SILVER OAK UNIVERSITY
EDUCATION TO INNOVATION

MOBILE APPLICATION DEVELOPMENT USING FLUTTER

BRANCH:MCA\MSCIT

SEMESTER:3

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OBJECTIVE OF LEARNING

- The objective of learning Flutter, Google's UI toolkit for building natively compiled applications for mobile, web, and desktop from a single codebase
- Flutter allows developers to write code once and deploy it on multiple platforms such as Android, iOS, web, and desktop.
- Flutter's hot reload feature enables developers to quickly see the effects of code changes without restarting the app, leading to faster iteration and development cycles

OBJECTIVE OF LEARNING

- Having a single codebase for multiple platforms simplifies maintenance and updates, as developers only need to make changes once rather than for each platform separately.
- Flutter is gaining popularity among developers and companies due to its efficiency. Learning Flutter can open up job opportunities in companies looking to build cross-platform applications.

OUTLINE ABOUT THE TOPICS

- Introduction to Flutter
- Why Flutter for App Development?
- Applications that are build using Flutter
- Feature of Flutter
- Advantages of Flutter
- Disadvantages of Flutter
- Flutter Installation in Windows
- Architecture of Flutter Applications

Introduction to Flutter

FLUTTER

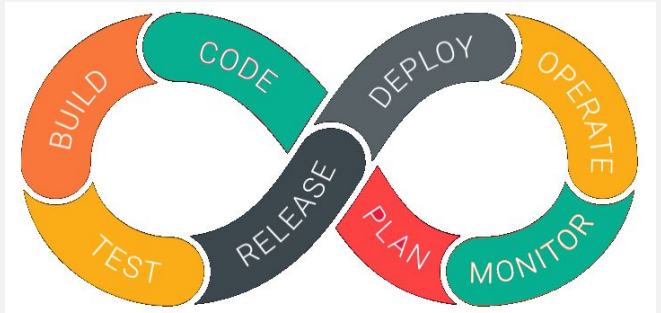
- Flutter is framework created by **google.**
- A cross-platform framework used to develop applications for
  - Android
  - iOS
  - Web
  - Desktop

WHY FLUTTER FOR APP DEVELOPMENT?

1. Open Source	2. Faster development Cycle	3. Super Productive

Flutter is Open-Source framework Therefore, anyone can use it for any given purpose.

Flutter is so fast that it takes less then 30 sec for first full compilation. Comes with Hot-Reload & Hot-Restart.



Comes with Hot-Reload & Hot-Restart.
Due to Stateful widget hot-reload feature Flutter is very fast iterative coding style.

WHY FLUTTER FOR APP DEVELOPMENT?

4. Ease to learn & code sharing	5. Widget Libraries	6. Community Support

Any one who have basic knowledge of OOPS & UI Designing can easily learn Flutter.

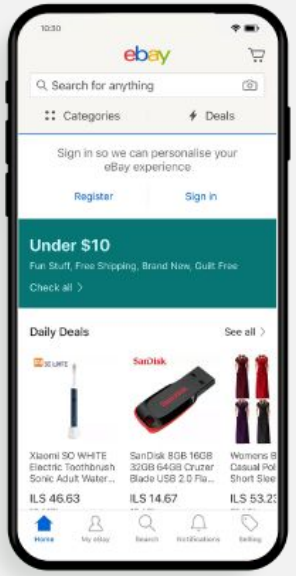
Ready to use widget, Flutter have many widget that you can use to build flutter application.
Such as : http, get, share plus, toggle switch etc.

Flutter Community is bit small if we compare with other framework like React.
But Flutter is grow very fast then other framework.

APPLICATIONS THAT ARE BUILD USING FLUTTER

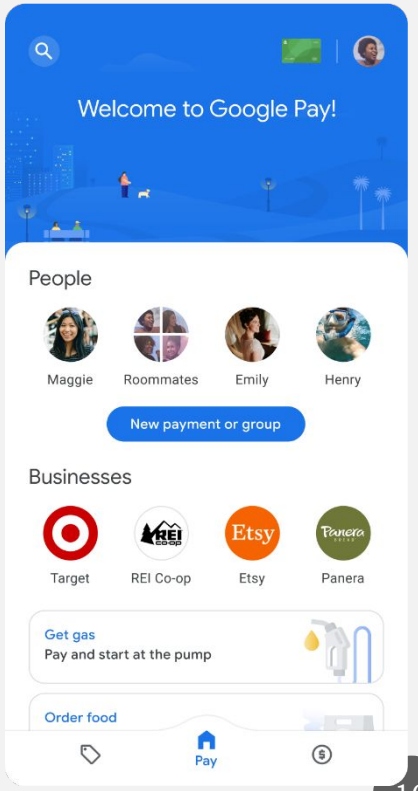
Dream 11

eBay



Stadia
gaming platform

Google
Pay



FEATURE OF FLUTTER

FEATURE OF FLUTTER

- **Open-Source:** Flutter is a free and open-source framework for developing mobile applications.
- **Cross-platform:** This feature allows Flutter to write the code once, maintain, and can run on different platforms. It saves the time, effort, and money of the developers. Minimal Coding.
- **Hot Reload:** Whenever the developer makes changes in the code, then these changes can be seen instantaneously with Hot Reload. It means the changes immediately visible in the app itself. It is a very handy feature, which allows the developer to fix the bugs instantly.Hot Reload & Hot Restart
- **Accessible Native Features and SDKs:** This feature allows the app development process easy and delightful through Flutter's native code, third-party integration, and platform APIs. Thus, we can easily access the SDKs on both platforms.

FEATURE OF FLUTTER

- **Minimal code:** Flutter app is developed by Dart programming language, which uses JIT and AOT compilation to improve the overall start-up time, functioning and accelerates the performance. JIT enhances the development system and refreshes the UI without putting extra effort into building a new one.

- **Widgets:** The Flutter framework offers widgets, which are capable of developing customizable specific designs. Most importantly, Flutter has two sets of widgets: Material Design and Cupertino widgets that help to provide a glitch-free experience on all platforms.

ADVANTAGES OF FLUTTER

- It makes the app development process extremely fast because of the hot-reload feature. This feature allows us to change or update the code are reflected as soon as the alterations are made.
- It provides the smoother and seamless scrolling experiences of using the app without much hangs or cuts, which makes running applications faster in comparison to other mobile app development frameworks.
- Flutter reduces the time and efforts of testing. As we know, flutter apps are cross-platform so that testers do not always need to run the same set of tests on different platforms for the same app.
- It has an excellent user interface because it uses a design-centric widget, high-development tools, advanced APIs, and many more features.
- It is similar to a reactive framework where the developers do not need to update the UI content manually.

ADVANTAGES OF FLUTTER

- It is suitable for MVP (Minimum Viable Product) apps because of its speedy development process and cross-platform nature.

DISADVANTAGES OF FLUTTER

- The Flutter is a comparatively new language that needs continuous integration support through the maintenance of scripts.
- It provides very limited access to SDK libraries. It means a developer does not have a lot of functionalities to create a mobile application. Such types of functionalities need to be developed by the Flutter developer themselves.
- The Flutter apps do not support the browser. It only supports Android and iOS platforms.
- It uses Dart programming for coding, so a developer needs to learn new technologies. However, it is easy to learn for developers.

FLUTTER INSTALLATION IN WINDOWS

System requirements for Windows

- **Operating System**Windows 7 or Later (You can also use Mac or Linux OS.).
- **Disk Space**400 MB (It does not include disk space for IDE/tools).
- **Tools**

  1. Windows PowerShell
  2. Git for Windows 2.x (Here, Use Git from Windows Command Prompt option).

- **SDK**Flutter SDK for Windows**IDE**Android Studio (Official)

FLUTTER INSTALLATION IN WINDOWS

- Install Git

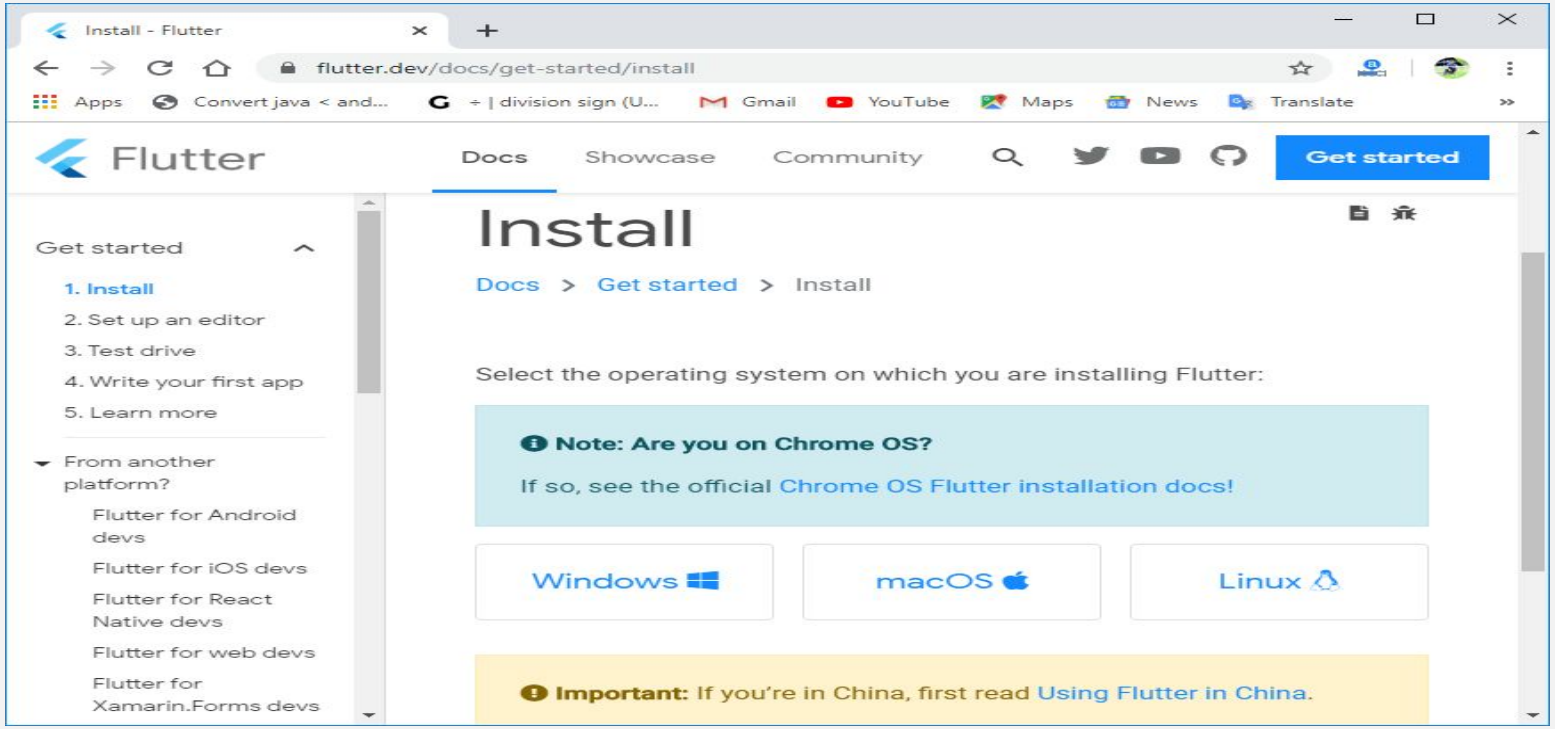
  Step 1: To download Git,

  Step 2: Run the **.exe** file to complete the installation. During installation, make sure that you have selected the recommended option.

- Install the Flutter SDK

  Step 1: Download the installation bundle of the Flutter Software Development Kit for windows. To download Flutter SDK, Go to its official website, click on **Get started** button, you will get the following screen.

FLUTTER INSTALLATION IN WINDOWS

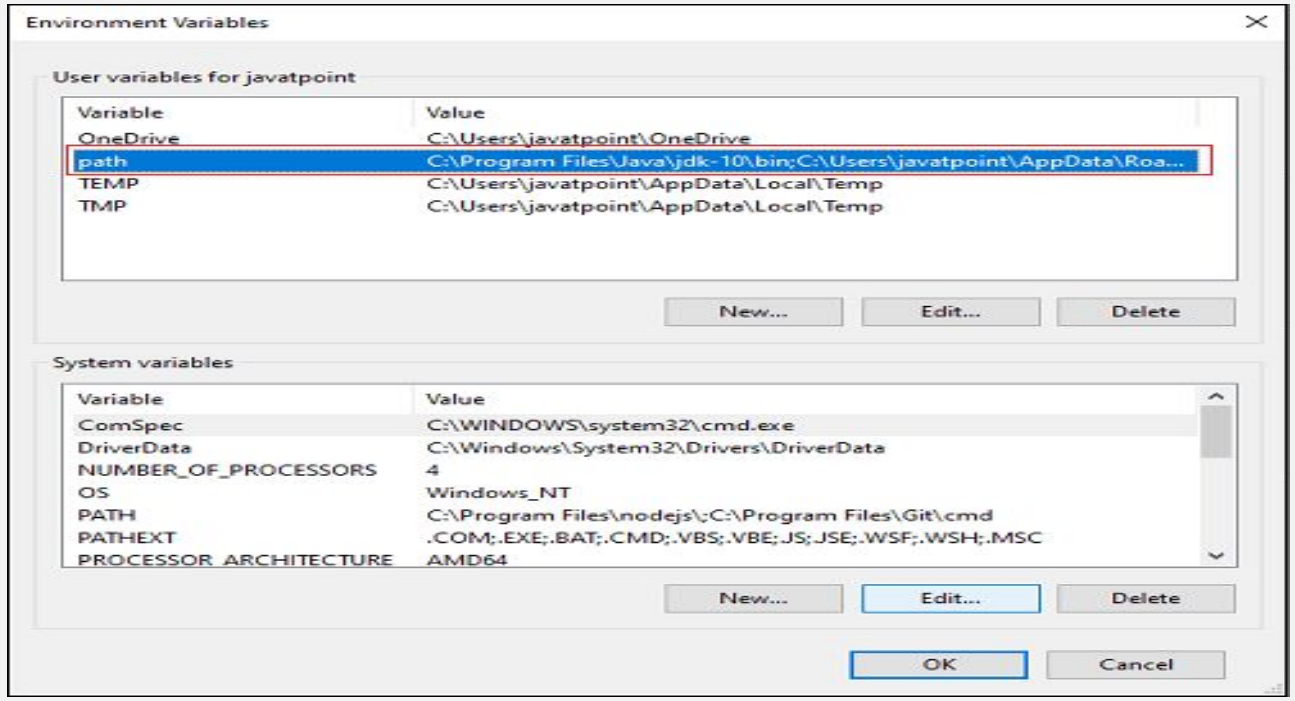


FLUTTER INSTALLATION IN WINDOWS

- **Step 2:** Next, to download the latest Flutter SDK, click on the Windows **icon**. Here, you will find the download link for SDK.
- **Step 3:** When your download is complete, extract the **zip** file and place it in the desired installation folder or location, for example, D: /Flutter.
- **Step 4:** To run the Flutter command in regular windows console, you need to update the system path to include the flutter bin directory. The following steps are required to do this:

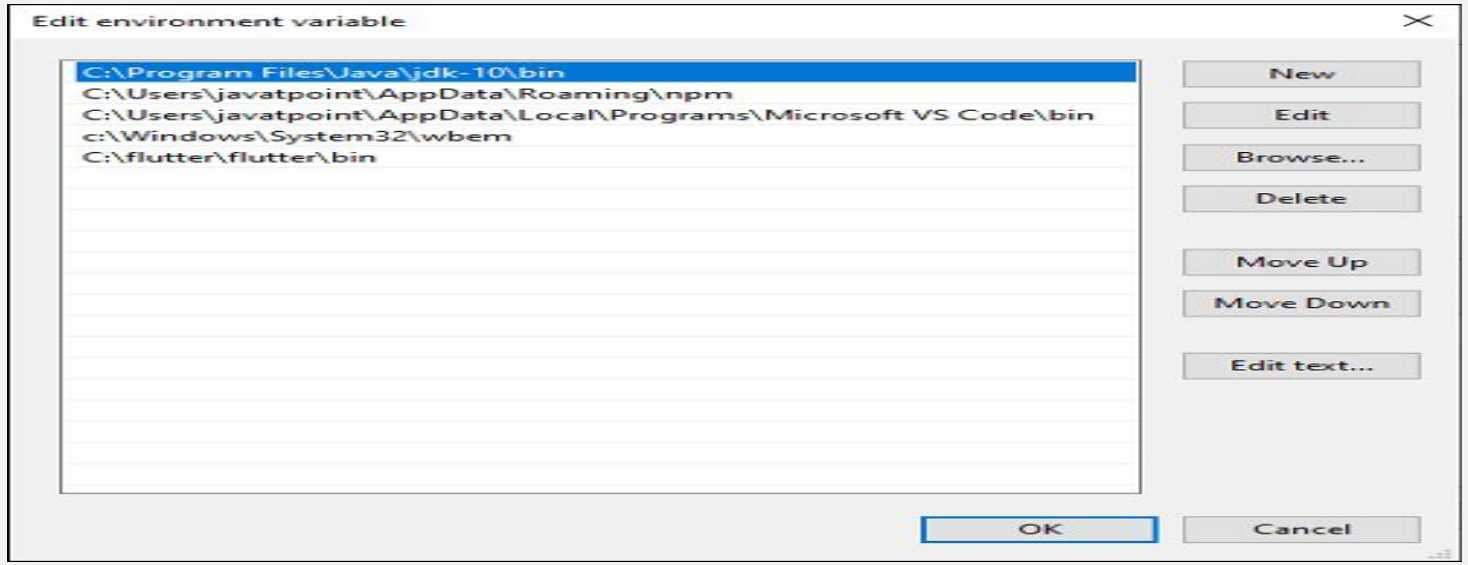
  Step 4.1: Go to MyComputer properties -> advanced tab -> environment variables. You will get the following screen.

FLUTTER INSTALLATION IN WINDOWS



FLUTTER INSTALLATION IN WINDOWS

- **Step 4.2:** Now, select path -> click on edit. The following screen appears.

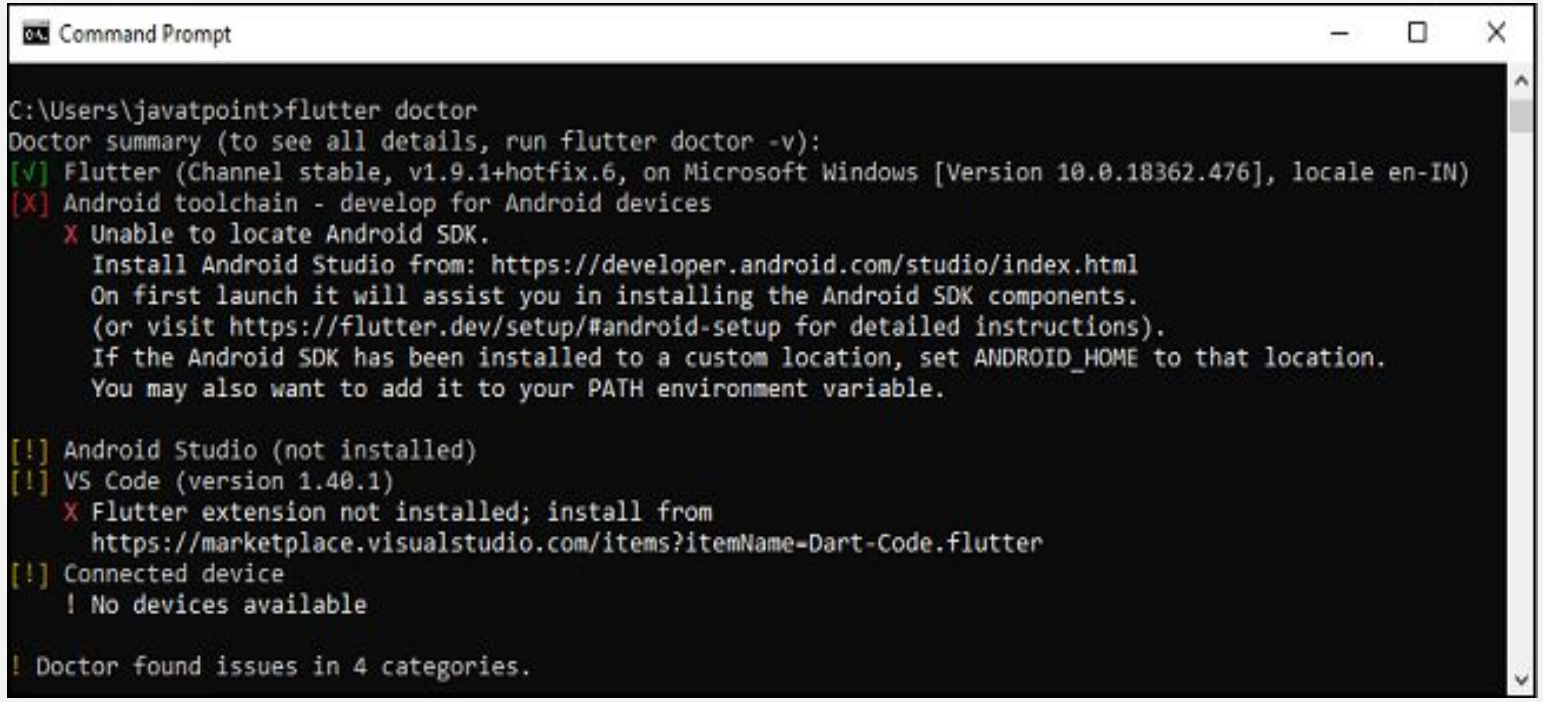


FLUTTER INSTALLATION IN WINDOWS

- **Step 4.3:** In the above window, click on New->write path of Flutter bin folder in variable value -> ok -> ok -> ok.
- **Step 5:** Now, run the $ **flutter doctor** command. This command checks for all the requirements of Flutter app development and displays a report of the status of your Flutter installation.

  $ flutter doctor
- **Step 6:** When you run the above command, it will analyze the system and show its report, as shown in the below image. Here, you will find the details of all missing tools, which required to run Flutter as well as the development tools that are available but not connected with the device.

FLUTTER INSTALLATION IN WINDOWS



FLUTTER INSTALLATION IN WINDOWS

- **Step 7:** Install the Android SDK. If the flutter doctor command does not find the Android SDK tool in your system, then you need first to install the Android Studio IDE. To install Android Studio IDE, do the following steps.

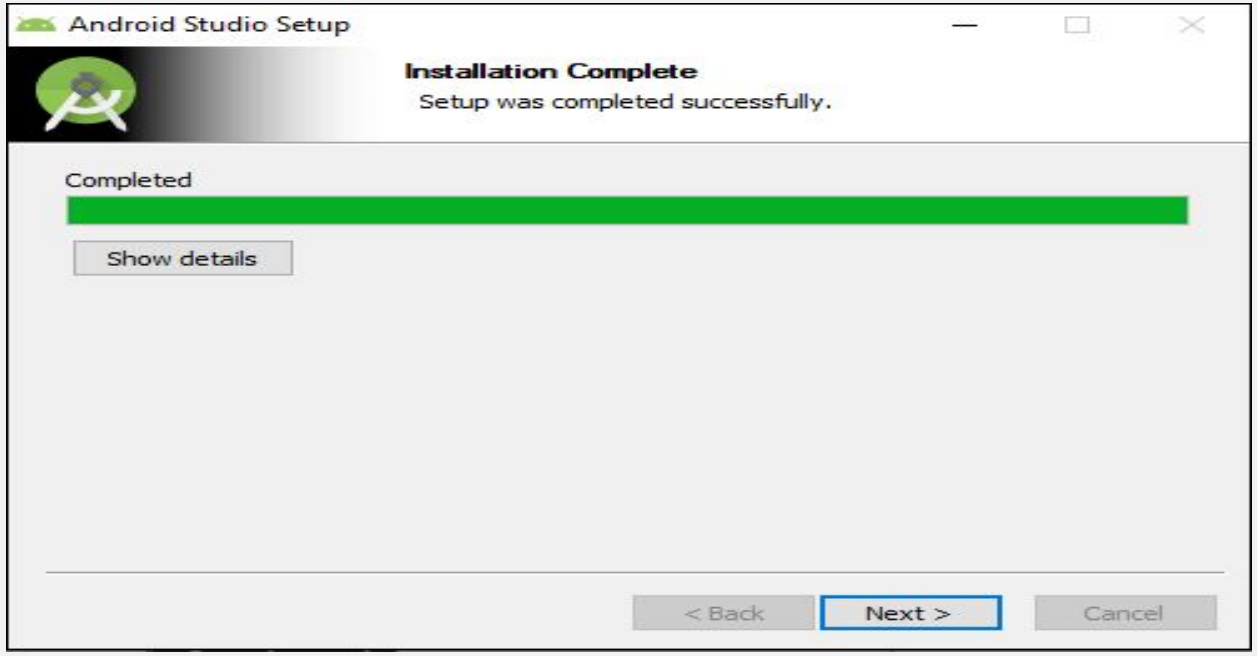
- **Step 7.1:** Download the latest Android Studio executable or zip file from the official site.

- **Step 7.2:** When the download is complete, open the **.exe** file and run it. You will get the following dialog box.

FLUTTER INSTALLATION IN WINDOWS

FLUTTER INSTALLATION IN WINDOWS

Step 7.3: Follow the steps of the installation wizard. Once the installation wizard completes, you will get the following screen.

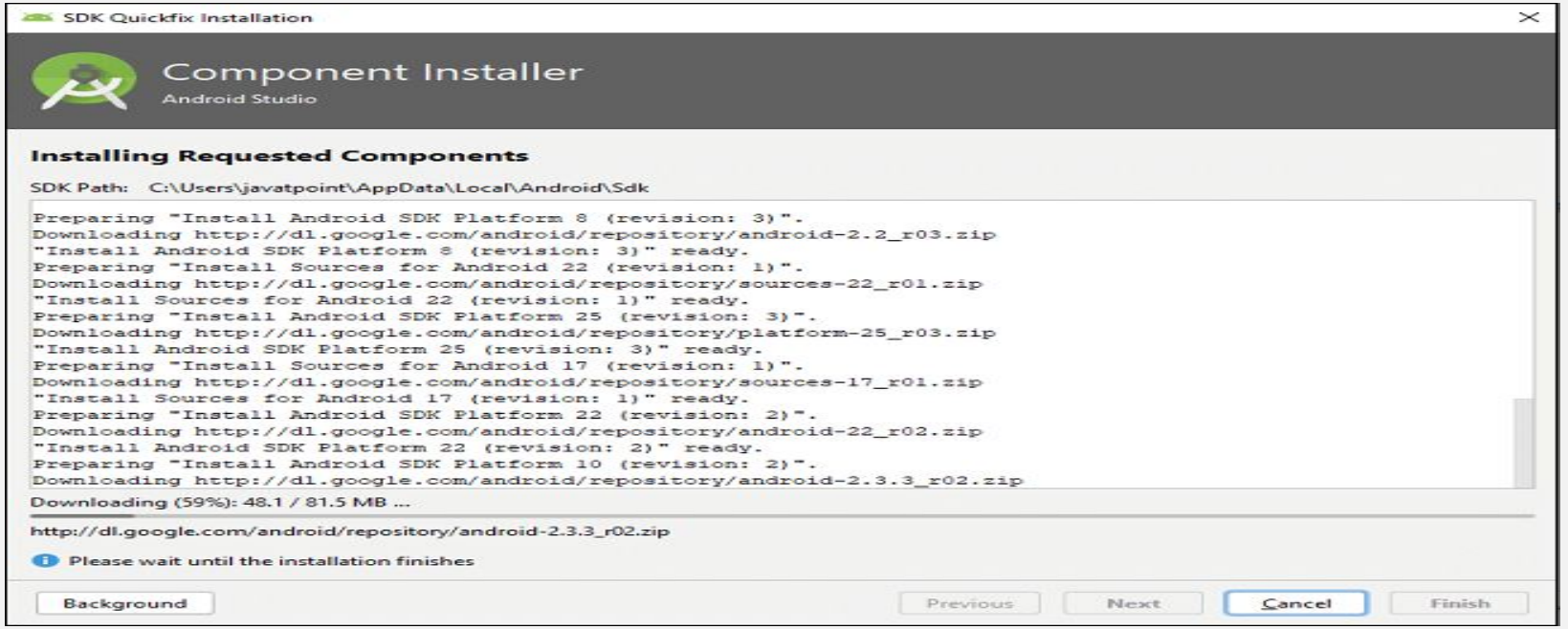


FLUTTER INSTALLATION IN WINDOWS

- **Step 7.4:** In the above screen, click Next-> Finish. Once the Finish button is clicked, you need to choose the 'Don't import Settings option' and click OK. It will start the Android Studio.

- **Note:** Meanwhile, the installation wizard also includes downloading Android SDK components that are required by Flutter for development.

FLUTTER INSTALLATION IN WINDOWS

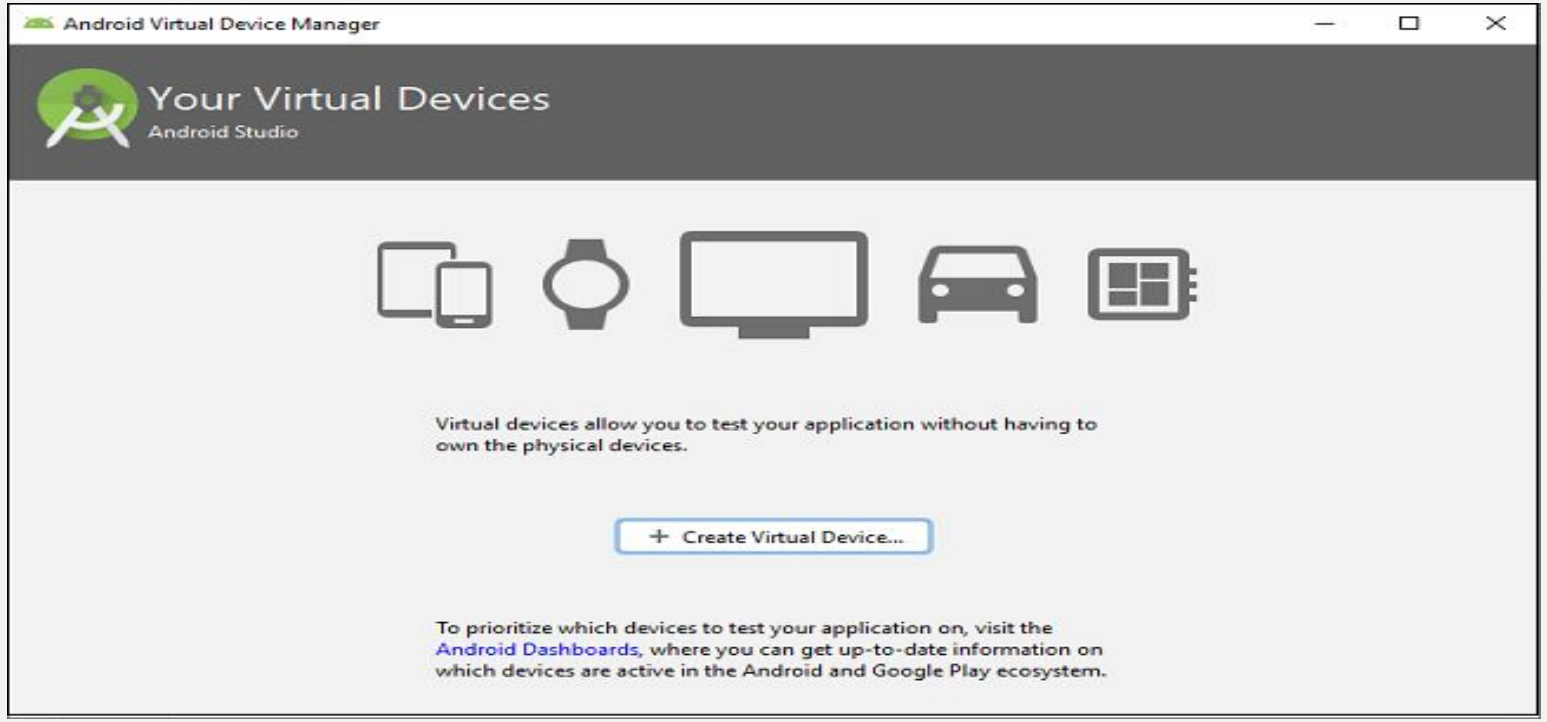


FLUTTER INSTALLATION IN WINDOWS

- **Step 8:** Next, you need to set up an Android emulator. It is responsible for running and testing the Flutter application.

- **Step 8.1:** To set an Android emulator, go to Android Studio > Tools > Android > AVD Manager and select Create Virtual Device. Or, go to Help->Find Action->Type Emulator in the search box. You will get the following screen.

FLUTTER INSTALLATION IN WINDOWS



FLUTTER INSTALLATION IN WINDOWS

- **Step 8.2:** Choose your device definition and click on Next.
- **Step 8.2:** Choose your device definition and click on Next.
- **Step 8.3:** Select the system image for the latest Android version and click on Next.
- **Step 8.4:** Now, verify the all AVD configuration. If it is correct, click on Finish. The following screen appears.

FLUTTER INSTALLATION IN WINDOWS

FLUTTER INSTALLATION IN WINDOWS

Step 8.5: Last, click on the icon pointed into the red color rectangle. The Android emulator displayed as below screen.

FLUTTER INSTALLATION IN WINDOWS

- **Step 9:** Now, install Flutter and Dart plugin for building Flutter application in Android Studio. These plugins provide a template to create a Flutter application, give an option to run and debug Flutter application in the Android Studio itself. Do the following steps to install these plugins.
- **Step 9.1:** Open the Android Studio and then go to File->Settings->Plugins.
- **Step 9.2:** Now, search the Flutter plugin. If found, select Flutter plugin and click install. When you click on install, it will ask you to install Dart plugin as below screen. Click yes to proceed.

FLUTTER INSTALLATION IN WINDOWS

- **Step 9.3:** Restart the Android Studio.

ARCHITECTURE OF FLUTTER APPLICATIONS

- The Flutter architecture mainly comprises of four components.
  1. Flutter Engine
  2. Foundation Library
  3. Widgets
  4. Design Specific Widgets

ARCHITECTURE OF FLUTTER APPLICATIONS

1.Flutter Engine :

It is a portable runtime for high-quality mobile apps and primarily based on the C++ language. It implements Flutter core libraries that include animation and graphics, file and network I/O, plugin architecture, accessibility support, and a dart runtime for developing, compiling, and running Flutter applications. It takes Google's open-source graphics library, **Skia**, to render low-level graphics.

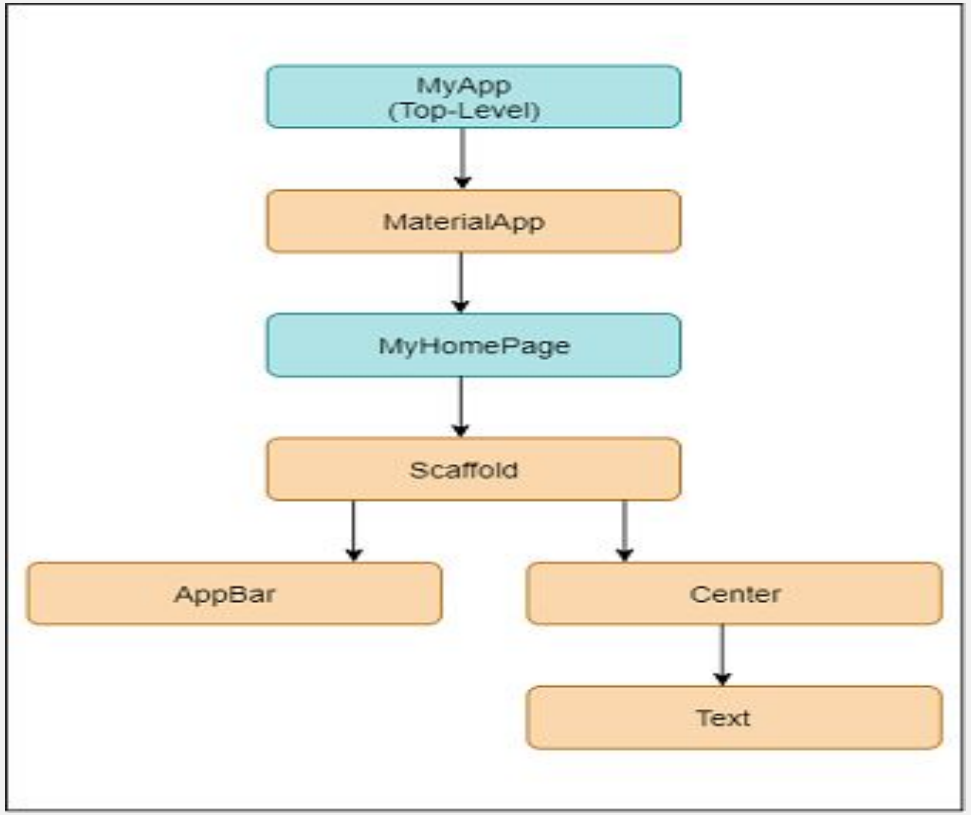
2.oundation Library :

It contains all the required packages for the basic building blocks of writing a Flutter application. These libraries are written in Dart language.

ARCHITECTURE OF FLUTTER APPLICATIONS

- 3.Widgets : In Flutter, everything is a widget, which is the core concept of this framework. Widget in the Flutter is basically a user interface component that affects and controls the view and interface of the app. It represents an immutable description of part of the user interface and includes graphics, text, shapes, and animations that are created using widgets. The widgets are similar to the React components.
- In Flutter, the application is itself a widget that contains many sub widgets. It means the app is the top-level widget, and its UI is build using one or more children widgets, which again includes sub child widgets. This feature helps you to create a complex user interface very easily.
- We can understand it from the hello world example created in the previous section. Here, we are going to explain the example with the following diagram.

ARCHITECTURE OF FLUTTER APPLICATIONS



ARCHITECTURE OF FLUTTER APPLICATIONS

4. Design Specific Widgets: The Flutter framework has two sets of widgets that conform to specific design languages. These are Material Design for Android application and Cupertino Style for IOS application.

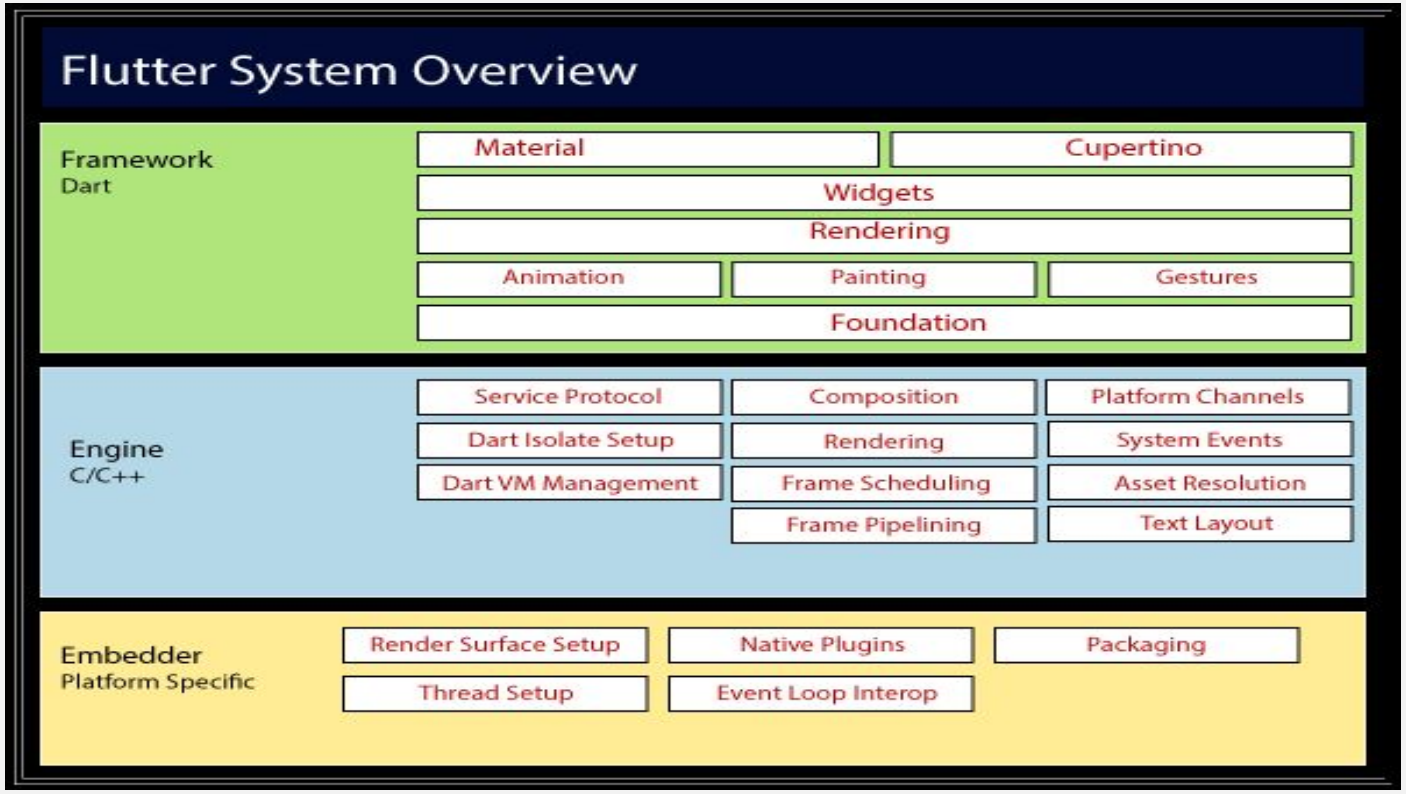
- Gestures
- It is a widget that provides interaction (how to listen for and respond to) in Flutter using GestureDetector. **GestureDector** is an invisible widget, which includes tapping, dragging, and scaling interaction of its child widget. We can also use other interactive features into the existing widgets by composing with the GestureDetector widget.
- State Management
- Flutter widget maintains its state by using a special widget, StatefulWidget. It is always auto re-rendered whenever its internal state is changed. The re-rendering is optimized by calculating the distance between old and new widget UI and render only necessary things that are changes.

ARCHITECTURE OF FLUTTER APPLICATIONS

- Layers

  Layers are an important concept of the Flutter framework, which are grouped into multiple categories in terms of complexity and arranged in the top-down approach. The topmost layer is the UI of the application, which is specific to the Android and iOS platforms. The second topmost layer contains all the Flutter native widgets. The next layer is the rendering layer, which renders everything in the Flutter app. Then, the layers go down to Gestures, foundation library, engine, and finally, core platform-specific code. The following diagram specifies the layers in Flutter app development

ARCHITECTURE OF FLUTTER APPLICATIONS



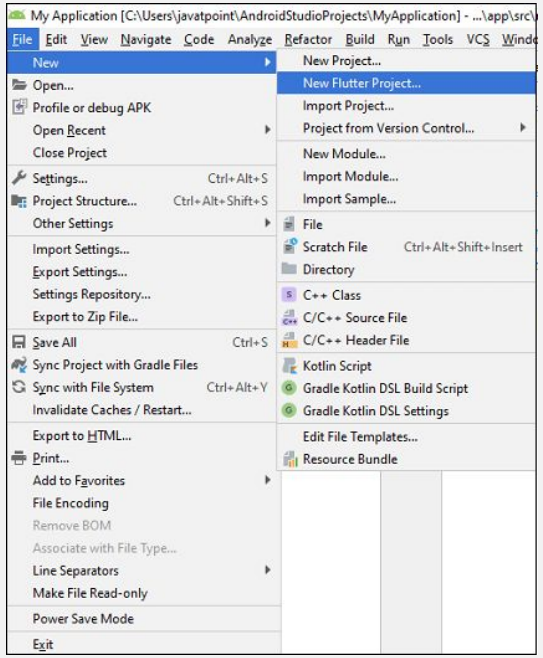
FLUTTER FIRST APPLICATION

- To create Flutter application, do the following steps:

  Step 1: Open the Android Studio.

  Step 2: Create the Flutter project. To create a project, go to File-> New->New Flutter Project. The following screen helps to understand it more clearly.

FLUTTER FIRST APPLICATION



FLUTTER FIRST APPLICATION

Step 3: In the next wizard, you need to choose the Flutter Application. For this, select Flutter Application-> click Next, as shown in the below screen.