Research & Vehicle Technology
"Infotainment Systems Product Development"

Feature –Ultimate Remote Control

APIM Phoenix Domain Controller Infotainment Subsystem Part Specific Specification (SPSS)

Version 1.0

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FORD CONFIDENTIAL

Revision History

Date	Version	Notes	
September 30, 2021	1.0	Initial Release	

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1 Overview

Ultimate Remote Control (URC) Feature allows the passenger Ultimate Remote Control of their environment inside the vehicle for each individual zone.

It is simple and centralized way for first row, second, and third row passenger(s) to control their own zone functions such as climate adjustments and sound/audio, and via user(s) device.

* The user device will connect with the vehicle
* The user(s) will select which seat/area zone they are sitting in and take control for their zone area only
* URC provides the driver/first row passenger freedom from being the constant caretaker for the rest of vehicle

1.1 Feature Operation

User pairs a mobile device with the vehicle (first time pairing will require in vehicle approval)
Once Paired, user selects seat location using app on mobile device.

App allows the user to control vehicle functions specific to the seat location selected
User can control features such as:

1. Climate
2. MSS Audio

1.2 Feature Assumptions

The vehicle is equipped with the URC feature and mobile devices have the URC function installed.

1.3 Terminology and Abbreviations

The following table lists terminologies that are used in this document along with a brief description.

Term	Description
URC	Ultimate Remote Control
MSS	My Seat Space
ICC	In Car Communication
DND	Do Not Disturb
APIM	Accessory Protocol Interface Module (SYNC/PDC)
PAC	Phoenix Audio Controller
PDC	Phoenix Domain Controller

2 Architectural Design

2.1 CLD-REQ-406537/A-URCOffBoardClient

The URCOffBoardClient is responsible for giving the user an interface to the feature while in the vehicle from their mobile device.

2.2 CLD-REQ-406538/A-URCApplicationServer

The URCApplicationServer is responsible for receiving information from the URC Off-Board Client, updating vehicle HMI and sending any information to the vehicle needed.

2.3 CLD-REQ-422017/A-ClimateControlManager

The ClimateControlManager is responsible for controlling the Climate from the center stack client and sending messages to the Climate Server for any client connected to the APIM.

2.4 CLD-REQ-422018/A-Climate Server

The Climate Server is responsible for receiving request for climate change and sending out the status of the climate system.

2.5 CLD-REQ-437018/A-Audio Control Client

The Audio Control Client is responsible for receiving request for audio change and sending out the status of the audio system.

2.6 CLD-REQ-437019/A-MSSApplicationServer

The MSSApplicationServer is responsible for receiving request for MSS and sending out the status of the MSS system. The MSSApplicationServer is a logical name for anything URC interfaces with in the MSS feature.

2.7 CLD-REQ-437020/A-ICCApplicationServer

The ICCApplicationServer is responsible for receiving request for In Car Communication (ICC) and sending out the status of the ICC system.

2.8 Physical Mapping of Classes

The table below shows an example of how the logical classes that make up the Ultimate Remote Control feature may be mapped into physical modules. This mapping example is specific to the Ultimate Remote Control architecture and does not necessarily carryover to other carlines or vehicle architectures.

Logical Class	Physical Module (ECU)
URCOffBoardClient	Mobile Device with URC App
URCApplicationServer	APIM URC SW
ClimateControlManager	APIM Climate SW
Climate Server	Climate Control Module
Audio Control Client	Phoenix Audio Controller (PAC)
MSSApplicationServer	APIM MSS SW
ICCApplicationServer	APIM ICC SW

2.9 Logical Signal Mapping

The CAN signals mentioned throughout this document shall refer to the CAN signal's logical name. The logical names shall be mapped to their actual CAN signal names. Please use the table below to perform the mapping. The InfoCAN database file is the master file for the actual CAN signal names. Note: There may be cases where the actual CAN signal name is used in this documentation.

Logical Name	CAN Signal Name
BTConnection_Rsp	TP message
BTConnection_Rq	TP message

Table: Logical name/CAN signal mapping

2.10 IIR-REQ-406539/A-URCApplicationServer _Rx

2.10.1 MD-REQ-406542/A-BTConnection_Rsp

Message Type: Response

This TP method is used to share the status of the BT connection.

Name	Literals	Value	Description
Opcode	-	-	A response stating mode of connection
	Reserved	0x00	
	Pairing	0x01	
	Connecting	0x02	
	Connected	0x03	
	Disconnected	0X04	
	Reserved	0x05-0xFF	
SeatLocation	-	-	A response stating Seat Location
	Reserved	0x00	
	Reserved	0x01	
	Seat2	0x02	
	Seat3	0x03	
	Seat4	0x04	
	Reserved	0x05-0xFF	
PACRandomID		Byte 6-11	If Opcode= 0x01

2.11 IIR-REQ-406541/A-URCApplicationServer _Tx

2.11.1 MD-REQ-406540/B-BTConnection_Rq

Message Type: Request

This TP method is used to request BT classic connection for the URCOffBoardClient

Name	Literals	Value	Description
Opcode	-	-	A request to
	Reserved	0x00	
	Connect	0x01	
	Disconnect	0x02	
	Transfer RandomIDs	0x03	
	Reserved	0x04-0xFF	
Seat Location	Reserved	0x00	
	Reserved	0x01	
	Seat2	0x02	
	Seat3	0x03	
	Seat4	0x04	
	Reserved	0x05-0xFF	
MACAddress		Bytes 6-11	If Opcode is 0x01
RandomIDA		Bytes 6-11	If Opcode is 0x03
RandomIDB		Bytes 12-17	If Opcode is 0x03

3 General Requirements

3.1 URC-REQ-406820/A-Status Feedback

The URC shall provide status to the user on the commodities they are controlling

3.2 URC-REQ-406824/A-URC Disable

URC Feature shall be disabled when the infotainment system is off

3.3 URC-REQ-406829/A-URC Enable

URC Feature shall be enabled when the infotainment system is fully booted

3.4 URC-REQ-406839/A-Zone Functions recognition

The URC shall be able to distinguish between the different zone functions availability (third row seat has less functionality to control than first and second row seats)

3.5 URC-REQ-406845/A-Request Pathway

Infotainment system shall receive commands from each URC User, transfer them to signal/messages, and guide them to the proper seating zone

3.6 URC-REQ-406847/A-Number of User Devices

Infotainment system shall accommodate connecting up to 5 URC users to the vehicle at one time

3.7 URC-REQ-406852/A-Zone Seating Layout

URC shall be able to display the zone seating layout on both URCApplicationServer and URC Off-Board Client

3.8 URC-REQ-406853/A-Selection - HMI

URC feature shall recognize each URC User selection seat and display it in the URCApplicationServer HMI

3.9 URC-REQ-421988/A-HMI User Management

The un-authenticated HMI guest user shall have the following user management capabilities:

1. Disconnect active URC sessions (terminate BLE session)

The authenticated HMI user shall have the capabilities of an un-authenticated user, and additionally:

1. Remove permanent URC users, requiring them to perform the BLE pairing/approval process again

3.10 URC-REQ-421995/A-URC Intent Input Validation

URC intents shall have a predefined, hardcoded set of supported commands. Received URC intents that do not exist on the list of allowed commands shall be discarded without further processing.

3.11 URC-REQ-421996/A-URC Embedded Input Validation

Internal requests to the URC/Mobile Apps Background Service using Java APIs including AIDL shall have a strict schema of supported inputs.
Received requests that:

- Are improperly formatted
- Contain invalid data types
- Use invalid data ranges

shall be discarded without further processing.

3.12 URC-REQ-416714/A-URC Approved App Authentication

URC apps approved to transmit URC intents over BLE shall authenticate to the HMI and maintain an encrypted application-layer session (in addition to BLE link layer encryption) for the duration of a URC session. Authentication and encryption mechanism shall require approval by cyber security.

3.13 URC-REQ-416715/A-Vehicle Factory Reset

If a vehicle factory reset event occurs (including master reset), the following shall result:

- all active URC sessions shall be disconnected
- all zone database seat mappings shall be erased
- all persistent users shall be removed and require new BLE pairing and driver approval

4 Functional Definition

4.1 URC-FUN-REQ-436746/A-Open QR code

4.1.1 Requirements

4.1.1.1 URC-REQ-436747/A-Start with QR code

There shall be HMI with a QR code used to help users navigate the URCOffBoardClient's to the Ford Pass App.

4.1.2 Use Cases

4.1.2.1 URC-UC-REQ-436748/A-Show QR code

Actors	URCApplicationServer User
Pre-conditions	URCApplicationServer is active
Scenario Description	URCApplicationServer User selects HMI to open QR code
Post-conditions	QR code is displayed in HMI URCOffBoardClient scans QR code
List of Exception Use Cases	
Interfaces	HMI

4.2 URC-FUN-REQ-406543/A-Connect BLE URCOffBoardClient

4.2.1 Requirements

4.2.1.1 URC-REQ-406544/A-Disconnect URCOffBoardClient

If the URCOffBoardClient is connected to the URCApplicationServer over BT classic, URCApplicationServer shall disconnect the URCOffBoardClient before started the process of connecting to the URCApplicationServer over BLE.

4.2.1.2 URC-REQ-406822/A-Zone Connection

URCOffBoard Client device shall connect with a seating zone prior to using the feature

4.2.1.3 URC-REQ-406825/A-Approve Connection

During the approval process the URCApplicationServer user shall approve the connection of the URCOffBoardClient.

Once approved, the URCOffBoardClient information will be stored by the URCApplicationServer and NO approval will be needed for future connections of the URCOffBoardClient.

4.2.1.4 URC-REQ-406841/A-Receive Seat Data

Once connected, the URCOffBoardClient will receive Seat Data specific for the seat selected during the connection process from the URCApplicationServer. The URCOffBoardClient shall update HMI to show the seat as occupied.

4.2.1.5 URC-REQ-406846/A-Pass Zone Database to URCOffBoardClient

The URCApplicationServer shall pass the Seat Zone data along to the URCOffBoardClient to display only the controls present in that seating zone.

4.2.1.6 URC-REQ-406848/A-Driver Response

The Driver shall be able to accept/decline the connection request of the URCOffBoardClients user using the URCApplicationServer's HMI

4.2.1.7 URC-REQ-406850/A-URC Zone Display

URCApplicationServer shall house an HMI screen that displays the seating zones and which URCOffBoardClients are populated in each seat

4.2.1.8 URC-REQ-406854/A-Connection List

URCApplicationServer shall house a connection list of URC user which have already been connected (Similar to what Sync does with Classic BT connections today).

4.2.1.9 URC-REQ-406823/A-Driver Disconnection

The URCApplicationServer shall allow the Driver to initiate the disconnection of each individual URCOffBoardClients

4.2.1.10 URC-REQ-421991/A-Passenger Approval

The URCApplicationServer shall prompt the driver to accept/deny the URC connection request from a URC Off-Board Client whose device is not already stored in the URC permanent device list.

If the Driver accepts this connection, the URCApplicationServer shall store the device info in the URC permanent device list.

4.2.1.11 URC-REQ-421992/A-BLE Security

URC Bluetooth Classic and BLE use cases shall follow the functional requirements defined in the Bluetooth Security Specification (FEDE RQT-001403-704846).

4.2.1.12 URC-REQ-421993/A-BLE Advertisement Window

Automatic URC BLE scanning shall only occur when:

- Vehicle owner authenticated to the HMI has approved automatic URC BLE scanning
- Vehicle parked
- BLE connection bandwidth is available

While not parked, the vehicle can be manually instructed to begin URC BLE scanning via the HMI. Manually launched BLE scanning shall stop advertising after 60 seconds.

4.2.1.13 URC-REQ-421994/A-Occupied Seat Selection

URC users shall not have the capability to select a seat that is already occupied. This shall be enforced both at the mobile app level, and at the in-vehicle app level, based on real-time seat state.

4.2.1.14 URC-REQ-421998/A-Driver Approval Expiration

If a pairing approval prompt has not been approved or denied within 60 seconds, the prompt shall disappear from the HMI, and the passenger BLE pairing session shall be terminated.

4.2.1.15 URC-REQ-447277/A-BLE List

When a URCOffBoardClient starts the pairing process there shall be HMI which shows a list of URCOffBoardClients on the URCApplicationServer if there are more than one URCOffBoardClient pairing at the same time.

The URCApplicationServer user shall select the URCOffBoardClient from the list before the pin approval process will start, if the list appears.

4.2.2 Use Cases

4.2.2.1 URC-UC-REQ-406545/A-Pair URCOffBoardClient First Time

Actors	URCOffBoardClient User, URCApplicationServer User
Pre-conditions	All URC conditions are met
Scenario Description	Rear Seat URCOffBoardClient User starts pairing process Rear Seat URCOffBoardClient User Confirms Pin URCApplicationServer user Confirms Pin URCApplicationServer User approves request.
Post-conditions	Connection is created between URCOffBoardClient and URCApplicationServer URCOffBoardClient information is stored. URCApplicationServer sends open seat locations to URCOffBoardClient Rear Seat URCOffBoardClient User selects Seat-4 as seat position URCApplicationServer sends URCOffBoardClient seat zone information for Seat-4
List of Exception Use Cases	
Interfaces	HMI

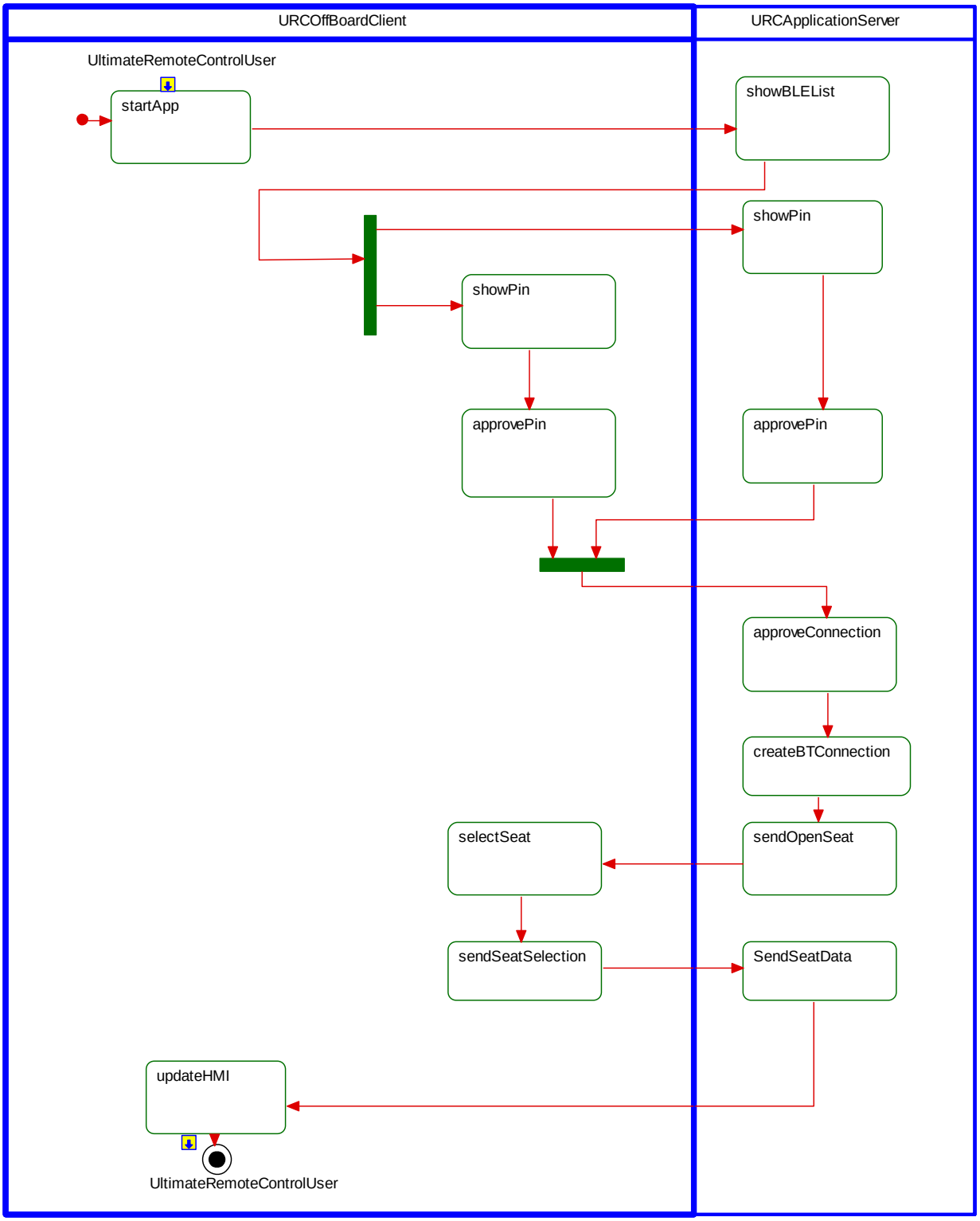
4.2.2.2 URC-UC-REQ-407215/A-Connect URC Off-Board Client

Actors	URCOffBoardClient User, URCApplicationServer User
Pre-conditions	All URC conditions are met
Scenario Description	URCOffBoardClient User starts connection process URCApplicationServer identifies URCOffBoardClient as a previously connected device. URCOffBoardClient User selects Seat3 as seat position
Post-conditions	Connection is created between URCOffBoardClient and URCApplicationServer URCApplicationServer sends URCOffBoardClient seat zone information for Seat3
List of Exception Use Cases	
Interfaces	HMI

4.2.3 White Box View

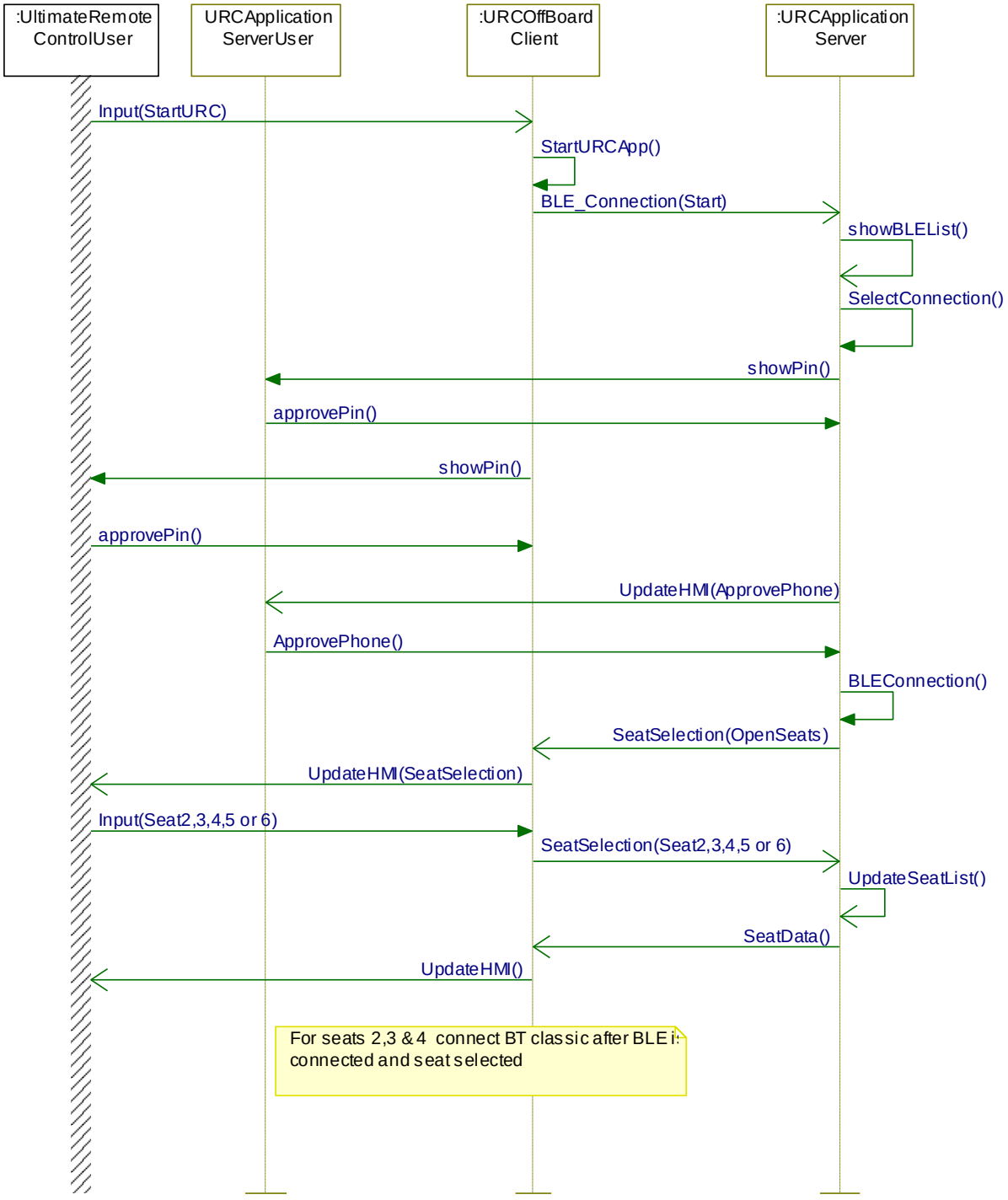
4.2.3.1 Activity Diagrams

4.2.3.1.1 URC-ACT-REQ-406546/A-User Selects Seat Location



4.2.3.2 Sequence Diagrams

4.2.3.2.1 URC-SD-REQ-412682/A-First time Connection



4.3 URC-FUN-REQ-431357/A-Connect BT Classic URCOffBoardClient

4.3.1 Requirements

4.3.1.1 URC-REQ-431358/A-Connect BT Classic URCOffBoardClient

When equipped with MSS, the URCApplicationServer shall initiate the URCOffBoardClient's in Seats 2, 3 or 4 to connect to the AudioControlClient over BT Classic after the URCOffBoardClient is connected to BLE and the user URCOffBoardClient user has selected a seat location.

The URCApplicationServer shall send BTConnection_Rq with Opcode="connect", Seat Location, MACAddress of phone in seat location.

4.3.1.2 URC-REQ-439919/A-Create RandonIDA

The URCApplicationServer shall receive TP message BTConnection_Rsp with Opcode="pairing", seat location and PACRandomID. The URCApplicationServer shall create RandomIDA and send an API over BLE with PACRandomID and RandomIDA to the URCOffBoardClient linked to the seat location sent in BTConnection_Rsp.

4.3.1.3 URC-REQ-439920/A-Transfer RandomIDs

The URCApplicationServer shall receive BLE_message with RandomIDB. The URCApplicationServer shall send BTConnection_Rq with Opcode="TransferRandomIDs", Seat location, RandomIDA and RandomIDB.

4.3.1.4 URC-REQ-439937/A-Recieve OPcode Connecting

The URCApplicationServer shall receive BTConnection_Rsp Opcode="Connecting" and seat location after sending BTConnection_Rq with Opcode ="Connect". This is to notify the URCApplicationServer the URCOffBoardClient sent in BTConnection_Rq was previously paired and there is no need to validate with the Random IDs.

4.3.1.5 URC-REQ-439938/A-BT Classic Completed

The URCApplicationServer shall receive BTConnection_Rsp Opcode="Connected" and seat location after AudioControlClient has completed the BT classic connection.

4.3.1.6 URC-REQ-439957/A-BLE Disconnection

The URCApplicationServer shall send BTConnection_Rq Opcode="Disconnect" and seat location when the URCApplicationServer detects a URCOffBoardClient's BLE connection is disconnected and any retry process was unable to reconnect.

4.3.1.7 URC-REQ-439958/A-BT Classic Disconnection

The URCApplicationServer shall receive BTConnection_Rsp Opcode="Disconnected" and seat location when the URCOffBoardClient's BT classic connection is disconnected and any retry process was unable to reconnect.

4.3.2 Use Cases

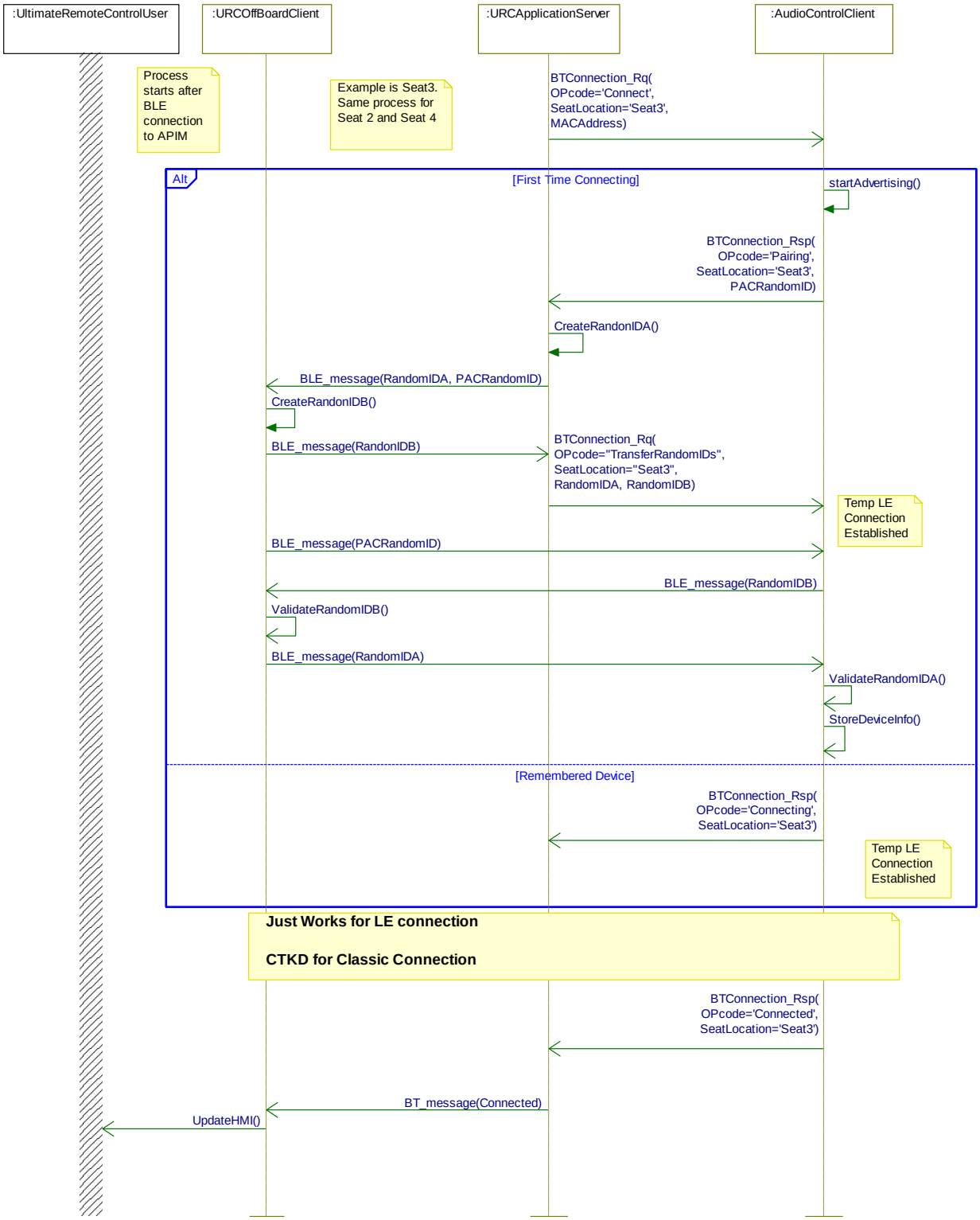
4.3.2.1 URC-UC-REQ-431359/A-Connect BT Classic to Audio Control Client

Actors	URCOffBoardClient User, URCApplicationServer User
Pre-conditions	URCOffBoardClient connected for BLE to URCApplicationServer
Scenario Description	URCOffBoardClient in seat 2, 3, or 4 connected to URCApplicationServer BLE URCApplicationServer initiates the BT classic connection between AudioControlClient and the URCOffBoardClient
Post-conditions	URCOffBoardClient is connected to AudioControlClient for BT classic
List of Exception Use Cases	
Interfaces	HMI

4.3.3 White Box View

4.3.3.1 Sequence Diagrams

4.3.3.1.1 URC-ACT-REQ-431360/A-Connect BT Classic



4.4 URC-FUN-REQ-416707/A-Lock Out Functions

4.4.1 Requirements

4.4.1.1 URC-REQ-440277/A-Rear Lock Out

The vehicle shall have a Rear Seat Lockout setting. If the Lockout is active, URC should become inactive for Rear Seats (Seat 3, 4, 5, 6). When URC is inactive the URCApplicationServer should NOT act on any BLE messages sent from ANY of the inactive URCOffBoardClients.

4.4.2 Use Cases

4.4.2.1 URC-UC-REQ-416721/A- Rear Seat Lockout Function

Actors	URCOffBoardClient User, URCApplicationServer User
Pre-conditions	All URC conditions are met
Scenario Description	Five (Seats 2-6) URCOffBoardClients are connected to the URCApplicationServer The Rear Lock Out become active
Post-conditions	URCOffBoardClients in Seats 3, 4, 5, 6 are lock out.
List of Exception Use Cases	
Interfaces	HMI

4.5 URC-FUN-REQ-419590/A-Volume Controls

4.5.1 Requirements

4.5.1.1 URC-REQ-419591/A-Control Zone Volume Offset

The URCOffBoardClient shall have HMI to control the Offset volume level. The level is an Offset volume from the vehicle's volume and will control the volume in the Zone the user in assigned.

If HMI is selected the URCOffBoardClient shall invoke an API over BLE to the URCApplicationServer with the requested Offset volume level. The URCApplicationServer shall Invoke an API to the MSSApplicationServer with the requested Offset volume level.

Reference:**MSS-FUN-REQ-430554/A-Volume Offset changes** from the MSS Zone Settings Management SPSS

4.5.1.2 URC-REQ-436997/A-Allowed Offset Volume Levels

The allowed Offset Volume levels are (-3, -2, -1, 0, 1, 2, 3).

4.5.1.3 URC-REQ-419592/A-Volume controls in Cabin Mode

The URCOffBoardClient shall have Volume control with the audio system in Zone mode. HMI should be enabled.

The URCOffBoardClient shall have NO Volume control with the audio system in Full cabin mode. HMI should be disabled.

4.5.1.4 URC-REQ-416105/A-Updating Volume Status

The URCApplicationServer shall receive the updated offset volume level from the MSSApplicationServer whenever there is an update to the Offset volume level of any zone. The URCApplicationServer shall invoke an API over BLE to update the URCOffBoardClient of the current Offset volume level.

4.5.2 Use Cases

4.5.2.1 URC-UC-REQ-419593/A-Volume Adjustment

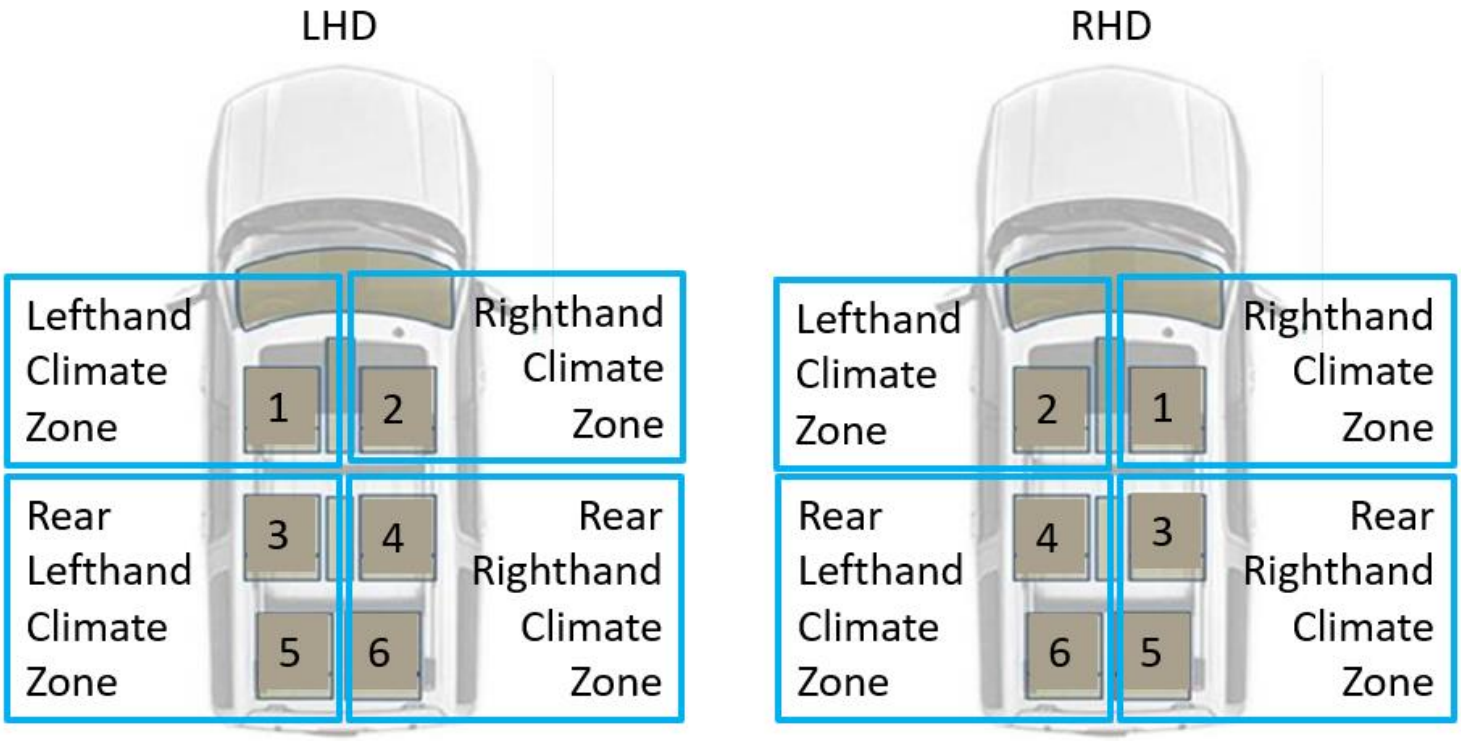
Actors	URCOffBoardClient User, URCApplicationServer User
Pre-conditions	All URC conditions are met
Scenario Description	User in Audio Zone Seat 5 selects to increase volume
Post-conditions	The volume HMI for all users in the zone shared with seat 5 shall update and the URCOffBoardClient's HMI in the zone shared with seat 5 shall update.
List of Exception Use Cases	
Interfaces	HMI

4.6 URC-FUN-REQ-407016/A-Climate Control

4.6.1 Requirements

4.6.1.1 URC-REQ-407017/A-Climate Zones

Climate Zones are defined as Right Hand side and Left Hand side. The seat definition will be defined as follows for Left Hand Drive (LHD) and Right Hand Drive (RHD) vehicles.



4.6.1.2 URC-REQ-413811/A-Reference Spec

All references to requirements in FUN-REQ-407016-Climate Control shall be referring to requirements in the Climate Control APIM SPSS. The Climate Control APIM SPSS will define the interaction between the ClimateControlManager and the ClimateServer.

4.6.1.3 URC-REQ-406837/A-Rear Seat Controls Lockout - Climate

The URC feature shall disable the rear climate control when the Rear Climate Lock out feature enabled.

4.6.1.4 URC-REQ-406844/A-Independent Climate Control

URC shall provide all passengers with the ability to control their own climate independently from other passenger areas in the vehicle based on the definition of Quad Climate Zones.

4.6.1.5 URC-REQ-422040/A-Control Front Climate Temp Selection

The URCOffBoardClient shall have HMI to control the Front Climate Temperature Selection.

If the HMI is selected the URCOffBoardClient shall invoke an API over BLE to the URCApplicationServer with the Front Climate Temp Selection. The URCApplicationServer shall invoke an API to the ClimateControlManager of the change.

Changing Front Climate Temperature Reference:
LHS: REQ-389373/A-Left Hand Side Temperature Setting via up/down interface
RHS: REQ-389376/A-Right Hand Side Temperature Setting via up/down interface

The URCApplicationServer shall invoke an API over BLE to the URCOffBoardClient when the Temperature Setpoint is changed. URCOffBoardClient shall update Front Climate Temperature HMI.
Updating HMI:
LHS: REQ-389366/A-Automatic Left Hand Side(LHS) Temperature Setpoint Display
RHS: REQ-389367/A-Automatic Right Hand Side(RHS) Temperature Setpoint Display

4.6.1.6 URC-REQ-410228/A-Control Rear Climate Power Selection

The URCOffBoardClient shall have HMI to control the Rear Power Selection.

If the HMI is selected the URCOffBoardClient shall invoke an API over BLE to the URCApplicationServer for Rear Climate Power Selection “On” or “Off”. The URCApplicationServer shall invoke an API to the ClimateControlManager of the change.

Changing Rear Power Selection:
LHS: REQ-389530/A-Left Hand Side Rear Power selection
RHS: REQ-389532/A-Right Hand Side Rear Power selection

The URCApplicationServer shall invoke an API over BLE to the URCOffBoardClient when the Rear Climate Power Selection changes. URCOffBoardClient shall update Front Climate Temperature HMI.

Updating HMI:
LHS: REQ-389531/A-Left Hand Side Rear Power Indication
RHS: REQ-389533/A-Right Hand Side Rear Power Indication

4.6.1.7 URC-REQ-413810/A-Control Rear Climate Auto Selection

The URCOffBoardClient shall invoke an API over BLE to the URCApplicationServer for Rear Climate Auto Selection. The URCApplicationServer will direct the ClimateControlManager of the change.

For Rear Lefthand Climate Zone refer to:
REQ-389549/A-Left Hand Side Rear Auto selection
REQ-389550/A-Left Hand Side Rear Auto Indication

For Rear Righthand Climate Zone refer to:
REQ-389551/A-Right Hand Side Rear Auto selection
REQ-389552/A-Right Hand Side Rear Auto Indication

4.6.1.8 URC-REQ-422037/A-Control Rear Climate Temp Selection

The URCOffBoardClient shall invoke an API over BLE to the URCApplicationServer for Rear Climate Temperature Selection. The URCApplicationServer will direct the ClimateControlManager of the change.

For Rear Lefthand Climate Zone refer to:
REQ-389502/A-Rear Left Hand Side Temperature Setting via up/down buttons
REQ-389495/A-Rear Automatic Left Hand Side(LHS) Temperature Setpoint Display

For Rear Righthand Climate Zone refer to:
REQ-389503/A-Rear Right Hand Side Temperature Setting via up/down buttons
REQ-389496/A-Rear Automatic Right Hand Side(RHS) Temperature Setpoint Display

4.6.1.9 URC-REQ-422038/A-Control Rear Climate Fan Speed

The URCOffBoardClient shall invoke an API over BLE to the URCApplicationServer for Rear Climate Fan Speed. The URCApplicationServer will direct the ClimateControlManager of the change.

For Rear Lefthand Climate Zone refer to:
REQ-389520/A-Left Hand Side Rear Blower Speed via up/down interface
REQ-389513/A-Rear Left Hand Side Blower Speed Display

For Rear Righthand Climate Zone refer to:
REQ-389521/A-Right Hand Side Rear Blower Speed via up/down interface
REQ-389515/A-Rear Manual Climate Control Systems Blower Speed Display

4.6.1.10 URC-REQ-422039/A-Control Rear Climate Vent Panel

The URCOffBoardClient shall invoke an API over BLE to the URCApplicationServer for Rear Climate Vent Panel. The URCApplicationServer will direct the ClimateControlManager of the change.

For Rear Lefthand Climate Zone refer to:
REQ-389538/A-Left Hand Side Rear Panel selection
REQ-389539/A-Left Hand Side Rear Panel Indication

For Rear Righthand Climate Zone refer to:
REQ-389540/A-Right Hand Side Rear Panel selection
REQ-389541/A-Right Hand Side Rear Panel Indication

4.6.1.11 URC-REQ-439418/A-Control Rear Climate Vent Floor

The URCOffBoardClient shall invoke an API over BLE to the URCApplicationServer for Rear Climate Vent Floor. The URCApplicationServer will direct the ClimateControlManager of the change.

For Rear Lefthand Climate Zone refer to:
REQ-389542/A-Left Hand Side Rear Panel selection
REQ-389543/A-Left Hand Side Rear Panel Indication

For Rear Righthand Climate Zone refer to:
REQ-389544/A-Right Hand Side Rear Panel selection
REQ-389545/A-Right Hand Side Rear Panel Indication

4.6.2 Use Cases

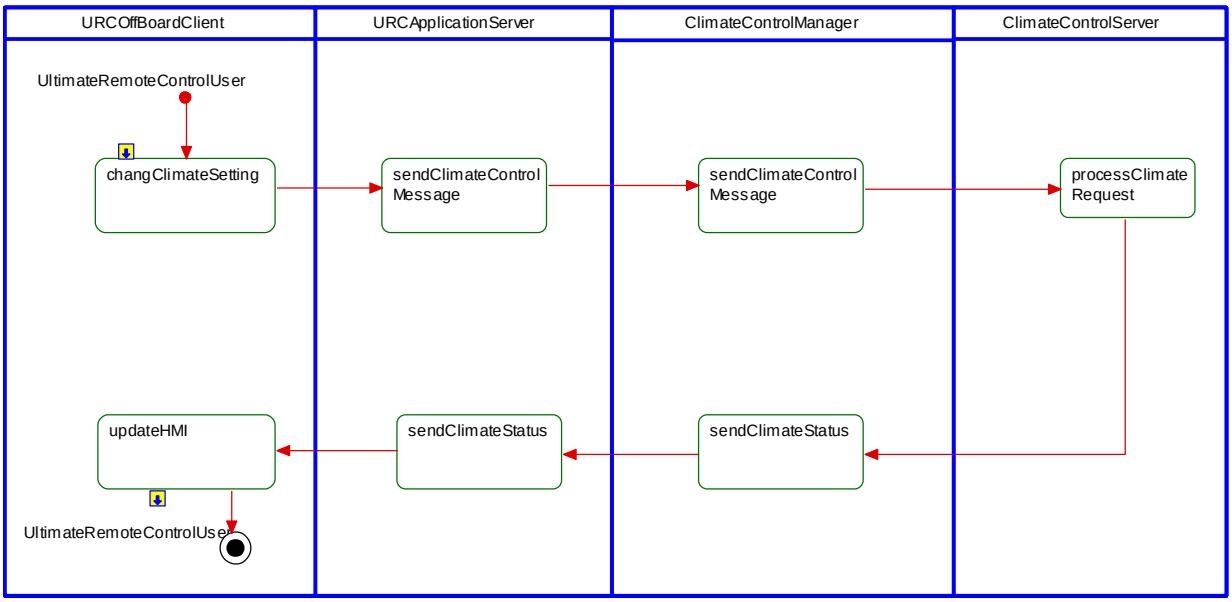
4.6.2.1 URC-UC-REQ-407018/A-Change Temperature

Actors	URCOffBoardClient User, URCApplicationServer User
Pre-conditions	All URC conditions are met
Scenario Description	URCOffBoardClient is connected to Seat4 URCOffBoardClient User changes Zone Temperature up 2 degrees
Post-conditions	Zone Temperature with Seat4 will increase 2 degrees
List of Exception Use Cases	
Interfaces	HMI

4.6.3 White Box View

4.6.3.1 Activity Diagrams

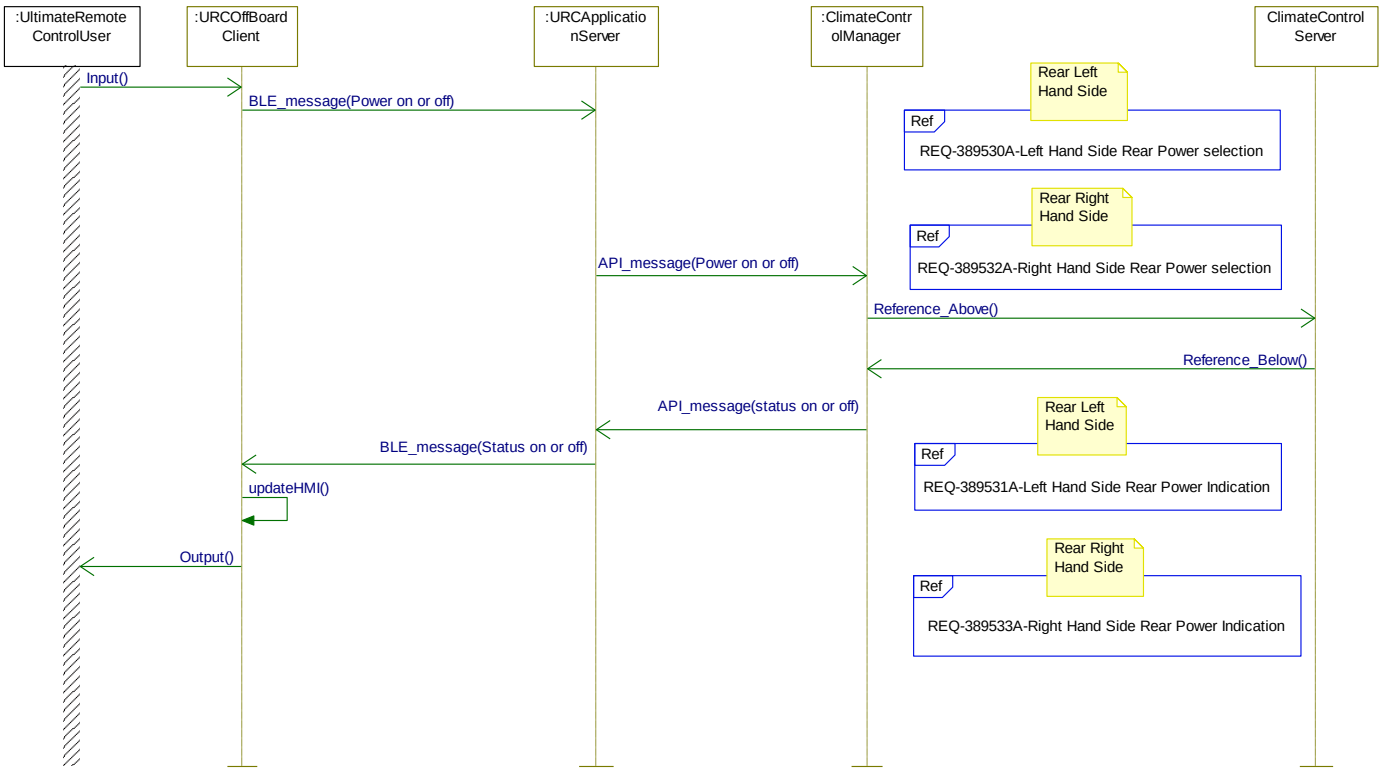
4.6.3.1.1 URC-ACT-REQ-407019/A-Climate Control



4.6.3.2 Sequence Diagrams

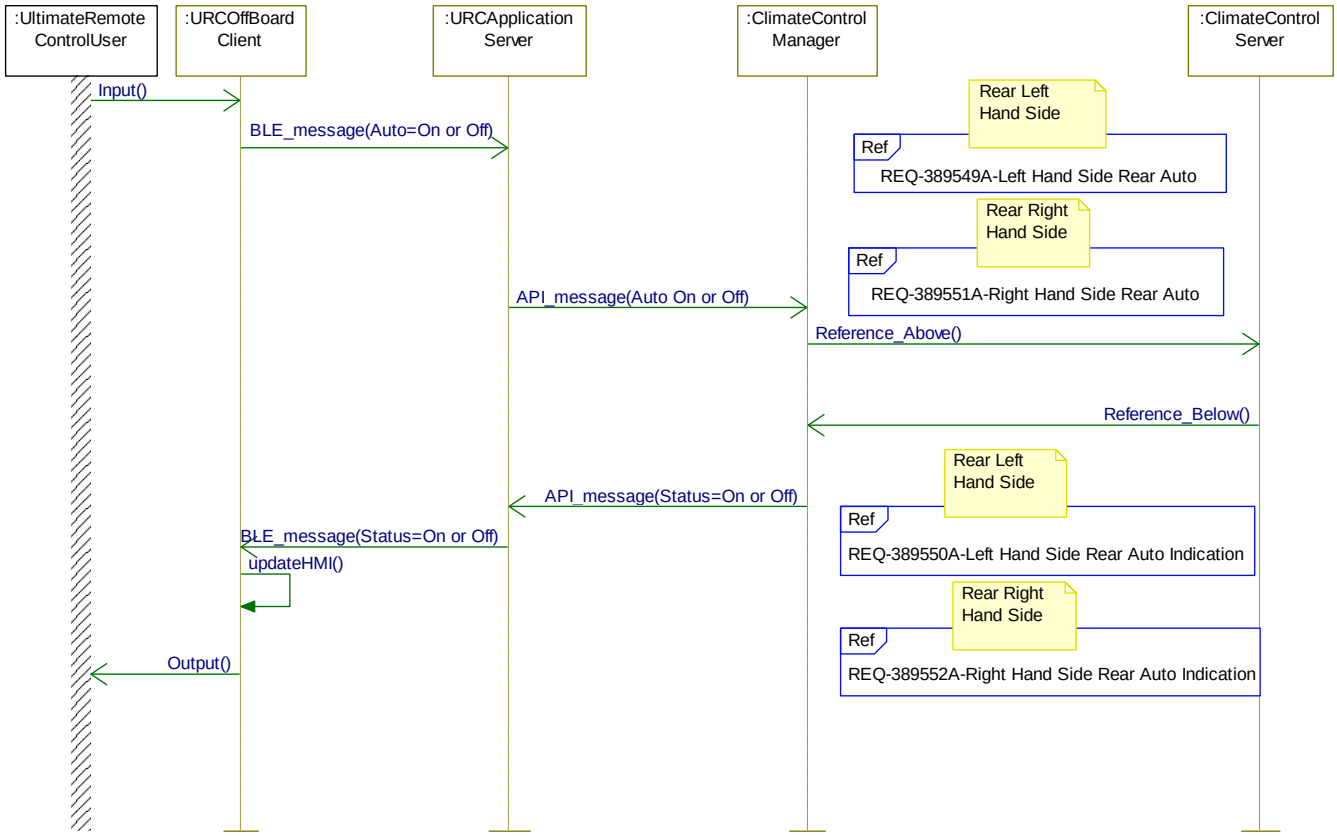
4.6.3.2.1 URC-SD-REQ-413787/A-Rear Climate Zones Power

Power Indication for Rear Climate Zones



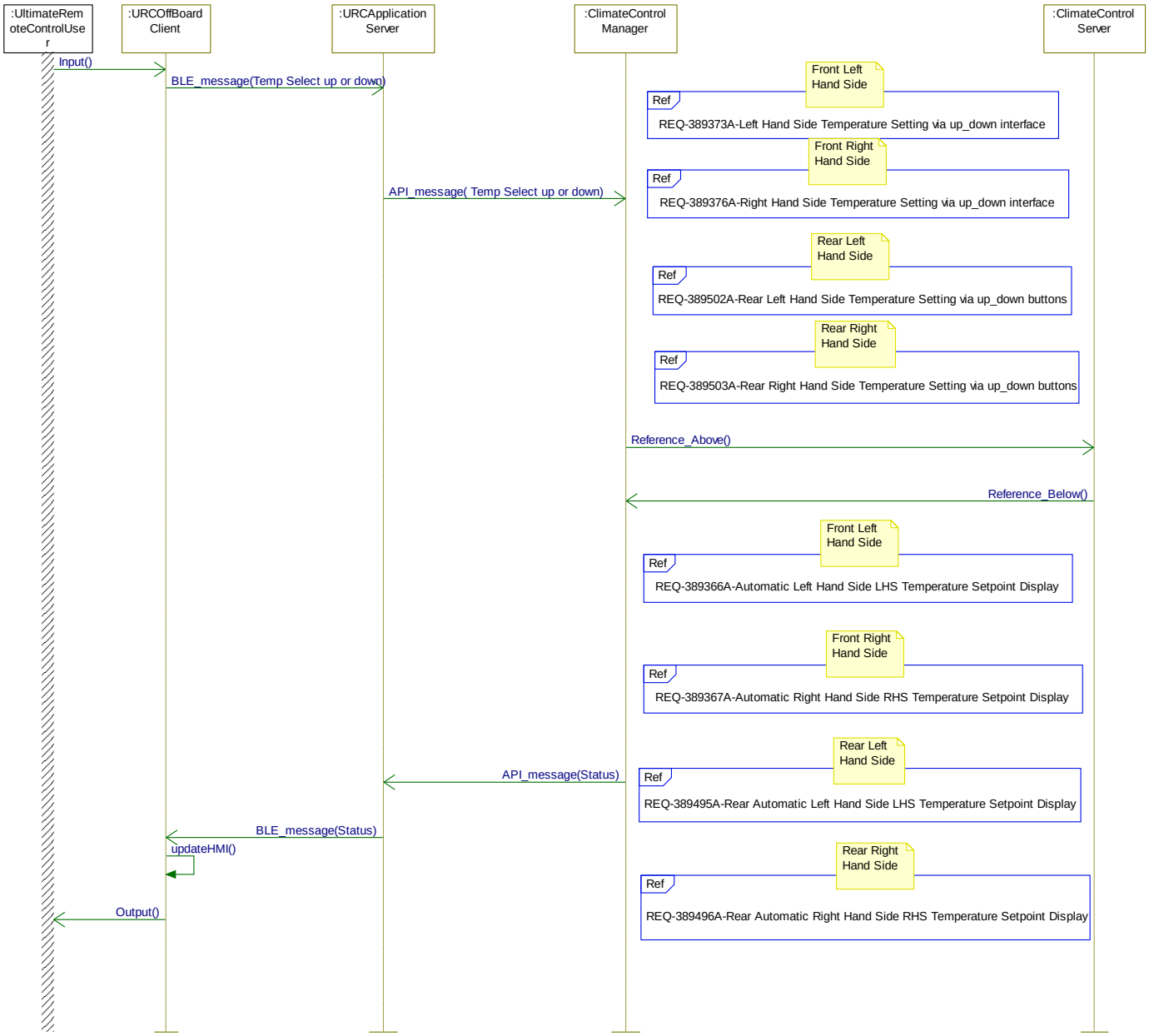
4.6.3.2.2 URC-SD-REQ-413788/A-Rear Climate Auto

Auto Selection Rear Climate



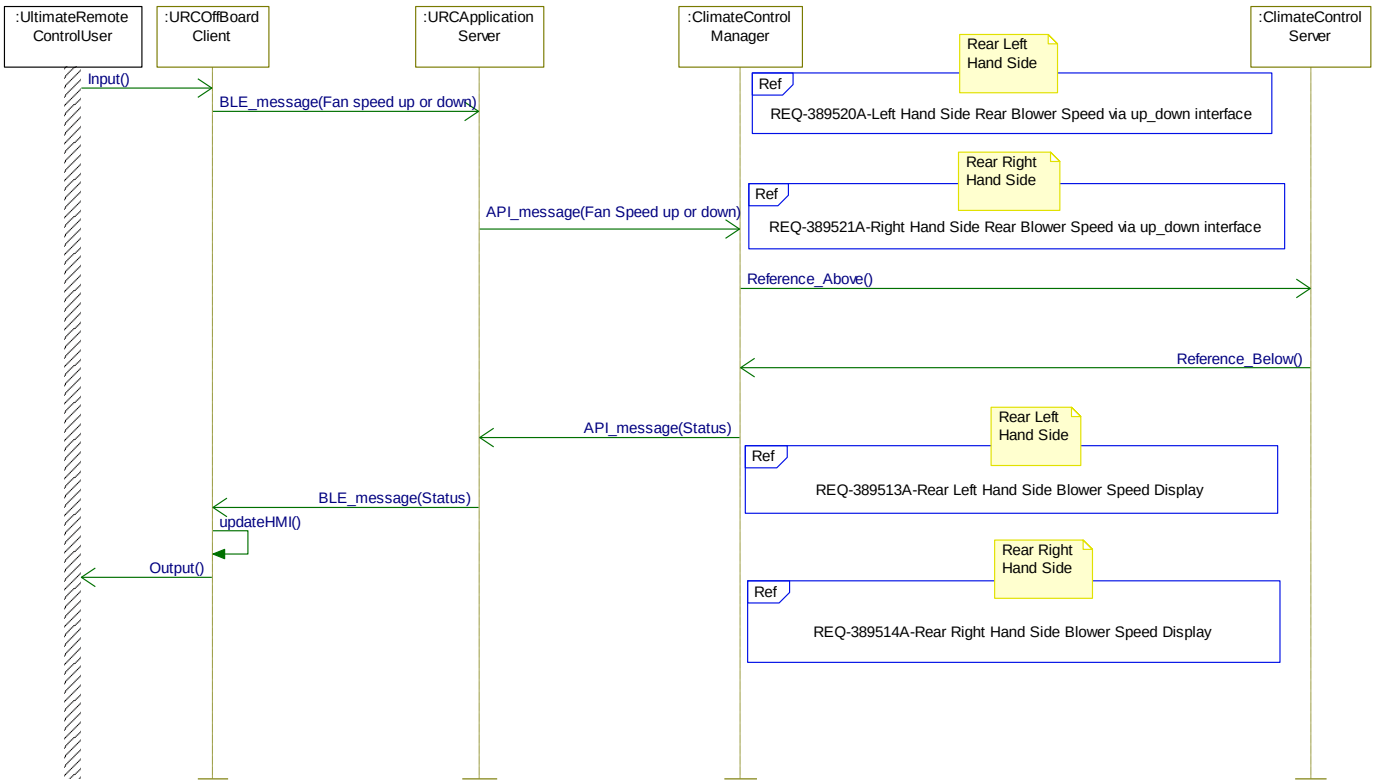
4.6.3.2.3 URC-SD-REQ-413789/A-Change Temperature

Change Temperature for any Climate Zone



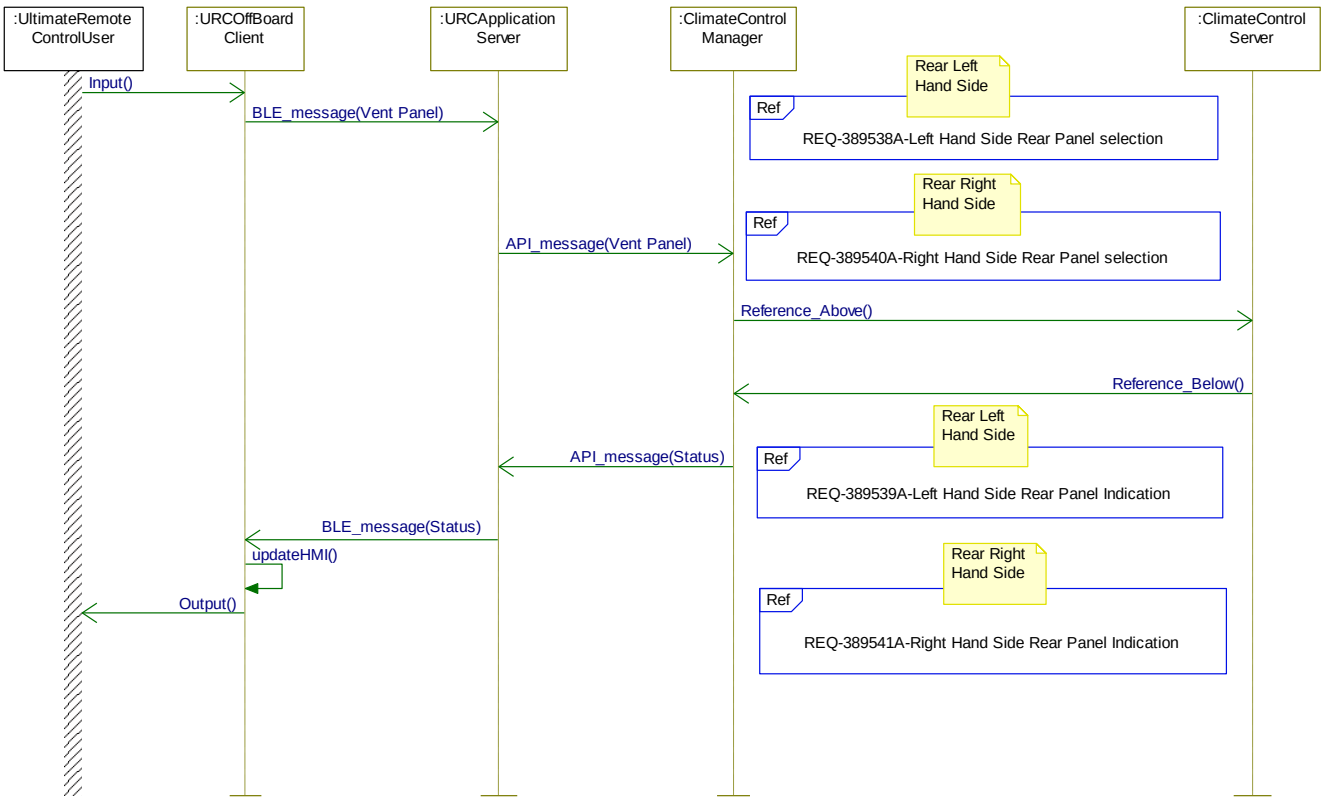
4.6.3.2.4 URC-SD-REQ-413790/A-Change Rear Fan Speed

Increase or Decrease Fan Speed in Rear Seat

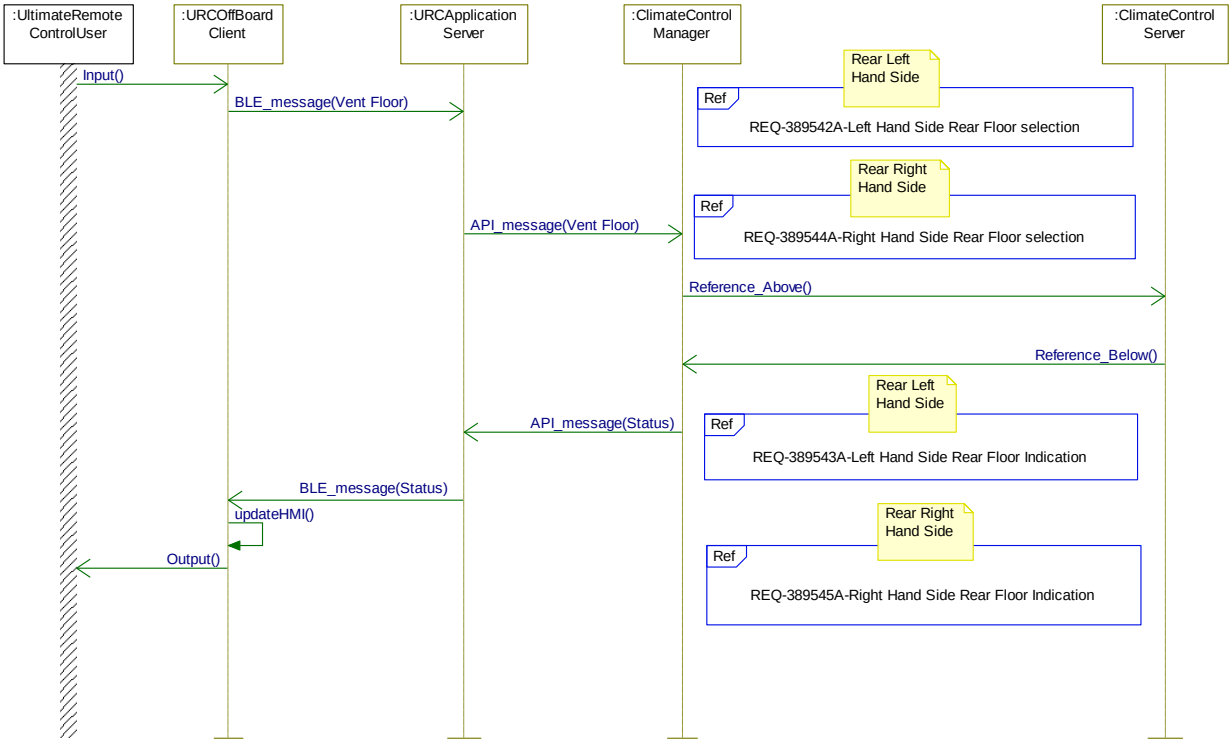


4.6.3.2.5 URC-SD-REQ-413792/A-Change Rear Vent Panel

Change Vent Panel for rear Seats.



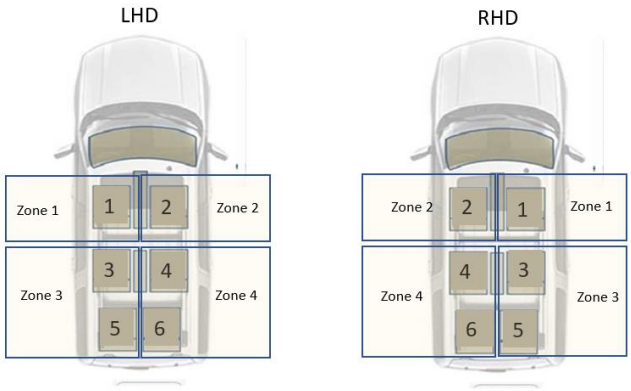
4.6.3.2.6 URC-SD-REQ-413793/A-Change Rear Vent Floor



4.7 URC-FUN-REQ-407037/A-MSS Audio Control

4.7.1 Requirements

4.7.1.1 URC-REQ-407038/A-Layout Four Zone System



4.7.1.2 URC-REQ-416717/A-Layout Two Zone System

4.7.1.3 URC-REQ-416718/A-Change Number of Zones

The MSS feature shall have the ability to change from a four zone system to a two zone system by the driver. When a change is made to the number of zones the URCOffBoardClient shall update HMI to match.

4.7.1.4 URC-REQ-406834/A-Individual Audio Control

URC feature shall allow passengers the ability to control individual seat audio when you have MSS

4.7.1.5 URC-REQ-416719/A-Request Play Media in Zone

The URCOffBoardClient shall have HMI to allow the user to Play Media from their Mobile Device to their vehicle zone.
1. HMI shall be for Seat 2, 3, and 4

If HMI is selected, the URCOffBoardClient shall invoke an API over BLE the URCApplicationServer to request to Play Media in Zone. The URCApplicationServer shall invoke an API to the MSSApplicationServer request to Play Media in Zone.

The MSSApplicationServer shall invoke an API message to the URCApplicationServer with “Approved” or “Rejected”. URCApplicationServer shall invoke an API over BLE to URCOffBoardClient with “Approved” or “Rejected”. URC HMI shall be update based on this message.

Reference: MSS-FUN-REQ-421040

4.7.1.6 URC-REQ-416720/A-Request Media to Play Full Cabin

The URCOffBoardClient shall have HMI to request media to be play in Full Cabin.
1. HMI shall be for Seat 2, 3, and 4

If HMI is selected the URCOffBoardClient shall invoke an API over BLE to the URCApplicationServer to request Play Media in Full Cabin Mode. The URCApplicationServer shall Invoke an API to the MSSApplicationServer to request Play Media in Full Cabin mode.

The MSSApplicationServer shall send an API message to the URCApplicationServer with “Approved” or “Rejected”. URCApplicationServer shall send an API over BLE to URCOffBoardClient with “Approved” or “Rejected”. URC HMI shall be update based on this API.

Reference: MSS-FUN-REQ-421040

4.7.1.7 URC-REQ-416729/A-Request to Share Media to Another Zone

The URCOffBoardClient1 shall have HMI to request to share media with another Zone in the vehicle, URCOffBoardClient2 (4 Zone System).

1. HMI shall be for Seat 2, 3, and 4
2. HMI shall be active when MSS is in 4 Zone Mode and URCOffBoardClient is playing media in their zone.

If HMI is selected, the URCOffBoardClient shall invoke an API over BLE to the URCApplicationServer to share media to targeted zone.

- If there is no connected URCOffBoardClient to the targeted zone the URCApplicationServer shall invoke an API to the MSSApplicationServer to share media to the targeted Zone.
- If there is a connected URCOffBoardClient to the targeted zone follow URC-REQ-429471 Approve Share Request.

Reference: MSS-FUN-REQ-421040

4.7.1.8 URC-REQ-429471/A-Approve Share Request

The URCOffBoardClient shall have HMI to Approve or Reject Share requests (4 Zone System).

HMI shall be for Seat 2, 3, and 4 when an incoming request is active and

1. DND is off for targeted zone
2. Targeted Zone is not on a phone call
3. Phone is connected to targeted zone

When a share request is made the URCApplicationServer shall invoke an API over BLE to the targeted zone's URCOffBoardClient to activate HMI to approve or reject the request. Once the user selects HMI, the URCOffBoardClient shall invoke an API over BLE to the URCApplicationServer with approve or reject. The URCApplicationServer shall invoke an API to the MSSApplicationServer.

- If the request is approved, the URCApplicationServer shall invoke an API to the MSSApplicationServer requesting the share.
- If the request is rejected, the URCApplicationServer shall invoke an API over BLE to the requestor's URCOffBoardClient with the rejection.

Reference: MSS-FUN-REQ-421040

4.7.1.9 URC-REQ-436408/A-Request Stop Sharing

The URCOffBoardClient shall have HMI to request to stop sharing (4 Zone System).

HMI shall be active once a request made from URC-REQ-416729/A-Request to Share Media to Another Zone

If the HMI is selected to Stop sharing , the URCOffBoardClient shall invoke an API over BLE to the URCApplicationServer with a stop to share. The URCApplicationServer shall invoke an API to the MSSApplicationServer with a stop sharing request.

Reference: MSS-SR-REQ-421042

4.7.1.10 URC-REQ-416730/A-Activate Or Deactivate Do Not Disturb

The URCOffBoardClient shall have HMI to Turn on or Turn off Do Not Disturb (DND).

If the HMI is selected to change the DND status URCOffBoardClient shall invoke an API over BLE to the URCApplicationServer to change DND status “On” or “Off”. URCApplicationServer shall invoke an API to MSSApplicationServer to update DND Status “On” or “Off”.

MSSApplicationServer invoke an API to URCApplicationServer with “On”, “Off” or “Inactive” for DND. The UCRApplicationServer shall invoke an API over BLE to the URCOffBoardClient with “On”, “Off” or “Inactive”. The URCOffBoardClient shall update HMI.

URCOffBoardClient shall make the DND HMI inactive when the DND status “Inactive”. The URCOffBoardClient shall NOT invoke an API over BLE for DND when the DND Status is “Inactive”.

Reference: MSS-FUN-REQ-425398/A-Do not Disturb activation

4.7.1.11 URC-REQ-429798/A-Activate or Deactivate Mute

The URCOffBoardClient shall have HMI to Turn on or Turn off Mute.

If the HMI is selected to change the Mute status URCOffBoardClient shall invoke an API over BLE to the URCApplicationServer to change Mute status “On” or “Off”. URCApplicationServer shall invoke an API to MSSApplicationServer to update Mute Status “On” or “Off”.

MSSApplicationServer shall invoke an API to URCApplicationServer with “On”, “Off” or “Inactive” for Mute. The UCRApplicationServer shall invoke an API over BLE to the URCOffBoardClient with “On”, “Off” or “Inactive”. The URCOffBoardClient shall update HMI.

Reference: MSS-FUN-REQ-415951/A-MSS zone Mute/Unmute

4.7.1.12 URC-REQ-429284/A-Define Logic API used in SD

PlayInZone(Seat#,Action)
Action- Request, Approved, Rejected

ShareMedia (FromSeat#,ToSeat#,Action)
Action- Request, Approved, Rejected

ApproveShare(Seat#of approver, Seat#ofRequester, Action)
Action- Request, Approved, Rejected, Complete

DND(Seat#, Status)
Status-On, Off

ICC (Status)
Status-On, Off

4.7.2 Use Cases

4.7.2.1 UC-REQ-407039/A-Request Seat3 PlayInZone

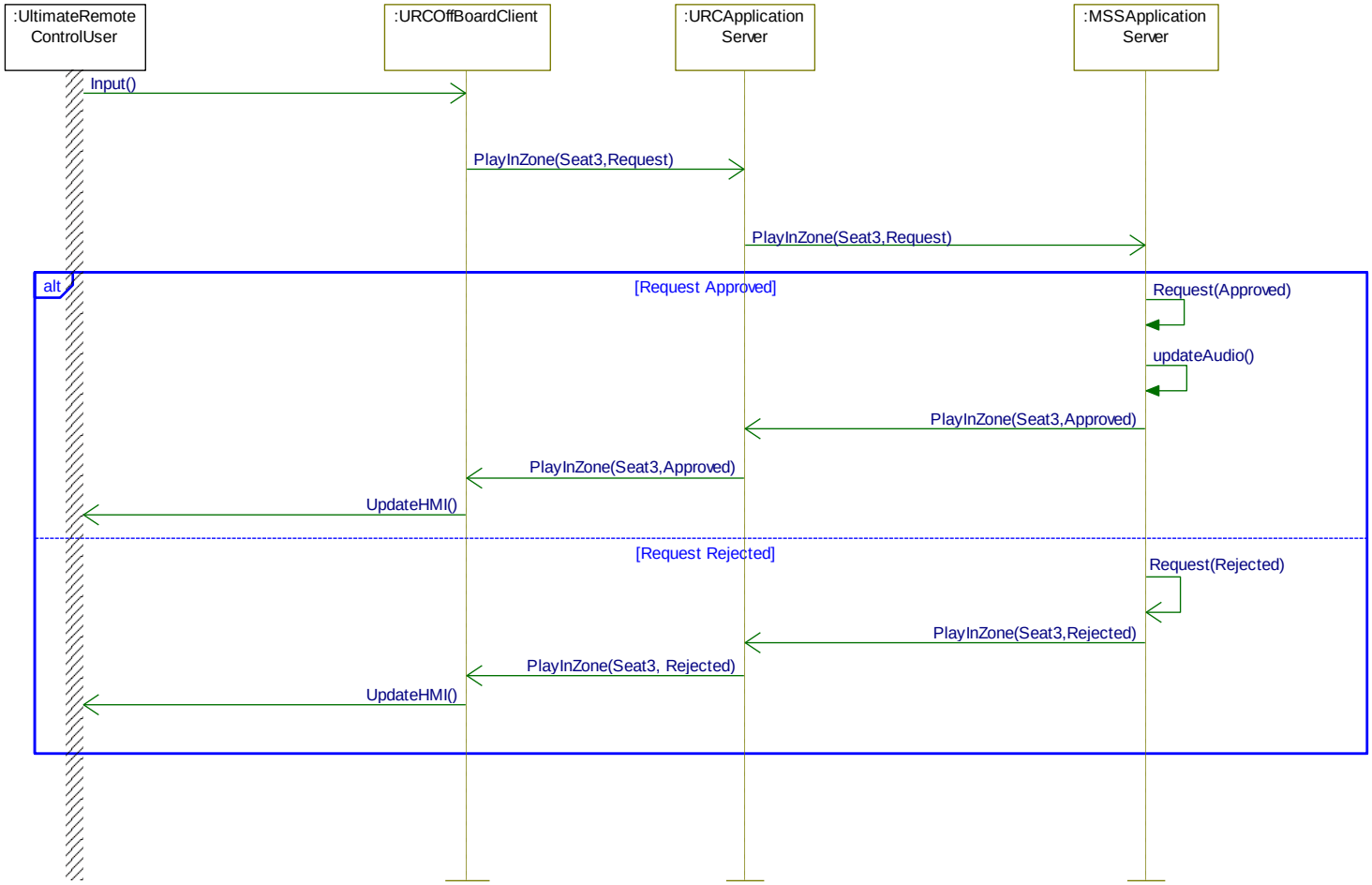
Actors	URC_User, MSS User
Pre-conditions	All Preconditions for URC are met. Media is started on Seat3 URCOffBoardClient
Scenario Description	Seat3 URC User select HMI to Play Media in Zone MSSApplicationServer approves request to Play Media in Zone

Post-conditions	Media Audio Plays in Zone URC HMI is updated
List of Exception Use Cases	
Interfaces	HMI

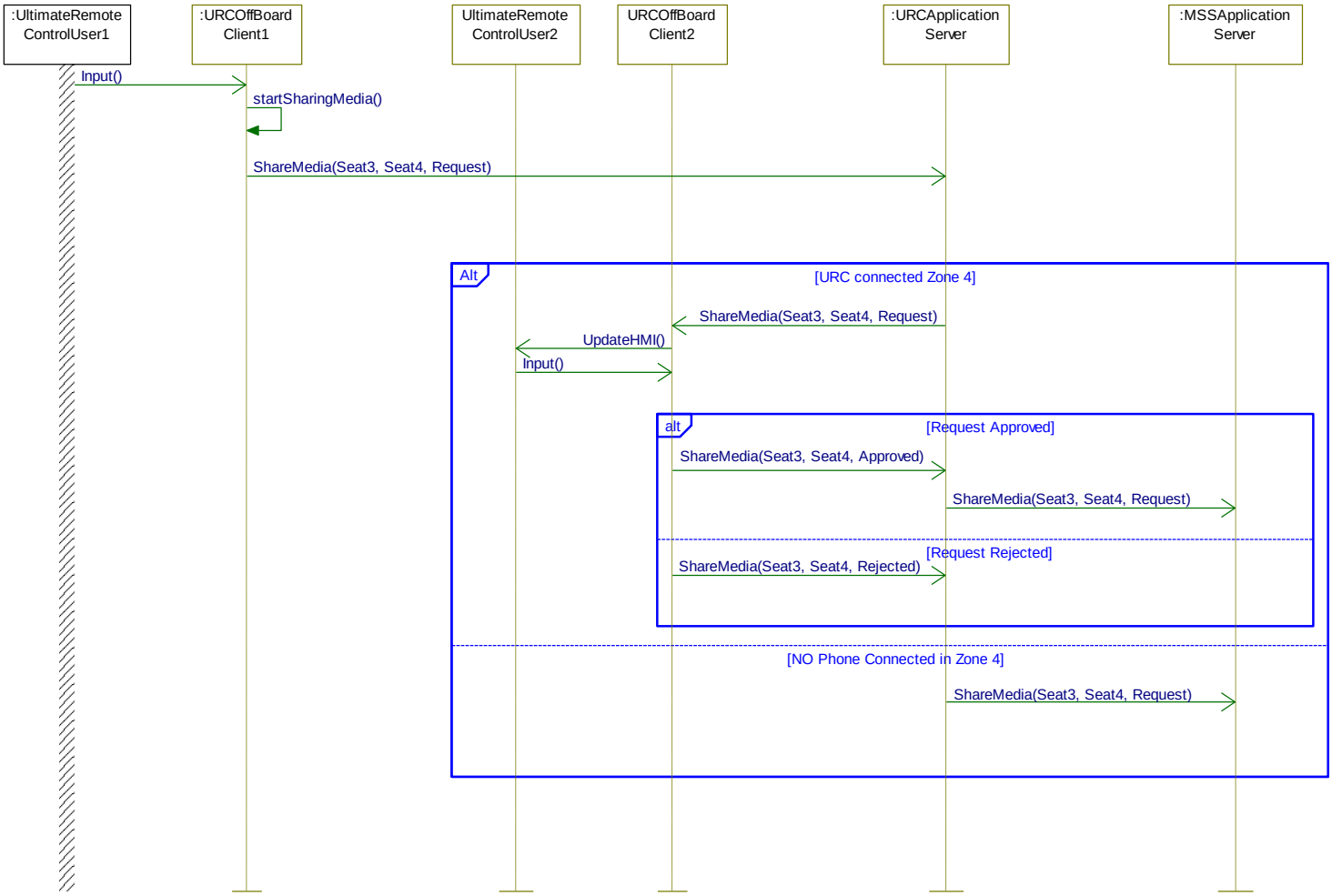
4.7.3 White Box View

4.7.3.1 Sequence Diagrams

4.7.3.1.1 URC-SD-REQ-428385/A-Request Seat3 PlayInZone



4.7.3.1.2 URC-SD-REQ-428386/A-Request Seat3 Share with Zone4



4.8 URC-FUN-REQ-411825/A-Rejuvenate

4.8.1 Requirements

4.8.1.1 URC-REQ-411826/A-Rejuvenate on

URC will be disabled when Rejuvenate is active. The URCApplicationServer shall ignore any URC BLE messages for all URCOffBoardClients while in disabled state.

Once Rejuvenate is non-active, the UCR function will return to normal state.

4.9 URC-FUN-REQ-436403/A-In Car Communication

4.9.1 Requirements

4.9.1.1 URC-REQ-416731/A-Activate or Deactivate ICC

The URCOffBoardClient shall have HMI to Turn on or Turn off In Car Communication (ICC).

If the HMI is selected to change the ICC status URCOffBoardClient shall invoke an API over BLE to the URCApplicationServer to change ICC status “On” or “Off”. URCApplicationServer shall invoke an API to ICCApplicationServer to update ICC Status “On” or “Off”.

ICCApplicationServer shall invoke an API to URCApplicationServer with “On”, “Off” or “Inactive” for ICC. The UCRApplicationServer shall invoke an API over BLE to the URCOffBoardClient with “On”, “Off” or “Inactive”. The URCOffBoardClient shall update HMI.

URCOffBoardClient shall make the ICC HMI inactive when the ICC status “Inactive”. The URCOffBoardClient shall NOT invoke an API over BLE for ICC when the ICC Status is “Inactive”.

Reference ICC-FUN-REQ-408873/A-Enable/Disable Sync/URC from **In Car Communication SPSS**

4.9.2 Use Cases

4.9.2.1 URC-UC-REQ-436405/A-Activate ICC

Actors	URCOffBoardClient
Pre-conditions	URCApplicationServer is active
Scenario Description	ICC is inactive URCOffBoardClient user selects HMI to active ICC
Post-conditions	ICC is active
List of Exception Use Cases	
Interfaces	HMI

5 Appendix: Reference Documents

Reference #	Document Title
1	Climate Control APIM SPSS
2	MSS Zone Manager SPSS
3	In Car Communication SPSS
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	