

AUTOSAR (Smartphone)

Project Training –Automotive Overview

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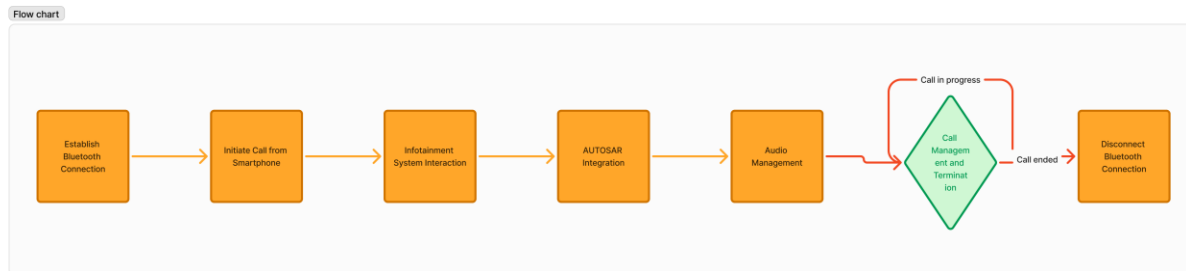
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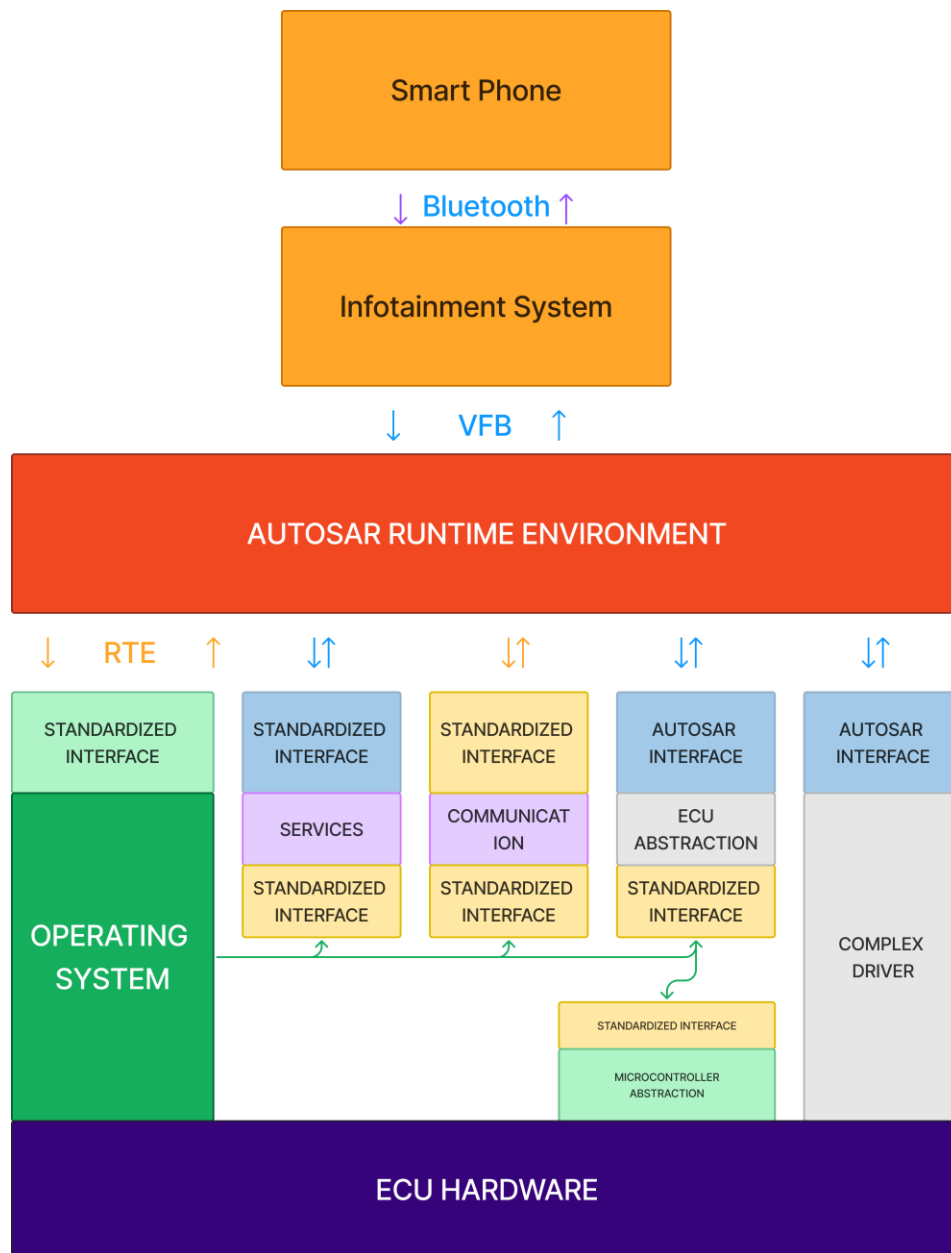
Status: DRAFT (The status would change to finalized post the BA, PM and dev team review and sign off)

Task 2: Determine the step-by-step flow of an android smartphone calling service integrated with a car using AUTOSAR and Step by step workflow with proper detailed explanation

High Level Overview



AUTOSAR ARCHITECTURE



Step 1: Establish Bluetooth Connection

Pairing the Devices

Discovery Mode:

- The car's infotainment system enters Bluetooth discovery mode, broadcasting its availability to nearby Bluetooth devices.
- The Android smartphone scans for available Bluetooth devices and detects the car's infotainment system.

Pairing Request:

- The user selects the car's infotainment system from the list of available devices on the smartphone.
- The smartphone sends a pairing request to the infotainment system.

Pairing Confirmation:

- The infotainment system displays a PIN or passkey that must be entered on the smartphone to confirm the pairing.
- Both devices exchange encryption keys to establish a secure connection.

Authentication

Secure Connection:

- The devices exchange Bluetooth profiles, including the Hands-Free Profile (HFP), to define the types of data they can share.
- Authentication ensures that the connection is secure and trusted for subsequent interactions.

Step 2: Initiate Call from Smartphone

User Action

Dialing a Number:

- The user initiates a call using the dialer app on the Android smartphone.
- The smartphone's operating system processes the call request and prepares to establish a call session.

Bluetooth Hands-Free Profile (HFP)

Call Request Transmission:

- The smartphone uses the Bluetooth HFP to send the call initiation command to the car's infotainment system.
- HFP defines how the smartphone communicates call status and controls with the infotainment system.

Step 3: Infotainment System Interaction

Call Handling

Receiving Call Command:

- The infotainment system receives the call initiation request and displays caller information on the car's display.

Audio Gateway (AG):

- The system acts as an audio gateway, routing audio streams from the smartphone to the car's speakers and microphone.

User Interface

Control Interface:

- The infotainment system provides controls for the user to manage the call (e.g., answer, reject, end call) via touch screen, steering wheel buttons, or voice commands.

Status Feedback:

- User actions are sent back to the smartphone via Bluetooth HFP, updating the call status.

Step 4: AUTOSAR Integration

AUTOSAR Software Components

Component Interaction:

- AUTOSAR software components within the infotainment system manage communication between the smartphone and the car's systems.
- Components include the Communication Manager (ComM), Diagnostic Event Manager (DEM), and Network Management (NM).

AUTOSAR Runtime Environment (RTE)

Message Passing:

- The RTE facilitates message passing between software components, ensuring data from the smartphone is correctly routed.
- RTE abstracts hardware details, allowing software components to interact seamlessly.

Step 5: Audio Management

Audio Signal Processing

Signal Enhancement:

- The infotainment system processes incoming audio signals, performing noise cancellation and echo suppression.
- Digital Signal Processing (DSP) techniques improve audio clarity for both parties.

Audio Output

Routing Audio:

- Processed audio signals are transmitted to the car's speakers, while the car's microphone captures the driver's voice.
- The microphone input is sent back to the smartphone via Bluetooth, completing the audio loop.

Step 6: Call Management and Termination

Call Control

User Commands:

- The user can control the call using the car's interface (accept, reject, hold, end).
- Commands are communicated to the smartphone via Bluetooth HFP, updating the call state.

End Call

Call Termination:

- When the call ends, the smartphone sends a termination signal to the infotainment system.
- The infotainment system stops routing audio and terminates the call session.

Step 7: Disconnect Bluetooth Connection

Post-Call Procedures

Maintaining Connection:

- The Bluetooth connection remains active for other functionalities like media playback and notifications.
- The user can manually disconnect the Bluetooth connection if needed.

Integration challenges and Solutions

