What is Flutter?

🚀 What is Flutter?

Flutter is an **open-source UI framework** created by **Google** for building **natively compiled** applications for **Android, iOS, Web, and Desktop** from a **single codebase**.

It uses the **Dart programming language** and provides a fast, expressive, and flexible way to build beautiful applications.

📌 1. Key Features of Flutter

✅ Single Codebase

- Write code **once** and run it on **multiple platforms** (Android, iOS, Web, Windows, macOS, Linux).

✅ Fast Performance

- Uses **Dart's Just-In-Time (JIT) and Ahead-Of-Time (AOT) compilation** for high-speed execution.

✅ Hot Reload

- Instantly see changes in the app without restarting.

✅ Beautiful UI (Material & Cupertino)

- Built-in support for **Material Design** (Android) and **Cupertino (iOS)**.

✅ Customizable Widgets

- Flutter is **widget-based**, allowing for **highly customizable UI components**.

✅ Dart Programming Language

- **Dart** is optimized for UI development, ensuring **smooth performance**.

✅ Native Performance

- Compiles to **ARM & x86 native code**, avoiding JavaScript bridges.

📌 2. Flutter Architecture

Flutter consists of **three main layers**:

🏗️ Framework (Dart)

- Includes **Widgets, Rendering Engine, Animations, and Gestures**.

⚙️ Engine (C++)

- Handles **Graphics (Skia), UI Components, Dart Runtime, and Plugins**.

📡 Platform-Specific Code

- Uses **native APIs** for device functions like Camera, Bluetooth, etc.

📌 3. How Flutter Works

Flutter does **not** use platform widgets like other frameworks (React Native, Xamarin).

Instead, it **renders everything on its own** using **Skia Graphics Engine**.

Advantages:

✔️ No need for platform-specific UI components

✔️ **Consistent** UI across all devices

✔️ **Smooth 60fps animations**

📌 4. Why Use Flutter?

Feature	Flutter	React Native	Native Android/iOS
Performance	⭐⭐⭐⭐	⭐⭐⭐	⭐⭐⭐⭐⭐
Code Reusability	⭐⭐⭐⭐⭐	⭐⭐⭐⭐	⭐
UI Customization	⭐⭐⭐⭐⭐	⭐⭐⭐	⭐⭐⭐⭐⭐
Learning Curve	⭐⭐⭐	⭐⭐⭐⭐	⭐⭐
Community Support	⭐⭐⭐⭐	⭐⭐⭐⭐⭐	⭐⭐⭐⭐⭐

📌 5. Installing Flutter

✅ Step 1: Download Flutter

Go to Flutter's official website.

- Download the SDK for your OS (Windows, macOS, Linux).

✅ Step 2: Setup Path

- Extract Flutter SDK and **add it to your system environment PATH**.

✅ Step 3: Install Dependencies

- Install **Android Studio** for Android development.
- Install **Xcode** (Mac users) for iOS development.

✅ Step 4: Verify Installation

Run the following command in the terminal:

```
sh
CopyEdit
flutter doctor
```

This checks if Flutter is set up correctly.

📌 6. Creating a Flutter App

To create a new Flutter project, run:

```
sh
CopyEdit
flutter create my_app
cd my_app
flutter run
```

📌 7. Flutter Project Structure

```
bash
CopyEdit
my_app/
 ├── android/       # Native Android code
 ├── ios/           # Native iOS code
 ├── lib/           # Main Dart code (app logic)
 ├── test/          # Unit tests
 ├── pubspec.yaml   # Project dependencies & settings
 ├── main.dart      # App entry point
```