CSI3007 - ADVANCED PYTHON PROGRAMMING
LAB ACTIVITY – 22
Flutter Mobile App Deployment: Converting Web Game to APK

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Goal: The process of converting a web-based game that was previously served by a Flask backend into a standalone, native Android application using the Flutter webview_flutter package and local asset loading.

It is to shift from relying on an external, live web server (like Render) to bundling all game files directly inside the APK, ensuring the game works offline.

Project Overview

Title – DOTS AND BOXES GAME

Aim: Dots and Boxes is a two-player game where players take turns drawing a line between two adjacent dots on a grid. The player who draws the fourth side of a small square (a "box") claims it by marking it with their initial or by coloring it in, and then takes another turn. The game ends when all boxes are completed, and the player with the most boxes wins.

Project Structure:

DOTSANDBOXESGAME

├── app.py   # Flask backend server

└── dots_and_boxes_app/   # Flutter frontend application

   ├── assets/   # Game assets and web resources

   ├── lib/   # Flutter application code

   ├── test/   # Test files

   └── pubspec.yaml   # Flutter dependencies

Github Link for Project: https://github.com/SonaliRajaram/Dots-And-Boxes-Game

Setup: Flutter Project Configuration

- Install flutter: https://docs.flutter.dev/install/manual
- Installation Verification:

```
Microsoft Windows [Version 10.0.26200.7019]
(c) Microsoft Corporation. All rights reserved.

C:\Users\sonal>flutter --version
Building flutter tool...
Running pub upgrade...
Resolving dependencies... (9.2s)
Downloading packages... (34.2s)
Got dependencies.
Flutter 3.35.7 • channel stable • https://github.com/flutter/flutter.git
Framework • revision adc9010625 (2 weeks ago) • 2025-10-21 14:16:03 -0400
Engine • hash 6b24e1b529bc46df7ff397667502719a2a8b6b72 (revision 035316565a) (15 days ago) • 2025-10-21 14:28:01.000Z
Tools • Dart 3.9.2 • DevTools 2.48.0

C:\Users\sonal>
```

- Create Flutter Project

```
PS C:\Users\sonal\OneDrive\Desktop\DotsAndBoxes> flutter create dots_and_boxes_app
Creating project dots_and_boxes_app...
Resolving dependencies in `dots_and_boxes_app`... (4.7s)
Downloading packages...
Got dependencies in `dots_and_boxes_app`.
Wrote 130 files.

All done!
You can find general documentation for Flutter at: https://docs.flutter.dev/
Detailed API documentation is available at: https://api.flutter.dev/
If you prefer video documentation, consider: https://www.youtube.com/c/flutterdev

In order to run your application, type:

  $ cd dots_and_boxes_app
  $ flutter run

Your application code is in dots_and_boxes_app\lib\main.dart.

PS C:\Users\sonal\OneDrive\Desktop\DotsAndBoxes> 
```

- Web App: Flask (app.py) served the game.
- Mobile App (main.dart):
  Used WebViewController().loadRequest(Uri.parse('https://dots-and-boxes-app-latest.onrender.com/')).

dots_and_boxes_app/lib/main.dart

import 'package:flutter/material.dart';

import 'package:webview_flutter/webview_flutter.dart';

void main() {

 WidgetsFlutterBinding.ensureInitialized();

 runApp(const DotsAndBoxesApp());

}

```dart
class DotsAndBoxesApp extends StatefulWidget {
  const DotsAndBoxesApp({super.key});

  @override
  State<DotsAndBoxesApp> createState() => _DotsAndBoxesAppState();
}

class _DotsAndBoxesAppState extends State<DotsAndBoxesApp> {
  late final WebViewController _controller;

  @override
  void initState() {
    super.initState();

    // Create a controller for the WebView
    _controller = WebViewController()
      ..setJavaScriptMode(JavaScriptMode.unrestricted);

    _controller.loadFlutterAsset('assets/index.html');
  }

  @override
  Widget build(BuildContext context) {
    return MaterialApp(
      debugShowCheckedModeBanner: false,
      title: 'Dots and Boxes',
      home: Scaffold(
        appBar: AppBar(title: const Text('Dots and Boxes')),
        body: SafeArea(
          child: WebViewWidget(controller: _controller),
```

```
      ),
     ),
   );
  }
}
```

- Add Dependencies and Assets in **pubspec.yaml**

dependencies:

  flutter:

    sdk: flutter

 # 1. ADD THE WEBVIEW PACKAGE

 webview_flutter: ^4.7.0 # Use the latest stable version

flutter:

 uses-material-design: true

 # 2. DECLARE THE ASSETS FOLDER

 assets:

  - assets/

- Clean Build Cache: Run flutter clean. (If this fails, restart your computer to release all persistent file locks).
- Run Pub Get

```
PS C:\Users\sonal\OneDrive\Desktop\DotsAndBoxes\dots_and_boxes_app> flutter pub get
Resolving dependencies...
Downloading packages...
  characters 1.4.0 (1.4.1 available)
  flutter_lints 5.0.0 (6.0.0 available)
  lints 5.1.1 (6.0.0 available)
  material_color_utilities 0.11.1 (0.13.0 available)
  meta 1.16.0 (1.17.0 available)
  test_api 0.7.6 (0.7.7 available)
Got dependencies!
6 packages have newer versions incompatible with dependency constraints.
Try `flutter pub outdated` for more information.
PS C:\Users\sonal\OneDrive\Desktop\DotsAndBoxes\dots_and_boxes_app>
```

- Final APK Build

```
PS C:\DotsAndBoxesGame\dots_and_boxes_app> flutter pub get
Resolving dependencies...
Downloading packages...
  characters 1.4.0 (1.4.1 available)
  flutter_lints 5.0.0 (6.0.0 available)
  lints 5.1.1 (6.0.0 available)
  material_color_utilities 0.11.1 (0.13.0 available)
  meta 1.16.0 (1.17.0 available)
  test_api 0.7.6 (0.7.7 available)
Got dependencies!
6 packages have newer versions incompatible with dependency constraints.
Try `flutter pub outdated` for more information.
PS C:\DotsAndBoxesGame\dots_and_boxes_app> flutter build apk --release
Font asset "MaterialIcons-Regular.otf" was tree-shaken, reducing it from 1645184 to 1312 bytes (99.9% reduction). Tree-sha
king can be disabled by providing the --no-tree-shake-icons flag when building your app.
Running Gradle task 'assembleRelease'...                        264.0s
√ Built build\app\outputs\flutter-apk\app-release.apk (39.9MB)
PS C:\DotsAndBoxesGame\dots_and_boxes_app> []
```
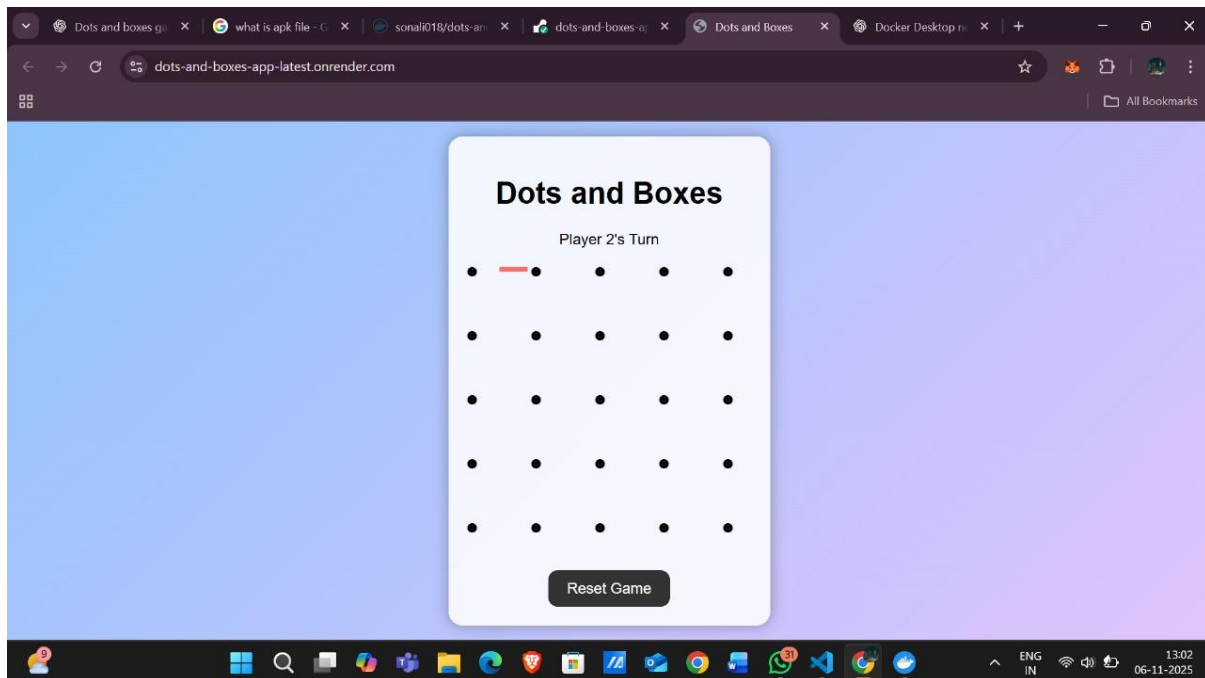
- Locating the Final APK: Upon successful completion, game's self-contained APK file will be located here:
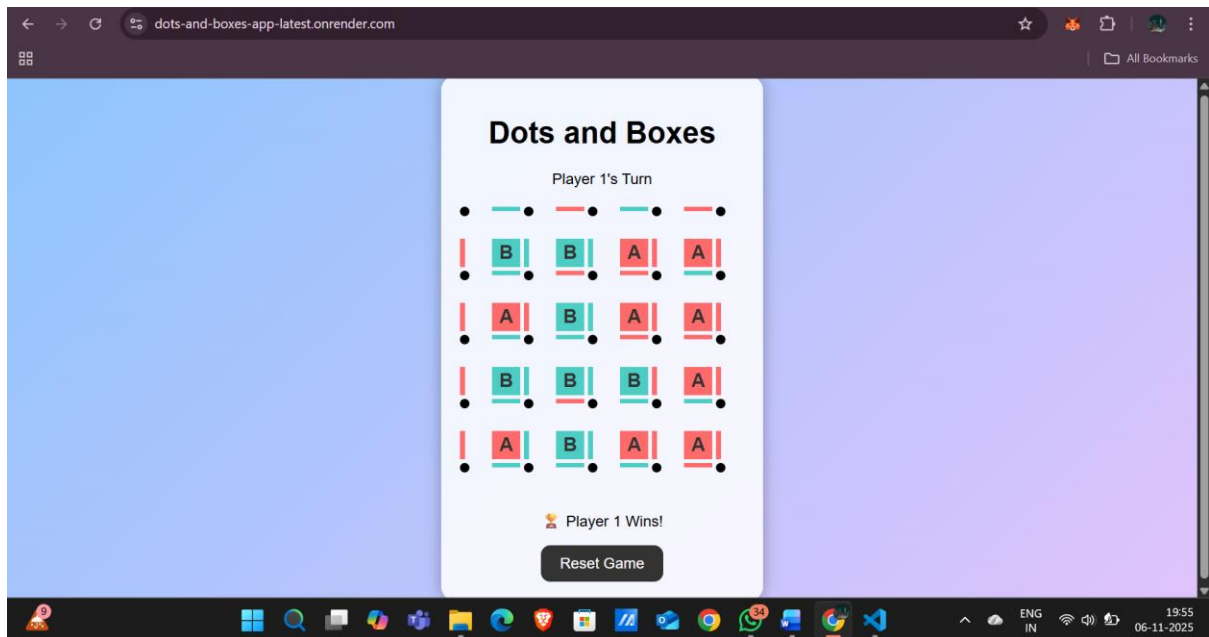
dots_and_boxes_app\build\app\outputs\flutter-apk\app-release.apk

Final Outcome

public URL: https://dots-and-boxes-app-latest.onrender.com/

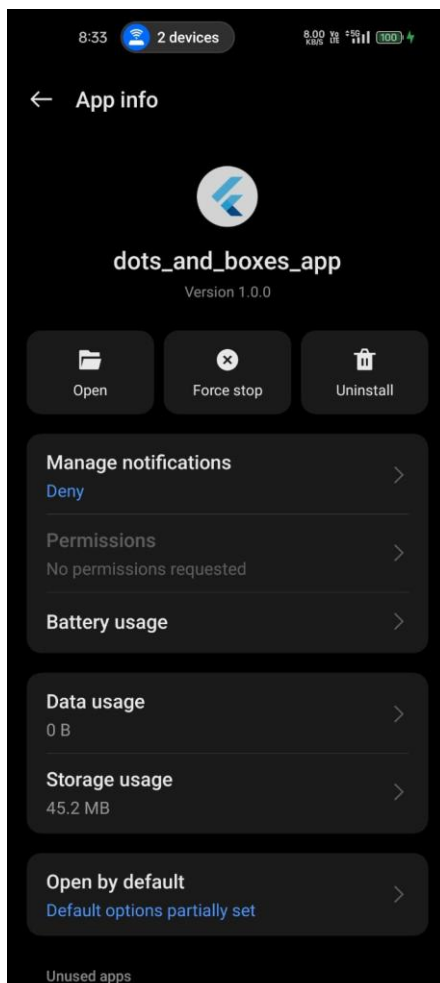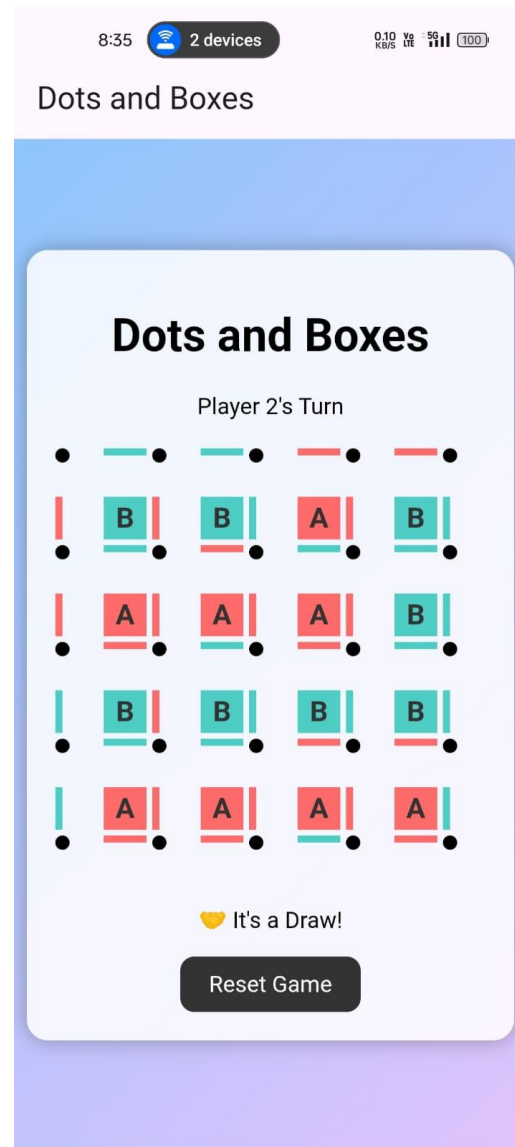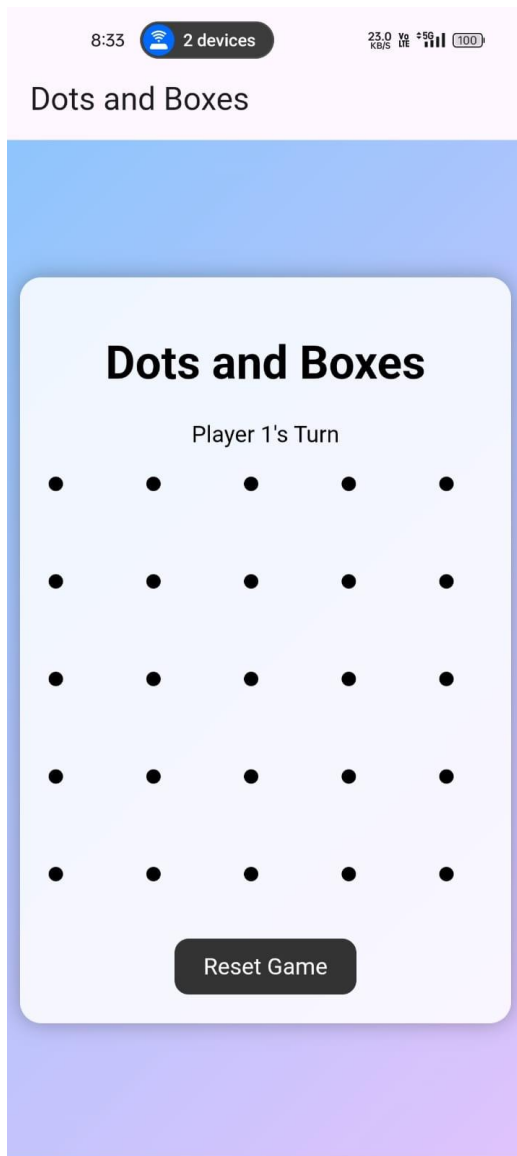**Dots and Boxes Game snapshots: (Web Service)**

APK file:

https://drive.google.com/file/d/114KSTSqBziJY1kWX_KpvdV7IkRbPbXbg/view?usp=sharing

Snapshots of Mobile App:

Conclusion

The deployment process successfully transitioned the Dots and Boxes game from a remote web application, dependent on your Render server and a persistent internet connection, into a fully self-contained Android APK. By utilizing the Flutter Assets system and the WebViewController.loadFlutterAsset() method, we have effectively bundled the compiled codes into a single, cohesive mobile application package. This ensures stability, reliability, and full control over the user experience.

Benefits of the Self-Contained APK (app-release.apk)

- Offline Access - The game works perfectly without an internet connection.
- Performance - Instant Load and Assets are loaded directly from the device's storage.
- Content Control - Guaranteed Version and The game version inside the APK is fixed and cannot be accidentally changed by a web deployment error.
- Stability High - Immune to network downtime, server failures, or URL changes.

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