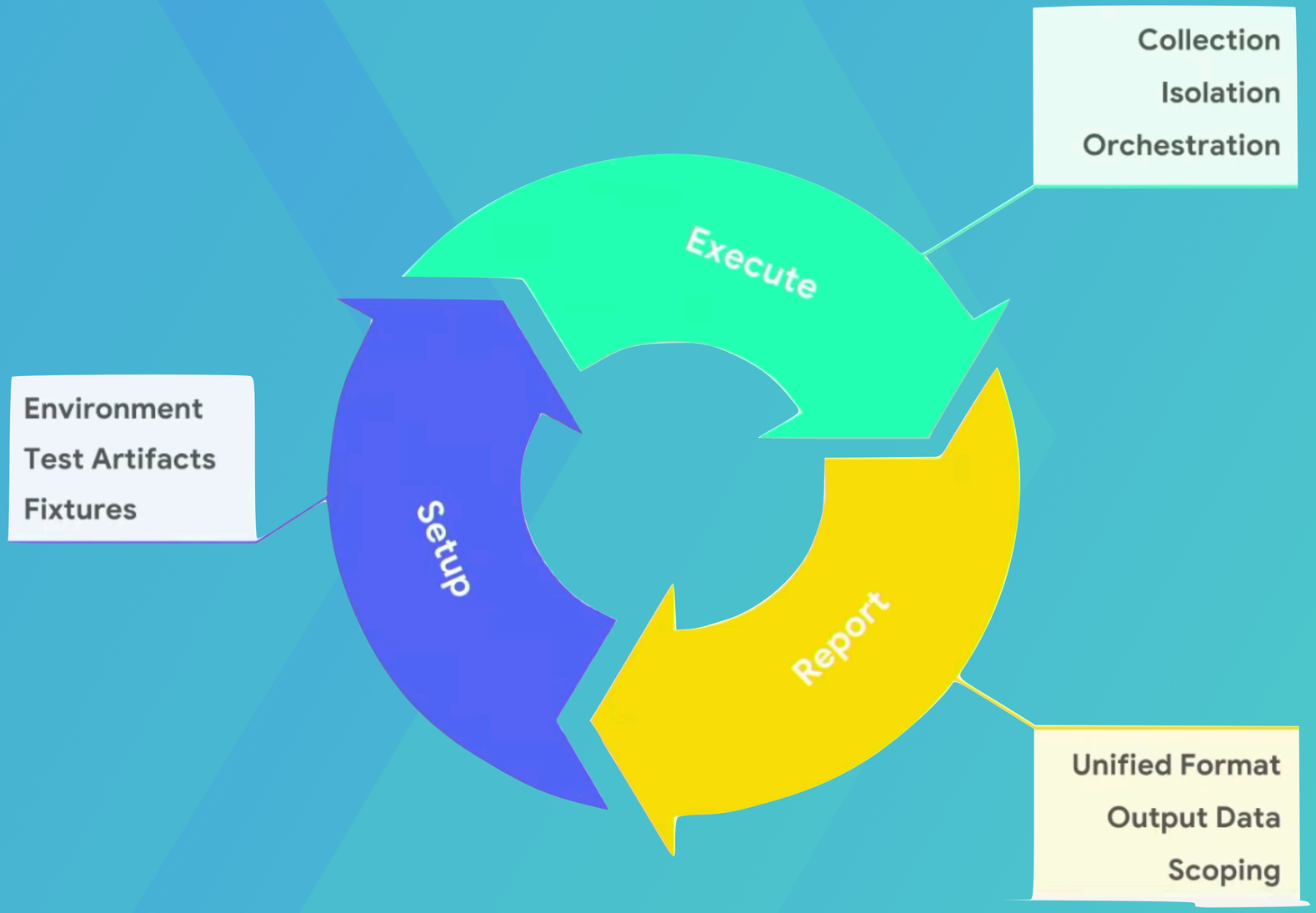

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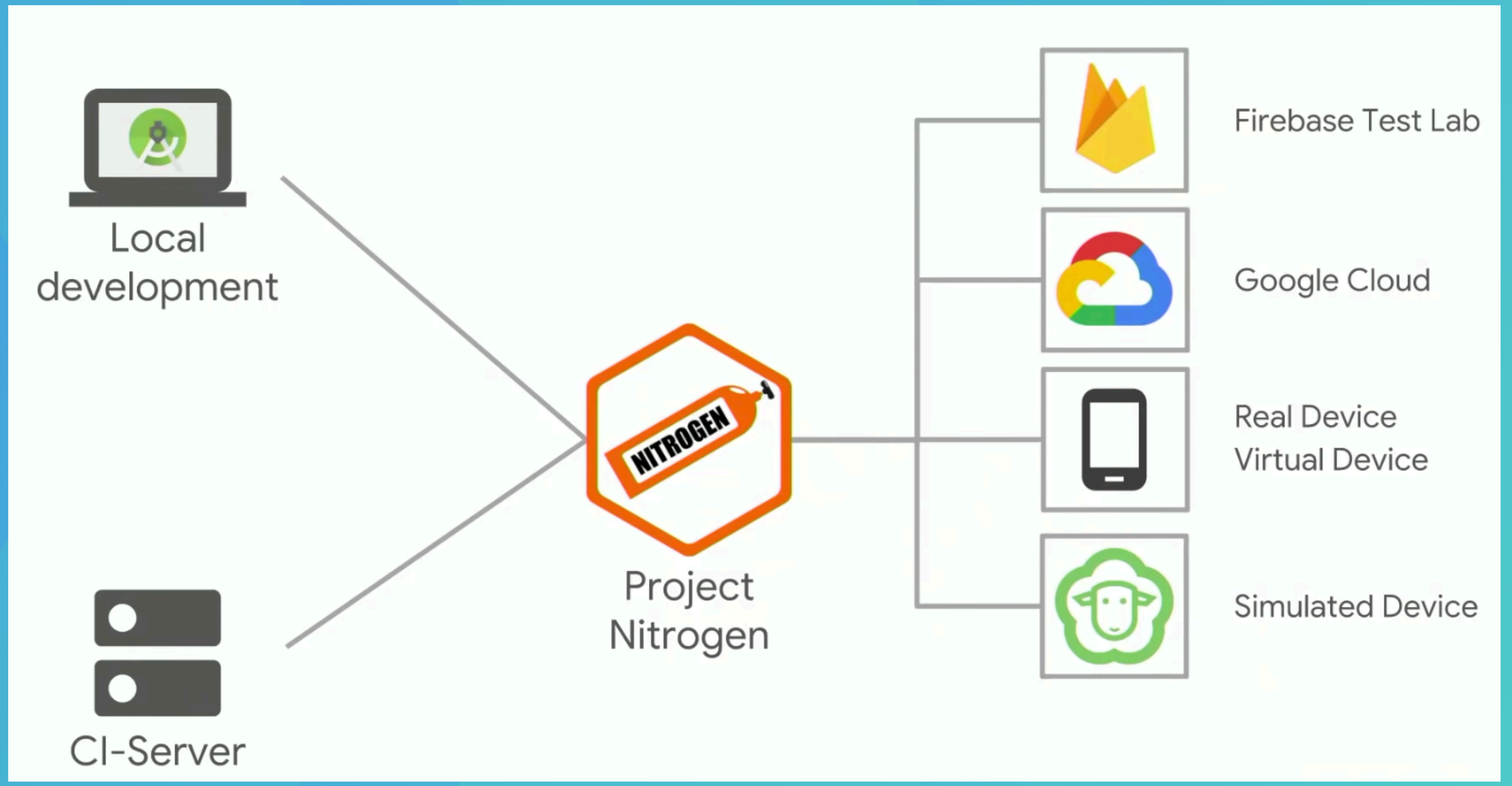

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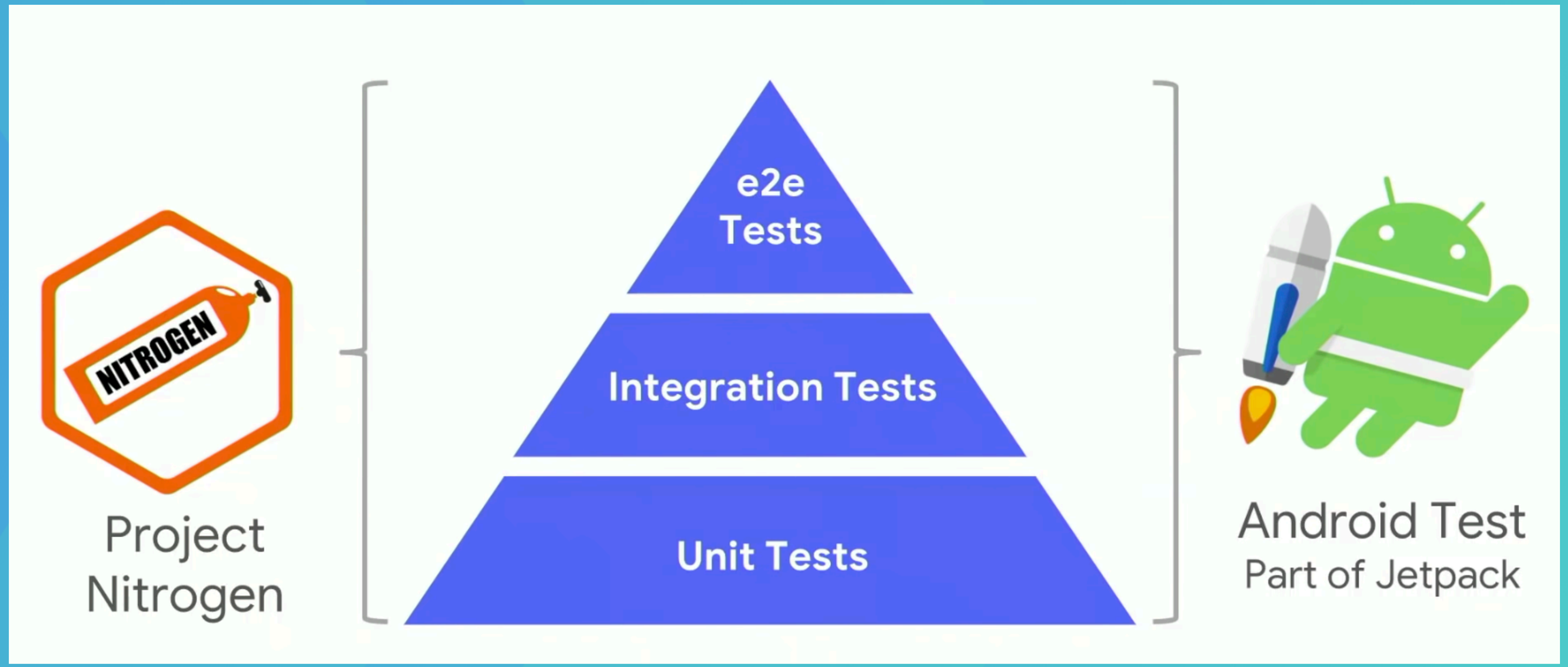

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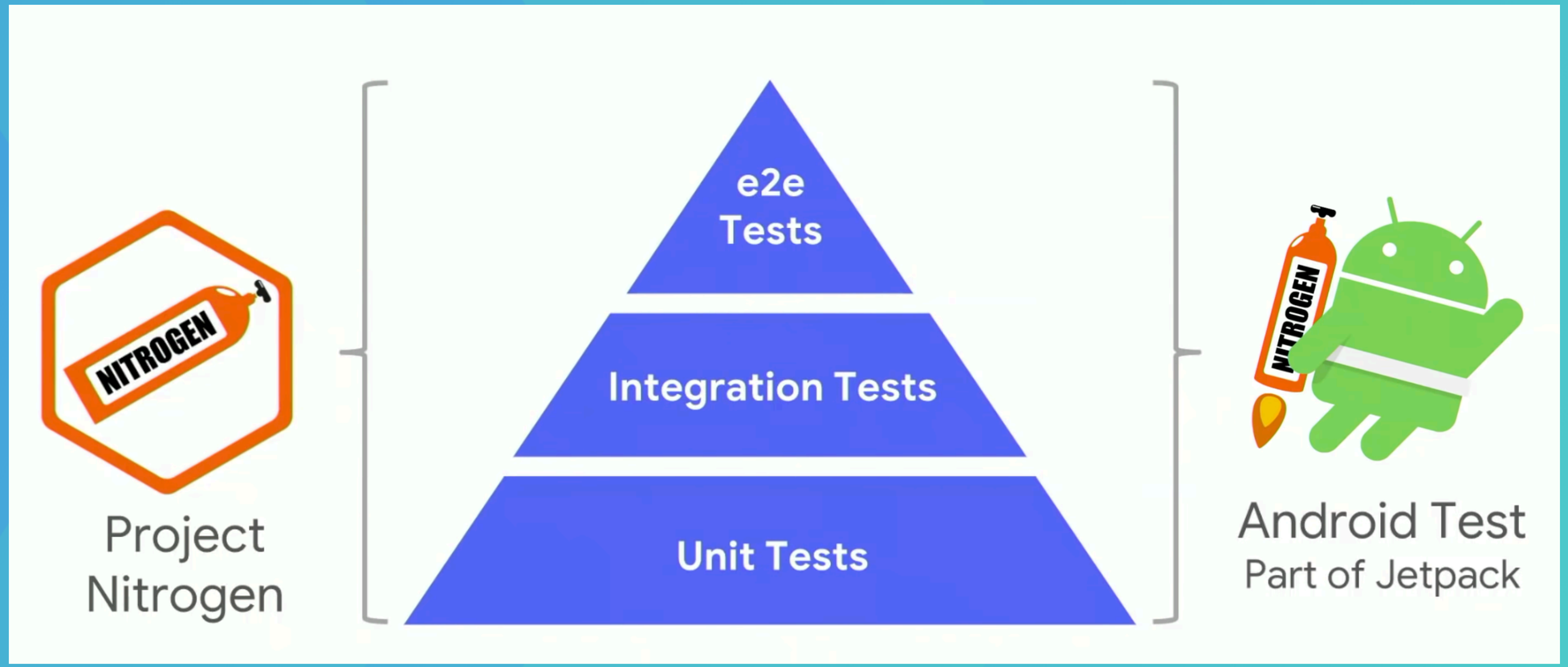


Practical Exam

- IMPORTANT! Obey the exam scheduler.

- Request, by email, attendance reschedule in the secondary date if something **major** is not allowing you to attend the primary date.

Software Requirements

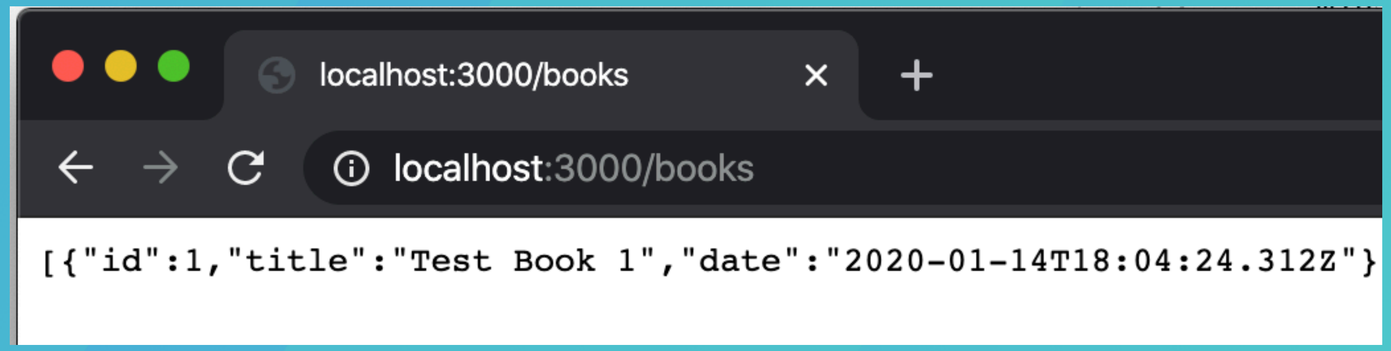
- Ensure that you have installed on your machine, the latest versions for:
  - Git
  - nodeJs
  - NPM
- Are able to share your camera and desktop.

Execute the Server

- Ensure that you are able to execute the server from:
  - https://github.com/dancojocar/MA/tree/master/lectures/12/server
- Steps to execute the server:
  1. Update the dependencies: **npm install**
  2. Start the server: **npm start**
- The above two commands are executed under the **server** directory!
- Note: You should be running the latest version of node (v15) and npm (v7.3).

Verify the Server

- Using the browser of your choice go to:
    - http://localhost:3000/books
- If everything is working properly you should receive a JSON similar to:



Practical Exam

- Two hours to solve the requirements.
- In these two hours:
  - You are **NOT** allowed to:
    - Discuss with anyone!
    - Disturb others!
  - You are allowed to:
    - Use all the materials available on your local machine or on the Internet. So, ensure that you are prepared!
    - Request clarifications only from the exam supervisor.
- If found breaking at least one of the above rules you will be denied to take the current exam and the following ones held this year!

Lecture outcomes

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- Introduction to the concepts and tools for building Android tests.
- Build complex unit tests with Android dependencies that cannot be satisfied with mock objects.
- Create tests to verify that the user interface behaves correctly for user interactions within a single app or for interactions across multiple apps.
- Create a stable and reusable testing harness to run performance tests.