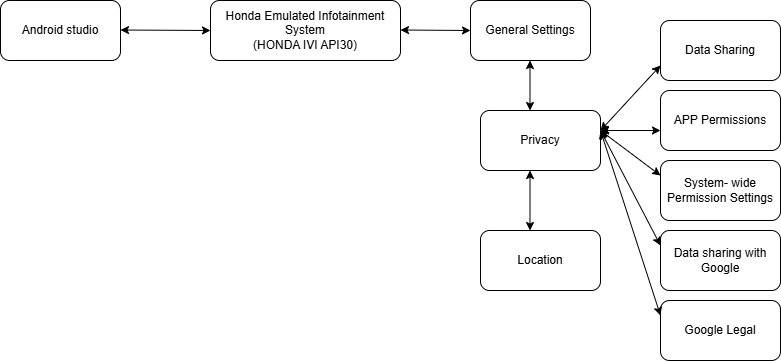
**Identifying Potential Vulnerabilities in a generic Android based Infotainment Systems Emulated within Android Studio**

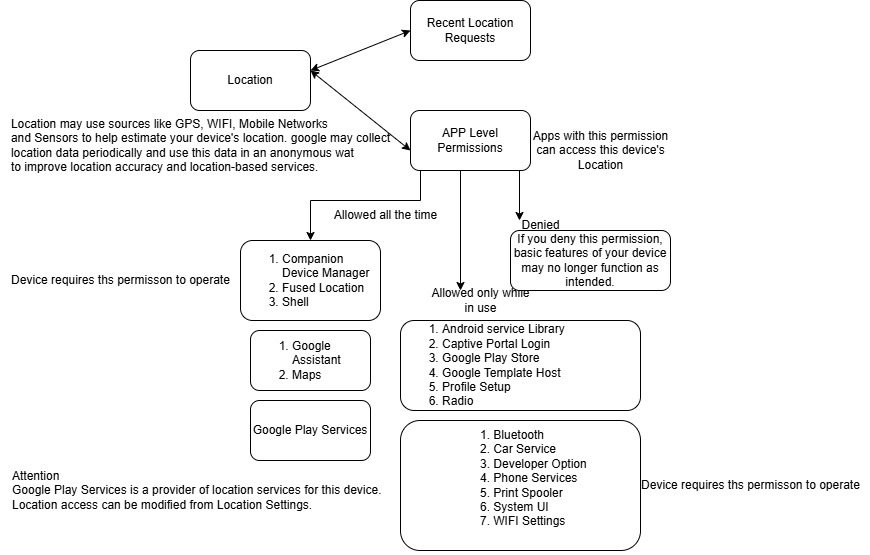
**Research and Documentation of Privacy Policies and Permissions for Common Applications in Honda Android Automotive OS**

The privacy policies and permissions of frequently used Honda Android Automotive OS applications are examined in this document, with a particular emphasis on location data. We are going to look at the kinds of data that are gathered, how they are used, and how the privacy policies of certain applications are handled. We will also evaluate the breadth and depth of possible privacy threats to users, contrasting our results with industry best practices and regulatory requires like GDPR.

Architectural Design of this Privacy Policies and Permissions is given below.

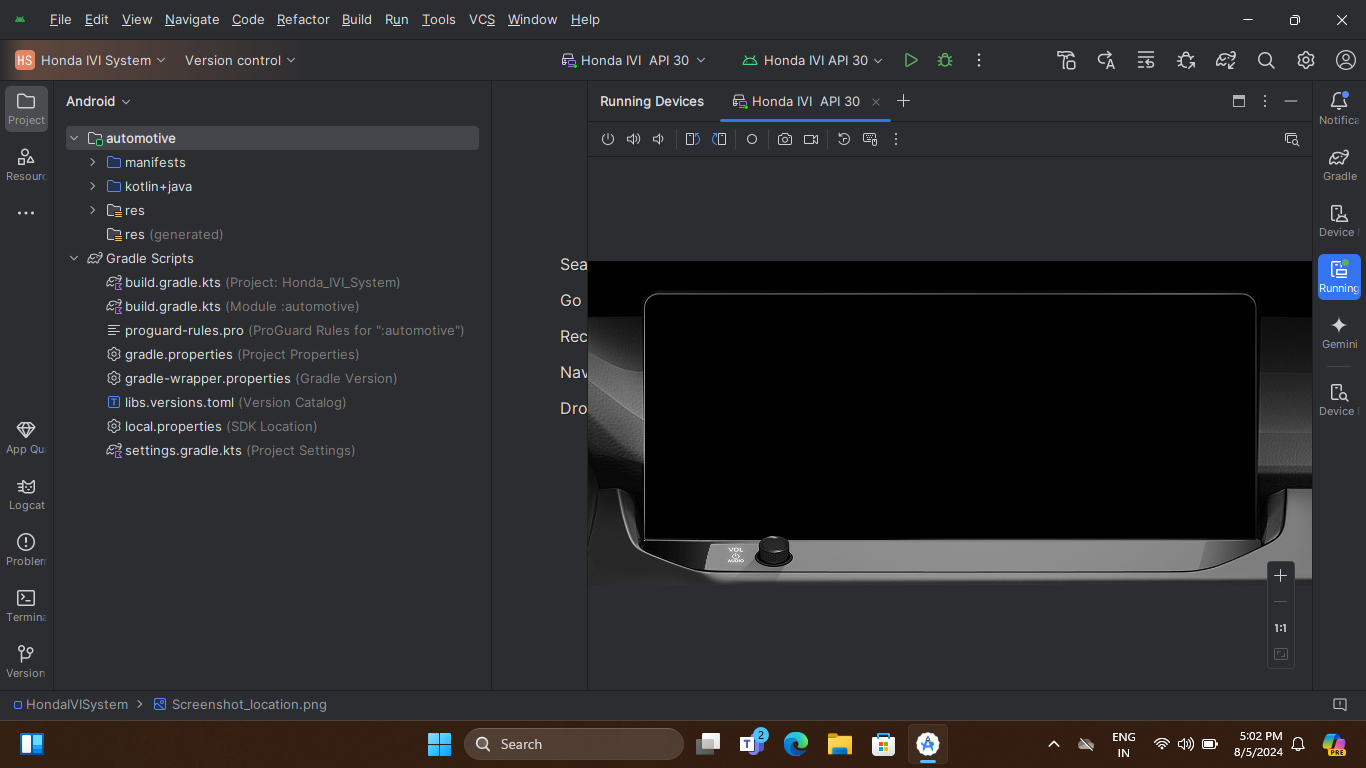


Detailed Design of Location Privacy and Permissions

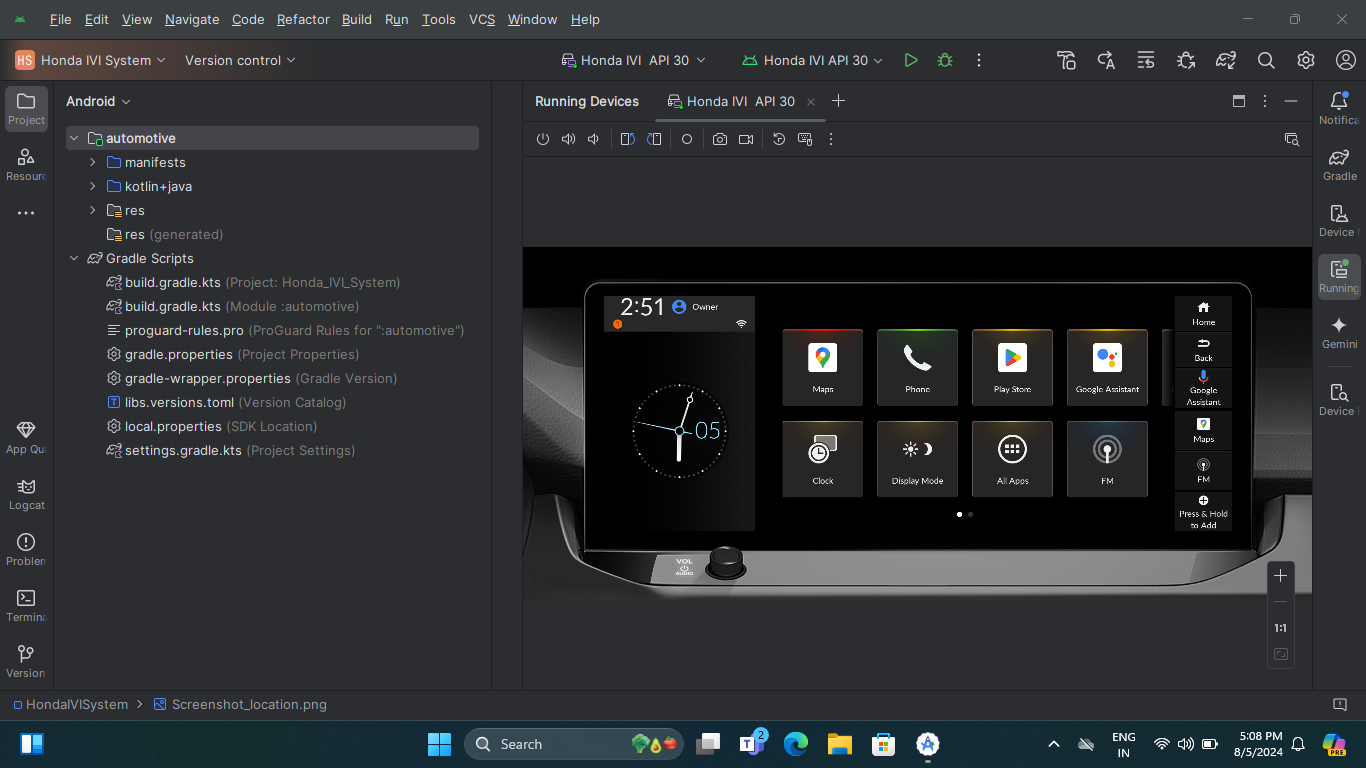


This how the emulator of HONDA IVI API 30 infotainment system of Privacy and policy image is given below

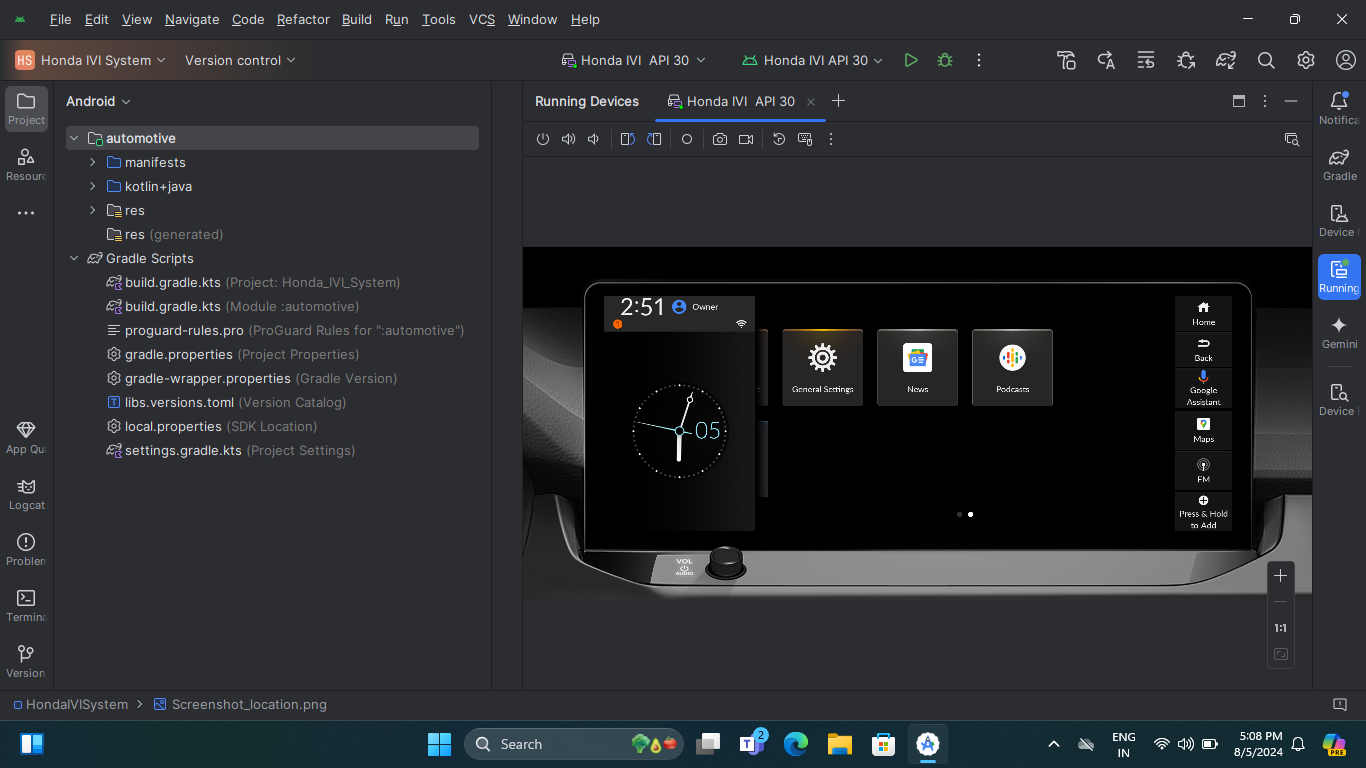
Step 1: The Honda Infotainment is running.



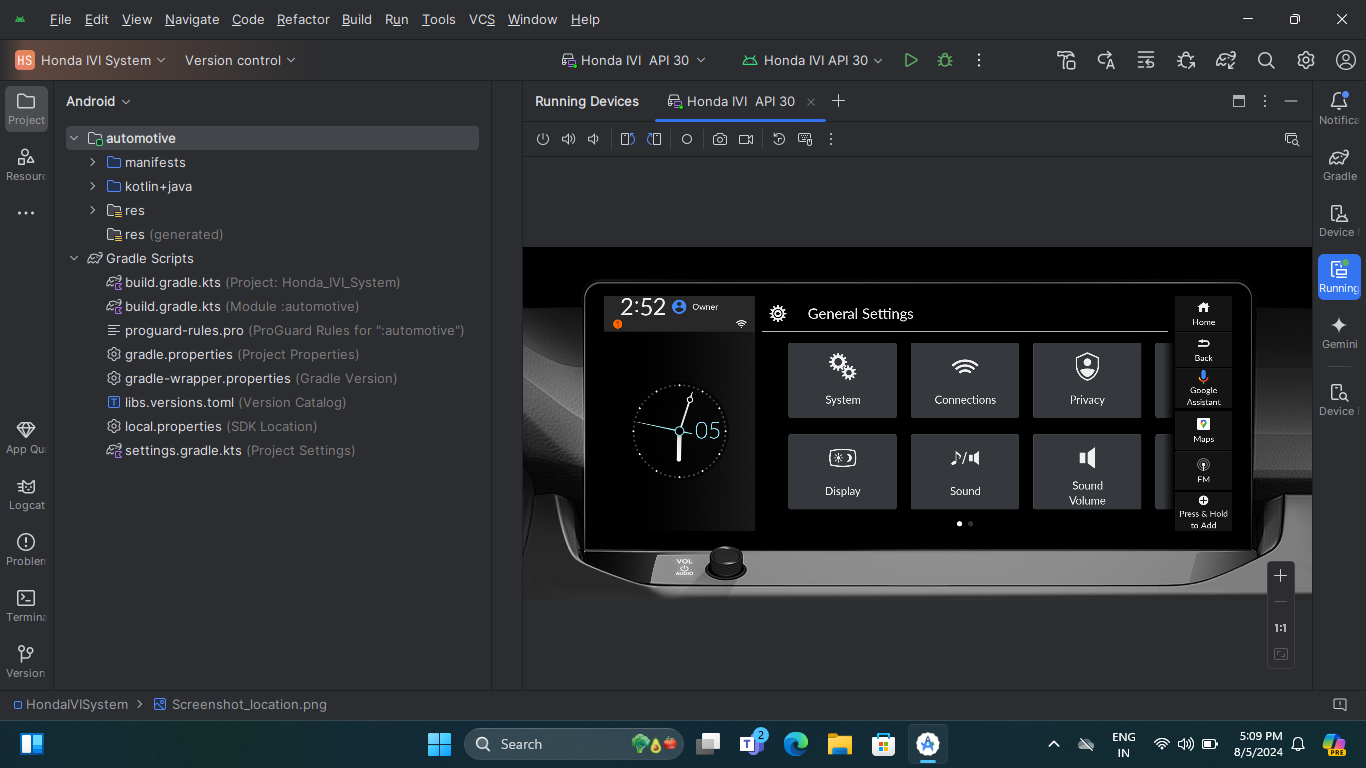
Now the Car infotainment is Running and displayed all features.



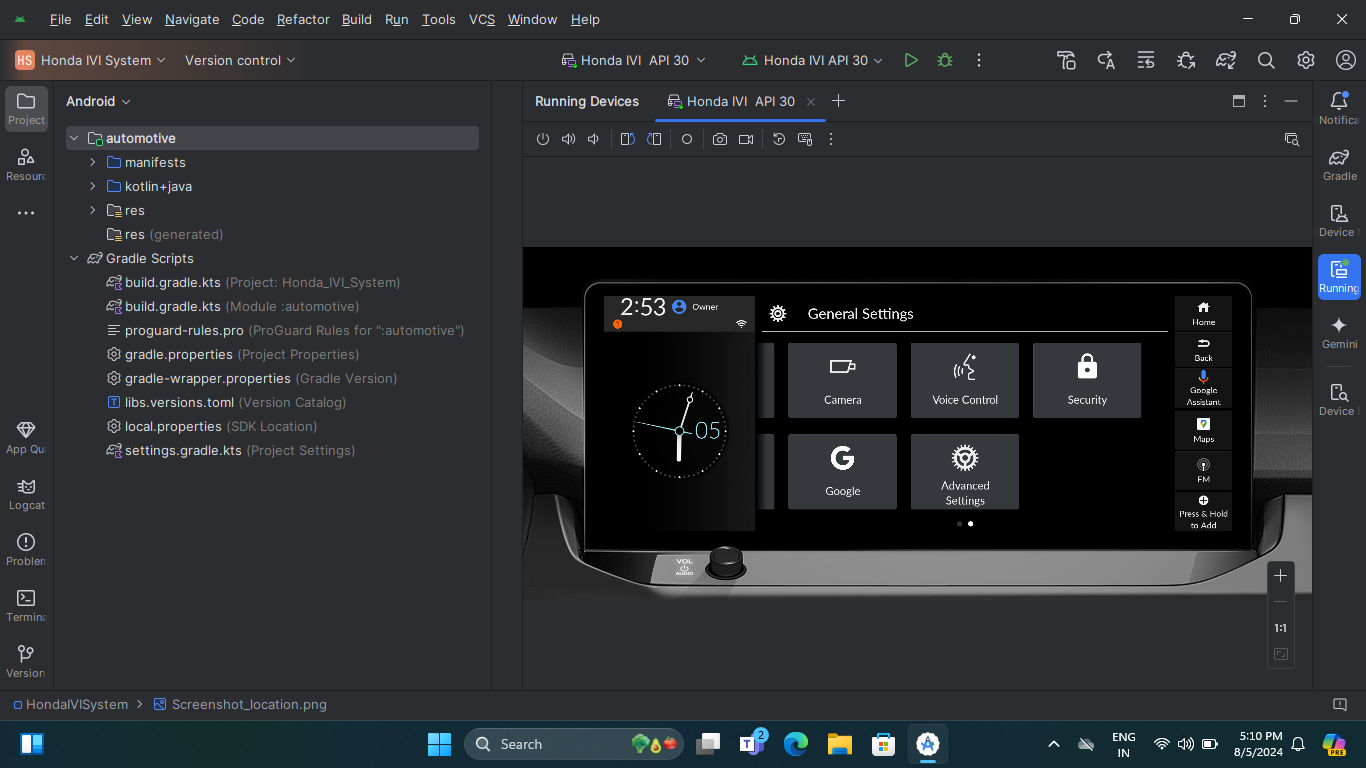
All features of this Honda IVI API 30 infotainments image is given



Step2 on here option General Settings going to Privacy options. Here can able to see the all the features, options inside the general settings of a Honda infotainment in Android studio.

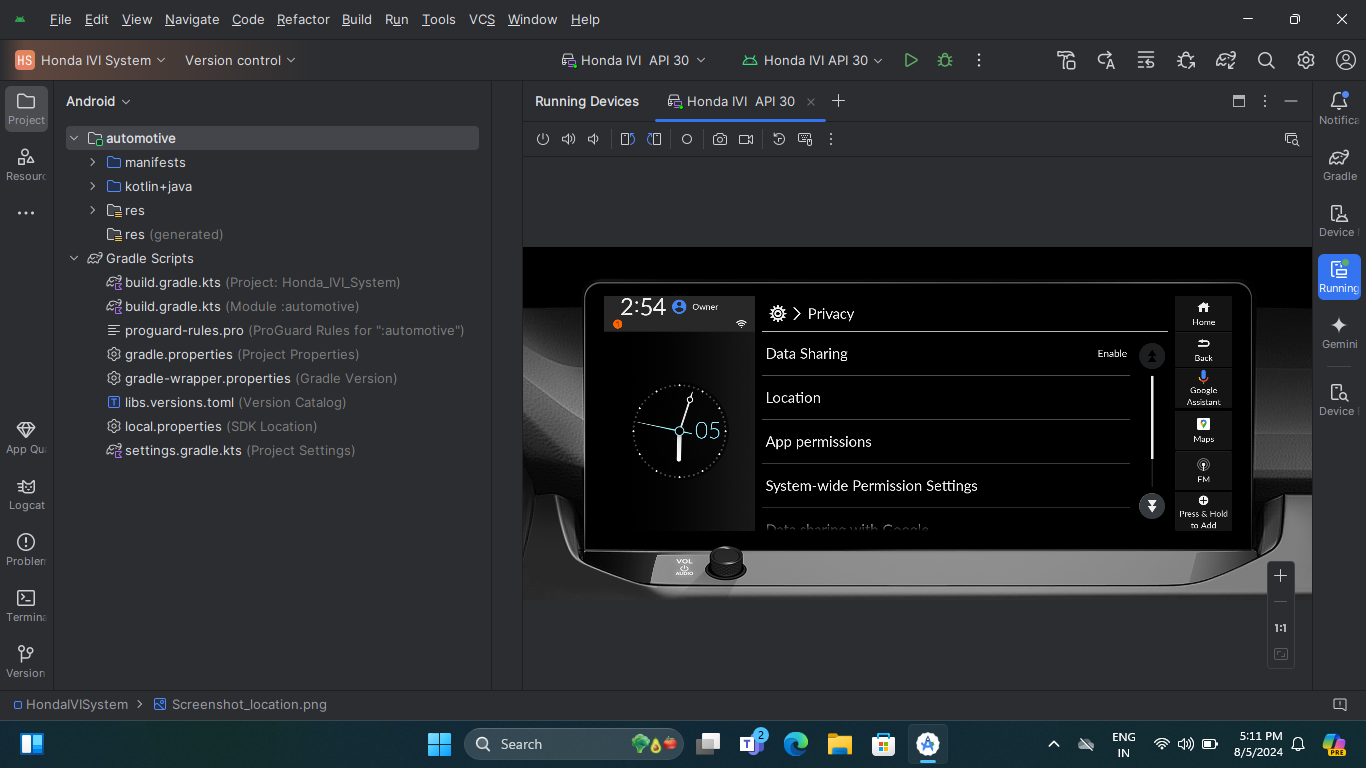
General Settings Features are:

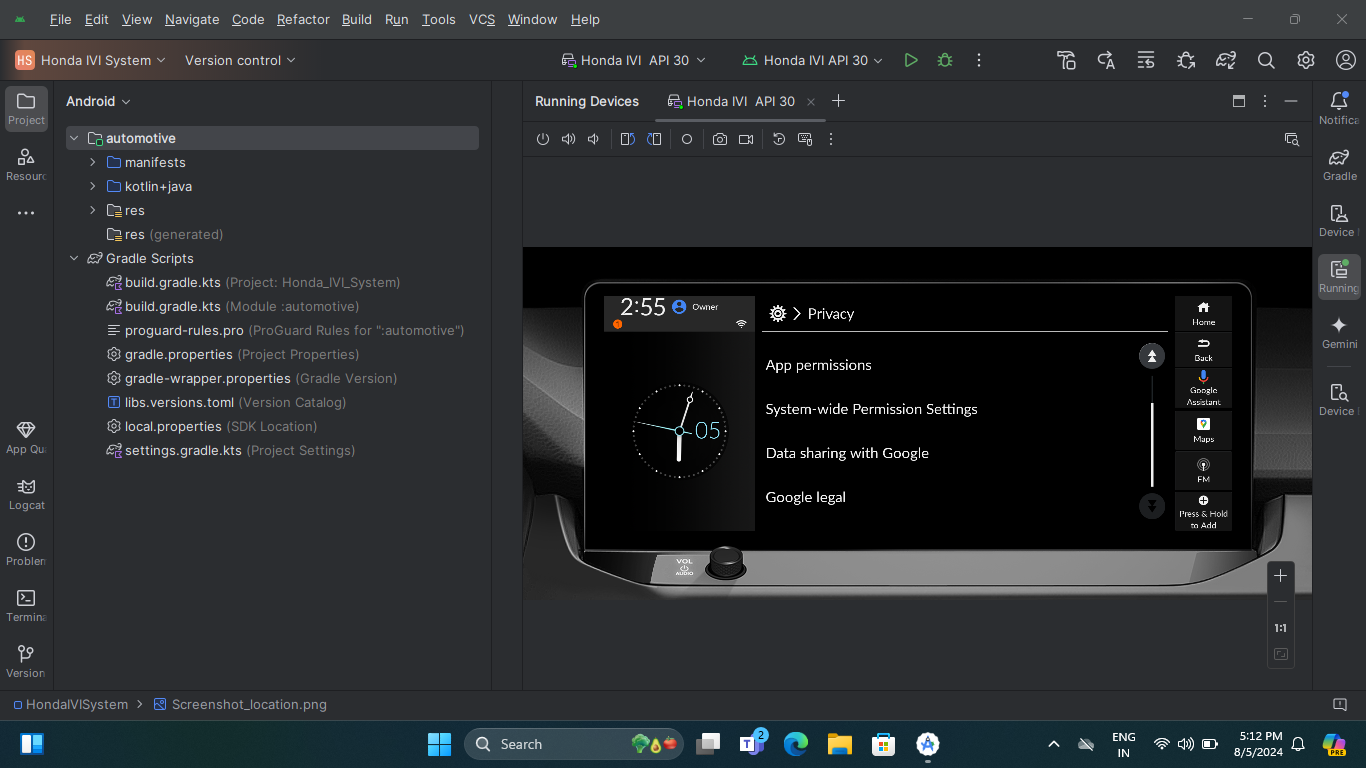
System, Connection, Privacy, Display, Sound, Sound Volume, Camera, Voice Control, Security, Google, Advanced Settings.



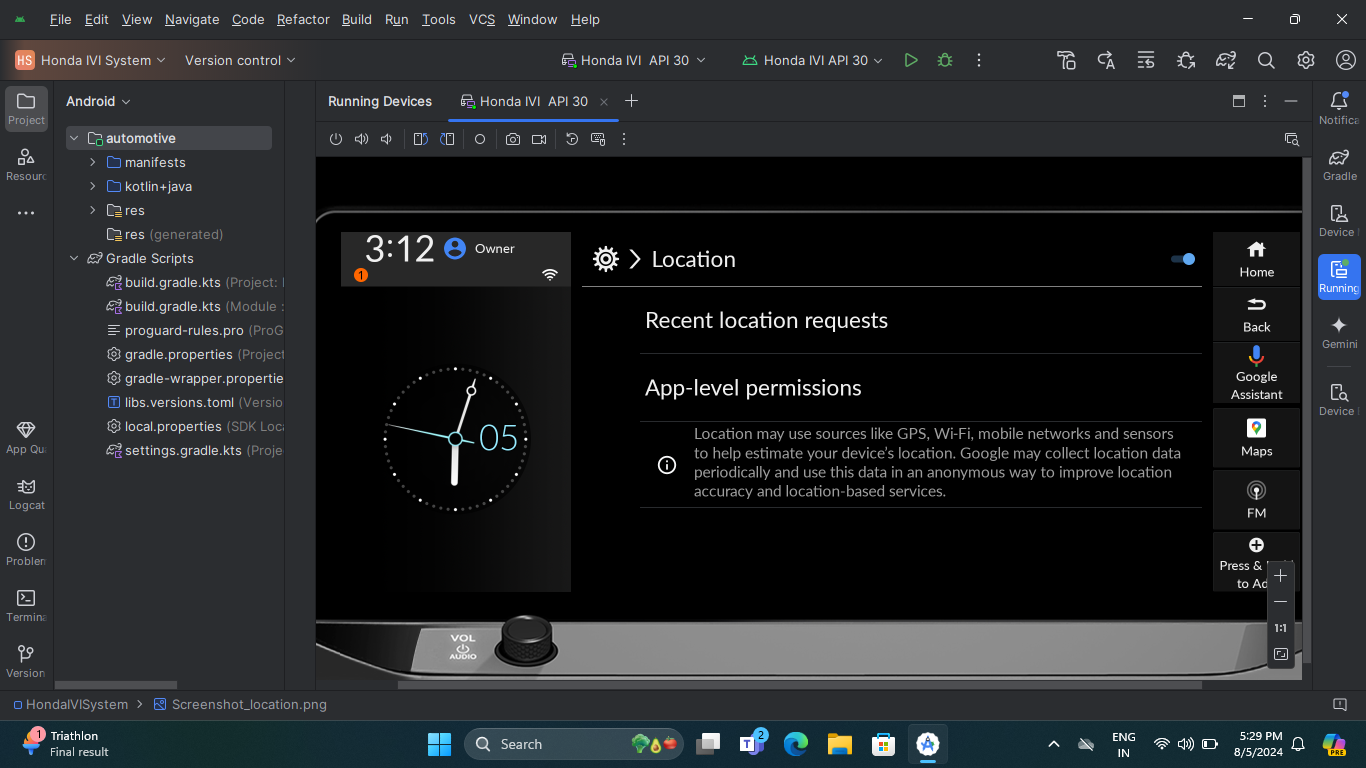
Step 3 now clicking to privacy able to see the whole features inside the privacy option.

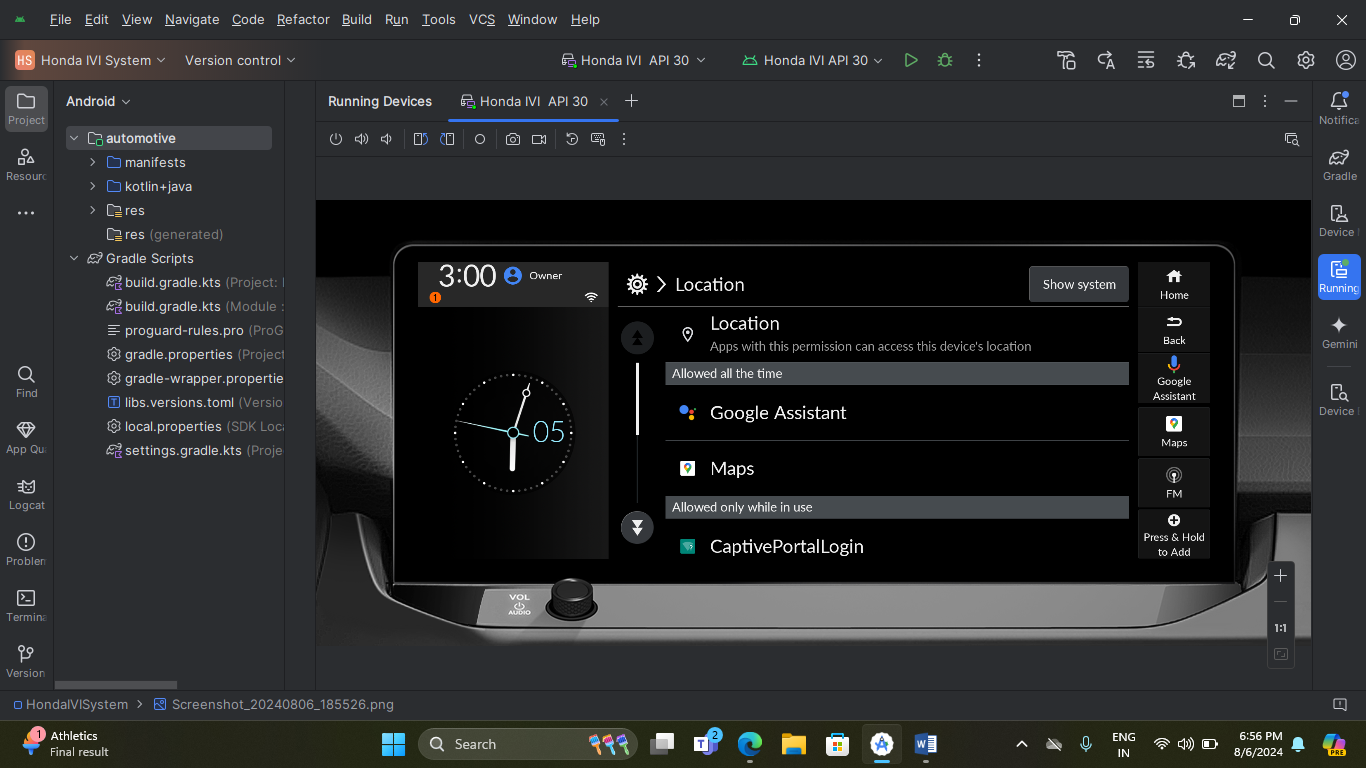
Data Sharing, Location, App Permission, System wide Permission Settings, Data Sharing with Google, Google Legal.

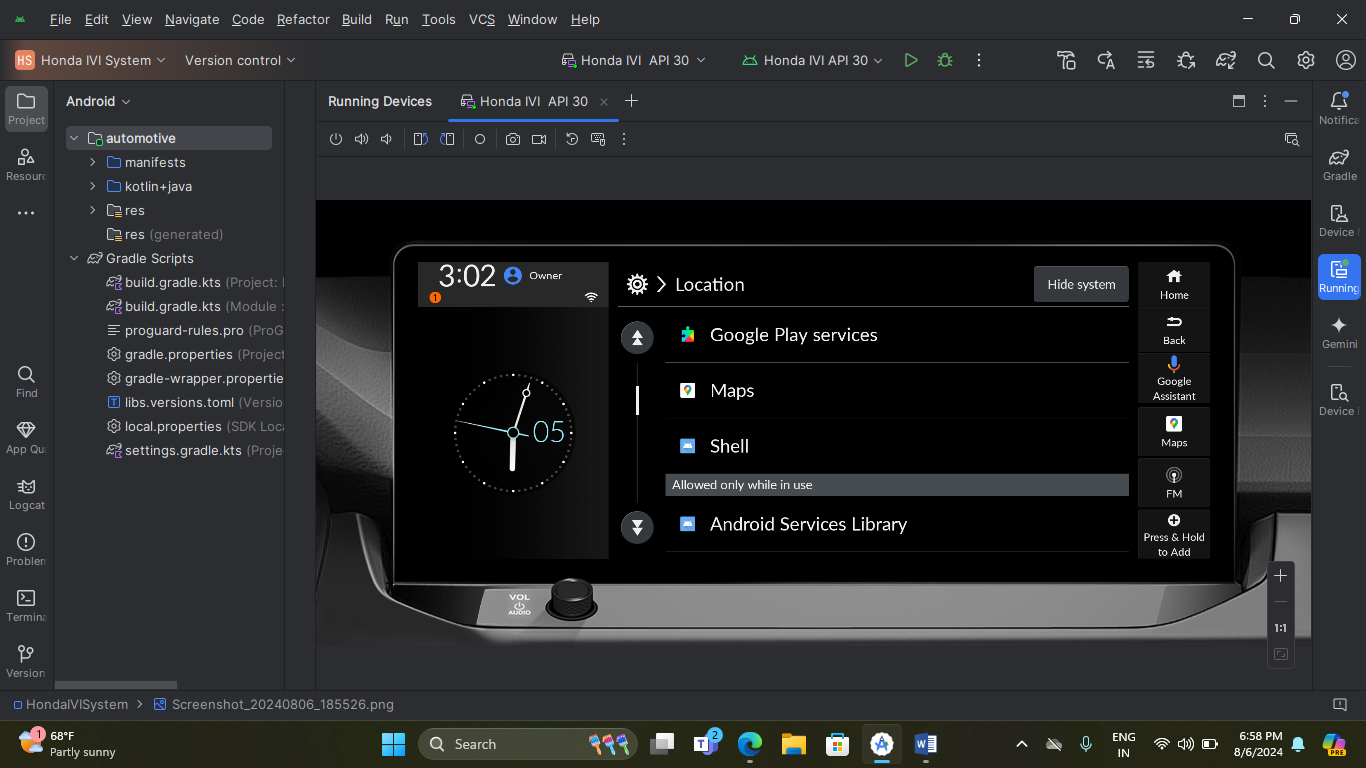


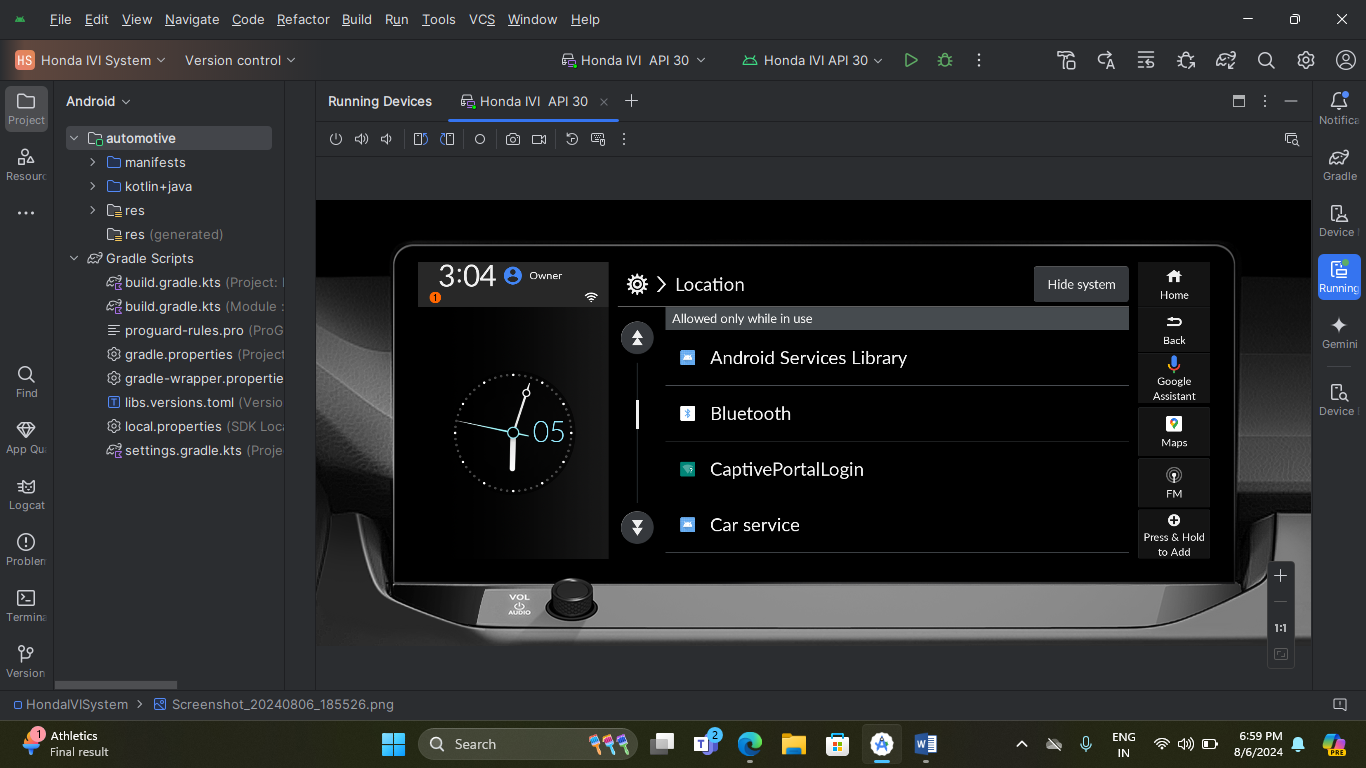


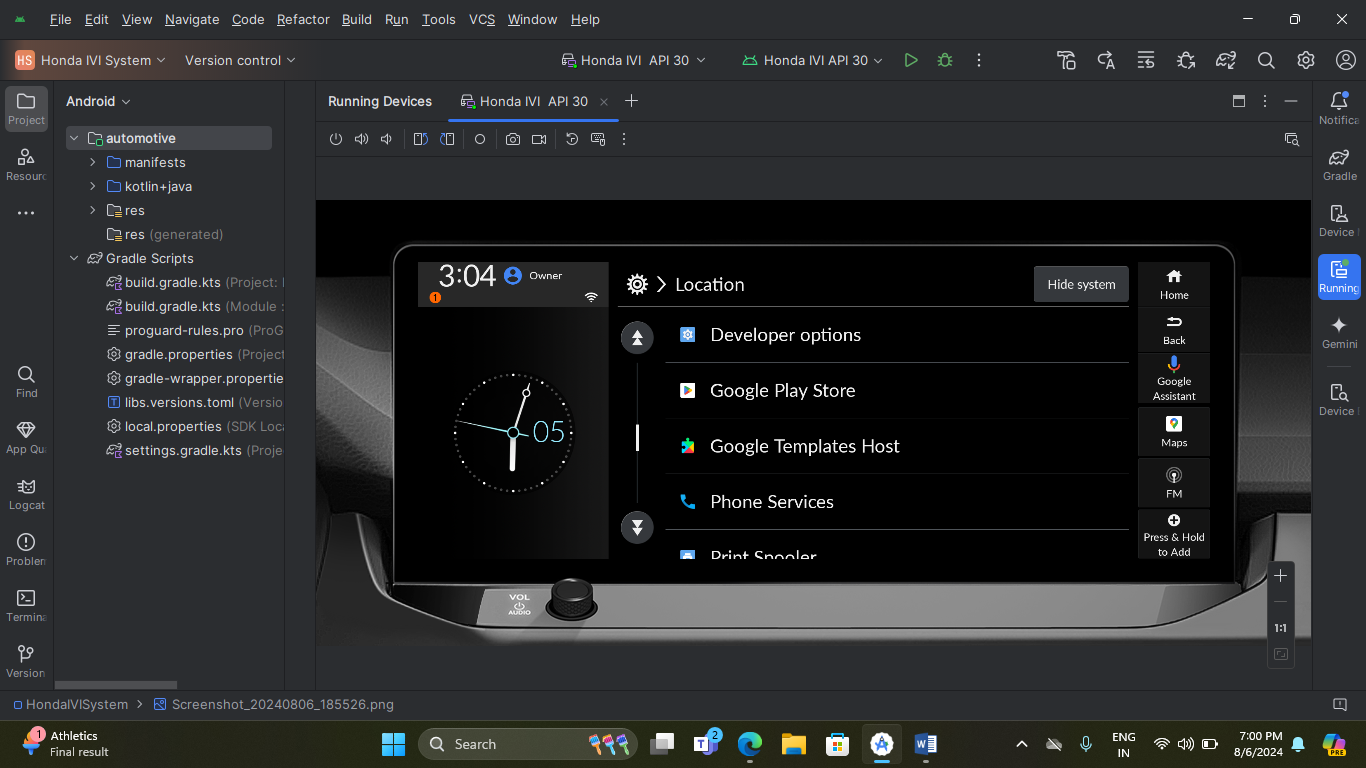
Step 4: here selecting the Privacy feature of Location and finding the whole details of Privacy and permissions of apps on this Location feature of this infotainment of Honda.

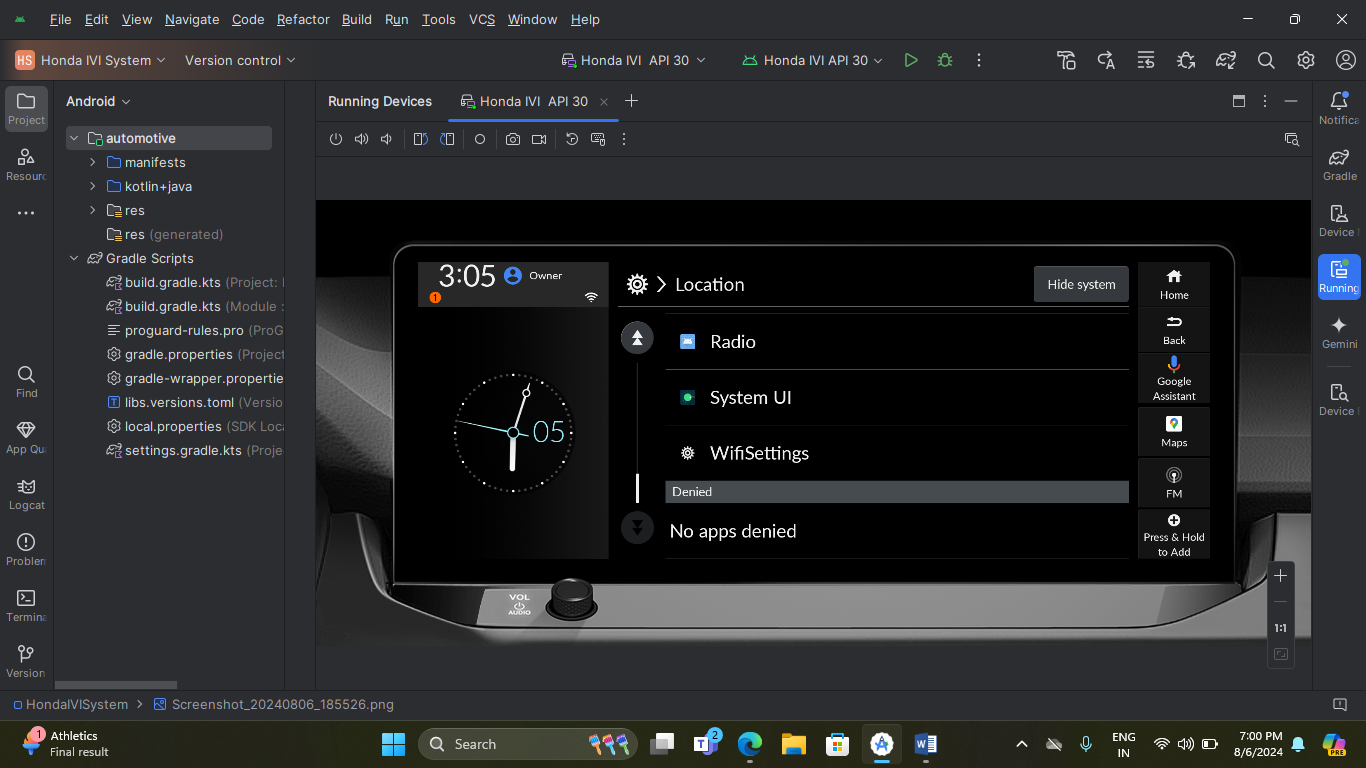










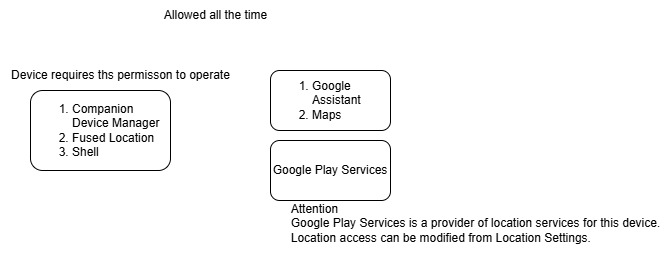


Commonly Used Applications

**Data Collection and Usage**

We will list the categories of data gathered, the purposes for which the data is put to use, and a synopsis of the privacy policy for each application.

This document examines the LOCATION data privacy policies and permissions for a few chosen Honda Android Automotive OS apps. The main topics of discussion will be data collection and use, privacy risks and ramifications, industry best practices, and regulatory obligations like GDPR.

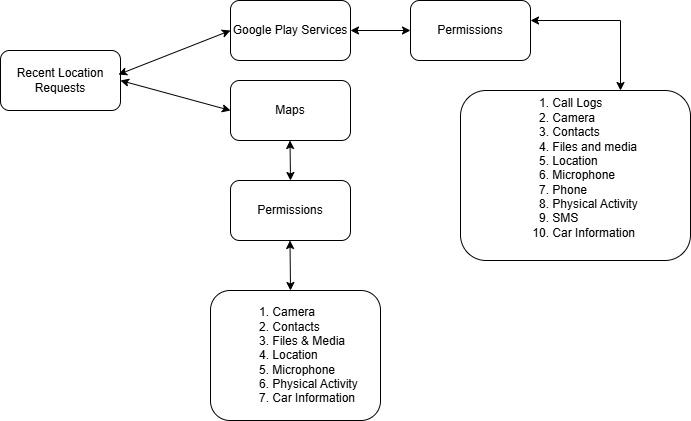


These apps require permission to access the location, and permission is Allowed all the time.

Allowed all the time

1. Companion Device Manager- Devices requires this permission to operate
2. Fused Location- Devices requires this permission to operate
3. Shell- Devices requires this permission to operate
4. Google Assistant- Give permission at all times. If the Google Assistant feature is denied or only allowed while in use, it will display a message similar to this one. Your device's basic features might stop working as intended if you deny this permission. As a result, the location can always be set to only Allow all the time.
5. Maps- Give permission at all times. If the Google Assistant feature is denied or only allowed while in use, it will display a message similar to this one. Your device's basic features might stop working as intended if you deny this permission. As a result, the location can always be set to only Allow all the time.
6. Google Play Services

**Permissions of Google Play Service and Maps**

****

It is concerning to note that the Google Play Services and Maps applications are given extensive permissions by default when testing the Honda IVI (In-Vehicle Infotainment) emulated system in Android Studio. These authorizations grant access to private areas like call logs, contacts, files and media, camera, location, microphone, phone, SMS, and vehicle data. Since users' personal information may be disclosed or used improperly without their express consent, this poses serious privacy and security risks. What increases the risk is that users cannot refuse these permissions; they are set to "allow" by default. Users cannot protect their personal information from potential threats or unauthorized access, and their control over their data is restricted.

In the context of an infotainment system, where private data about the car and its occupants can be accessed, this degree of access is particularly dangerous. Unauthorized tracking, data breaches, or misuse of private personal and vehicle data could result from such unrestricted permissions. As a result, in order to properly protect user data, developers should think about putting in place stronger privacy controls and user consent procedures, and users should be aware of these risks when using the Honda IVI emulator.

|  |  |  |
| --- | --- | --- |
| **Apps** | **Permissions** | **No: of Apps permissions Allowed** |
| **Google Play Services** | **Allowed** | 1. Call Logs 2. Camera 3. Contacts 4. Files and Media 5. Location 6. Microphone 7. Phone 8. Physical Activity 9. SMS 10. Car Information |
| **Maps** | **Allowed** | 1. Camera 2. Contacts 3. Files & Media 4. Location 5. Microphone 6. Physical Activity 7. Car Information |

**Each Permissions are Explained and Identifying the Risks**

**1 Google Play Service: - Call Logs**

|  |  |  |
| --- | --- | --- |
| **Permissions of Call logs** | **Allow/ Deny** | **Each Risks Identified in detailed while giving All Permissions** |
| While giving all permissions to this Call logs app on this infotainment of this emulated Honda Car the call logs have permissions like   * Rerouting outgoing calls * Read call logs * Write call logs. | If the user going to deny this permission of call Logs this permission message will show as “If you deny this permission, basic features of your device may no longer function as intended.” | **Rerouting outgoing calls**- Allows the app to see the number being dialed during an outgoing call with the option to redirect the call to a different number or abort the call al together.  **Read Call Logs**- This app read your call history.  **Write Call Logs**- Allows the app to modify your phones’ call log, including data about incoming and outgoing calls, Malicious apps may use this to erase or modify your call log. |

**2 Google Play Service:- Camera**

|  |  |  |
| --- | --- | --- |
| **Permissions of Camera** | **Allow/ Deny** | **Each Risks Identified in detailed while giving All Permissions** |
| While giving all permissions to this Camera app on this infotainment of this emulated Honda Car the camera have permissions like   * Take pictures and Videos | If the user going to deny this permission of Camera this permission message will show as “If you deny this permission, basic features of your device may no longer function as intended.” | **Take Pictures and Videos-** This app can take pictures and record videos using the camera at any time. |

**3 Google Play Service: - Contacts**

|  |  |  |
| --- | --- | --- |
| **Permissions of Contacts** | **Allow/ Deny** | **Each Risks Identified in detailed while giving All Permissions** |
| While giving all permissions to this Contacts app on this infotainment of this emulated Honda Car the contacts have permissions like   * Find accounts on the device * Read your Contacts * Modify your contacts | If the user going to deny this permission of Contacts this permission message will show as “If you deny this permission, basic features of your device may no longer function as intended.” | **Find accounts on the device**- Allows the app to get the list of accounts known by the phone. This may include ant accounts created by application that you have installed.  **Read your Contacts-** Allows, the app to read data about your contacts stored on your phone. Apps will also have access to the accounts on your phone that have created contacts. This may include any accounts created by apps that you have installed. This permission allows any apps to save your contact data, and malicious app may share contact data without your Knowledge.  **Modify your Contacts**- Allows the app to modify the data about your contacts stored on your phone. This permission allows apps to delete contact data. |

**4 Google Play Service: - Files and Media**

|  |  |  |
| --- | --- | --- |
| **Permissions of files and media** | **Allow/ Deny** | **Each Risks Identified in detailed while giving All Permissions** |
| While giving all permissions to this files and media app on this infotainment of this emulated Honda Car the files and media have permissions like   * Read the contents of your shared storage * Modify or delete the contents of your shared storage * Read locations from your media collection | If the user going to deny this permission of files and media this permission message will show as “If you deny this permission, basic features of your device may no longer function as intended.” | **Read the contents of your shared storage** - Allows the app to read the contents of your shared storage.  **Modify or delete the contents of your shared storage** – Allows the app to write the contents of your shared storage.  **Read locations from your media collection** – Allows the app to read the locations from your media collection |

**5 Google Play Service: - Location**

|  |  |  |
| --- | --- | --- |
| **Permissions of Location** | **Allow/ Deny** | **Each Risks Identified in detailed while giving All Permissions** |
| While giving all permissions to this Location app on this infotainment of this emulated Honda Car the Location have permissions like   * Access precise location only in the foreground * Access location in the background * Access approximate location only in the foreground | If the user going to deny this permission of Location this permission message will show as “If you deny this permission, basic features of your device may no longer function as intended.” | **Access precise location only in the foreground** – This app can get your precise location Service while the app is in use. Location Service for your device must be turned on for the app to get location. This may increase battery usage.  **Access location in the background** – This app can access location at any time, even while the app is not in use.  **Access approximate location only in the foreground** – This app can get your approximate location Service while the app is in use. Location Services for your device must be turned on for the app to get location. |

**6 Google Play Service: - Microphone**

|  |  |  |
| --- | --- | --- |
| **Permissions of Microphone** | **Allow/ Deny** | **Each Risks Identified in detailed while giving All Permissions** |
| While giving all permissions to this Microphone app on this infotainment of this emulated Honda Car the Microphone have permissions like   * Record audio | If the user going to deny this permission of Microphone this permission message will show as “If you deny this permission, basic features of your device may no longer function as intended.” | **Record Audio** – This app can record audio using the microphone at any time. |

**7 Google Play Service: - Phone**

|  |  |  |
| --- | --- | --- |
| **Permissions of Phone** | **Allow/ Deny** | **Each Risks Identified in detailed while giving All Permissions** |
| While giving all permissions to this Phone app on this infotainment of this emulated Honda Car the Phone have permissions like   * Read phone status and identity * Directly call phone numbers | If the user going to deny this permission of Phone this permission message will show as “If you deny this permission, basic features of your device may no longer function as intended.” | **Read phone status and identity** – allows the app to access the phone features of the device. This permission allows the app to determine the phone number and device IDs, whether a call is active and the remote number connected by a call.  **Directly call phone numbers** – Allows the app to call phone numbers without your intervention. This may result in unexpected charges or calls. Note that this doesn’t allow the app to call emergency numbers. Malicious apps may cost you money by making calls without your confirmation. |

**8 Google Play Service: - Physical Activity**

|  |  |  |
| --- | --- | --- |
| **Permissions of Physical Activity** | **Allow/ Deny** | **Each Risks Identified in detailed while giving All Permissions** |
| While giving all permissions to this Physical Activity app on this infotainment of this emulated Honda Car the Physical Activity have permissions like   * Recognize physical activity | If the user going to deny this permission of Physical Activity this permission message will show as “If you deny this permission, basic features of your device may no longer function as intended.” | **Recognize physical activity** – This app can recognize your physical activity. |

**9 Google Play Service: - SMS**

|  |  |  |
| --- | --- | --- |
| **Permissions of SMS** | **Allow/ Deny** | **Each Risks Identified in detailed while giving All Permissions** |
| While giving all permissions to this SMS app on this infotainment of this emulated Honda Car the SMS have permissions like   * Receive text messages(SMS) * Receive text messages (MMS) * Send and view SMS messages * Read your text messages(SMS or MMS) | If the user going to deny this permission of SMS this permission message will show as “If you deny this permission, basic features of your device may no longer function as intended.” | **Receive text messages (SMS)** – Allows the app to receive and process SMS messages. This means that the app could monitor or delete messages sent to your devices without showing them to you.  **Receive text messages (MMS)** – Allow the app to receive and process MMS messages. This means that the app could monitor or delete messages sent your device without showing them to you.  **Send and view SMS messages** – Allows the app to send SMS messages. This may result in unexpected charges. Malicious apps may cost you money by sending messages without your confirmation.  **Read your text messages (SMS or MMS)** – This app can read all SMS (text) messages stored on your phone. |

**10 Google Play Service: - Car Information**

|  |  |  |
| --- | --- | --- |
| **Permissions of Car Information** | **Allow/ Deny** | **Each Risks Identified in detailed while giving All Permissions** |
| While giving all permissions to this Car Information app on this infotainment of this emulated Honda Car the Car Information have permissions like.   * Access car’s energy information. | If the user going to deny this permission of Car Information this permission message will show as “If you deny this permission, basic features of your device may no longer function as intended.” | **Access car’s energy information** – Access your car’s energy information |