Name: Dhairyash Jain

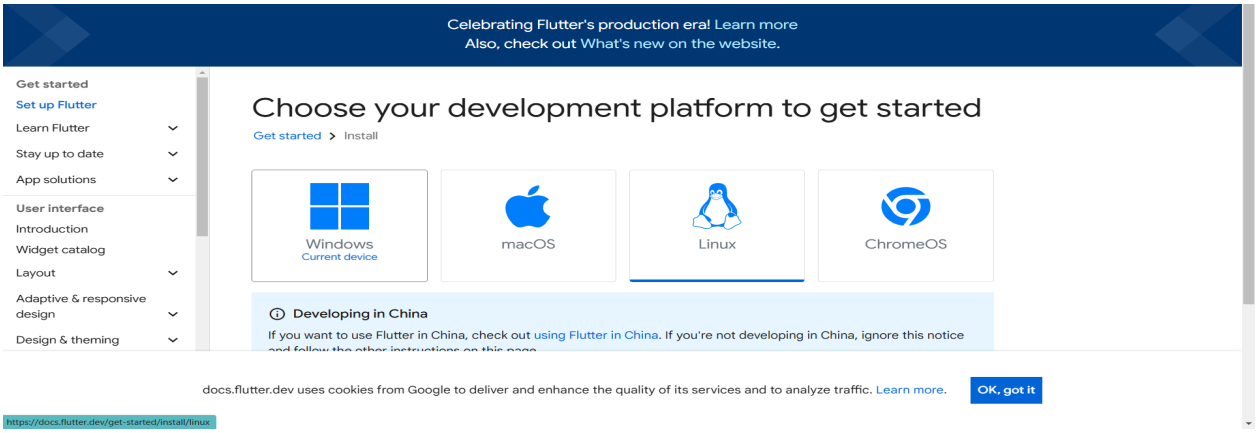
Class: D15B

Roll: 22

EXP 1: Installation and Configuration of Flutter Environment.

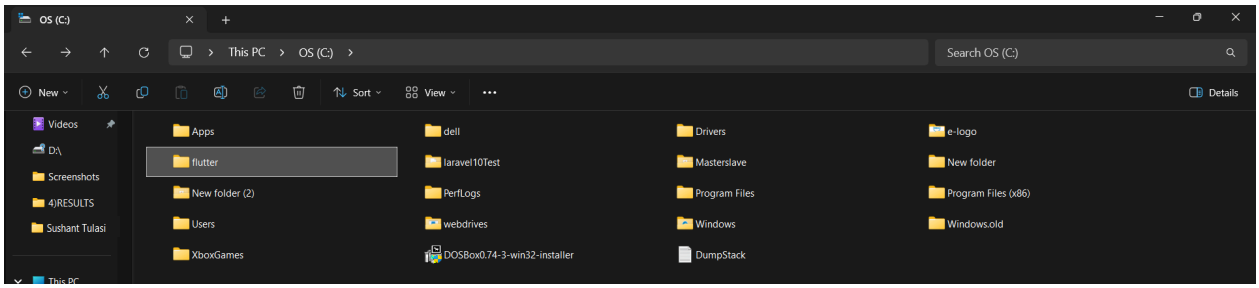
Install the Flutter SDK

Step 1: Download the installation bundle of the Flutter Software Development Kit for windows. To download Flutter SDK, Go to its official website https://docs.flutter.dev/get-started/install , you will get the following screen.



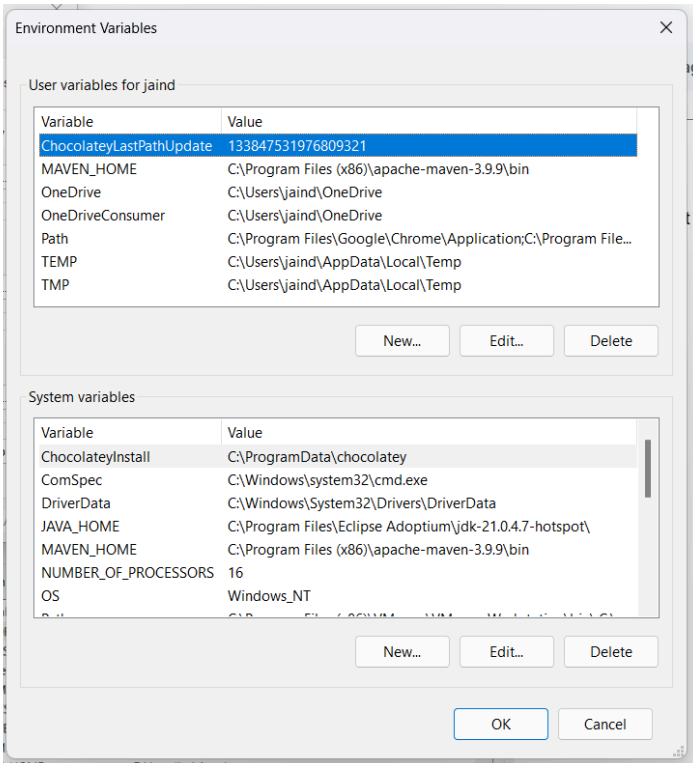
Step 2: Next, to download the latest Flutter SDK, click on the Windows icon. Here, you will find the download link for SDK.

Step 3: When your download is complete, extract the zip file and place it in the desired installation folder or location, for example, C: /Flutter.

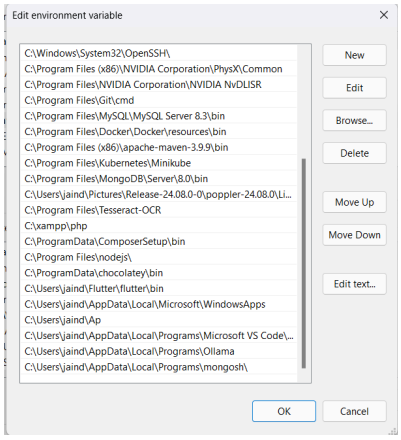


Step 4: To run the Flutter command in the regular windows console, you need to update the system path to include the flutter bin directory. The following steps are required to do this:

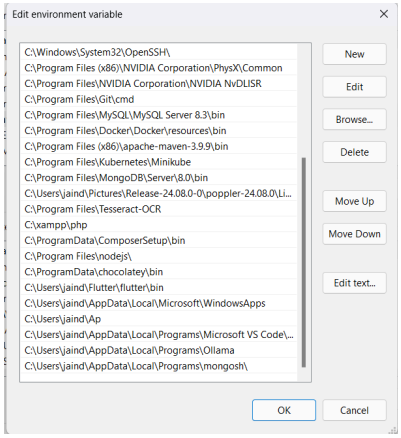
Step 4.1: Go to MyComputer properties -> advanced tab -> environment variables. You will get the following screen.



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



Step 4.3: In the above window, click on New->write path of Flutter bin folder in variable value -> ok -> ok -> ok.

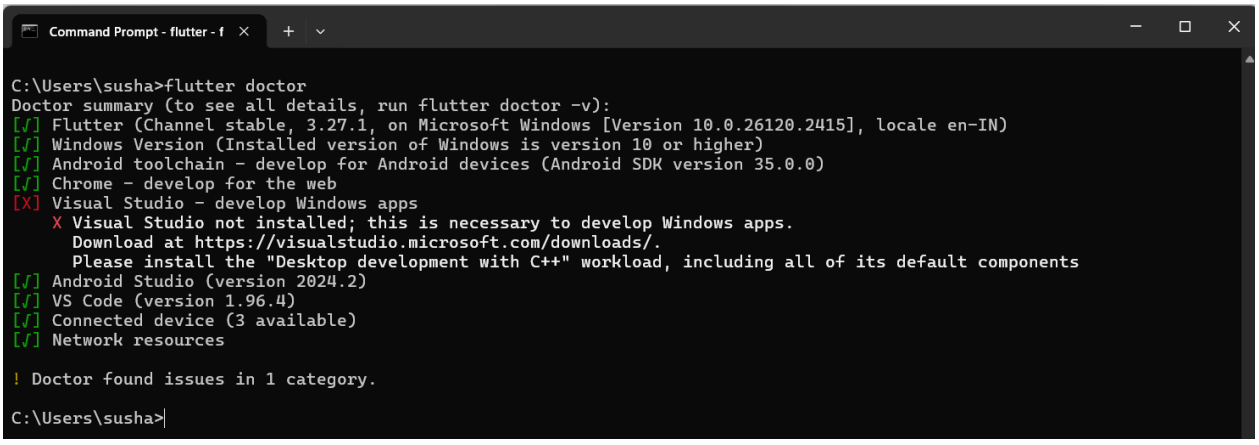


Step 5: Now, run the $ flutter command in command prompt.

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.

```
C:\Users\jaind>flutter
Manage your Flutter app development.

Common commands:

  flutter create <output directory>
    Create a new Flutter project in the specified directory.

  flutter run [options]
    Run your Flutter application on an attached device or in an emulator.

Usage: flutter <command> [arguments]

Global options:
-h, --help                  Print this usage information.
-v, --verbose               Noisy logging, including all shell commands executed.
                            If used with "--help", shows hidden options. If used with "flutter doctor", shows additional
                            diagnostic information. (Use "-vv" to force verbose logging in those cases.)
-d, --device-id             Target device id or name (prefixes allowed).
    --version               Reports the version of this tool.
    --enable-analytics      Enable telemetry reporting each time a flutter or dart command runs.
    --disable-analytics     Disable telemetry reporting each time a flutter or dart command runs, until it is
                            re-enabled.
    --suppress-analytics    Suppress analytics reporting for the current CLI invocation.
```

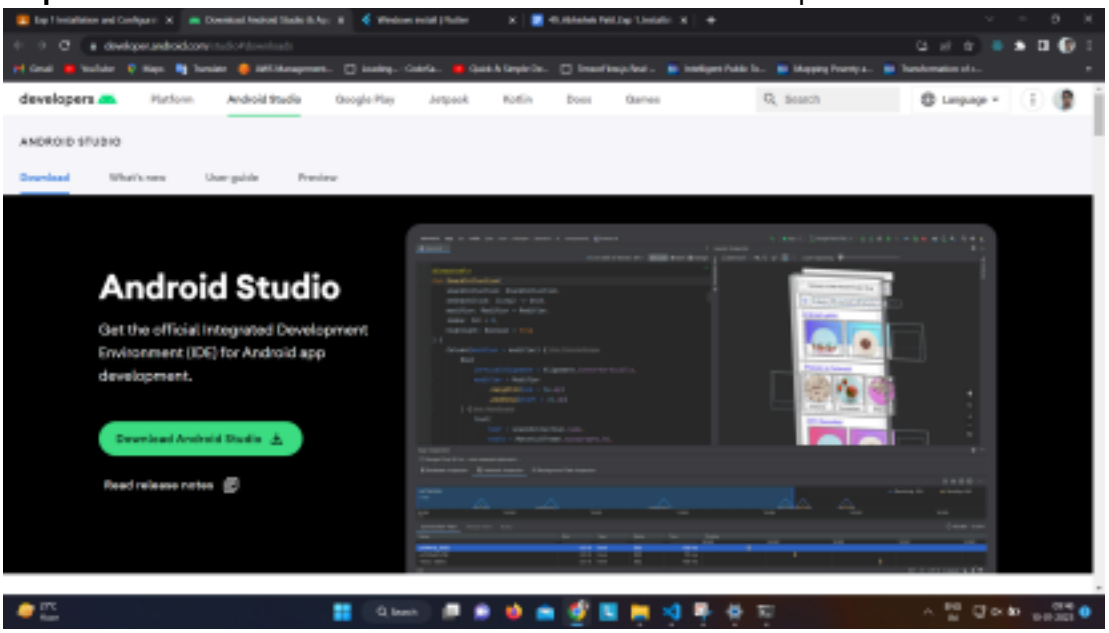
Step 6: When you run the above command, it will analyze the system and show its report, as shown in the below image. Here, you will find the details of all missing tools, which required to run Flutter as well as the development tools that are available but not connected with the device.



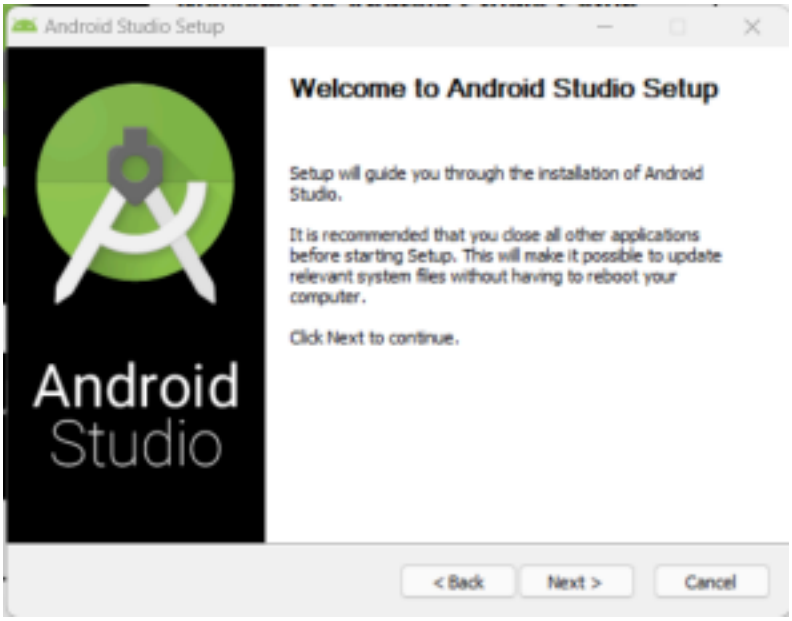
Step 7: Install the Android SDK. If the flutter doctor command does not find the Android SDK

tool in your system, then you need first to install the Android Studio IDE. To install Android Studio IDE, do the following steps.

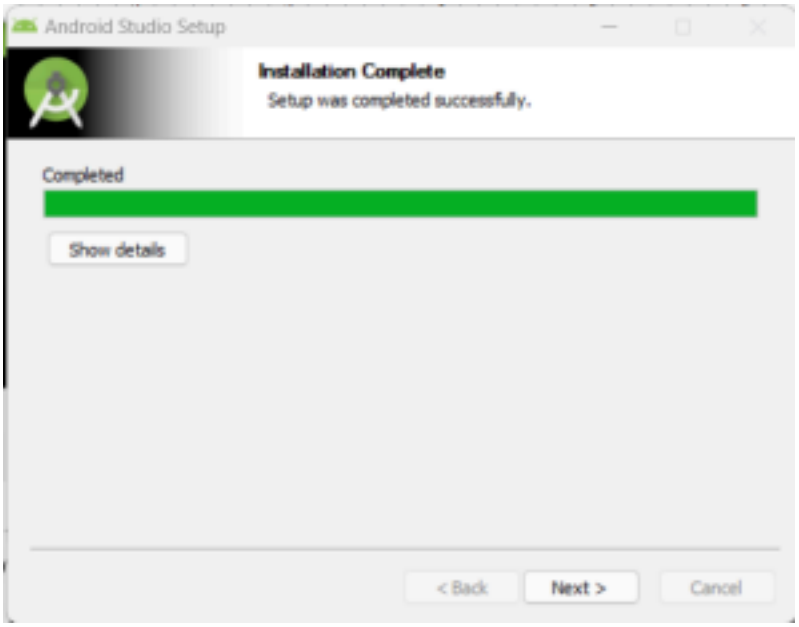
Step 7.1: Download the latest Android Studio executable or zip file from the official site.



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



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



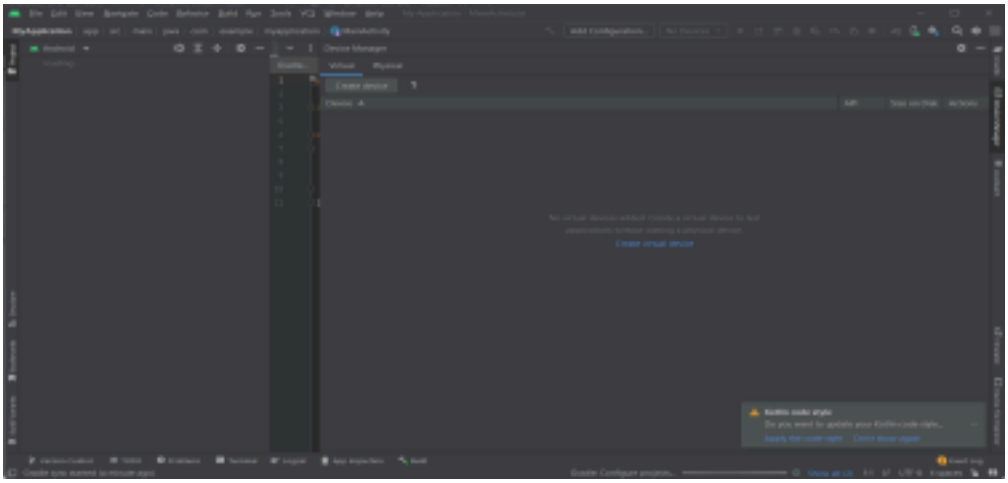
Step 7.4: In the above screen, click Next-> Finish. Once the Finish button is clicked, you need to choose the 'Don't import Settings option' and click OK. It will start the Android Studio.

Step 7.5: run the $ flutter doctor command and Run flutter doctor --android-licenses command.

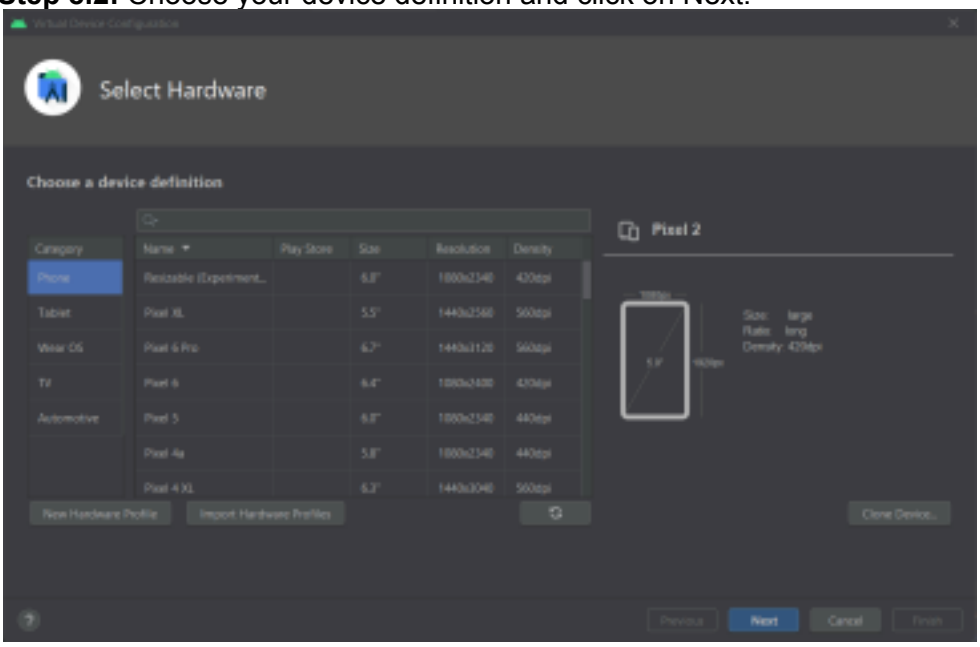
```
C:\Users\jaind>flutter doctor
Doctor summary (to see all details, run flutter doctor -v):
[✓] Flutter (Channel stable, 3.27.3, on Microsoft Windows [Version 10.0.22631.5039], locale en-IN)
[✓] Windows Version (Installed version of Windows is version 10 or higher)
[✓] Android toolchain - develop for Android devices (Android SDK version 35.0.1)
[✓] Chrome - develop for the web
[!] Visual Studio - develop Windows apps (Visual Studio Build Tools 2019 16.11.44)
    X The current Visual Studio installation is incomplete.
      Please use Visual Studio Installer to complete the installation or reinstall Visual Studio.
[✓] Android Studio (version 2024.2)
[✓] VS Code (version 1.99.0)
[✓] Connected device (3 available)
[✓] Network resources

! Doctor found issues in 1 category.

C:\Users\jaind>
```

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.

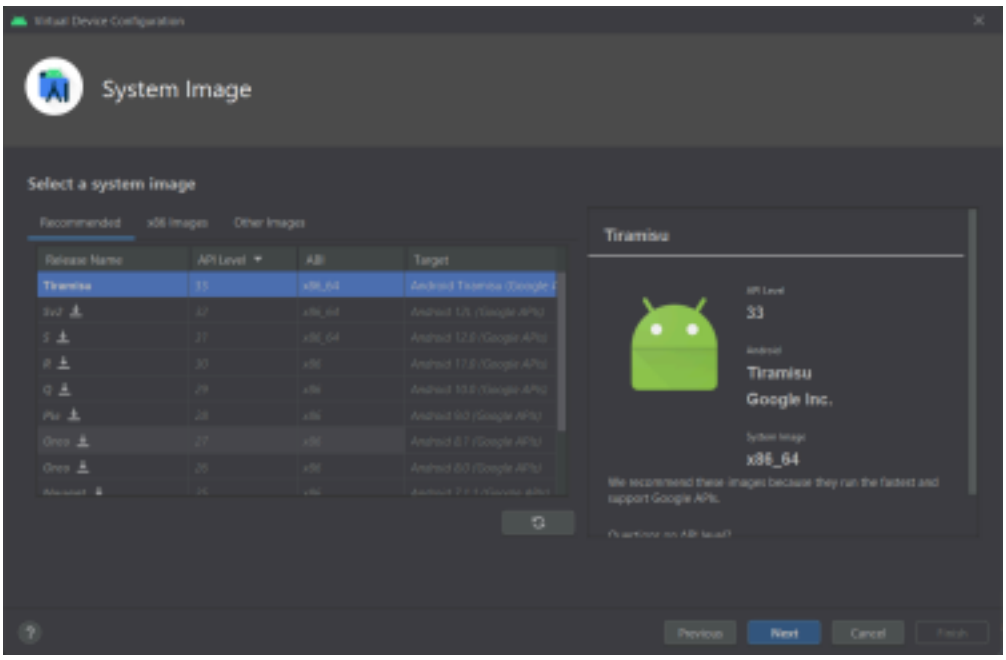


Step 8.2: Choose your device definition and click on Next.



Step 8.3: Select the system image for the latest Android version and click on Next.

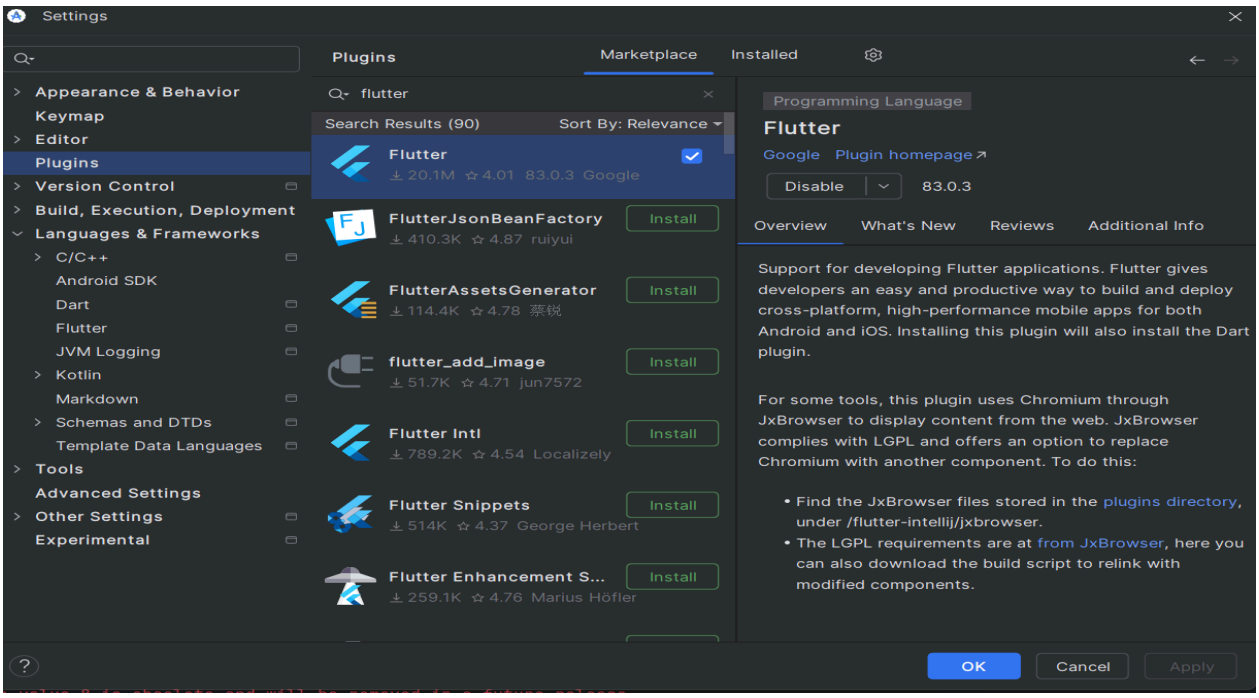
Step 8.4: Now, verify the all AVD configuration. If it is correct, click on Finish. The following screen appears.



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

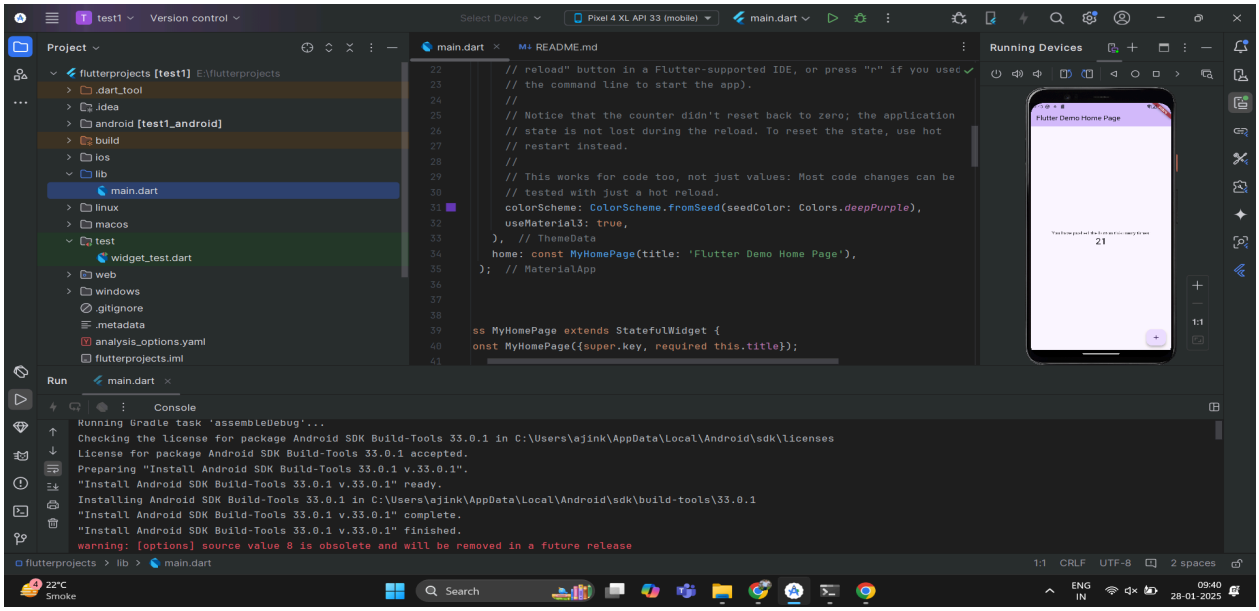
Step 9: Now, install Flutter and Dart plugin for building Flutter application in Android Studio. These plugins provide a template to create a Flutter application, give an option to run and debug Flutter application in the Android Studio itself. Do the following steps to install these plugins.

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.

Step 9.3: Restart the Android Studio.



Name: Dhairyash Jain
Class: D15B
Roll: 22

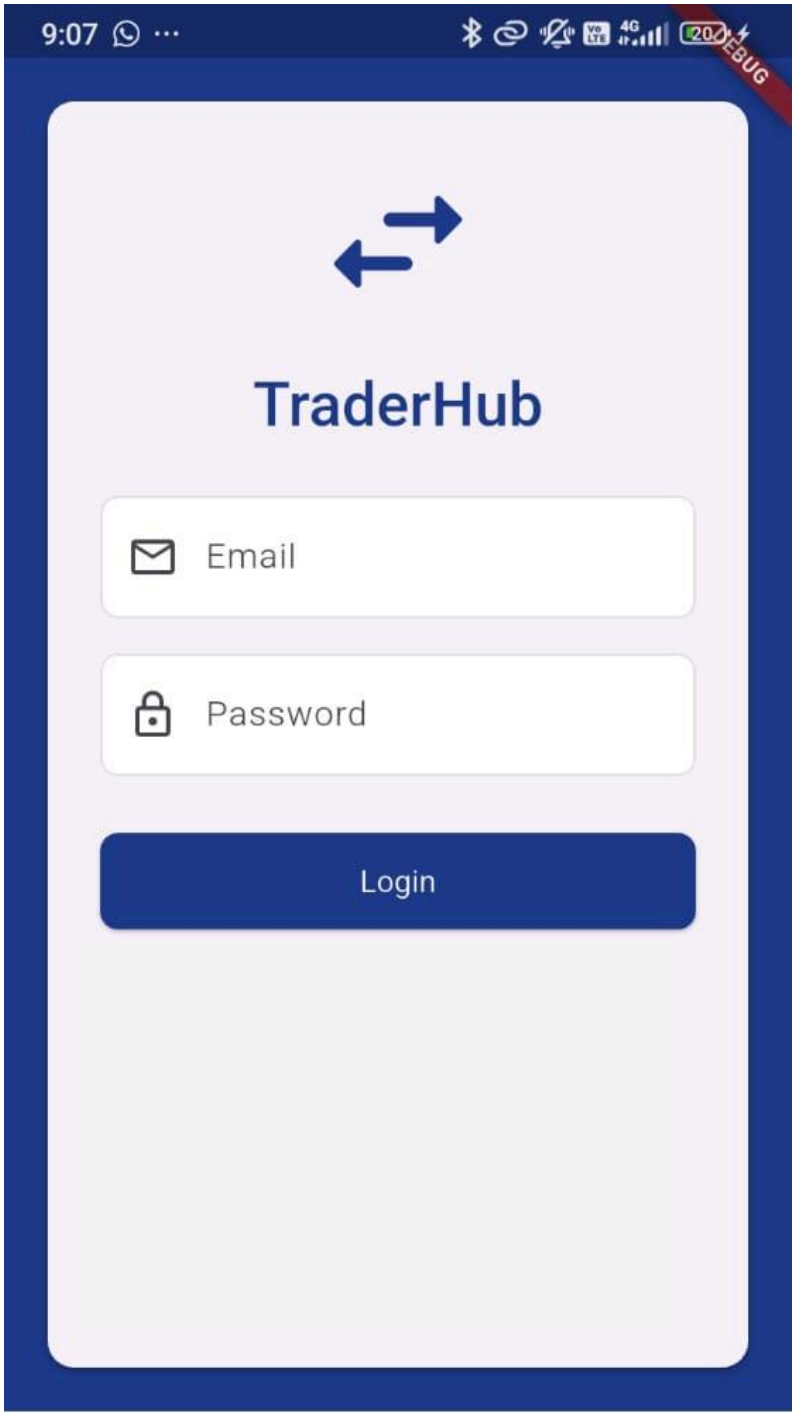
Experiment 02 : To design Flutter UI by including common widgets.

```
import 'package:flutter/material.dart';

void main() {
  runApp(AccountApp());
}

class AccountApp extends StatelessWidget {
  @override
  Widget build(BuildContext context) {
    return MaterialApp(
      theme: ThemeData(
        primaryColor: Color(0xFF6200EE),
        colorScheme: ColorScheme.fromSeed(seedColor: Color(0xFF6200EE)),
        useMaterial3: true,
      ),
      home: Account(),
    );
  }
}

class Account extends StatelessWidget {
  const Account({Key? key}) : super(key: key);

  @override
  Widget build(BuildContext context) {
    return Scaffold(
      backgroundColor: Theme.of(context).colorScheme.background,
      appBar: AppBar(
        centerTitle: true,
        backgroundColor: Theme.of(context).colorScheme.primary,
        leading: IconButton(
          onPressed: () {
            Navigator.pop(context);
          },
          icon: Icon(Icons.arrow_back, color: Colors.white),
        ),
        title: Text(
          "Settings",
          style: TextStyle(color: Colors.white, fontWeight: FontWeight.bold),
        ),
      ),
      body: SafeArea(
        child: ListView(
```

```
        padding: EdgeInsets.all(16),
        children: [
          _buildProfileCard(context),
          SizedBox(height: 16),
          _buildSectionCard(context, "Features", [
            _buildListTile(context, "Memories", Icons.calendar_today, () {
              print("You pressed Memories Button");
            }),
            _buildListTile(context, "Blocked Profile", Icons.block, () {
              print("You pressed Blocked Profile Button");
            }),
          ]),
          SizedBox(height: 16),
          _buildSectionCard(context, "Settings", [
            _buildListTile(context, "Notifications", Icons.notifications, () {
              print("You pressed Notifications Button");
            }),
            _buildListTile(context, "Time Zone", Icons.access_time, () {
              print("You pressed Time Zone Button");
            }),
            _buildListTile(context, "Others", Icons.settings_suggest, () {
              print("You pressed Others Button");
            }),
          ]),
          SizedBox(height: 16),
          _buildSectionCard(context, "About", [
            _buildListTile(context, "Share BeReal", Icons.share, () {
              print("You pressed Share BeReal Button");
            }),
            _buildListTile(context, "Rate", Icons.star_outline, () {
              print("You pressed Rate Button");
            }),
            _buildListTile(context, "Help", Icons.help_outline, () {
              print("You pressed Help Button");
            }),
            _buildListTile(context, "About", Icons.info, () {
              print("You pressed About Button");
            }),
          ]),
        ],
      ),
    ),
  );
}

Widget _buildProfileCard(BuildContext context) {
  return Card(
    elevation: 4,
```

```
    shape: RoundedRectangleBorder(borderRadius: BorderRadius.circular(12)),
    child: Padding(
      padding: EdgeInsets.all(16),
      child: Column(
        children: [
          CircleAvatar(
            radius: 50,
            backgroundColor: Theme.of(context).colorScheme.secondary,
            child: Icon(Icons.person, size: 50, color: Colors.white),
          ),
          SizedBox(height: 16),
          Text(
            "VESIT",
            style: TextStyle(fontSize: 24, fontWeight: FontWeight.bold),
          ),
          SizedBox(height: 8),
          ElevatedButton(
            onPressed: () {
              print("You pressed Edit Profile Button");
            },
            child: Text("Edit Profile"),
            style: ElevatedButton.styleFrom(
              backgroundColor: Theme.of(context).colorScheme.primary,
              foregroundColor: Colors.white,
            ),
          ),
        ],
      ),
    ),
  );
}

Widget _buildSectionCard(BuildContext context, String title, List<Widget> children) {
  return Card(
    elevation: 2,
    shape: RoundedRectangleBorder(borderRadius: BorderRadius.circular(12)),
    child: Column(
      crossAxisAlignment: CrossAxisAlignment.start,
      children: [
        Padding(
          padding: EdgeInsets.all(16),
          child: Text(
            title,
            style: TextStyle(fontSize: 20, fontWeight: FontWeight.bold),
          ),
        ),
        Divider(height: 1),
        ...children,
```

```
      ],
    ),
  );
}

Widget _buildListTile(BuildContext context, String title, IconData icon, VoidCallback onTap) {
  return ListTile(
    leading: Icon(icon, color: Theme.of(context).colorScheme.primary),
    title: Text(title),
    trailing: Icon(Icons.chevron_right),
    onTap: onTap,
  );
}
```




```
A Dart VM Service on Chrome is available at: http://127.0.0.1:51393/9cYPtot4fBY=
The Flutter DevTools debugger and profiler on Chrome is available at: http://127.0.0.1:9101?uri=http://127.0.0.1:51393/9cYPtot4fBY=
You pressed Profile Button
You pressed Profile Button
You pressed Memories Button
You pressed Blocked Profile Button
You pressed Notifications Button
You pressed Time Zone Button
You pressed Others Button
You pressed Share BeReal Button
```

Usage of Widgets:

- Widgets like Row, Column, SizedBox, ElevatedButton, and Align are used to structure the UI.
- The SafeArea widget ensures that content is displayed within the safe area of the screen.

- The SingleChildScrollView widget allows scrolling when the content overflows the screen

List of Widgets

Flutter Scaffold
Flutter Container
Flutter Row & Column
Flutter Text
Flutter TextField
Flutter Buttons
Flutter Stack
Flutter Forms
Flutter
AlertDialog
Flutter Icons
Flutter Images
Flutter Card
Flutter Tabbar
Flutter Drawer
Flutter Lists
Flutter GridView
Flutter Toast
Flutter Checkbox
Flutter Radio Button
Flutter Progress
Bar Flutter
Snackbar Flutter
Tooltip Flutter Slider
Flutter Switch
Flutter Charts
Bottom Navigation Bar
Flutter Themes
Flutter Table
Flutter Calendar
Flutter Animation

Name: Dhairyash Jain

Class: D15B
Roll: 22

Experiment 03: Including Icons, Images, and Fonts in a Flutter App

Introduction

Flutter allows seamless integration of icons, images, and custom fonts to enhance the visual appeal of mobile applications. In this document, we will explore how to include and use these assets effectively.

1. Including Icons in Flutter

Flutter provides built-in icons via the `Icons` class and allows the use of custom icons through the `pubspec.yaml` file.

1.1 Using Built-in Icons

Flutter provides an extensive set of material icons that can be used as follows:

```
import 'package:flutter/material.dart';

void main() {
  runApp(MyApp());
}

class MyApp extends StatelessWidget {
  @override
  Widget build(BuildContext context) {
    return MaterialApp(
      home: Scaffold(
        appBar: AppBar(title: Text("Flutter Icons")),
        body: Center(
          child: Icon(
            Icons.favorite,
```

```
            color: Colors.red,
            size: 50.0,
          ),
        ),
      ),
    );
  }
}
```

1.2 Using Custom Icons

To use custom icons, first, download or generate an icon font using FlutterIcon and add it to the `pubspec.yaml` file:

```
flutter:
  fonts:
    - family: CustomIcons
      fonts:
        - asset: assets/fonts/custom_icons.ttf
```

Use it in your app:

```
Icon(IconData(0xe900, fontFamily: 'CustomIcons'))
```

2. Including Images in Flutter

Flutter supports various ways to include images, such as from the assets folder, network URLs, and memory.

2.1 Adding Image Assets

1. Place images inside the `assets/images/` directory.
2. Declare them in `pubspec.yaml`:

```
flutter:
  assets:
    - assets/images/sample.png
```

3. Use them in your app:

```
Image.asset('assets/images/sample.png', width: 200, height: 200)
```

2.2 Using Network Images

Load images directly from the internet:

Image.network('https://example.com/sample.jpg')

3. Including Custom Fonts in Flutter

Custom fonts can enhance the UI by providing unique typography.

3.1 Adding Custom Fonts

1. Place font files in `assets/fonts/`.
2. Declare them in `pubspec.yaml`:

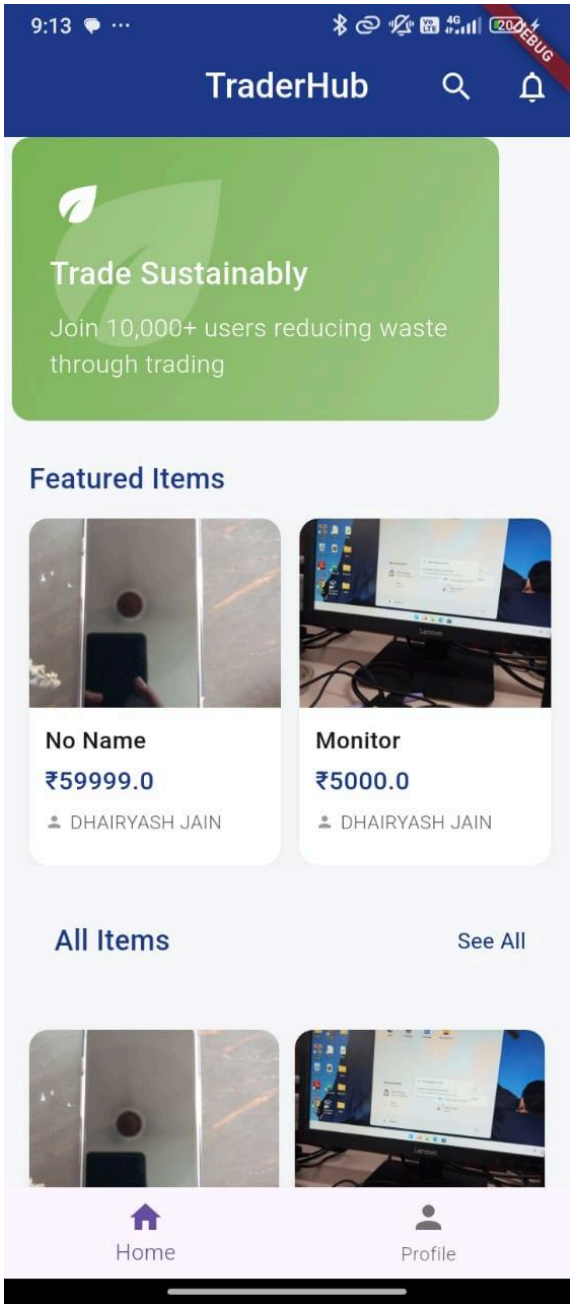
```
flutter:
  fonts:
    - family: CustomFont
      fonts:
        - asset: assets/fonts/CustomFont-Regular.ttf
```

3.2 Using Custom Fonts in the App

Apply the font to text widgets:

```
Text(
  'Hello, Flutter!',
  style: TextStyle(fontFamily: 'CustomFont', fontSize: 24),
)
```

Output



Conclusion

This document covered the integration of icons, images, and fonts in a Flutter app. These elements significantly enhance UI design, making the app more engaging and visually appealing.

Name: Dhairyash Jain
Class: D15B
Roll: 22

Lab 04

Aim: To create an interactive Form using form widget

Theory

Form validation is an essential feature in mobile applications to ensure the correctness of user inputs before processing them. In Flutter, `Form` and `TextFormField` widgets are used to create forms with built-in validation capabilities.

Key Concepts:

1. GlobalKey: Used to uniquely identify the form and manage its state.
2. TextFormField: A widget that allows users to enter input and supports validation.
3. Validation Logic: Defines conditions to verify the correctness of input.
4. Submit Button: Triggers form validation and processes the input if valid.

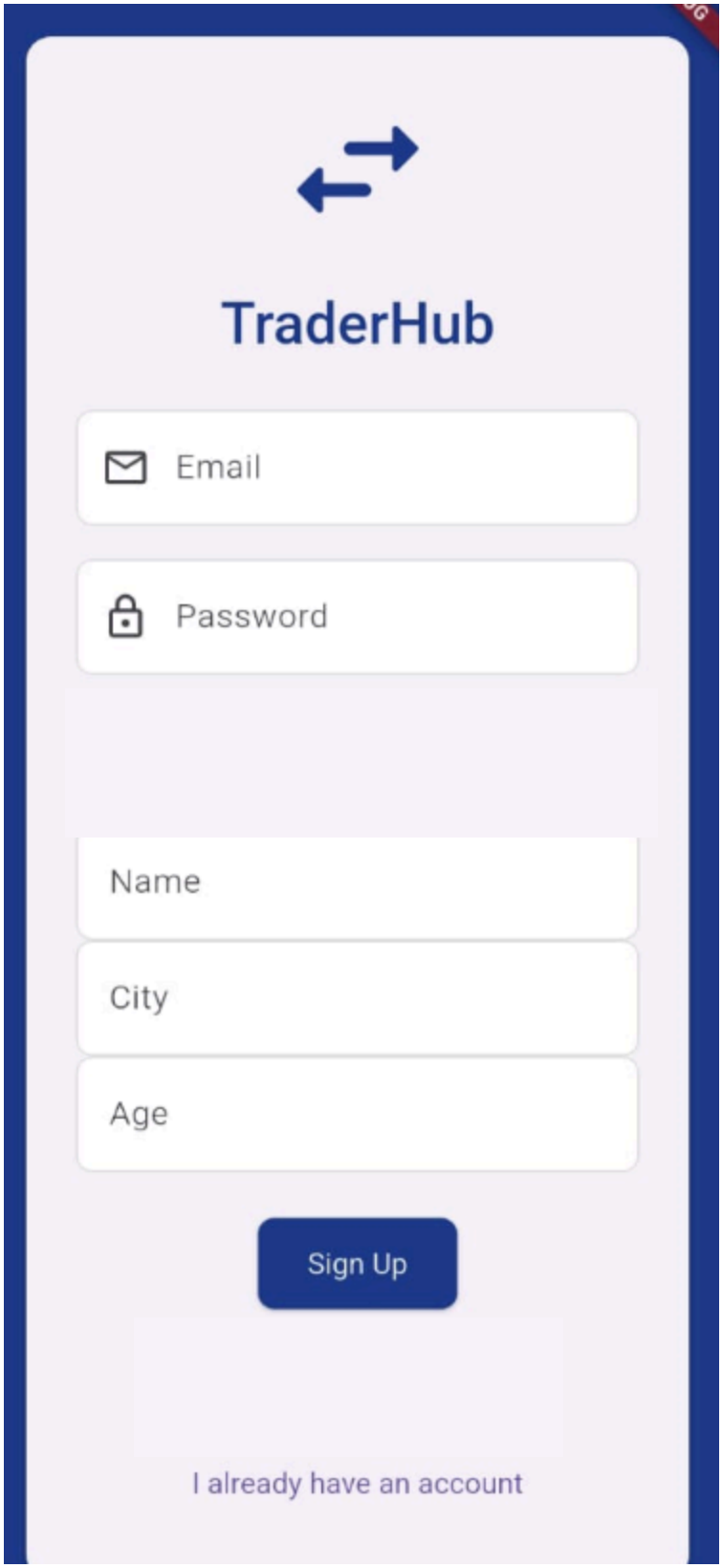
Code Implementation

```
import 'package:flutter/material.dart';

void main() {
  runApp(MyApp());
}

class MyApp extends StatelessWidget {
  @override
  Widget build(BuildContext context) {
    return MaterialApp(
      debugShowCheckedModeBanner: false,
      home: FormScreen(),
    );
  }
```

```
}

class FormScreen extends StatefulWidget {
  @override
  _FormScreenState createState() => _FormScreenState();
}

class _FormScreenState extends State<FormScreen> {
  final _formKey = GlobalKey<FormState>();
  final TextEditingController _nameController = TextEditingController();

  void _submitForm() {
    if (_formKey.currentState!.validate()) {
      ScaffoldMessenger.of(context).showSnackBar(
        SnackBar(content: Text('Form Submitted Successfully')),
      );
    }
  }

  @override
  Widget build(BuildContext context) {
    return Scaffold(
      appBar: AppBar(title: Text('Form Validation Demo')),
      body: Padding(
        padding: const EdgeInsets.all(16.0),
        child: Form(
          key: _formKey,
          child: Column(
            children: [
              TextFormField(
                controller: _nameController,
                decoration: InputDecoration(labelText: 'Enter your name'),
                validator: (value) {
                  if (value == null || value.isEmpty) {
                    return 'Name cannot be empty';
                  }
                  return null;
```

```
              },
            ),
            SizedBox(height: 20),
            ElevatedButton(
              onPressed: _submitForm,
              child: Text('Submit'),
            ),
          ],
        ),
      ),
    ),
  );
 }
}
```

Output


TraderHub
Email
Password
Name
City
Age
Sign Up
I already have an account

Conclusion

Form validation in Flutter can be efficiently managed using the `GlobalKey`, `TextFormField`, and validation functions. This ensures user inputs are validated before processing, improving app reliability.

Name: Dhairyash Jain
Class: D15B
Roll: 22

MAD Lab 5

Aim: Navigation, Routing, and Gestures in Flutter

Introduction

Navigation, routing, and gestures are essential for building interactive Flutter applications. Navigation allows users to move between screens, routing manages structured transitions, and gestures detect user interactions like taps, swipes, and long presses.

Routing and Navigation in Flutter

In Flutter, routing and navigation are essential for managing screen transitions in an application. Flutter uses a stack-based navigation system, where screens (also called routes) are managed using a Navigator widget.

Types of Navigation in Flutter

1. Imperative Navigation (Navigator API)

- Uses Navigator.push() and Navigator.pop()
- Follows a stack-based approach (LIFO - Last In, First Out)
- Best suited for simple applications

2. Declarative Navigation (Go Router, Auto Route)

- Uses URL-based navigation
- Ideal for large applications with deep linking
- Navigator and Routes in Flutter

The Navigator manages the stack of screens in a Flutter app. Each screen is called a Route, and the Navigator widget helps in transitioning between routes.

1. Navigation in Flutter

Flutter's Navigator widget manages a stack of screens. Below is an example of basic navigation between two screens.

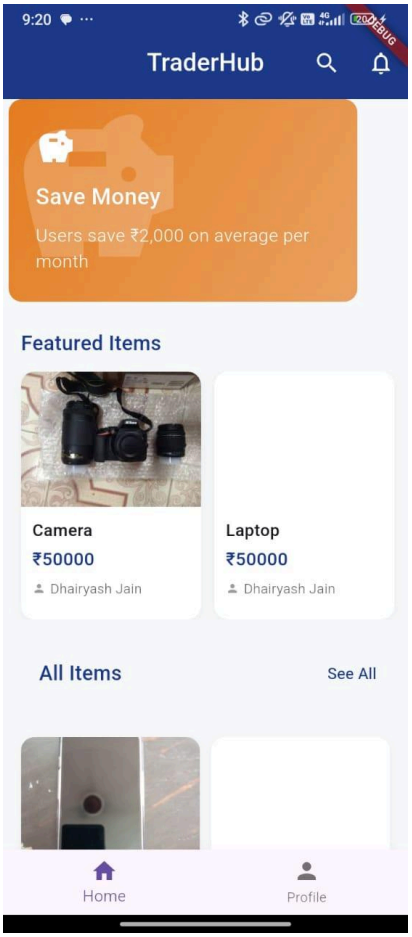
```
import 'package:flutter/material.dart';

void main() {
    runApp(MaterialApp(home: FirstScreen()));
}

class FirstScreen extends StatelessWidget { @override
    Widget build(BuildContext context) { return Scaffold(
            appBar: AppBar(title: Text('First Screen')), body: Center(
                child: ElevatedButton(
                    onPressed: () {
                        Navigator.push(
                            context, MaterialPageRoute(builder: (context) => SecondScreen()));
                    },
                    child: Text('Go to Second Screen'),
                ),
            ),
        );
    }
}

class SecondScreen extends StatelessWidget { @override
    Widget build(BuildContext context) { return Scaffold(
             appBar: AppBar(title: Text('Second Screen')), body: Center
            child: ElevatedButton( onPressed:
            () {
                                Navigator.pop(context);
                            },
                            child: Text('Go Back'),
                        ),
                    ),
                );
            }
```

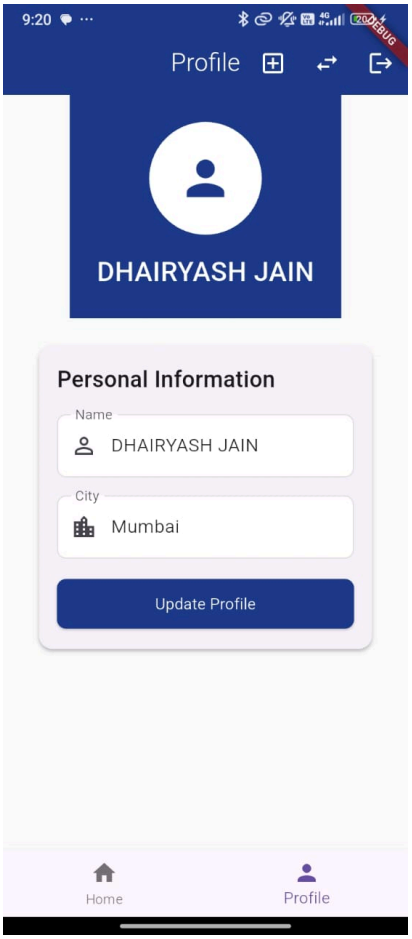
2. Gesture Detection in Flutter

Flutter's GestureDetector widget captures various gestures like taps, double taps, long presses, and swipes. Below is an example of detecting different gestures.

```
import 'package:flutter/material.dart';

void main() {
    runApp(MaterialApp(home: GestureExample()));
}

class GestureExample extends StatefulWidget { @override
    _GestureExampleState createState() => _GestureExampleState();
}

class _GestureExampleState extends State<GestureExample> { String _message =
    "Tap or Swipe";

    @override
    Widget build(BuildContext context) { return Scaffold(
            appBar: AppBar(title: Text('Gesture Detector Example')), body:
            GestureDetector(
                onTap: () {
                    setState(() { _message = "Tapped!"; });
                },
                onDoubleTap: () {
                    setState(() { _message = "Double Tapped!"; });
                },
                onLongPress: () {
                    setState(() { _message = "Long Pressed!"; });
                },
                onHorizontalDragEnd: (details) { setState(() { _message =
                    "Swiped!"; });
                },
                child: Center(
                                    child: Text(_message, style: TextStyle(fontSize: 24, fontWeight:
    FontWeight.bold)),
                 ),
            ),
        );
    }
}
```

OUTPUT





Conclusion

Navigation allows movement between screens using Navigator. Routing helps structure navigation better using named routes. Gesture detection enables interactivity with user input. These features make Flutter apps more user-friendly.

Name: Dhairyash Jain
Class: D15B
Roll: 22

Setting Up Firebase with Flutter for iOS and Android Apps

This document provides a detailed step-by-step guide on how to integrate Firebase with a Flutter project for both iOS and Android platforms. Firebase offers a suite of tools for app development, including analytics, authentication, cloud storage, and more. By following this guide, you will be able to set up Firebase in your Flutter app and start using its features.

Prerequisites
Before starting, ensure you have the following:

Flutter SDK installed on your machine.

Android Studio or Xcode for Android and iOS development, respectively.

A Firebase account (create one at firebase.google.com).

A Flutter project created (flutter create project_name).

Step 1: Create a Firebase Project
Go to the Firebase Console.

Click Add Project.

Enter a project name and follow the prompts to create the project.

Once the project is created, you will be redirected to the Firebase project dashboard.

Step 2: Add Firebase to Your Flutter Project
For Android
In the Firebase Console, click the Android icon to add an Android app to your Firebase project.

Enter your app's details:

Android package name: Find this in your android/app/build.gradle file under applicationId.

App nickname (optional): Add a nickname for your app.

Debug signing certificate SHA-1 (optional): If you need Firebase Authentication or Dynamic Links, add your SHA-1 key.

Click Register App.

Download the google-services.json file and place it in the android/app directory of your Flutter project.

Add the following dependencies to your android/build.gradle file:

```
buildscript {
   dependencies {
      classpath 'com.google.gms:google-services:4.3.15' // Use the latest version
   }
}
```

Add the following to the bottom of your android/app/build.gradle file:

```
apply plugin: 'com.google.gms.google-services'
```

For iOS

In the Firebase Console, click the iOS icon to add an iOS app to your Firebase project.

Enter your app's details:

iOS bundle ID: Find this in your Xcode project under Bundle Identifier.

App nickname (optional): Add a nickname for your app.

Click Register App.

Download the GoogleService-Info.plist file.

Open your Flutter project in Xcode.

Drag and drop the GoogleService-Info.plist file into the Runner directory in Xcode.

Ensure the file is added to the Runner target.

Add the following to your ios/Podfile:

```
platform :ios, '11.0' # or higher
```

Run pod install in the ios directory to install Firebase dependencies.

Step 3: Add Firebase Dependencies to Flutter

Open your pubspec.yaml file in your Flutter project.

Add the following dependencies under dependencies:

```
dependencies:
  flutter:
    sdk: flutter
  firebase_core: latest_version # Required for Firebase integration
  firebase_analytics: latest_version # Optional: For analytics
  firebase_auth: latest_version # Optional: For authentication
  cloud_firestore: latest_version # Optional: For Firestore database
  firebase_storage: latest_version # Optional: For cloud storage
```

Run flutter pub get to install the dependencies.

Step 4: Initialize Firebase in Your Flutter App

Open your lib/main.dart file.

Import the Firebase Core package:

```
import 'package:firebase_core/firebase_core.dart';
```

Initialize Firebase in the main function:

```
dart
Copy
void main() async {
  WidgetsFlutterBinding.ensureInitialized();
  await Firebase.initializeApp();
  runApp(MyApp());
}
```

Step 5: Test Firebase Integration

Run your app on an Android or iOS emulator/device.

Check the Firebase Console to ensure your app is connected and sending data (e.g., analytics events).

Step 6: Use Firebase Services

Now that Firebase is set up, you can start using its services in your Flutter app. For example:

Firebase Authentication: Add user authentication using email/password, Google Sign-In, etc.

Firestore: Store and retrieve data from a NoSQL database.

Firebase Storage: Upload and download files.

Firebase Analytics: Track user behavior and app usage.

Troubleshooting
Android: If you encounter issues with the google-services.json file, ensure it is placed in the correct directory (android/app).

iOS: If the app crashes on launch, ensure the GoogleService-Info.plist file is added to the Xcode project and the Runner target.

Dependencies: Always use the latest versions of Firebase plugins and ensure there are no version conflicts.

Conclusion
You have successfully set up Firebase in your Flutter app for both iOS and Android platforms. You can now leverage Firebase's powerful features to enhance your app's functionality. For more details, refer to the official Firebase Flutter documentation.Replace latest_version with the actual version numbers of the Firebase plugins you are using. You can find the latest versions on pub.dev.

Name:Dhairyash Pankaj Jain
Class: D15B
Roll No:22

EXPERIMENT No. 7

Aim: To write meta data of your Ecommerce PWA in a Web app manifest file to enable add to homescreen feature

Theory:

Making a Vite React App a Progressive Web App (PWA)

A Progressive Web App (PWA) is a type of web application that provides a reliable, fast, and engaging user experience similar to a native mobile app. It leverages modern web technologies, including service workers, caching strategies, and a web app manifest, to enable offline functionality, push notifications, and an installable experience.

In the context of a web application, converting the app into a PWA involves integrating these key components:

1. Service Workers:

   Service workers act as a proxy between the browser and the network, enabling background processes such as caching and offline capabilities.

   They allow the app to load even when there is no internet connection by storing static assets locally.

2. Web App Manifest:

   The manifest.json file provides metadata about the app, including its name, icons, theme color, and display mode.
   This file helps the browser recognize the app as installable and controls its behavior when launched.

3. HTTPS Hosting

   A secure environment is required for service workers and manifest to work.

   Always host your PWA over **HTTPS** to ensure integrity and security.

Key Features of a PWA:

Offline Availability: Allows users to access the app without an internet connection.

Fast Performance: Uses caching strategies to reduce loading time.

App-Like Interface: Can be installed on devices and launched in a standalone mode.

Secure & Reliable: Served over HTTPS to prevent data tampering.

Background Sync & Push Notifications: Keeps users engaged with real-time updates.

Steps to Make Your Web Application a PWA

Create a Web App Manifest File

Go to the root or public folder of your project.

Create a new file named manifest.json.

Add metadata such as the app name, icons, theme color, and display mode.

This file helps browsers recognize your app as installable and enables the Add to Home Screen feature.

Link the Manifest in HTML

Open your `index.html` file.

Add a `<link>` tag to reference the manifest.json file inside the `<head>` section.

Also, include a `<meta>` tag for the theme color.

This allows the browser to detect and use the manifest.

Register a Service Worker

Create a new file named service-worker.js in your project root.

Add code to cache static assets and handle fetch events.

Service workers enable offline functionality and caching strategies.

Add Service Worker Registration Script

Open your main JavaScript file (e.g., main.js or inside a <script> tag in `index.html`) .

Add the logic to register the service worker when the page loads.

This ensures the service worker gets activated and starts handling caching.

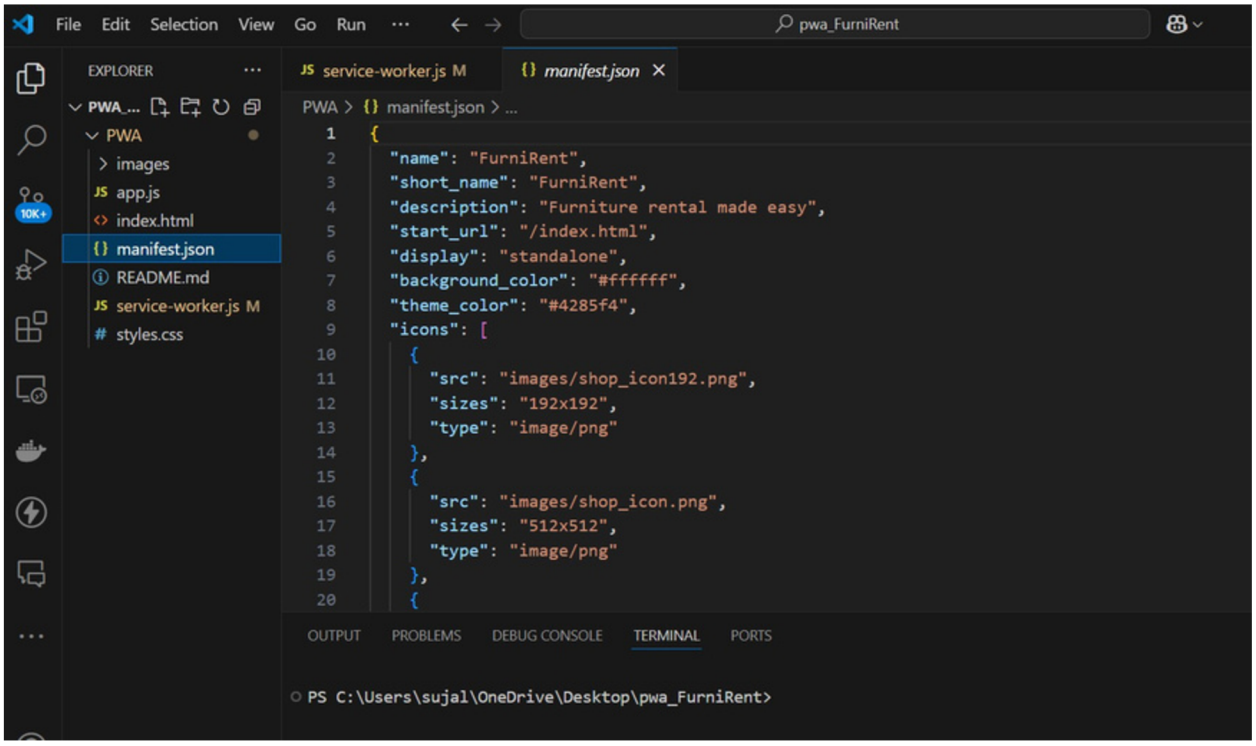
Serve Over HTTPS

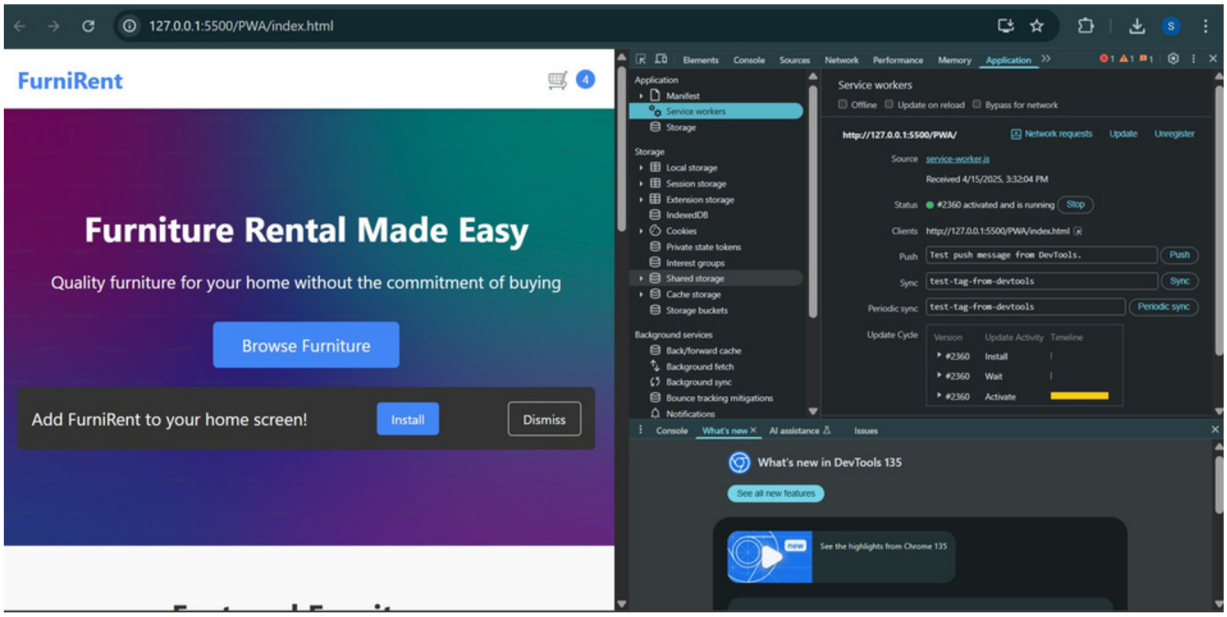
Host your web app using HTTPS to ensure security.

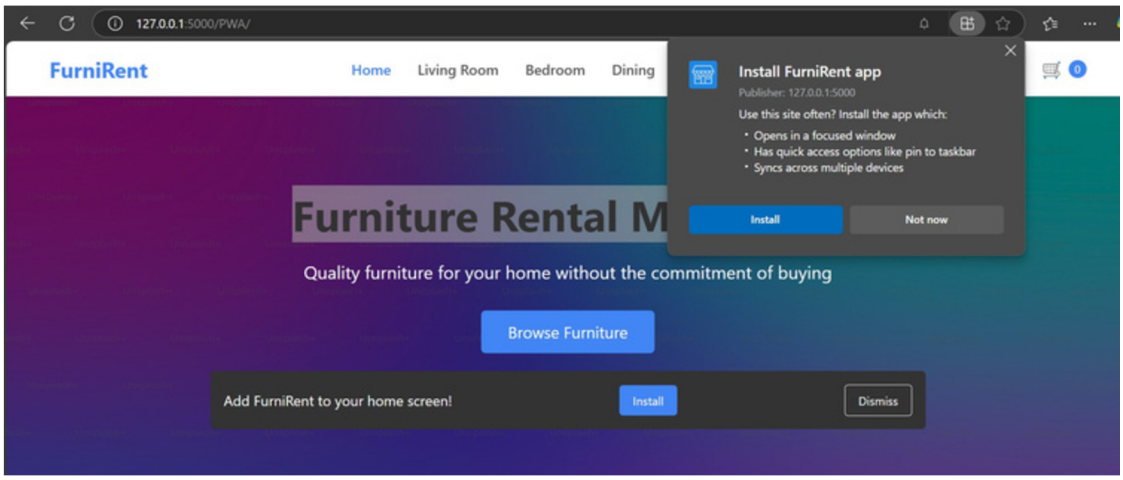
Platforms like Netlify, Vercel, or GitHub Pages provide free HTTPS support.

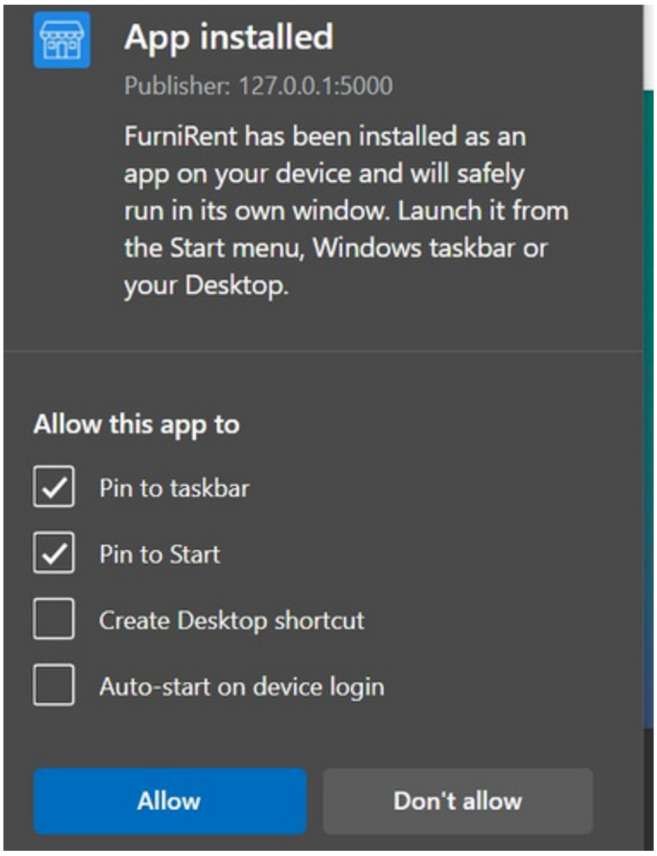
HTTPS is required for service workers and installability features.

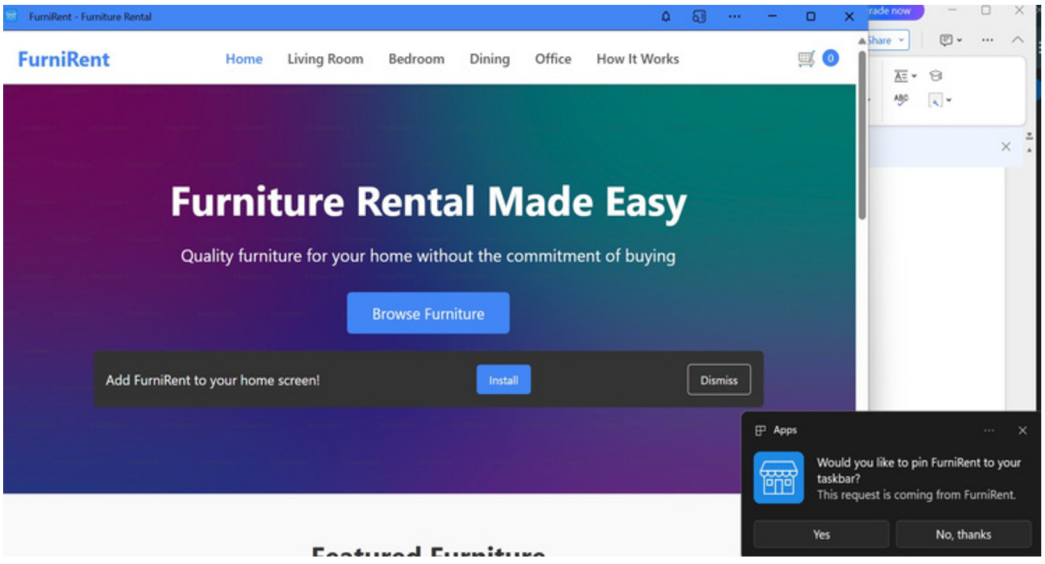
OUTPUT :




127.0.0.1:5500/PWA/index.html
FurniRent
Furniture Rental Made Easy
Quality furniture for your home without the commitment of buying
Browse Furniture
Add FurniRent to your home screen!
Install
Dismiss
Elements
Console
Sources
Network
Performance
Memory
Application
Service workers
Offline
Update on reload
Bypass for network
Storage
Local storage
Session storage
Extension storage
IndexedDB
Cookies
Private state tokens
Interest groups
Shared storage
Cache storage
Storage buckets
Background services
Back/forward cache
Background fetch
Background sync
Bounce tracking mitigations
Notifications
Manifest
Service workers
http://127.0.0.1:5500/PWA/
Network requests
Update
Unregister
Source
service-worker.js
Received 4/15/2025, 3:32:04 PM
Status
#2360 activated and is running
Stop
Clients
http://127.0.0.1:5500/PWA/index.html
Push
Test push message from DevTools.
Push
Sync
test-tag-from-devtools
Sync
Periodic sync
test-tag-from-devtools
Periodic sync
Update Cycle
Version
Update Activity
Timeline
#2360 Install
#2360 Wait
#2360 Activate
Console
What's new
AI assistance
Issues
What's new in DevTools 135
See all new features
new
See the highlights from Chrome 135


127.0.0.1:5000/PWA/
FurniRent
Home
Living Room
Bedroom
Dining
Install FurniRent app
Publisher: 127.0.0.1:5000
Use this site often? Install the app which:
• Opens in a focused window
• Has quick access options like pin to taskbar
• Syncs across multiple devices
Install
Not now
Furniture Rental M
Quality furniture for your home without the commitment of buying
Browse Furniture
Add FurniRent to your home screen!
Install
Dismiss





Conclusion:
By following these steps, we successfully converted our Vite React application into a Progressive Web App. This enables offline accessibility, caching for better performance, and an installable app experience on mobile and desktop devices. Implementing PWA features enhances user engagement and makes the app function seamlessly even in limited network conditions.

Name:Dhairyash Jain
Class: D15B
Roll No: 22

EXPERIMENT No. 8

Aim: To code and register a service worker, and complete the install and activation process for a new service worker for the E-commerce PWA.

Theory:

Service Worker
Service Worker is a script that works on browser background without user interaction independently. Also, It resembles a proxy that works on the user side. With this script, you can track network traffic of the page, manage push notifications and develop “offline first” web applications with Cache API.

Things to note about Service Worker:
- A service worker is a programmable network proxy that lets you control how network requests from your page are handled.
- Service workers only run over HTTPS. Because service workers can intercept network requests and modify responses, "man-in-the-middle" attacks could be very bad.
- The service worker becomes idle when not in use and restarts when it's next needed. You cannot rely on a global state persisting between events. If there is information that you need to persist and reuse across restarts, you can use IndexedDB databases.

What can we do with Service Workers?
- You can dominate Network Traffic

You can manage all network traffic of the page and do any manipulations. For example, when the page requests a CSS file, you can send plain text as a response or when the page requests an HTML file, you can send a png file as a response. You can also send a true response too.
- You can Cache

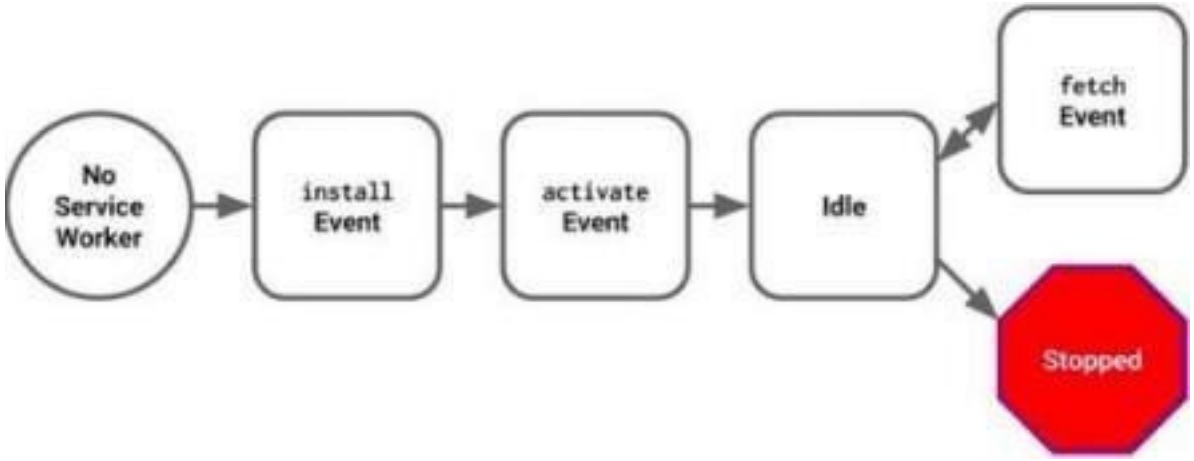
You can cache any request/response pair with Service Worker and Cache API and you can access these offline content anytime.
- You can manage Push Notifications

You can manage push notifications with Service Worker and show any information message to the user.
- You can Continue Although Internet connection is broken, you can start any process with Background Sync of Service Worker.

What can’t we do with Service Workers?
- You can’t access the Window

You can’t access the window, therefore, You can’t manipulate DOM elements. But, you can communicate to the window through post Message and manage processes that you want.
- You can’t work it on 80 Port

Service Worker just can work on HTTPS protocol. But you can work on localhost during development. Service Worker Cycle



A service worker goes through three steps in its life cycle:

- Registration
- Installation
- Activation

Registration

To install a service worker, you need to register it in your main JavaScript code. Registration tells the browser where your service worker is located, and to start installing it in the background. Let's look at an example: main.js if ('serviceWorker' in navigator) { navigator.serviceWorker.register('/service-worker.js') .then(function(registration) { console.log('Registration successful, scope is:', registration.scope); }) .catch(function(error) { console.log('Service worker registration failed, error:', error); }); } This code starts by checking for browser support by examining navigator.serviceWorker. The service worker is then registered with navigator.serviceWorker.register, which returns a promise that resolves when the service worker has been successfully registered. The scope of the service worker is then logged with registration.scope. If the service worker is already installed, navigator.serviceWorker.register returns the registration object of the currently active service worker. The scope of the service worker determines which files the service worker controls, in other words, from which path the service worker will intercept requests. The default scope is the location of the service worker file, and extends to all directories below. So if service-worker.js is located in the root directory, the service worker will control requests from all files at this domain. You can also set an arbitrary scope by passing in an additional parameter when registering. For example: main.js navigator.serviceWorker.register('/service-worker.js', { scope: '/app/'

}); In this case we are setting the scope of the service worker to /app/, which means the service worker will control requests from pages like /app/, /app/lower/ and /app/lower/lower, but not from pages like /app or /, which are higher. If you want the service worker to control higher pages e.g. /app (without the trailing slash) you can indeed change the scope option, but you'll also need to set the Service-Worker-Allowed HTTP Header in your server config for the request serving the service worker script. main.js navigator.serviceWorker.register('/app/service-worker.js', { scope: '/app' }); Installation Once the browser registers a service worker, installation can be attempted. This occurs if the service worker is considered to be new by the browser, either because the site currently doesn't have a registered service worker, or because there is a byte difference between the new service worker and the previously installed one. A service worker installation triggers an install event in the installing service worker. We can include an install event listener in the service worker to perform some task when the service worker installs. For instance, during the install, service workers can precache parts of a web app so that it loads instantly the next time a user opens it (see caching the application shell). So, after that first load, you're going to benefit from instant repeat loads and your time to interactivity is going to be even better in those cases. An example of an installation event listener looks like this: service-worker.js // Listen for install event, set callback self.addEventListener('install', function(event) { // Perform some task }); Activation Once a service worker has successfully installed, it transitions into the activation stage. If there are any open pages controlled by the previous service worker, the new service worker enters a waiting state. The new service worker only activates when there are no longer any pages loaded that are still using the old service worker. This ensures that only one version of the service worker is running at any given time. When the new service worker activates, an activate event is triggered in the activating service worker. This event listener is a good place to clean up outdated caches (see the Offline Cookbook for an example). service-worker.js self.addEventListener('activate', function(event) { // Perform some task }); Once activated, the service worker controls all pages that load within its scope, and starts listening for events from those pages. However, pages in your app that were loaded before the service worker activation will not be under service worker control. The new service worker will

only take over when you close and reopen your app, or if the service worker calls clients.claim(). Until then, requests from this page will not be intercepted by the new service worker. This is intentional as a way to ensure consistency in your site.

CODE :

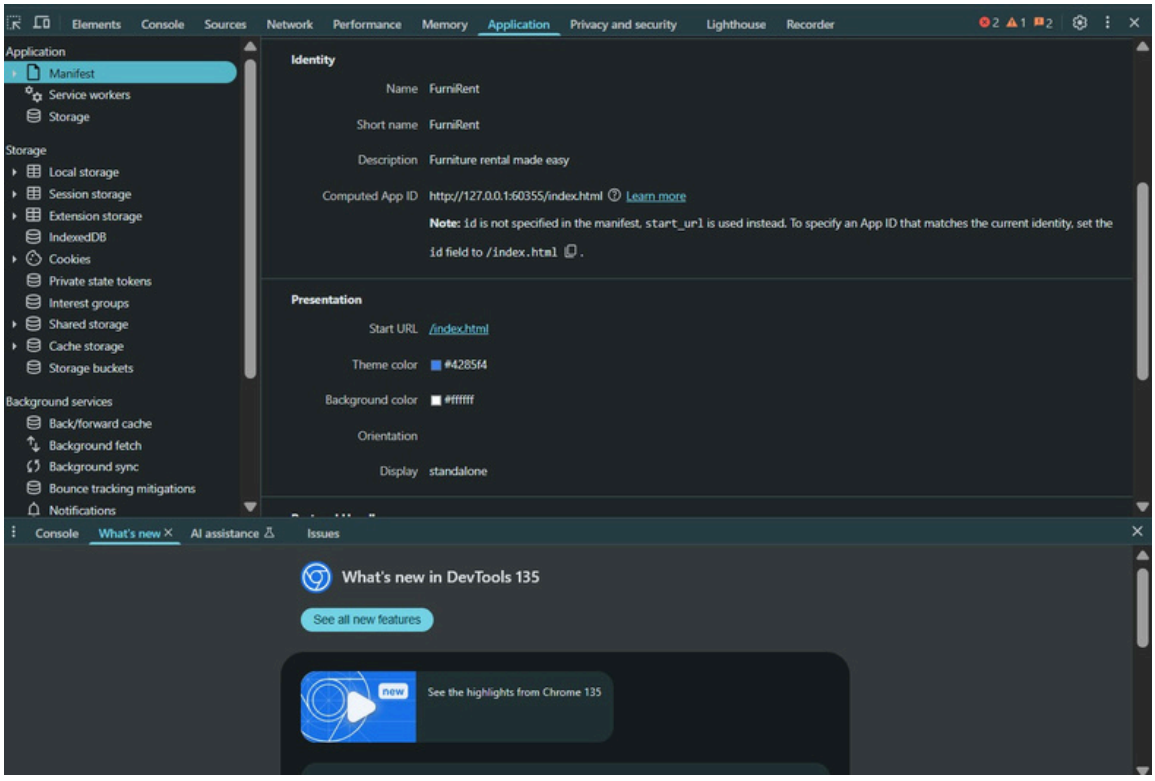
sw.js

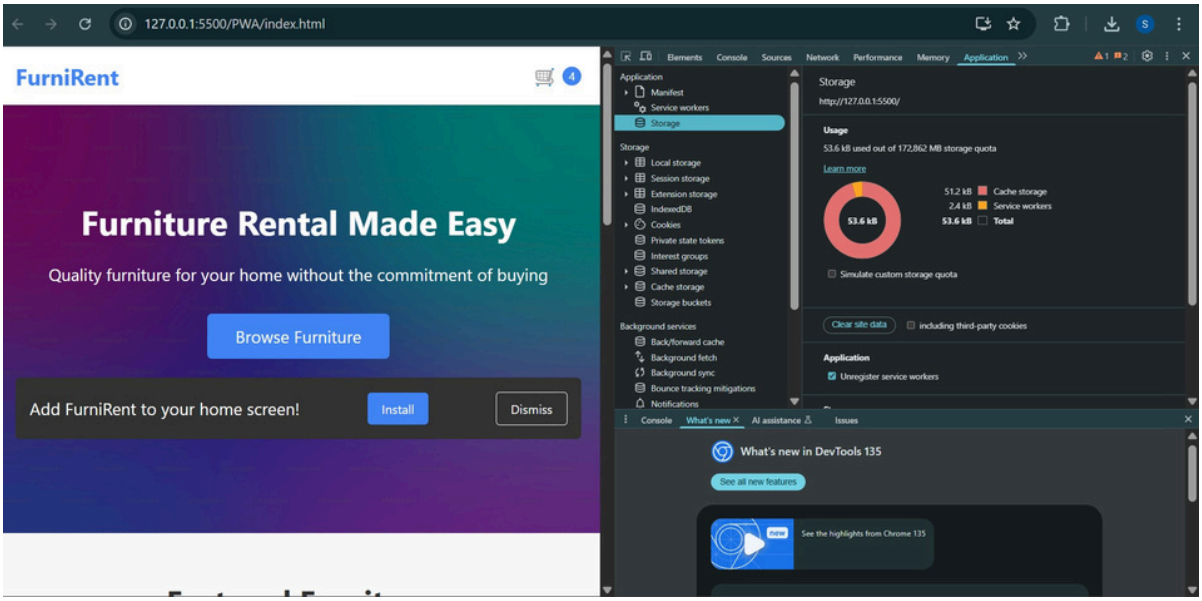
```
/**
 * Copyright 2018 Google Inc. All Rights Reserved.
 * Licensed under the Apache License, Version 2.0 (the "License");
 * you may not use this file except in compliance with the License.
 * You may obtain a copy of the License at
 *     http://www.apache.org/licenses/LICENSE-2.0
 * Unless required by applicable law or agreed to in writing, software
 * distributed under the License is distributed on an "AS IS" BASIS,
 * WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either express or implied.
 * See the License for the specific language governing permissions and
 * limitations under the License.
 */

// If the loader is already loaded, just stop.
if (!self.define) {
  let registry = {};

  // Used for `eval` and `importScripts` where we can't get script URL by other means.
  // In both cases, it's safe to use a global var because those functions are synchronous.
  let nextDefineUri;

  const singleRequire = (uri, parentUri) => {
  uri = new URL(uri + ".js", parentUri).href;
  return registry[uri] || (

        new Promise(resolve => {
          if ("document" in self) {
            const script = document.createElement("script");
            script.src = uri;
            script.onload = resolve;
            document.head.appendChild(script);
          } else {
            nextDefineUri = uri;
            importScripts(uri);
            resolve();
          }
        })
```

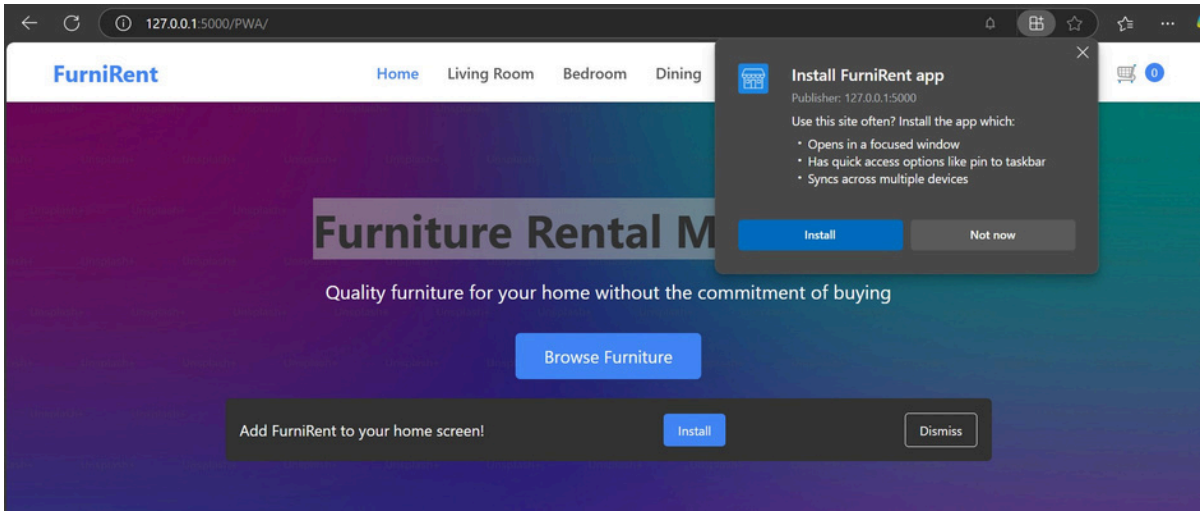
```
      .then(() => {
        let promise = registry[uri];
        if (!promise) {
          throw new Error(`Module ${uri} didn't register its module`);
        }
        return promise;
      })
    );
  };

  self.define = (depsNames, factory) => {
    const uri = nextDefineUri || ("document" in self ? document.currentScript.src : "") ||
location.href;
    if (registry[uri]) {
      // Module is already loading or loaded.
      return;
    }
    let exports = {};
    const require = depUri => singleRequire(depUri, uri);
    const specialDeps = {
      module: { uri },
      exports,
      require
    };
    registry[uri] = Promise.all(depsNames.map(
      depName => specialDeps[depName] || require(depName)
    )).then(deps  =>  {
    factory(...deps);
    return exports;
    });
  };
}
define(['./workbox-d9a5ed57'], (function (workbox) { 'use strict';

  self.skipWaiting();
  workbox.clientsClaim();

  /**
   * The precacheAndRoute() method efficiently caches and responds to
   * requests for URLs in the manifest.
   * See https://goo.gl/S9QRab
   */
  workbox.precacheAndRoute([{
  "url": "registerSW.js",
```

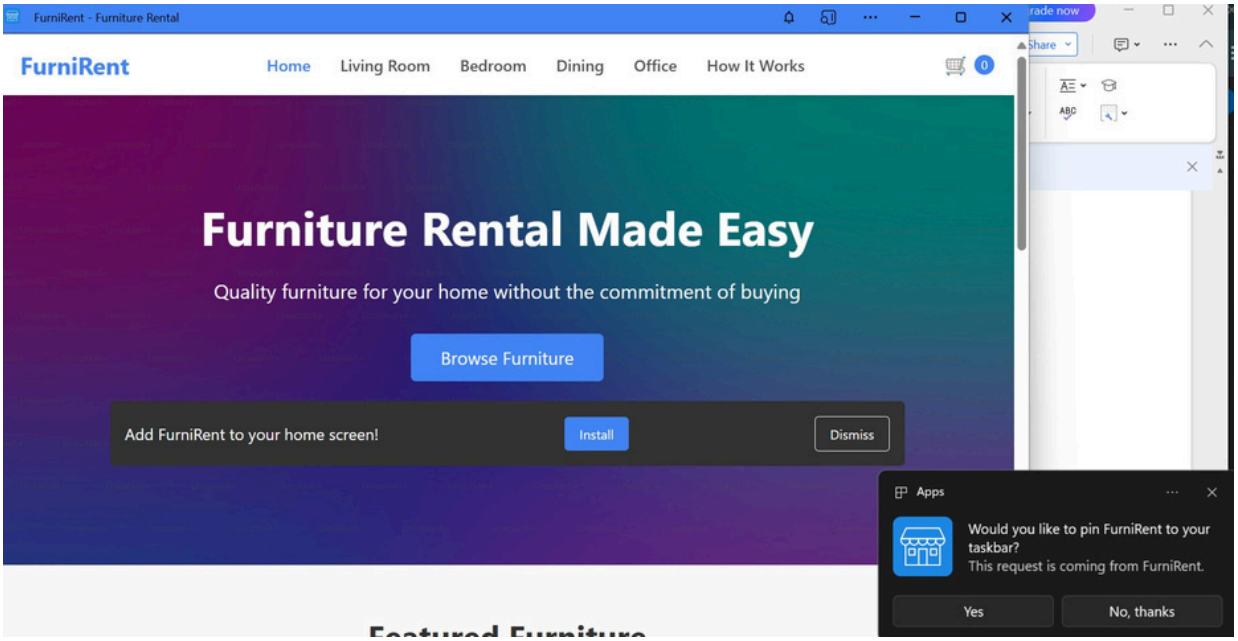
```
    "revision": "3ca0b8505b4bec776b69afdba2768812"
  }, {
    "url": "index.html",
    "revision": "0.7e7jl0981k"
  }], {});
  workbox.cleanupOutdatedCaches();
  workbox.registerRoute(new
workbox.NavigationRoute(workbox.createHandlerBoundToURL("index.html"), {
    allowlist: [/^\/$/]
  }));
  workbox.registerRoute(/\.(?:png|jpg|jpeg|svg)$/, new workbox.CacheFirst({
    "cacheName": "images-cache",
    plugins: [new workbox.ExpirationPlugin({
      maxEntries: 50,
      maxAgeSeconds: 2592000
    })]
  }), 'GET');

}));
```

OUTPUT :




127.0.0.1:5500/PWA/index.html
FurniRent
Furniture Rental Made Easy
Quality furniture for your home without the commitment of buying
Browse Furniture
Add FurniRent to your home screen!
Install
Dismiss
Elements
Console
Sources
Network
Performance
Memory
Application
Storage
Usage
Learn more
Clear site data
Application
Unregister service workers
What's new in DevTools 135
See all new features
See the highlights from Chrome 135


127.0.0.1:5000/PWA/
FurniRent
Home
Living Room
Bedroom
Dining
Install FurniRent app
Publisher: 127.0.0.1:5000
Use this site often? Install the app which:
• Opens in a focused window
• Has quick access options like pin to taskbar
• Syncs across multiple devices
Install
Not now
Furniture Rental M
Quality furniture for your home without the commitment of buying
Browse Furniture
Add FurniRent to your home screen!
Install
Dismiss



CONCLUSION :

Service workers are essential for PWAs, enabling offline access, caching, and efficient network request handling. In this implementation, the service worker is registered, installed, and activated using **Workbox**, ensuring seamless updates and improved performance. By precaching assets and using runtime caching strategies, it enhances page load speed, reduces server load, and allows access to content even without an internet connection. This makes the e-commerce PWA more reliable, responsive, and user-friendly.

Name:Dhairyash Jain
Class: D15B
Roll No: 22

EXPERIMENT No. 9

Implementing Service Worker Events (Fetch, Sync, Push) for E-Commerce PWA

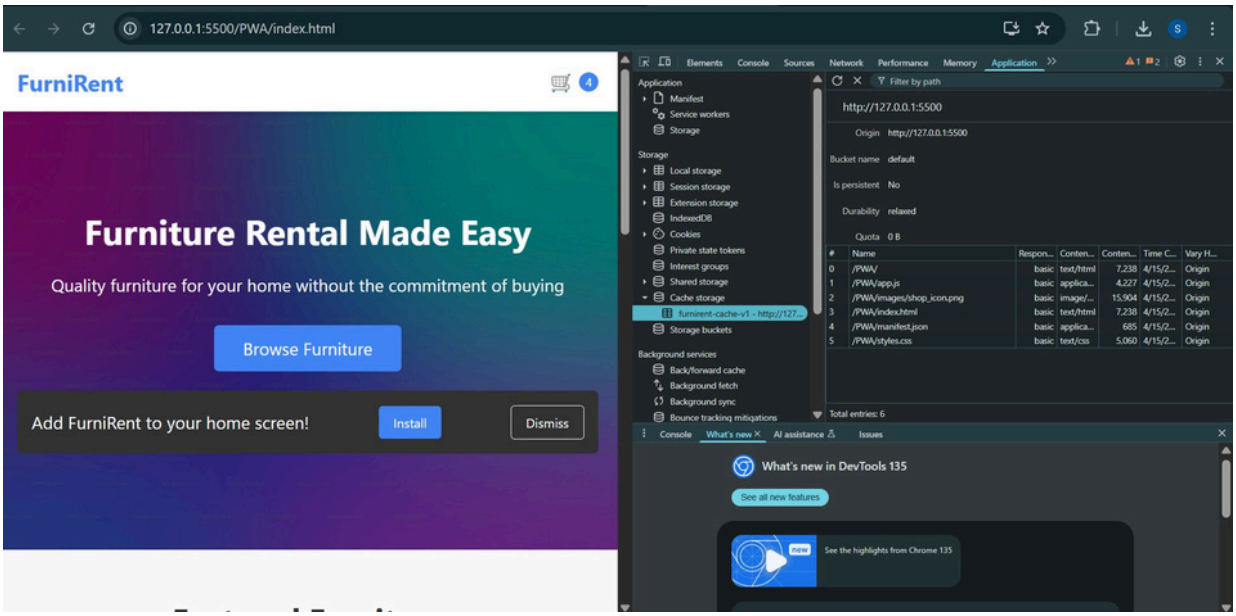
Progressive Web Apps (PWAs) are web applications that offer app-like experiences through modern web capabilities. One of the key components of a PWA is the service worker, which enables features like offline access, background sync, and push notifications. In this document, we will explore how to implement service worker events such as fetch, sync, and push in the context of an e-commerce application. Below is a sample implementation.

---

1. Caching Static Assets Using Install Event

The install event is triggered when the service worker is installed. During this phase, essential files are cached to enable offline access.

```
const CACHE_NAME = "campquest-v1";
const ASSETS_TO_CACHE = [
  "/",
  "/index.html",
  "/src/main.jsx",
  "/CampQuest.svg",
  "/manifest.json",
];

self.addEventListener("install", (event) => {
  event.waitUntil(
  caches.open(CACHE_NAME).then((cache) => {
     return cache.addAll(ASSETS_TO_CACHE);
   })
  );
});
```



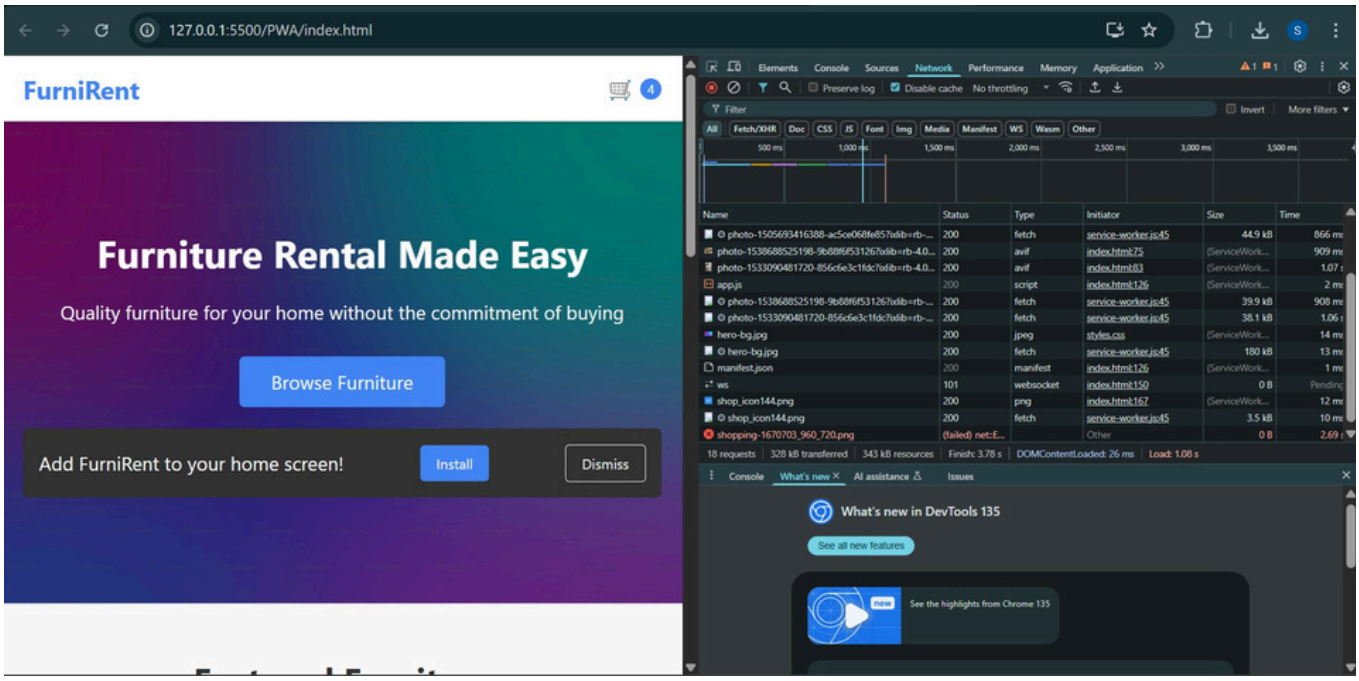
---

2. Handling Fetch Requests

The fetch event intercepts network requests. We use this event to implement a cache-first or network-first strategy depending on the URL path.

```
self.addEventListener("fetch", (event) => {
const url = new URL(event.request.url);
if (url.pathname.startsWith("/campgrounds")) {

  event.respondWith(
    fetch(event.request)
      .then((response) => {
        const responseClone = response.clone();
        caches.open(CACHE_NAME).then((cache) => {
        cache.put(event.request, responseClone);
        });
        return response;
      })
      .catch(() => {
        return caches.match(event.request);
      })
  );
```

```
  } else {
    event.respondWith(
      caches.match(event.request).then((response) => {
        return response || fetch(event.request);
      })
    );
  }
});
```



3. Background Sync (Conceptual Example)

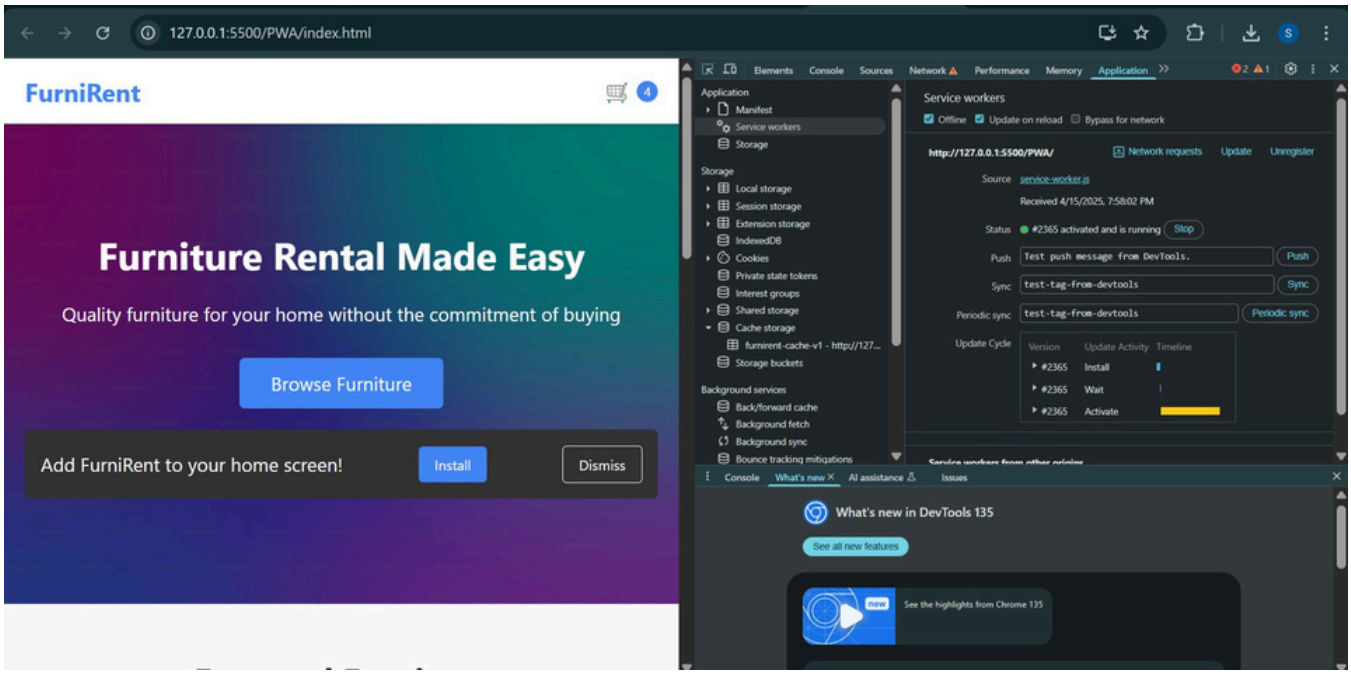
The sync event is used to defer actions until the user has stable connectivity. For an e-commerce app, you could use this to sync cart data or orders.

```
self.addEventListener("sync", (event) => {
  if (event.tag === "sync-cart") {
  event.waitUntil(
    // Logic to sync cart data with server
  );
  }
});
```

4. Push Notifications (Conceptual Example)

The push event is triggered when a push message is received. This could be used to notify users of new deals or order status updates.

```
self.addEventListener("push", (event) => {

  const data = event.data.json();
  const options = {
    body: data.body,
    icon: "/icon.png",
  };
  event.waitUntil(
    self.registration.showNotification(data.title, options)
  );
});
```



Conclusion

Service workers are powerful tools in building resilient and engaging e-commerce PWAs. By handling install, fetch, sync, and push events effectively, you can create a seamless experience for users, even in offline or low-connectivity scenarios.

Name:Dhairyash Jain

Class: D15B

Roll No: 22

EXPERIMENT No. 10

GitHub Pages Documentation

Introduction

GitHub Pages is a free web hosting service provided by GitHub that allows you to host static websites directly from a GitHub repository. It's perfect for portfolios, documentation, project pages, or any static content.

This guide will walk you through the process of setting up and publishing your website using GitHub Pages.

Prerequisites

- A GitHub account
- A repository containing your static website (HTML, CSS, JS)
- Basic knowledge of Git and GitHub

Steps to Deploy Your Website with GitHub Pages

Step 1: Create or Use an Existing Repository

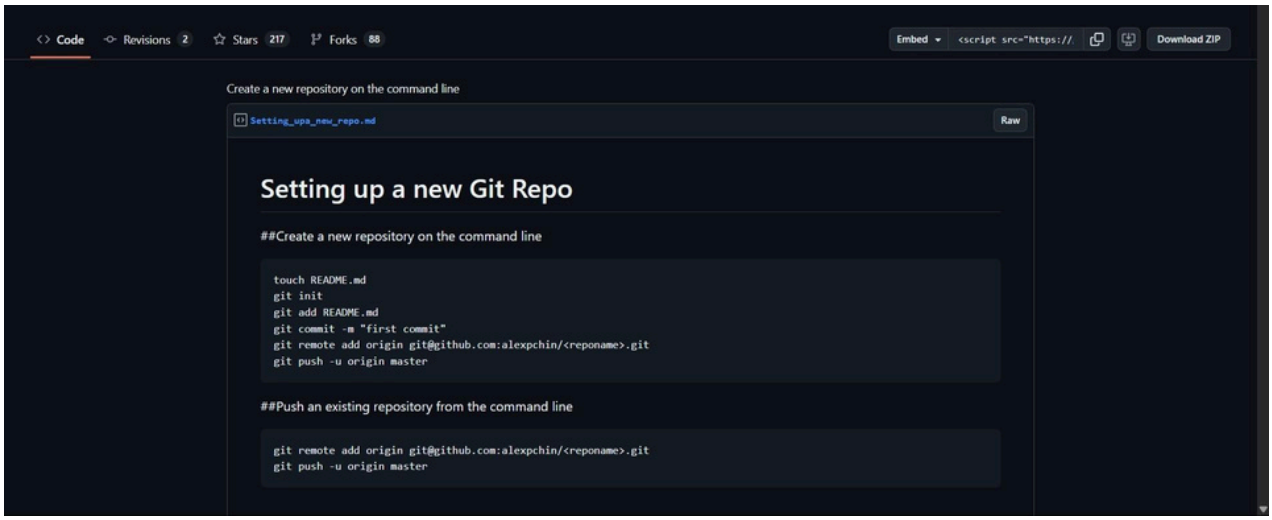
If you don't have a repository yet, create one:

1. Go to github.com

2. Click on **New repository**

3. Name your repository (e.g., `my-portfolio`)

4. Initialize it with a README (optional)

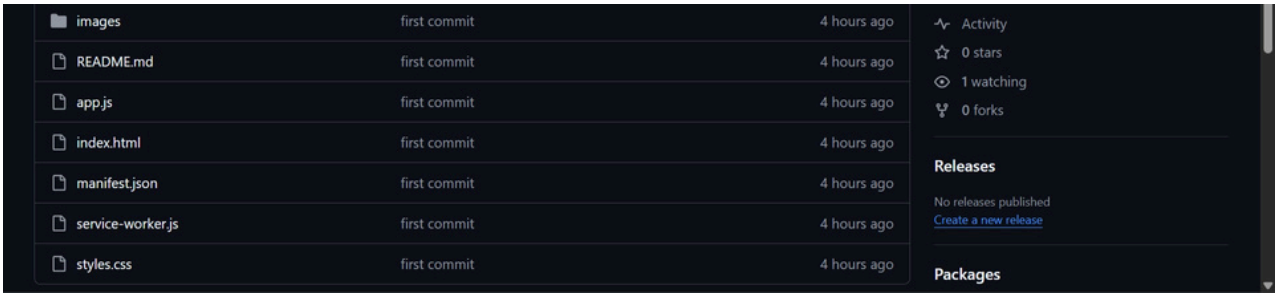


Step 2: Upload Your Website Files

Make sure your repository contains the files you want to publish, such as index.html.

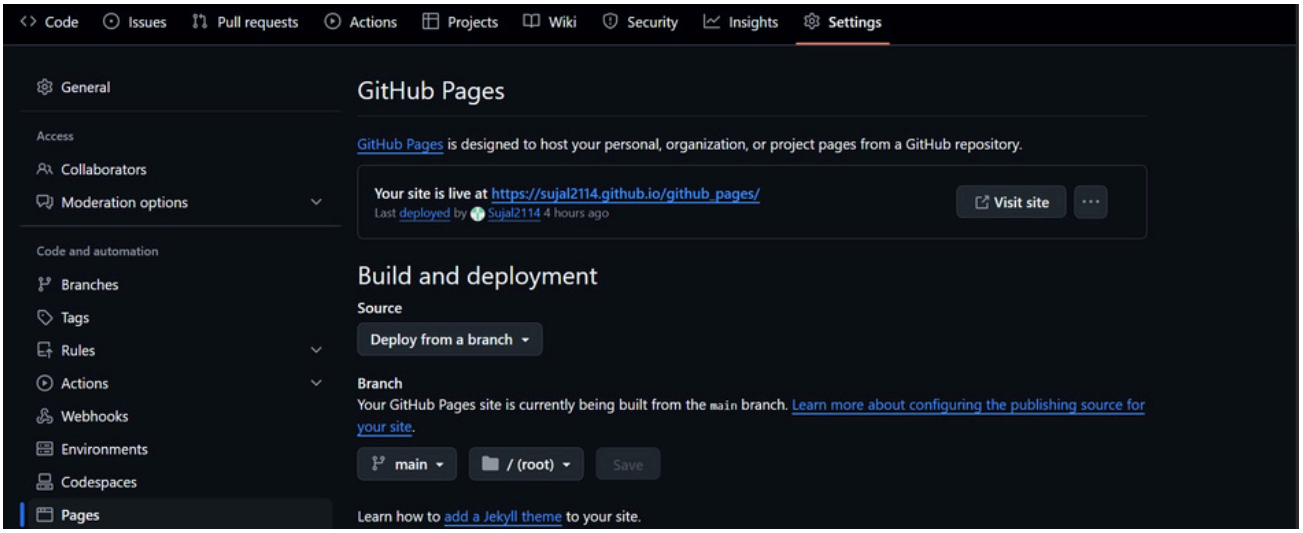
You can either:

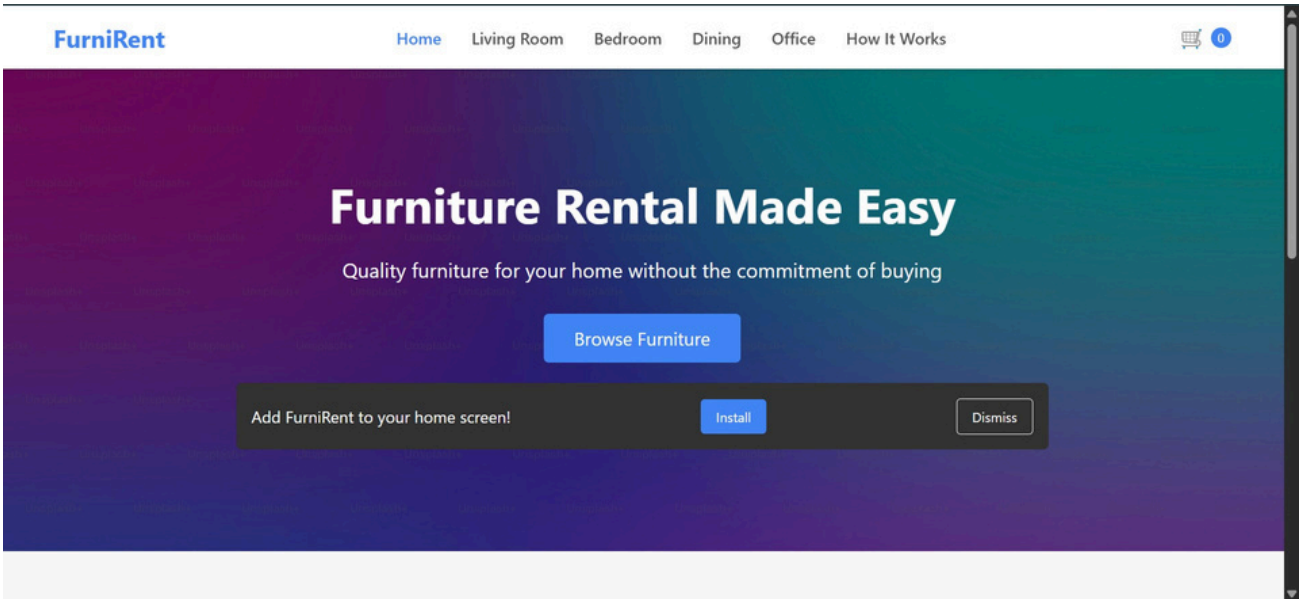
- Drag and drop files on the web interface
- Use Git commands (git add, git commit, git push) from your local machine



Step 3: Enable GitHub Pages

1. Go to your repository
2. Click on the **Settings** tab
3. Scroll down to **Pages** in the left menu
4. Under **Source**, select the branch (usually `main`) and folder (e.g., `/root` or `/docs`)
5. Click **Save**


Code
Issues
Pull requests
Actions
Projects
Wiki
Security
Insights
Settings
General
Access
Collaborators
Moderation options
Code and automation
Branches
Tags
Rules
Actions
Webhooks
Environments
Codespaces
Pages
GitHub Pages
GitHub Pages is designed to host your personal, organization, or project pages from a GitHub repository.
Your site is live at https://sujal2114.github.io/github_pages/
Last deployed by Sujal2114 4 hours ago
Visit site
Build and deployment
Source
Deploy from a branch
Branch
Your GitHub Pages site is currently being built from the main branch. Learn more about configuring the publishing source for your site.
main
/ (root)
Save
Learn how to add a Jekyll theme to your site.



Tips

- Your homepage must be named index.html
- You can use a custom domain by configuring the **Custom domain** section under GitHub Pages settings
- Use relative paths for assets to avoid 404 errors

Conclusion

GitHub Pages provides an easy, fast, and free way to publish static websites directly from your GitHub repo. Whether you're showcasing a project or building a personal site, it's a powerful tool in your web development journey.

Name:Dhairyash Jain

Class: D15B

Roll No: 22

EXPERIMENT No. 11

Google Lighthouse Extension Documentation

What is Lighthouse?

Lighthouse is an open-source tool developed by Google to audit web pages for performance, accessibility, SEO, best practices, and Progressive Web App (PWA) compatibility. It helps developers improve the quality of their websites.

Lighthouse can be accessed:

- As a **Chrome DevTools tab** (built-in)
- As a **Chrome extension**
- From the command line (lighthouse)
- In **PageSpeed Insights**

Why Use Lighthouse?

Lighthouse is commonly used to:

- Evaluate page **performance** (loading speed, render times)
- Improve **accessibility** (for users with disabilities)
- Follow **SEO best practices**

- Detect **common coding issues**
- Ensure PWA compliance (if applicable)

How to Use Lighthouse in Chrome Inspect Element

Step-by-step Guide

1. Open Your Website in Chrome

Go to the webpage you want to audit.

📸 **Insert Screenshot of your site opened in Chrome**

---

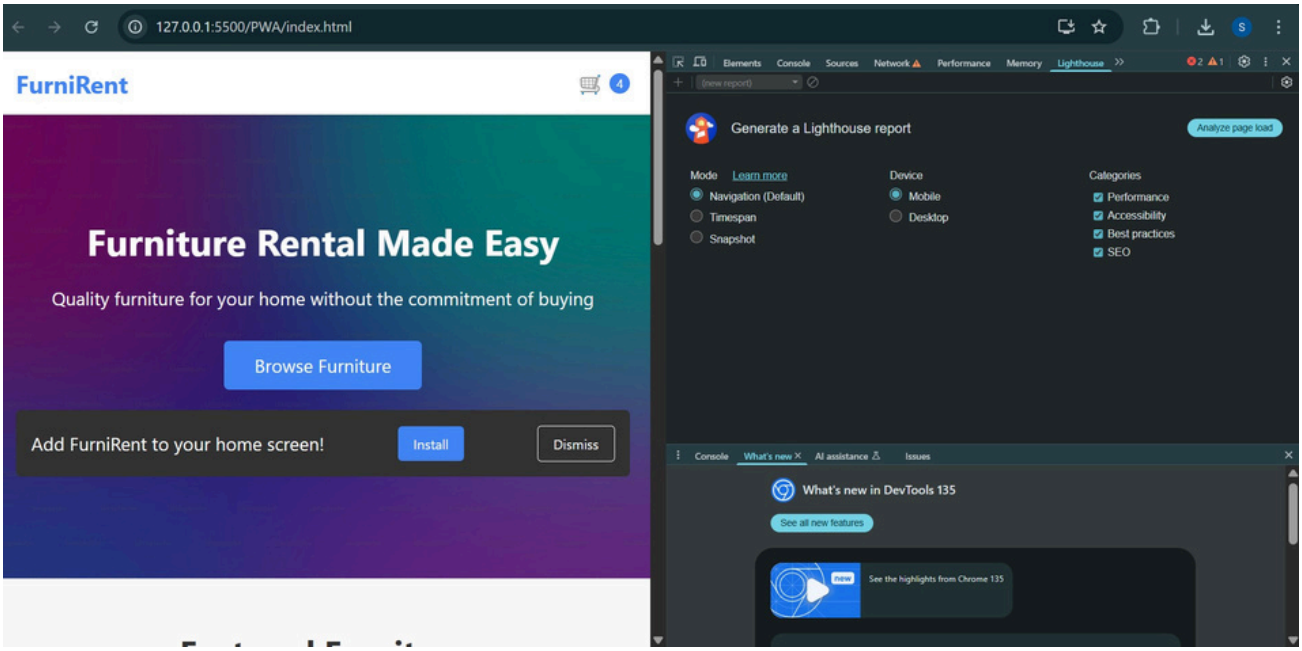
2. Open Chrome DevTools

- Right-click anywhere on the page → click **Inspect**, OR
- Press `Ctrl + Shift + I` (Windows) or `Cmd + Option + I` (Mac)

---

3. Configure Lighthouse Audit

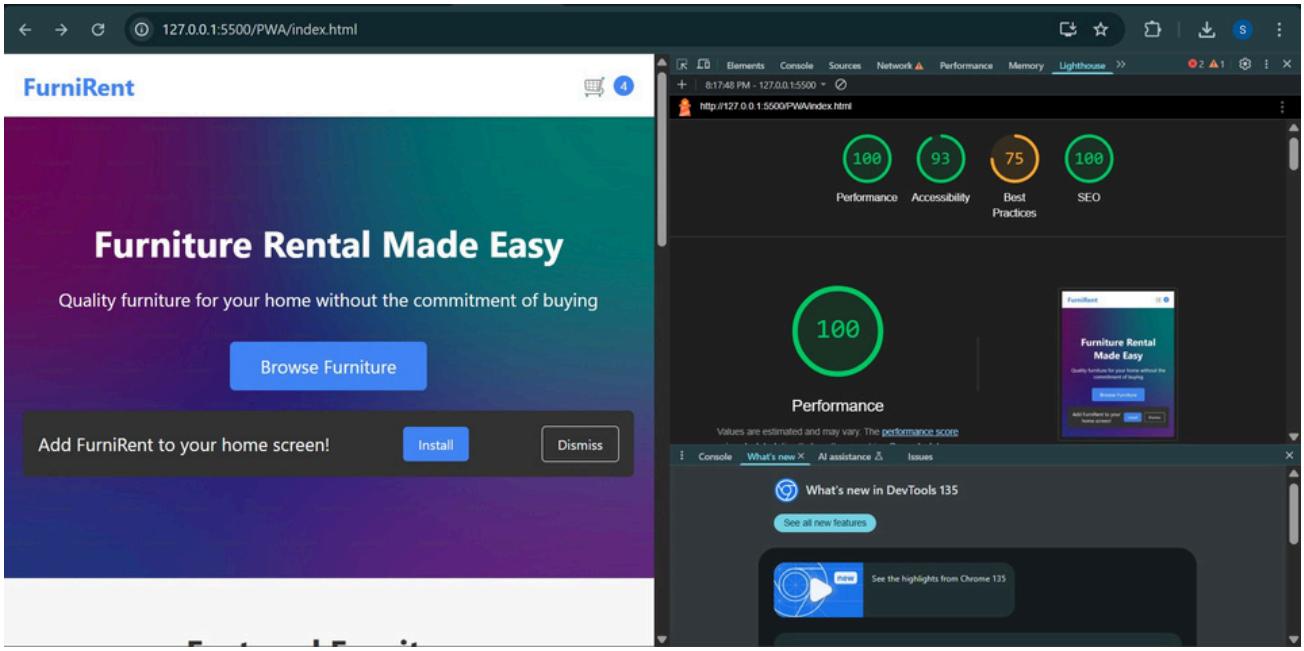
- Choose device type: **Mobile** or **Desktop**
- Select categories: Performance, Accessibility, Best Practices, SEO, PWA
- Click **Analyze page load**



---

4. View the Report

Lighthouse will run its audit and generate a score report in a few seconds.



Understanding the Scores

Metric	Description
Performance	Measures speed, loading time, and responsiveness
Accessibility	Checks usability for assistive technologies (screen readers, etc.)
Best Practices	Analyzes common coding issues, HTTPS, errors
SEO	Reviews metadata, alt tags, and other ranking factors
PWA	Tests service workers, offline mode, installability (if PWA is present)

Conclusion

Lighthouse is an essential tool for modern web developers. It provides a comprehensive report on your website's strengths and weaknesses, helping you optimize user experience and site performance with actionable insights.

Start using it regularly during development to catch issues early and ship high-quality web apps 🚀