Research & Vehicle Technology
"Infotainment Systems Product Development"

Feature – Wi-Fi Hotspot OnBoard Client v2

Subsystem Part Specific Specification (SPSS)

Version 1.5

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Version Date: October 13, 2021

FORD CONFIDENTIAL

Revision History

Date	Version	Notes	
November 6, 2017	**1.0**	**Initial Release**	
November 27, 2017	**1.1**		
	WFHSv2-REQ-274791/B-Logical Signal Mapping		MBORREL: Added WifiHtspt_D_Falt
	STR-285950/B-Requirements		MBORREL4: Added new REQ-288215
	WFHSv2-REQ-283550/B-Monitoring Wi-Fi Hotspot feature availability		jshelby5: removed Wi-Fi error requirement (new requirement added for this)
	WFHSv2-REQ-283612/B-Wi-Fi Hotspot traffic model		jshelby5: updated the max number of devices to be tested
	WFHSv2-REQ-283614/B-Wi-Fi throughput		jshelby: updated throughput
	WFHSv2-REQ-283615/B-Modulation scheme		jshelby5: updated MCS
	WFHSv2-REQ-283628/B-Reporting out diagnostics		jshelby5: WifiHotspotServer shall report out any wi-fi related, active DTCs
	WFHS-REQ-288215/A-Displaying Diagnostic Failures		jshelby5: new requirement
	WFHSv2-FUN-REQ-274796/B-Turning Wi-Fi Hotspot On or Off		MBORREL4: Updated text as REQ-191653 changed to REQ-288222
	STR-209312/B-Requirements		MBORREL4: added REQ-288222, removed REQ-191653
	WFHSv2-REQ-288222/A-Managing the connected devices list		MBORREL4: new req to replace REQ-191653, jshelby5: updated max number of connected devices
	WFHSv2-REQ-283769/B-Hiding data usage screen based on data usage feature flag		jshelby5: added a requirement for missing CAN signal
	WFHS-REQ-283659/B-Reporting data usage response error messages for failed Refresh requests		jshelby5: updated table
	STR-285784/B-Requirements		MBORREL4: added REQ-288270, removed REQ-191718
	WFHSv2-REQ-288270/A-Initial carrier hotline number		MBORREL4: replaced REQ-191718 with REQ-288270, jshelby5: added examples
	WFHSv2-REQ-281871/B-Updating the carrier landing page URL		jshelby5: added examples
	WFHSv2-UC-REQ-283778/B-China customer initiates a call to the carrier hotline though the WifiHotspotOnBoardClient display		jshelby5: updated post condition, customer may not remain on the current screen
	WFHSv2-REQ-283737/B-Restricting frequency channels		jshelby5: added restricted channels
	WFHSv2-REQ-283779/B-Displaying the frequency band		jshelby5: added requirement for missing CAN signal
June 25, 2018	**1.2**		
	STR-286782/B-Overview		jshelby5: Included backend updates
	WFHS-CLD-REQ-191764/B-Wifi Hotspot Off Board Client		jshelby5: Included backend updates
	DOC-460201/B-Physical Mapping of Classes		MBORREL4: Changed V-SDN to TMC
	WFHSv2-REQ-274791/C-Logical Signal Mapping		MBORREL4: Updated table for new signal
	MD-REQ-195171/B-WifiHotspotMAC_Rq		MBORREL4: Clarification, added "STA" to "MAC Address"
	WFHSv2-IIR-REQ-283542/B-WifiHotspotOnBoardClient_Rx		MBORREL4: Added REQ-304589
	MD-REQ-195174/B-WifiHotspotMAC_Rsp		MBORREL4: Clarification, added "STA" to "MAC Address"
	MD-REQ-304589/A-NewHotSpotCredentials_St		MBORREL4: New signal
	STR-285950/C-Requirements		MBORREL4: Added REQ-315639, 315646, 315647. Replaced REQ-191906 with REQ-315645
	WFHSv2-REQ-283628/C-Reporting out diagnostics		jshelby5: Updated content and DTC table
	WFHSv2-REQ-283648/B-APN connections		jshelby5: Added clarification of APN updates
	WFHS-REQ-315639/A-Wi-Fi Hotspot feature dependency on the Vehicle Connectivity state		jshelby5: New req. to align with CCS implementation

WFHSv2-REQ-315645/A-AP connection rules	jshelby5: removed WAP support
WFHSv2-REQ-281705/B-Wi-Fi Chipset AP and STA mode	jshelby5: Removed AP/STA mode requirements
WFHS-REQ-263050/B-Broadcasting as a metered account	jshelby5: Spelling fix (no content change)
WFHS-REQ-283630/B-ECU Reset FTCP Command	jshelby5: Specified failure response types
WFHS-REQ-315646/A-Service Oriented Architecture Client	jshelby5: New Req.
WFHS-REQ-315647/A-Sending country code to the WifiHotspotOnBoardClient	jshelby5: New Req.
WFHSv2-UC-REQ-283740/B-User is navigating in the Wi-Fi Hotspot screens when a Wi-Fi error occurs	jshelby5: Updated Post-Conditions
WFHSv2-FUN-REQ-274796/C-Turning Wi-Fi Hotspot On or Off	jshelby5: Included backend updates
STR-209298/B-Requirements	MBORREL4: Added REQ-315657-661
WFHSv2-REQ-283564/B-Wi-Fi Hotspot enablement condition checks	jshelby5: Added WifiHotspotOffBoardClient to the table
WFHS-REQ-315657/A-Informing the WifiHotspotOffBoardClient of a Wi-Fi Hotspot Enablement change	jshelby5: New req.
WFHS-REQ-315658/A-Authorization dependency on enablement updates from the WifiHotspotOffBoardClient	jshelby5: New req.
WFHS-REQ-191707/B-Request from WifiHotspotOnBoardClient to turn the Wi-Fi Hotspot on or off	jshelby5: Included updating the backend.
WFHS-REQ-315659/A-Request from WifiHotspotOffBoardClient to turn the Wi-Fi Hotspot on or off	jshelby5: New req.
WFHS-REQ-315660/A-Receiving multiple enablement requests	jshelby5: New req.
WFHS-REQ-315661/A-Request from the WifiHotspotOffBoardClient for the current enablement state	jshelby5: New req.
WFHSv2-UC-REQ-283574/B-User turns Wi-Fi Hotspot On	jshelby5: Included backend updates
WFHSv2-UC-REQ-283746/B-User turns Wi-Fi Hotspot Off	jshelby5: Included backend updates
WFHSv2-UC-REQ-283576/B-User attempts to turn the Wi-Fi Hotspot on when the Wi-Fi Hotspot enablement conditions are not met	jshelby5: Included backend updates
WFHSv2-UC-REQ-283577/B-Wi-Fi Hotspot in On-disabled state when the Wi-Fi Hotspot enablement conditions become met	jshelby5: Included backend updates
WFHSv2-UC-REQ-283579/B-Wi-Fi Hotspot is on when the Wi-Fi Hotspot enablement conditions become not met	jshelby5: Included backend updates
STR-267668/B-Activity Diagrams	MBORREL4: Replaced REQ-167127 with REQ-317275. Added REQ-317276.
WFHSv2-ACT-REQ-317275/A-User Turns Wi-Fi Hotspot On from WifiHotspotOnBoardClient	MBORREL4: New req. replacing REQ-167127. Updated for backend updates.
WFHSv2-ACT-REQ-317276/A-User Turns Wi-Fi Hotspot On from WifiHotspotOffBoardClient	MBORREL4: New req.
STR-267747/B-Sequence Diagrams	MBORREL4: Replaced REQ-167144 with REQ-317513. Added REQ-317514.
WFHSv2-SD-REQ-317513/A-User Turns Wi-Fi Hotspot On/Off from WifiHotspotOnBoardClient	MBORREL4: New req. replacing REQ-167144. Updated to include backend update
WFHSv2-SD-REQ-317514/A-User Turns Wi-Fi Hotspot On/Off from WifiHotspotOffBoardClient	MBORREL4: New req.
WFHSv2-FUN-REQ-274797/B-Managing SSID	jshelby5: Included backend updates
STR-209300/B-Requirements	MBORREL4: Added REQ-315689-696
WFHS-REQ-315689/A-Informing the WifiHotspotOffBoardClient of an SSID change	jshelby5: New Req.
WFHS-REQ-315690/A-SSID encryption	jshelby5: New Req.

WFHS-REQ-315691/A-Authorization dependency on SSID updates from the WifiHotspotOffBoardClient	jshelby5: New Req.
WFHS-REQ-191628/B-SSID update request from WifiHotspotOnBoardClient	jshelby5: Included backend updates
WFHS-REQ-315692/A-Request from WifiHotspotOffBoardClient to change the SSID	jshelby5: New Req.
WFHS-REQ-315693/A-Setting the SSID update bit	jshelby5: New Req.
WFHS-REQ-315694/A-Updating the SSID while the user is in the screen	jshelby5: New Req.
WFHS-REQ-315695/A-Receiving multiple SSID requests	jshelby5: New Req.
WFHS-REQ-315696/A-Request from the WifiHotspotOffBoardClient for the current SSID	jshelby5: New Req.
STR-209305/B-Use Cases	MBORREL4: Added REQ-315701-702
WFHSv2-UC-REQ-283780/B-User changes SSID from WifiHotspotOnBoardClient	jshelby5: Included backend updates
WFHS-UC-REQ-315701/A-User changes SSID from WifiHotspotOnBoardClient when Vehicle is Off	jshelby5: New usecase
WFHS-UC-REQ-315702/A-User changes SSID from WifiHotspotOffBoardClient when Vehicle is ON	jshelby5: New usecase
STR-267749/B-Activity Diagrams	MBORREL4: Replaced REQ-167121 with REQ-317273. Added REQ-317274.
WFHSv2-ACT-REQ-317273/A-User Changes SSID from WifiHotspotOnBoardClient	MBORREL4: New req. replacing REQ-167121. Updated for backend updates.
WFHSv2-ACT-REQ-317274/A-User Changes SSID from WifiHotspotOffBoardClient	MBORREL4: New req.
STR-267750/B-Sequence Diagrams	MBORREL4: Replaced REQ-167136 with REQ-317511. Added REQ-317512.
WFHSv2-SD-REQ-317511/A-User Changes SSID from WifiHotspotOnBoardClient	MBORREL4: New req. replacing REQ-167136. Updated to include backend update
WFHSv2-SD-REQ-317512/A-User Changes SSID from WifiHotspotOffBoardClient	MBORREL4: New req.
WFHSv2-FUN-REQ-274798/B-Managing Password	jshelby5: Included backend updates
STR-209306/B-Requirements	MBORREL4: Added REQ-315704-710, REQ-315718
WFHSv2-REQ-283753/B-Displaying the password on the WifiHotspotOnBoardClient display	jshelby5: Referred to the Private Information section instead of specify how the password shall be hidden. Also, the password shall not be stored.
WFHS-REQ-315704/A-Informing the WifiHotspotOffBoardClient of a password change	jshelby5: New req.
WFHS-REQ-315705/A-Password encryption	jshelby5: New req.
WFHS-REQ-315706/A-Authorization dependency on password updates from the WifiHotspotOffBoardClient	jshelby5: New req.
WFHS-REQ-191638/B-Password update request from WifiHotspotOnBoardClient	jshelby5: Included backend updates
WFHS-REQ-315707/A-Request from WifiHotspotOffBoardClient to change the password	jshelby5: New req.
WFHS-REQ-315708/A-Setting the password update bit	jshelby5: New req.
WFHS-REQ-315718/A-Updating the password while the user is in the screen	jshelby5: New req.
WFHS-REQ-315709/A-Receiving multiple password requests	jshelby5: New req.
WFHS-REQ-315710/A-Request from the WifiHotspotOffBoardClient for the current password	jshelby5: New req.
STR-209307/B-Use Cases	MBORREL4: Added REQ-315719-720
WFHSv1-UC-REQ-191939/C-User changes password from WifiHotspotOnBoardClient	jshelby5: Included backend updates
WFHS-UC-REQ-315719/A-User changes password from WifiHotspotOnBoardClient when Vehicle is Off	jshelby5: New usecase

	WFHS-UC-REQ-315720/A-User changes password from WifiHotspotOffBoardClient when Vehicle is ON	jshelby5: New usecase
	STR-250186/B-Activity Diagrams	MBORREL4: Replaced REQ-167117 with REQ-317271. Added REQ-317272
	WFHSv2-ACT-REQ-317271/A-User Changes Password from WifiHotspotOnBoardClient	MBORREL4: New req. replacing REQ-167117 . Updated for backend updates.
	WFHSv2-ACT-REQ-317272/A-User Changes Password from WifiHotspotOffBoardClient	MBORREL4: New req.
	STR-250187/B-Sequence Diagrams	MBORREL4: Replaced REQ-167132 with REQ-317509. Added REQ-317510.
	WFHSv2-SD-REQ-317509/A-User Changes Password from WifiHotspotOnBoardClient	MBORREL4: New req. replacing REQ-167132. Updated to include backend update
	WFHSv2-SD-REQ-317510/A-User Changes Password from WifiHotspotOffBoardClient	MBORREL4: New req.
	WFHSv2-FUN-REQ-274799/B-Changing Security Algorithm	jshelby5: removed WPA
	STR-209309/B-Requirements	MBORREL4: Replaced REQ-191642 with REQ-317121
	WFHSv2-REQ-317121/A-Security algorithm offerings per region	jshelby5: new req to replace REQ-191642, removed WPA
	STR-209312/C-Requirements	MBORREL4: Replaced REQ-191696 with REQ-317122
	WFHSv2-REQ-288222/B-Managing the connected devices list	jshelby5: updated default value to 10
	WFHSv2-REQ-317122/A-Managing the blocked devices list	jshelby5: new req replacing REQ-191696, updated default value to 10
	WFHSv3-REQ-281851/B-Displaying data usage information	jshelby5: Added requirement for displaying User ID
	WFHS-REQ-283659/C-Reporting data usage response error messages for failed Refresh requests	jshelby5: Updated table and content
	WFHSv2-ACT-REQ-274803/B-User Refreshes Data Usage Values From Centerstack	MBORREL4: Updated to include Error Code changes
	WFHSv2-SD-REQ-274804/B-User Refreshes Data Usage Values From Centerstack	MBORREL4: Updated to include Error Code changes
	WFHSv2-REQ-283775/B-Displaying critical data plan related popups	MBORREL4: Editorial fix
	WFHSv2-REQ-283734/B-Requesting for carrier information due to the user entering a specific screen	jshelby5: Updated content as VIN may not always be displayed with the hotline number.
	WFHSv2-REQ-283735/B-Displaying carrier information	jshelby5: Updated image
	WFHSv2-UC-REQ-283778/C-China customer initiates a call to the carrier hotline though the WifiHotspotOnBoardClient display	jshelby5: Updated pre-condition as VIN will not be displayed.
	WFHSv2-REQ-283559/B-Wi-Fi Hotspot reset settings	jshelby5: Removed WPA
	WFHSv2-FUN-REQ-274813/B-Switching Frequency Bands	jshelby5: changed "location" to "region/country"
	WFHSv2-REQ-283736/B-Estimating current vehicle location	jshelby5: Updated content as est. vehicle location shall be stored as country code
	WFHSv2-REQ-283737/C-Restricting frequency channels	jshelby5: Updated req. to enable/disable all 3 channels based on EOL config
	WFHSv2-REQ-283779/C-Displaying the frequency band	MBORREL4: Editorial fix
July 15, 2019	**1.3**	
	DOC-460201/C-Physical Mapping of Classes	MBORREL4: Removed SubSYNC
	WFHSv2-REQ-274791/D-Logical Signal Mapping+	MBORREL4: Updated table
	WFHSv2-REQ-274791/E-Logical Signal Mapping	MBORREL4: Removed TelematicService_St
	WFHSv2-IIR-REQ-283542/C-WifiHotspotOnBoardClient_Rx	MBORREL4: Removed REQ-028115
	STR-285950/D-Requirements	MBORREL4: Added REQ-358564-566. Removed REQ-194010. Replaced REQ-194010 with REQ-358568
	WFHS-REQ-358564/A-WifiHotspotServer detects the Customer Connectivity Settings	MBORREL4: New req.

WFHS-REQ-358565/A-WifiHotspotOnBoardClient detects the Customer Connectivity Settings	MBORREL4: New req.
WFHS-REQ-315639/B-Wi-Fi Hotspot feature dependency on the Vehicle Connectivity state+	jshelby5: Clarification
WFHS-REQ-315639/C-Wi-Fi Hotspot feature dependency on the Vehicle Connectivity state	MBORREL4: Updated req.
WFHS-REQ-358566/A-Wi-Fi Hotspot feature dependency on the Cellular Connectivity state	MBORREL4: New req.
WFHSv2-REQ-281701/B-Wi-Fi Hotspot feature dependency on the vehicle authorization state	MBORREL4: Updated req.
WFHSv2-REQ-281705/C-Wi-Fi Chipset AP and STA mode	MBORREL4: Updated req.
WFHSv2-REQ-358568/A-Wi-Fi Hotspot parameters transmitted during provisioning	MBORREL4: New req. to replace REQ-194010
WFHS-REQ-283630/C-ECU Reboot FTCP Command	jshelby5: clarification: changed 'reset' to 'reboot'
STR-209298/C-Requirements	MBORREL4: Added REQ-336814 & REQ-336938. Removed REQ-191707. Replaced REQ-191707 with REQ-336938
WFHS-REQ-336814/A-Configurable Non-Correlated Enablement Alerts	MBORREL4: New req
WFHS-REQ-315657/B-Informing the WifiHotspotOffBoardClient of a Wi-Fi Hotspot Enablement change	jshelby5: added alert type
WFHS-REQ-315658/B-Authorization dependency on enablement updates from the WifiHotspotOffBoardClient	MBORREL4: Updated req.
WFHS-REQ-336938/A-Request from WifiHotspotOnBoardClient to turn the Wi-Fi Hotspot on or off	MBORREL4: New req to replace REQ-191707, added alert type
WFHS-REQ-315659/B-Request from WifiHotspotOffBoardClient to turn the Wi-Fi Hotspot on or off	jshelby5: added alert type
STR-209300/C-Requirements	MBORREL4: Added REQ-336815-816. Removed REQ-191628. Replaced REQ-191628 with REQ-336816.
WFHS-REQ-336815/A-Configurable Non-Correlated SSID Alerts	MBORREL4: New req.
WFHS-REQ-315689/B-Informing the WifiHotspotOffBoardClient of an SSID change	jshelby5: added alert type
WFHS-REQ-315691/B-Authorization dependency on SSID updates from the WifiHotspotOffBoardClient	MBORREL4: New Req.
WFHSv2-REQ-336816/A-SSID update request from WifiHotspotOnBoardClient	MBORREL4: New req to replace REQ-191628, added alert type
WFHS-REQ-315692/B-Request from WifiHotspotOffBoardClient to change the SSID	jshelby5: added alert type
WFHS-UC-REQ-315701/B-User changes SSID from WifiHotspotOffBoardClient when Vehicle is Off	jshelby5: clarification: fixed the title from OnBoard to OffBoard
STR-209306/C-Requirements	MBORREL4: Added REQ-336825-826. Removed REQ-191638. Replaced REQ-191638 with REQ-336826.
WFHS-REQ-336825/A-Configurable Non-Correlated Password Alerts	MBORREL4: New req.
WFHS-REQ-315704/B-Informing the WifiHotspotOffBoardClient of a password change	jshelby5: added alert type
WFHS-REQ-315706/B-Authorization dependency on password updates from the WifiHotspotOffBoardClient	MBORREL4: Updated req.
WFHSv2-REQ-336826/A-Password update request from WifiHotspotOnBoardClient	MBORREL4: New req replaces REQ-191638, added alert type
WFHS-REQ-315707/B-Request from WifiHotspotOffBoardClient to change the password	jshelby5: added alert type
WFHSv1-UC-REQ-191939/D-User changes password from WifiHotspotOnBoardClient	jshelby5: Revert to RevB content

	WFHS-UC-REQ-315719/B-User changes password from WifiHotspotOffBoardClient when Vehicle is Off	jshelby5: clarification: changed title from OnBoard to OffBoard
	WFHSv2-FUN-REQ-274802/B-Reporting Data Used	MBORREL4: Updated function description (removed table)
	WFHSv3-REQ-281851/C-Displaying data usage information	MBORREL4: Updated req.
	WFHSv2-UC-REQ-281865/B-User refreshes the data usage values on the mobile app while in the Wi-Fi Hotspot screen on the WifiHotspotOnBoardClient display	MBORREL4: Repalced WifiHotspotServer with WifiHotspotOnBoardClient in the Actor section
	STR-209318/B-Requirements	MBORREL4; Added REQ-336918
	WFHS-REQ-336918/A-Informing the WifiHotspotOffBoardClient of a Wi-Fi Hotspot reset	MBORREL4: New req.
	WFHSv2-UC-REQ-281878/B-Dealer replaces WifiHotspotServer while a Wi-Fi Hotspot data plan is active	MBORREL4: Updated scenario
September 22, 2020	**1.4**	
	STR-285950/E-Requirements	MBORREL4: Removed REQ-191896. Replaced REQ-191896 with REQ-398697
	WFHSv2-REQ-283727/B-WifiHotspotOnBoardClient identifies the vehicle region	jshelby5: added Brazil market
	WFHSv2-REQ-283728/B-WifiHotspotServer identifies the vehicle region	jshelby5: added RoW market
	WFHSv2-REQ-398697/A-FCC and international radio regulatory requirements	MBORREL4: New req. to replace REQ-191896
	WFHSv2-REQ-283628/D-Reporting out diagnostics	OVEGAMAR: Remove DTCs 0x9D5611 (B1D56-11) WLAN Primary Antenna (Antenna #3 Circuit) Circuit Short To Ground Permanent and 0x9D5613 (B1D56-13) WLAN Primary Antenna (Antenna #3 Circuit) Circuit Open Permanent
	WFHSv2-REQ-283648/C-APN connections	jshelby5: added RoW market
	WFHS-REQ-358566/B-Wi-Fi Hotspot feature dependency on the Cellular Connectivity state	OVEGAMAR: Change Vehicle connectivity to Cellular connectivity in requirements
	STR-285783/B-Requirements	MBORREL4: Removed REQ-191713. Replaced REQ-191713 with REQ-398394
	WFHSv2-REQ-398394/A-Reporting out technology used to connect to the cellular network	MBORREL4: New req. to replace REQ-191713
	WFHSv2-REQ-283741/B-Displaying the dedicated WifiHotspotServer icon on the WifiHotspotOnBoardClient display	jshelby5: Updated req. as icons may be different per region
	STR-209300/D-Requirements	MBORREL4: Removed REQ-191596. Replaced REQ-191596 with REQ-399815
	WFHSv2-REQ-399815/A-Generating the default SSID	MBORREL4: New req. to replace REQ-191596, updated req to replace REQ-191610 with REQ-399814
	WFHSv2-REQ-283748/B-Keyboard used to edit the SSID through WifiHotspotOnBoardClient display	jshelby5: Updated to include all regions
	WFHSv2-UC-REQ-283751/B-E5 User attempts to view SSID/password through WifiHotspotOnBoardClient while under driver restriction	OVEGAMAR: Updated to reflect changes of H21j driver restriction
	STR-209306/D-Requirements	MBORREL4: Removed REQ-191610. Replaced REQ-191610 with REQ-399814
	WFHSv2-REQ-399814/A-Generating the initial password	MBORREL4: New req. to replace REQ-191610
	WFHSv2-REQ-283755/B-Keyboard used to edit the password through WifiHotspotOnBoardClient display	jshelby5: Updated to include all regions
	WFHSv2-REQ-283766/B-User requests to block a device from the hotspot through WifiHotspotOnBoardClient display	OVEGAMAR: Removed popup to confirm when blocking devices in HMI for Wi-Fi Hotspot
	WFHSv2-REQ-283768/B-User requests to unblock a device from the blocked list through WifiHotspotOnBoardClient display	OVEGAMAR: Removed popup to confirm when unblocking devices in HMI for Wi-Fi Hotspot
	WFHSv2-REQ-281708/B-Request to refresh data usage info without a response required	jshelby5: Updated req. as data usage refresh timeout default value shall apply to all regions

	WFHSv2-REQ-281855/B-Request from WifiHotspotOnBoardClient to refresh the data usage values	jshelby5: Updated req. as data usage refresh timeout default value shall apply to all regions
	WFHSv2-REQ-283730/B-Triggering free trial period reminders	jshelby5: Added RoW market
	WFHSv2-REQ-283775/C-Displaying critical data plan related popups	jshelby5: Clarification updates
	WFHSv2-FUN-REQ-274808/B-Managing Carrier Information	jshelby5: Clarified that customers can use landing page in all markets
	WFHSv2-REQ-288270/B-Initial carrier hotline number	OVEGAMAR: Add clarification for CHINA region
	WFHSv2-REQ-281870/B-Updating the carrier service hotline number	OVEGAMAR: Add clarification for CHINA region
	WFHSv2-REQ-281871/C-Updating the carrier landing page URL	jshelby5: Added Brazil market
	WFHSv2-REQ-283581/B-Reporting out the carrier information to the WifiHotspotOnBoardClient	jshelby5: Added Brazil market
	WFHSv2-REQ-283559/C-Wi-Fi Hotspot reset settings	OVEGAMAR: Remove Hotspot_Enablement_Timer timer and Enhanced_Hotspot_Enablement_Mode, not needed for FNV2. MBORREL4: Replaced REQ-191610 with REQ-399814. Replaced REQ-191596 with REQ-399815
October 13, 2021	**1.5**	
	STR-286782/C-Overview	MBORREL4: Removed mention of using CAN interface
	DOC-460201/D-Physical Mapping of Classes	MBORREL4: Added PDC
	WFHSv2-REQ-274791/F-Logical Signal Mapping	MBORREL4: Updated to include SoA mapping
	WFHSv2-IIR-REQ-283541/B-WifiHotspotOnBoardClient_Tx	MBORREL4: Added REQ-454777-786
	MD-REQ-454777/A-HotspotEnablementCommand	MBORREL4: New req.
	MD-REQ-454778/A-HotspotVisibilityCommand	MBORREL4: New req.
	MD-REQ-454779/A-CarrierInfoCommand	MBORREL4: New req.
	MD-REQ-454780/A-DataUsageCommand	MBORREL4: New req.
	MD-REQ-454781/A-DeviceListCommand	MBORREL4: New req.
	MD-REQ-454782/A-RemoveDeviceCommand	MBORREL4: New req.
	MD-REQ-454783/A-WifiInfo_Command	MBORREL4: New req.
	MD-REQ-454784/A-WifiHotspotMacCommand	MBORREL4: New req.
	MD-REQ-454785/A-HotspotTrialReminderSelectionCommand	MBORREL4: New req.
	MD-REQ-454786/A-HotspotFrequencyBandCommand	MBORREL4: New req.
	WFHSv2-IIR-REQ-283542/D-WifiHotspotOnBoardClient_Rx	MBORREL4: Added REQ-454787-801, REQ-454783, REQ-454779, REQ-454780, REQ-454781, REQ-454784
	MD-REQ-454787/A-HotspotEnablementStatus	MBORREL4: New req.
	MD-REQ-454788/A-HotspotSecurityStatus	MBORREL4: New req.
	MD-REQ-454789/A-HotspotVisibilityStatus	MBORREL4: New req.
	MD-REQ-454790/A-NewDeviceListStatus	MBORREL4: New req.
	MD-REQ-454791/A-CellularConnectivityMetricsInd	MBORREL4: New req.
	MD-REQ-454792/A-CarrierDataNotificationStatus	MBORREL4: New req.
	MD-REQ-454793/A-TcuAvailabilityStatus	MBORREL4: New req.
	MD-REQ-454783/A-WifiInfo_Command	MBORREL4: New req.
	MD-REQ-454779/A-CarrierInfoCommand	MBORREL4: New req.
	MD-REQ-454780/A-DataUsageCommand	MBORREL4: New req.
	MD-REQ-454781/A-DeviceListCommand	MBORREL4: New req.
	MD-REQ-454784/A-WifiHotspotMacCommand	MBORREL4: New req.

MD-REQ-454794/A-NumberOfConnectedDeviceStatus	MBORREL4: New req.
MD-REQ-454795/A-TelematicsDtcStatus	MBORREL4: New req.
MD-REQ-454796/A-DataUsageFeatureStatus	MBORREL4: New req.
MD-REQ-454797/A-HotspotApnConnectionStatus	MBORREL4: New req.
MD-REQ-454798/A-HotspotAvailableBandStatus	MBORREL4: New req.
MD-REQ-454799/A-HotspotFrequencyBandStatus	MBORREL4: New req.
MD-REQ-454800/A-WifiErrorCodeStatus	MBORREL4: New req.
MD-REQ-454801/A-NewHotspotCredentialsStatus	MBORREL4: New req.
STR-209295/B-General Requirements	MBORREL4: REQ-454817, REQ-454818
WFHSv2-REQ-283641/B-HMI Specification References	MBORREL4: Added Phoenix HMI reference
WFHSv2-REQ-283642/B-Diagnostic Specification References	MBORREL4: Added Phoenix reference
WFHS-REQ-454817/A-SoA Messages return to Null/NoRequest state	MBORREL4: New req.
WFHS-REQ-454818/A-WifiHotspotOnBoadClient Type Configuration	MBORREL4: New req.
STR-285950/F-Requirements	MBORREL4: Added REQ-454819
WFHSv3-REQ-454819/A-Monitoring Wi-Fi Hotspot feature availability v3	MBORREL4: New req. for PDC
WFHSv2-REQ-283647/B-Disabling driver restricted screens	MBORREL4: Removed "CAN"
WFHSv2-REQ-283626/B-Wi-Fi certification	MBORREL4: Added clarification for Phoenix
WFHSv2-REQ-283628/E-Reporting out diagnostics	MBORREL4: Removed "CAN"
WFHS-REQ-288215/B-Displaying Diagnostic Failures	MBORREL4: Removed "CAN". Added text to make applicable to both SoA and CAN
WFHSv2-REQ-283554/B-Shutting down and powering up the Wi-Fi chipset and WifiHotspotServer	MBORREL4: Added "NULL/NONE" and removed "CAN"
WFHSv2-REQ-315645/B-AP connection rules	MBORREL4: Added Phoenix content
WFHSv2-REQ-283570/B-Operating on the 2.4 GHz band in AP mode	MBORREL4: Removed "CAN"
WFHSv2-REQ-283553/B-WifiHotspotServer EOL configuration for determining Wi-Fi Hotspot feature enablement	MBORREL4: Removed "CAN"
WFHSv2-REQ-281706/B-Vehicle becomes not authorized	MBORREL4: Added "NULL/NONE"
WFHS-REQ-283630/D-ECU Reboot FTCP Command	MBORREL4: Removed "CAN" and added "NULL/NONE"
WFHSv2-UC-REQ-283738/B-User wakes WifiHotspotOnBoardClient up before WifiHotspotServer wakes up	MBORREL4: Added "SoA" under Interfaces
WFHSv2-UC-REQ-283739/B-User is navigating in the Wi-Fi Hotspot screens when WifiHotspotOnBoardClient loses communication with WifiHotspotServer	MBORREL4: Added "SoA" under Interfaces
WFHSv2-UC-REQ-283740/C-User is navigating in the Wi-Fi Hotspot screens when a Wi-Fi error occurs	MBORREL4: Added "SoA" under Interfaces
WFHSv2-UC-REQ-283649/B-User enters a Wi-Fi Hotspot screen and the text display is delayed	MBORREL4: Added "SoA" under Interfaces
STR-285783/C-Requirements	MBORREL4: Replaced REQ-222428 with REQ-454837. Replaced REQ-191711 with REQ-454839. Added REQ-454838, REQ-454840, REQ-454841
WFHSv3-REQ-454838/A-Reporting out technology used to connect to the cellular network v3	MBORREL4: New req. for Phoenix
WFHSv2-REQ-454839/A-Reporting out the number of devices connected to the Wi-Fi Hotspot v2	MBORREL4: New req. to replace REQ-191711. Removed "CAN"

WFHSv2-REQ-454840/A-Converting and reporting out the number of WifiHotspotServer signal strength bars v2	MBORREL4: New req. for Phoenix
WFHSv3-REQ-454841/A-Displaying the dedicated WifiHotspotServer icon on the WifiHotspotOnBoardClient display v3	MBORREL4: New req. for Phoenix
WFHSv2-REQ-283650/B-Displaying the Wi-Fi Hotspot service state	MBORREL4: Removed "CAN" and added "NONE/NULL"
WFHSv2-REQ-454837/A-Reporting out the Wi-Fi APN connectivity status	MBORREL4: New req. to replace REQ-222428, removed "CAN" and added "NULL/NONE"
WFHSv2-REQ-283744/B-Displaying the number of connected devices	MBORREL4: Removed "CAN"
WFHSv2-FUN-REQ-274796/D-Turning Wi-Fi Hotspot On or Off	MBORREL4: Removed "CAN"
STR-209298/D-Requirements	MBORREL4: Replaced REQ-191709 with REQ-454857
WFHSv2-REQ-283564/C-Wi-Fi Hotspot enablement condition checks	MBORREL4: Updated to include the kilometer dependency on the hotspot enablement mode. Updated to disable hotspot in factory mode. Updated diagrams. Removed "CAN" and added "NONE/NULL"
WFHSv2-REQ-283745/B-Displaying the Wi-Fi Hotspot's enablement state on the WifiHotspotOnBoardClient display	MBORREL4: Removed "CAN"
WFHSv2-REQ-454857/A-User requests to turn the Wi-Fi Hotspot on or off through the WifiHotspotOnBoardClient display	MBORREL4: New req. to replace REQ-191709, removed "CAN"
WFHS-REQ-336938/B-Request from WifiHotspotOnBoardClient to turn the Wi-Fi Hotspot on or off	MBORREL4: Removed "CAN"
WFHS-REQ-315659/C-Request from WifiHotspotOffBoardClient to turn the Wi-Fi Hotspot on or off	MBORREL4: Removed "CAN", clarified this is not a wakeup event
STR-209299/B-Use Cases	MBORREL4: Removed REQ-283580. Added REQ-407972-975. Replaced REQ-191931 with REQ-454858. Replaced REQ-191973 with REQ-454859
WFHS-UC-REQ-407972/A-User turns the Wi-Fi Hotspot enablement to ON when reset occurs and Kilometer Dependency is met	MBORREL4: New usecase
WFHS-UC-REQ-407973/A-User turns the Wi-Fi Hotspot enablement to ON when reset occurs and Kilometer Dependency is not met	MBORREL4: New usecase
WFHS-UC-REQ-407974/A-User Controls the WiFi hotspot Enablement On/Off	MBORREL4: New usecase
WFHS-UC-REQ-407975/A-Kilometer Dependency condition Met WiFi hotspot default turned on	MBORREL4: New usecase
WFHSv2-UC-REQ-283574/C-User turns Wi-Fi Hotspot On	MBORREL4: Added "SoA" to Interfaces
WFHSv2-UC-REQ-283746/C-User turns Wi-Fi Hotspot Off	MBORREL4: Added "SoA" to Interfaces
WFHSv2-UC-REQ-283576/C-User attempts to turn the Wi-Fi Hotspot on when the Wi-Fi Hotspot enablement conditions are not met	MBORREL4: Added "SoA" to Interfaces
WFHSv2-UC-REQ-283577/C-Wi-Fi Hotspot in On-disabled state when the Wi-Fi Hotspot enablement conditions become met	MBORREL4: Added "SoA" to Interfaces
WFHSv2-UC-REQ-283579/C-Wi-Fi Hotspot is on when the Wi-Fi Hotspot enablement conditions become not met	MBORREL4: Added "SoA" to Interfaces, updated exception reference
WFHSv2-UC-REQ-454858/A-E4 Wi-Fi Hotspot configuration through WifiHotspotOnBoardClient fails	MBORREL4: New usecase to replace REQ-191931, added "SoA"
WFHSv2-UC-REQ-454859/A-E11 WifiHotspotOnBoardClient update failed	MBORREL4: New usecase to replace REQ-191973, added "SoA"
WFHSv2-REQ-283747/B-Displaying the SSID on the WifiHotspotOnBoardClient display	MBORREL4: Removed "CAN"
WFHSv2-REQ-283749/B-Accepting and updating user SSID configurations	MBORREL4: Removed "CAN"
WFHSv2-REQ-336816/B-SSID update request from WifiHotspotOnBoardClient	MBORREL4: Removed "CAN"
WFHS-REQ-315692/C-Request from WifiHotspotOffBoardClient to change the SSID	MBORREL4: Removed "CAN", clarified this is not a wakeup event

WFHS-REQ-315693/B-Setting the SSID update bit	MBORREL4: Removed "CAN"
WFHS-REQ-315694/B-Updating the SSID while the user is in the screen	MBORREL4: Removed "CAN"
STR-209305/C-Use Cases	MBORREL4: Replaced REQ-191935 with REQ-454897
WFHSv2-UC-REQ-283780/C-User changes SSID from WifiHotspotOnBoardClient	MBORREL4: Updated exception references, added "SoA" to Interfaces
WFHSv2-UC-REQ-283751/C-E5 User attempts to view SSID/password through WifiHotspotOnBoardClient while under driver restriction	MBORREL4: Added "SoA" to Interfaces
WFHSv2-UC-REQ-454897/A-E6 SSID update from WifiHotspotOnBoardClient failed	MBORREL4: New req. to replace REQ-191935. Added "SoA" to Interfaces
WFHS-UC-REQ-315702/B-User changes SSID from WifiHotspotOffBoardClient when Vehicle is ON	MBORREL4: Added "SoA" to Interfaces
STR-209306/E-Requirements	MBORREL4: Replaced REQ-191627 with REQ-454898
WFHSv2-REQ-283753/C-Displaying the password on the WifiHotspotOnBoardClient display	MBORREL4: Removed "CAN"
WFHSv2-REQ-454898/A-Reporting the SSID and password	MBORREL4: New req. to replace REQ-191627. Removed "CAN"
WFHSv2-REQ-283756/B-Accepting and updating user password configurations	MBORREL4: Removed "CAN"
WFHSv2-REQ-336826/B-Password update request from WifiHotspotOnBoardClient	MBORREL4: Removed "CAN"
WFHS-REQ-315707/C-Request from WifiHotspotOffBoardClient to change the password	MBORREL4: Removed "CAN", clarified not a wakeup event, added Example
WFHS-REQ-315708/B-Setting the password update bit	MBORREL4: Removed "CAN"
WFHS-REQ-315718/B-Updating the password while the user is in the screen	MBORREL4: Removed "CAN"
STR-209307/C-Use Cases	MBORREL4: Replaced REQ-191939 with REQ-454880. Replaced REQ-191937 with REQ-454899. Replaced REQ-191938 with REQ-454900. Replaced REQ-191941 with REQ-454901.
WFHSv2-UC-REQ-454899/A-User enters into the Wi-Fi Hotspot screen that displays the SSID and password	MBORREL4: New req. to replace REQ-191937, removed CAN from interfaces
WFHSv2-UC-REQ-454900/A-User views the password on the WifiHotspotOnBoardClient	MBORREL4: New req. to replace REQ-191938, removed CAN from interfaces
WFHSv2-UC-REQ-454880/A-User changes password from WifiHotspotOnBoardClient	MBORREL4: New req. to replace REQ-191939, updated exception reference and removed CAN from interfaces
WFHS-UC-REQ-315720/B-User changes password from WifiHotspotOffBoardClient when Vehicle is ON	MBORREL4: Removed "CAN"
WFHSv2-UC-REQ-454901/A-E9 Password update from WifiHotspotOnBoardClient failed	MBORREL4: New req. to replace REQ-191941, removed CAN from interfaces
WFHSv2-FUN-REQ-274799/C-Changing Security Algorithm	MBORREL4: Updated to Phoenix
WFHSv2-REQ-317121/B-Security algorithm offerings per region	MBORREL4: Updated for Phoenix, removed CAN, added NULL/NONE
WFHSv2-REQ-283760/B-Displaying the security type	MBORREL4: Removed "CAN"
WFHSv2-FUN-REQ-274800/B-Turning Visibility ON or OFF	MBORREL4: Updated on/off to ON/OFF. Removed "CAN"
STR-209310/B-Requirements	MBORREL4: Replaced REQ-191648 with REQ-454902. Replaced REQ-191649 with REQ-454903.
WFHS-REQ-191647/C-Function of the visibility feature	MBORREL4: Updated on/off to ON/OFF
WFHSv2-REQ-454902/A-Reporting the visibility status	MBORREL4: New req. to replace REQ-191648, removed "CAN"
WFHSv2-REQ-283761/B-Displaying the status of the visibility feature	MBORREL4: Removed "CAN"
WFHS-REQ-191651/B-User requests to configure visibility feature through WifiHotspotOnBoardClient display	MBORREL4: Updated on/off to ON/OFF. Added Clarification. Removed "CAN"
WFHSv2-REQ-454903/A-Visibility update request from WifiHotspotOnBoardClient	MBORREL4: New req. to replace REQ-191649, removed "CAN"

WFHSv2-UC-REQ-283762/B-User turns the Wi-Fi Hotspot visibility ON	MBORREL4: Updated on/off to ON/OFF. Updated exception reference, removed CAN from interfaces
WFHSv2-UC-REQ-283763/B-User turns Wi-Fi Hotspot visibility OFF	MBORREL4: Updated on/off to ON/OFF. Added Clarification. Updated exception references, removed CAN from interfaces
STR-209312/D-Requirements	MBORREL4: Replaced REQ-191654 with REQ-454917. Replaced REQ-191698 with REQ-454918. Replaced REQ-191699 with REQ-454919
WFHSv2-REQ-283764/B-Displaying the connected devices list on the WifiHotspotOnBoardClient display	MBORREL4: Removed "CAN", updated reference
WFHSv2-REQ-454917/A-Reporting the connected devices list	MBORREL4: New req. to replace REQ-191654, removed "CAN"
WFHSv2-REQ-283557/B-Setting the connected device update bit	MBORREL4: Removed "CAN"
WFHSv2-REQ-283765/B-Updating the connected devices screen while the user is in the screen	MBORREL4: Removed "CAN"
WFHSv2-REQ-317122/B-Managing the blocked devices list	MBORREL4: Removed "CAN"
WFHSv2-REQ-283766/C-User requests to block a device from the hotspot through WifiHotspotOnBoardClient display	MBORREL4: Removed "CAN"
WFHSv2-REQ-283566/B-Request from the WifiHostpotOnBoardClient to block a device from the Wi-Fi Hotspot	MBORREL4: Removed "CAN"
WFHSv2-REQ-283767/B-Displaying the blocked devices list on the WifiHotspotOnBoardClient display	MBORREL4: Removed "CAN", updated reference
WFHSv2-REQ-454918/A-Reporting the blocked devices list	MBORREL4: New req. to replace REQ-191698, removed "CAN"
WFHSv2-REQ-283768/C-User requests to unblock a device from the blocked list through WifiHotspotOnBoardClient display	MBORREL4: Removed "CAN"
WFHSv2-REQ-454919/A-Request from the WifiHotspotOnBoardClient to remove a device from the blocked list	MBORREL4: New req. to replace REQ-191699, removed "CAN"
STR-209313/B-Use Cases	MBORREL4: Replaced REQ-191955 with REQ-454877. Replaced REQ-191956 with REQ-454878. Replaced REQ-191957 with REQ-454879.
WFHSv2-UC-REQ-454877/A-Vehicle occupant blocks a device from the Wi-Fi Hotspot through the WifiHotspotOnBoardClient	MBORREL4: New req. to replace REQ-191955. Updated exception reference, removed CAN from interfaces
WFHSv2-UC-REQ-454878/A-User blocks a device from the Wi-Fi Hotspot through the WifiHotspotOnBoardClient while the blocked list is full	MBORREL4: New req. to replace REQ-191956. Updated exception reference, removed CAN from interfaces
WFHSv2-UC-REQ-454879/A-Vehicle occupant removes a device from the Wi-Fi Hotspot's blocked list through the WifiHotspotOnBoardClient	MBORREL4: New req. to replace REQ-191957. Updated exception reference, removed CAN from interfaces
STR-209314/B-Requirements	MBORREL4: Replaced REQ-191869 with REQ-454920. Replaced REQ-191874 with REQ-456557
WFHSv2-REQ-281707/B-Data usage feature flag	MBORREL4: Removed "CAN"
WFHSv2-REQ-283769/C-Hiding data usage screen based on data usage feature flag	MBORREL4: Removed "CAN", added Null/None
WFHSv2-REQ-283770/B-WifiHotspotOnBoardClient initiates data usage request due to user entering into Wi-Fi Hotspot menu	MBORREL4: Removed "CAN"
WFHSv2-REQ-281708/C-Request to refresh data usage info without a response required	MBORREL4: Removed "CAN"
WFHSv3-REQ-281851/D-Displaying data usage information	MBORREL4: Removed "CAN"
WFHSv2-REQ-283651/B-Request from WifiHotspotOnBoardClient for the WifiHotspotServer's stored data usage information	MBORREL4: Removed "CAN"
WFHSv2-REQ-283652/B-Request from WifiHotspotOnBoardClient for data usage while WifiHotspotServer is updating the data usage information	MBORREL4: Removed "CAN"

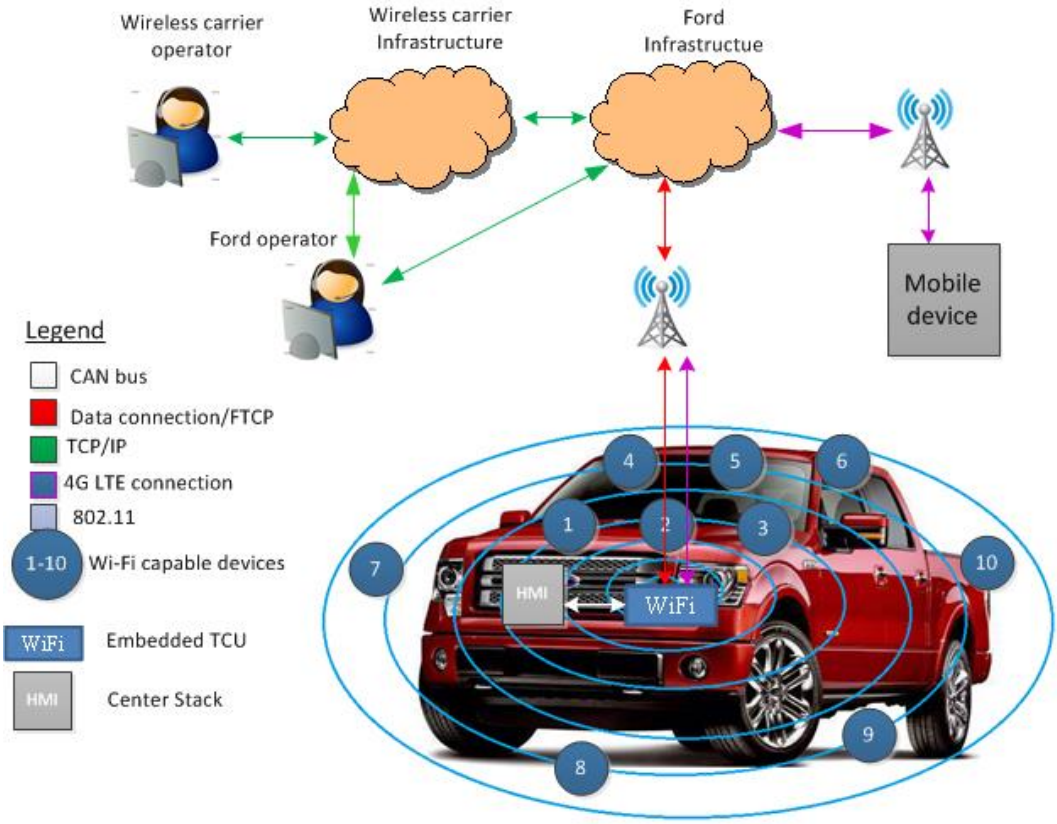
WFHSv2-REQ-456557/A-User refreshes data usage screen	MBORREL4: New req. to replace REQ-191874, removed "CAN"
WFHS-REQ-283653/B-Displaying data usage response error messages	MBORREL4: Removed "CAN"
WFHSv2-REQ-281855/C-Request from WifiHotspotOnBoardClient to refresh the data usage values	MBORREL4: Removed "CAN"
WFHS-REQ-283659/D-Reporting data usage response error messages for failed Refresh requests	MBORREL4: Removed "CAN"
WFHSv2-REQ-454920/A-Request from WifiHotspotOnBoardClient for a data usage refresh while WifiHotspotServer is updating the data usage information	MBORREL4: New req. to replace REQ-191869, removed "CAN", updated reference
WFHSv2-REQ-283545/B-Monitoring elapsed time since the data usage update	MBORREL4: Removed "CAN"
WFHSv2-UC-REQ-281857/B-User accesses the data usage screen in a good network coverage area	MBORREL4: Updated exception reference and added "SoA" to interfaces
WFHSv2-UC-REQ-281858/B-User accesses the data usage screen in a no network coverage area	MBORREL4: Updated exception reference and added "SoA" to interfaces
WFHSv2-UC-REQ-281859/B-User enters into the Wi-Fi Hotspot menu and refreshes the data usage screen immediately	MBORREL4: Updated exception reference and added "SoA" to interfaces
WFHSv2-UC-REQ-281860/B-User refreshes the data usage values from the WifiHotspotOnBoardClient	MBORREL4: Updated exception reference and added "SoA" to interfaces
WFHSv2-UC-REQ-281861/B-User refreshes data usage values from WifiHotspotOnBoardClient when vehicle is in a no coverage area	MBORREL4: Updated exception reference and added "SoA" to interfaces
WFHSv2-UC-REQ-281862/B-User refreshes data usage values from WifiHotspotOnBoardClient when vehicle is in a poor coverage area	MBORREL4: Updated exception reference and added "SoA" to interfaces
WFHSv2-UC-REQ-281863/B-User refreshes the data usage values on the mobile app in a good coverage area	MBORREL4: Added "SoA" to Interfaces
WFHSv2-UC-REQ-281864/B-User refreshes the data usage values on the mobile app in a no coverage area	MBORREL4: Added "SoA" to Interfaces
WFHSv2-UC-REQ-281865/C-User refreshes the data usage values on the mobile app while in the Wi-Fi Hotspot screen on the WifiHotspotOnBoardClient display	MBORREL4: Added "SoA" to Interfaces
WFHSv2-FUN-REQ-274805/B-Carrier Data Notification	MBORREL4: Removed "CAN"
WFHSv2-REQ-281868/B-Receiving carrier data notifications and data usage updates	MBORREL4: Removed "CAN", added NULL/NONE, updated reference
WFHSv2-REQ-283730/C-Triggering free trial period reminders	MBORREL4: Add requirements for WiFi Trial Reminder popup not to display when WIFI_Hotspot_Enable is DISABLED. Removed "CAN"
WFHSv2-REQ-283775/D-Displaying critical data plan related popups	MBORREL4: Removed "CAN", added NULL/NONE, updated figure, added Option3 - More Info
WFHSv2-UC-REQ-281869/B-The vehicle's Wi-Fi Hotspot data plan changes to a low balance or expired or trial period waiting status	MBORREL4: Updated exception reference, added SoA to Interfaces
WFHSv2-REQ-283734/C-Requesting for carrier information due to the user entering a specific screen	MBORREL4: Removed "CAN"
WFHSv2-REQ-283581/C-Reporting out the carrier information to the WifiHotspotOnBoardClient	MBORREL4: Removed "CAN"
WFHSv2-REQ-283735/C-Displaying carrier information	MBORREL4: Removed "CAN"
WFHSv2-REQ-283777/B-Initiating a call to the carrier hotline	MBORREL4: Removed "CAN"
STR-285785/B-Use Cases	MBORREL4: Replaced REQ-191962 with REQ-454937

	WFHSv2-UC-REQ-283778/D-China customer initiates a call to the carrier hotline though the WifiHotspotOnBoardClient display	MBORREL4: Added "SoA" to Interfaces
	WFHSv2-UC-REQ-281872/B-China customer purchases data/activates trial period through the carrier hotline	MBORREL4: Added "SoA" to Interfaces
	WFHSv2-UC-REQ-281873/B-Customer purchases data/activates free trial period through connected device	MBORREL4: Added "SoA" to Interfaces
	WFHSv2-UC-REQ-454937/A-E10 Carrier did not add data to the Wi-Fi Hotspot	MBORREL4: New req. to replace REQ-191962, added "SoA" to Interfaces
	STR-209318/C-Requirements	MBORREL4: Replaced REQ-191862 with REQ-454938
	WFHSv2-REQ-454938/A-Reporting out a Wi-Fi Hotspot reset	MBORREL4: New req. to replace REQ-191862, removed "CAN", added NULL/NONE
	WFHSv2-REQ-283559/D-Wi-Fi Hotspot reset settings	MBORREL4: Added kilometer dependency on hotspot enablement mode.
	WFHSv2-UC-REQ-281877/B-User performs a reset but does not deactivate their Wi-Fi Hotspot data plan	MBORREL4: Added "SoA" to Interfaces
	WFHSv2-UC-REQ-281878/C-Dealer replaces WifiHotspotServer while a Wi-Fi Hotspot data plan is active	MBORREL4: Added "SoA" to Interfaces
	STR-296559/B-Requirements	MBORREL4: Replaced REQ-194536 with REQ-454939
	WFHSv2-REQ-454939/A-Reporting out the Wi-Fi chipset MAC address	MBORREL4: New req. to replace REQ-194536, removed "CAN"
	WFHSv2-FUN-REQ-274813/C-Switching Frequency Bands	MBORREL4: Removed "CAN"
	WFHS-REQ-263087/B-Reporting available bands	MBORREL4: Removed "CAN", added NULL/NONE
	WFHS-REQ-263088/B-Reporting the frequency band	MBORREL4: Removed "CAN", added NULL/NONE
	WFHSv2-REQ-283779/D-Displaying the frequency band	MBORREL4: Removed "CAN"
	WFHS-REQ-263090/B-User changes the frequency band on WifiHotspotOnBoardClient	MBORREL4: Removed "CAN"
	WFHS-REQ-263091/B-Frequency band change request from WifiHotspotOnBoardClient	MBORREL4: Removed "CAN"
	WFHSv1-UC-REQ-263187/B-User changes frequency band	MBORREL4: Updated exception reference and added "SoA" to Interfaces
	WFHSv1-UC-REQ-263186/B-User attempts to change to restricted frequency band	MBORREL4: Added "SoA" to Interfaces

Table of Contents

1 Architectural Design

1.1 Overview



The Wi-Fi (Wireless Fidelity) Hotspot feature allows Wi-Fi enabled devices to connect to the vehicle's embedded modem (TCU) and stream data from the internet using the TCU's 4G LTE MIMO (multiple in multiple out) antenna setup and modem. Vehicles equipped with an applicable infotainment display module (SYNC, Sub-SYNC, etc.) shall have a Wi-Fi Hotspot HMI within the vehicle that allows the user to interact with the Wi-Fi Hotspot feature. Ford shall also offer a mobile app that may be used for subscription purposes and shall also provide the customer the ability to change certain Wi-Fi Hotspot settings. The TMC (Transportation Mobility Cloud; contained within the Ford infrastructure) shall interface with the embedded modem, the mobile app and the wireless carrier's backend. The carrier backend shall provide essential information to the TMC regarding activation of hotspot data plans, data usage information and more.

The embedded modem shall be the sole server of the feature and shall be referred to as the WifiHotspotServer throughout this document. The WifiHotspotServer shall be responsible for controlling, transmitting and saving all Wi-Fi Hotspot settings. The TMC and infotainment display module shall act as the clients to the feature. The TMC, which shall be referred to as the WifiHotspotOffBoardClient in this document, shall store Wi-Fi Hotspot settings and shall route traffic between the WifiHotspotServer, mobile app and carrier backend. The mobile app shall store and display Wi-Fi Hotspot subscription information and accept customer input for changing Wi-Fi Hotspot settings. The infotainment display module (SYNC, Sub-SYNC, etc.), which shall be referred to as the WifiHotspotOnBoardClient in this document, shall not be responsible for storing Wi-Fi Hotspot settings and shall only be used to accept customer input and display the Wi-Fi Hotspot settings by monitoring Wi-Fi Hotspot statuses and requesting for appropriate information when needed. The enhanced central gateway (ECG) shall be referred to as the WifiHotSpotGateway and is responsible for packing, unpacking, and routing all incoming and outgoing FTCP communication.
The use cases included in this document refer to command/control failures. The user may experience failures while attempting to utilize the WifiHotspotOnBoardClient or mobile app interface due to:

a. Mobile app failure
b. WifiHotspotServer failure
c. WifiHotspotOnBoardClient failure
d. CAN failure

e. WifiHotspotOffBoardClient failure
f. Cellular network failure
g. Carrier backend failure

The example WifiHotspotOnBoardClient screens, popups and icons displayed throughout this document are example images and shall not be interpreted as the final implementation. Also, the screen names mentioned throughout this document are subject to change. Refer to the appropriate specifications identified in each requirement for the final implementation of WifiHotspotOnBoardClient screens, popups, screen names and icons.

1.2 WFHS-CLD-REQ-191762/A-Wifi Hotspot Server

Responsibility: The Wifi Hotspot Server is responsible for storing Wifi content and providing that content to the display module when requested.

1.3 WFHS-CLD-REQ-191763/A-Wifi Hotspot On Board Client

Responsibility: The Wifi Hotspot On Board Client is responsible for displaying the Wifi information to the vehicle user. The Wifi Hotspot On Board Client is also responsible for allowing the in vehicle user to adjust the Wifi settings.

1.4 WFHS-CLD-REQ-191764/B-Wifi Hotspot Off Board Client

Responsibility: The Wifi Hotspot Off Board Client is responsible for supplying carrier information related to Wifi usage and Wi-Fi Hotspot settings requests to the Wifi Hotspot Server.

1.5 WFHS-CLD-REQ-207990/A-Wifi Hotspot Mobile Client

Responsibility: The Wifi Hotspot Mobile Client is a user's Wi-Fi enabled device responsible for providing the user with a method to connect to and disconnect from the Wifi Hotspot (in STA mode).

1.6 WFHS-CLD-REQ-274838/A-Wifi Hotspot Gateway

Responsibility: The Wifi Hotspot Gateway is responsible for gatewaying all relevant CAN and SoA (Ethernet) communication to the respective Wifi Hotspot Servers and Clients, and handling all FTCP interfacing to/from the Wifi Hotspot Off Board Client.

1.7 Physical Mapping of Classes

The table below shows an example of how the logical classes that make up the Wifi Hotspot feature can be mapped into physical modules. This mapping is an FNV2 example only and does not necessarily carryover to other carlines or vehicle architectures.

Logical Class	Physical Module (ECU)
WifiHotspotServer	TCU
WifiHotspotOnBoadClient	SYNC, PDC
WifiHotspotOffBoadClient	TMC
WifiHotspotMobileClient	Mobile Phone, etc.
WifiHotspotGateway	ECG

1.8 WFHSv2-REQ-274791/F-Logical Signal Mapping

The signals mentioned throughout this document shall refer to the CAN or SoA signal's logical name. The logical names shall be mapped to their actual CAN or SoA 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. The relative proto files are the master file for the actual SoA signal names.
Note: some CAN signals referenced throughout this document may use the logical name while some may use the actual CAN signal name.

Logical Name	CAN Signal Name	SoA Name
HotspotEnablement_St	WifiHtsptEnbl_D_Stat	HotspotEnablementStatus
HotspotSecurity_St	WifiHtsptScrty_D_Stat	HotspotSecurityStatus
HotspotVisibility_St	WifiHtsptVisbl_D_Stat	HotspotVisibilityStatus
NewDeviceList_St	WifiDevcListNew_B_Stat	NewDeviceListStatus
TCUSignalStrength_St	ModemSigStren_D_Stat	CellularConnectivityMetricsInd
TCUTechnologyUsed2_St	ModemTechnology_D2_Stat	CellularConnectivityMetricsInd
CarrierDataNotification_St	WifiDataUsage_D_Stat	CarrierDataNotificationStatus
	WifiDataUsage_Pc_Actl	
TCUAvailability_St	WifiEnbl_D_Stat	TcuAvailabilityStatus
HotspotEnablement_Rq	WifiHtsptEnbl_D_Rq	HotspotEnablementCommand
HotspotVisibility_Rq	WifiHtsptVisbl_D_Rq	HotspotVisibilityCommand
CarrierInfo_Rq	WifiCarrierInfo_B_Rq	CarrierInfoCommand
DataUsage_Rq	WifiDataUsage_D_Rq	DataUsageCommand (Request)
DeviceList_Rq	WifiDevcList_D_Rq	DeviceListCommand (Request)
	WifiDevcListIndx_No_Rq	
	WifiDevcListSize_D_Rq	
RemoveDevice_Rq	WifiRemoveDevc_D_Rq	RemoveDeviceCommand
	WifiRemoveIndx_No_Rq	
IgnitionStatus_St	Ignition_Status	N/A
VehicleSpeed_St	Veh_V_ActlEng	N/A
CarMode_St	LifeCycMde_D_Actl	N/A
OdometerMasterValue	OdometerMasterValue	N/A
HotspotFrequencyBand_Rq	WifiHtsptFqBand_D_Rq	HotspotFrequencyBandCommand
HotspotFrequencyBand_St	WifiHtsptFqBand_D_Stat	HotspotFrequencyBandStatus
HMIMode_St	HMI_HMIMode_St	N/A
WifiHotspotMAC_Rq	WifiHtsptMacAddr_B_Rq	WifiHotspotMacCommand
HotspotAvailableBand_St	WifiHtsptFq_D_Avail	HotspotAvailableBandStatus
VehicleGGCCData	VehicleGGCCData	N/A
NumberOfConnectedDevices_St	WifiNoDevcCnnct_No_Actl	NumberOfConnectedDeviceStatus
HotspotTrialReminderSelection_Rq	WifiHtsptTrial_D_RqDrv	HotspotTrialReminderSelectionCommand
TelematicsDTC_St	Telematics_D_Falt	TelematicsDtcStatus
DataUsageFeature_St	WifiDataUsageOn_D_Stat	DataUsageFeatureStatus
HotspotAPNConnection_St	WifiHtsptCnnct_D_Stat	HotspotApnConnectionStatus
WifiErrorCode_St	WifiHtspt_D_Falt	WifiErrorCodeStatus
NewHotspotCredentials_St	WifiHtsptCrdntl_B_Stat	NewHotspotCredentialsStatus
WifiInfo_Rsp	N/A	WifiInfo_Command (Response)
WifiInfo_Rq	N/A	WifiInfo_Command (Request)
WifiHotspotMAC_Rsp	N/A	WifiHotspotMacCommand (Response)

CarrierInfo_Rsp	N/A	CarrierInfoCommand (Response)
DataUsage_Rsp	N/A	DataUsageCommand (Response)
DeviceList_Rsp	N/A	DeviceListCommand (Response)

Table. Logical to CAN/SoA signal mapping

1.9 WifiHotspotOnBoardClient Interface

1.9.1 WFHSv2-IIR-REQ-283541/B-WifiHotspotOnBoardClient_Tx

1.9.1.1 MD-REQ-179288/A-HotspotEnablement_Rq

Message Type: Request

This signal is used to request a change to the Hotspot Enablement from the WifiHotSpotOnBoardClient

Name	Literals	Value	Description
Type	-	-	Request to change the hotspot's transmission of Wi-Fi signals status
	Null	0x0	
	Off	0x1	
	On	0x2	

1.9.1.2 MD-REQ-454777/A-HotspotEnablementCommand

Message Endpoint: SERVICES/REQUEST/TCU/WHSS/HOTSPOT_ENABLEMENT

This API is used to request a change to the Hotspot Enablement from the WifiHotSpotOnBoardClient.

Method Type	Fire & Forget
QoS Level	0
Retained	No

R/O	Name	Type	Literals	Value	Description
Request					
R	Type	Enum	-	-	Request to change the hotspot's transmission of Wi-Fi signals status
			Off	0x1	
			On	0x2	
Response					
-	-	-	-	-	N/A

1.9.1.3 MD-REQ-179292/A-HotspotVisibility_Rq

Message Type: Request

This signal is used to request a change to the Hotpot Visibility from the WifiHotSpotOnBoardClient

Name	Literals	Value	Description
Type	-	-	Request to change the hotspot's transmission of SSID status

	Null	0x0	
	Off	0x1	
	On	0x2	

1.9.1.4 MD-REQ-454778/A-HotspotVisibilityCommand

Message Endpoint: SERVICES/REQUEST/TCU/WHSS/HOTSPOT_VISIBILITY

This API is used to request a change to the Hotpot Visibility from the WifiHotSpotOnBoardClient.

Method Type	Fire & Forget
QoS Level	0
Retained	No

R/O	Name	Type	Literals	Value	Description
Request					
R	Type	Enum	-	-	Request to change the hotspot's transmission of SSID status
			Off	0x1	
			On	0x2	
Response					
-	-	-	-	-	N/A

1.9.1.5 MD-REQ-179294/A-CarrierInfo_Rq

Message Type: Request

This signal is used to request the Carrier Information from the WifiHotSpotServer

Name	Literals	Value	Description
Type	-	-	Carrier Info request from center stack
	NoRequest	0x0	
	Request	0x1	

1.9.1.6 MD-REQ-454779/A-CarrierInfoCommand

Message Endpoint: SERVICES/REQUEST/TCU/WHSS/CARRIER_INFO

This API is used to request the Carrier Information from the WifiHotSpotServer.

Method Type	One-Shot A-SYNC
QoS Level	0
Retained	No

R/O	Name	Type	Literals	Value	Description
Request					
-	-	-	-	-	N/A
Response					
R	Ford Landing page URL	String	-	0-191 Chars.	Ford website displayed to update plan based on data availability and region.

					Data array that consists of textual information up to 192 characters in length
R	Lincoln Landing page URL	String-	-	0-191 Chars.	Lincoln website displayed to update plan based on data availability and region. Data array that consists of textual information up to 192 characters in length
R	Ford Phone Number	String	-	0-23 Chars.	Ford specific phone number displayed to update plan. Data array that consists of textual information up to 24 characters in length
R	Lincoln Phone Number	String	-	0-23 Chars.	Lincoln specific phone number displayed to update plan. Data array that consists of textual information up to 24 characters in length
R	Error Execution Code	Enum	-	-	Return Code
			Error_Code	0x0	Error/Failure
			Success_Code	0x1	Success

1.9.1.7 MD-REQ-179296/B-DataUsage_Rq

Message Type: Request

This signal is used for the WifiHotSpotOnBoardClient to request the current data usage variables from the WifiHotSpotServer, to request a refresh of this data from the WifiHotSpotOffBoardClient with an expected response, or to request a refresh of this data from the WifiHotSpotOffBoardClient without an expected response.

Name	Literals	Value	Description
Type	-	-	Data Usage request from center stack
	Null	0x0	
	CurrentData	0x1	
	RefreshData	0x2	
	RefreshDataNoResponse	0x3	

1.9.1.8 MD-REQ-454780/A-DataUsageCommand

Message Endpoint: SERVICES/REQUEST/TCU/WHSS/DATA_USAGE

This API is used for the WifiHotSpotOnBoardClient to request the current data usage variables from the WifiHotSpotServer, to request a refresh of this data from the WifiHotSpotOffBoardClient with an expected response, or to request a refresh of this data from the WifiHotSpotOffBoardClient without an expected response.

Method Type	One-Shot A-SYNC
QoS Level	0
Retained	No

R/O	Name	Type	Literals	Value	Description
Request					

R	Type	Enum	-	-	Data Usage request from center stack
			Null	0x0	
			CurrentData	0x1	
			RefreshData	0x2	
			RefreshDataNoResponse	0x3	
Response					
O	CES	Enum	-	-	Command execution status
			Fail	0x0	Error_Code
			Success	0x1	Success_Code
			Wait	0x2	Immediate wait
O	TimeStamp	Long	-	-	The time stamp is FFF then the time stamp is invalid.
R	Expiry/ RenewalDate	Enum	-	-	DataUsage
			Invalid	0x0	The text used to differentiate between an Expiry and Renewal Date
			ExpiryDate	0x1	-
			RenewalDate	0x2	-
R	Expiry/ RenewalMonth	Enum	-	-	Month of the next Expiry/Renewal Date
			Invalid	0x00	
			January	0x01	
			February	0x02	
			March	0x03	
			April	0x04	
			May	0x05	
			June	0x06	
			July	0x07	
			August	0x08	
			September	0x09	
			October	0x0A	
			November	0x0B	
			December	0x0C	
			Reserved	0x0D-0xFF	
R	Expiry/ RenewalDay	Enum	-	-	Day of the next Expiry/Renewal Date
			Invalid	0x00	
			Day	0x01-0x1F	
			Reserved	0x20-0xFF	
R	Expiry/ RenewalYear	Enum	-	-	Year of the next Expiry/Renewal Date. Offset of 2000
			Year	0x00-0xFE	
			Invalid	0xFF	
R	Expiry/ RenewalHour	Enum	-	-	Hour of the Expiry/Renewal Date
			Hour	0x00-0x17	
			Reserved	0x18-0xFE	
			Invalid	0xFF	
R	Expiry/ RenewalMinute	Enum	-	-	Minute of the Expiry/Renewal Date
			Minute	0x00-0x3B	
			Reserved	0x3C-0xFE	
			Invalid	0xFF	

R	Expiry/ RenewalSecond	Enum	-	-	Second of the Expiry/Renewal Date
			Second	0x00-0x3B	
			Reserved	0x3C-0xFE	
			Invalid	0xFF	
R	PlanType	Enum	-	-	Plan type being used
			Invalid	0x0	-
			Shared	0x1	-
			Session	0x2	-
R	OverageFlag	Enum	-		Overage Flag status
			Invalid	0x0	-
			No	0x1	-
			Yes	0x2	-
R	DataPlanStatus	Enum	-	-	Status of the Carrier's Data Plan
			Invalid	0x0	-
			FreeTrialPeriodWaiting	0x1	-
			FreeTrialPeriodActive	0x2	-
			NoActiveSubscription	0x3	-
			ActiveSubscription	0x4	-
R	DataUsed	Enum	-	-	Data used since start of last Renewal Date. Use HEX encoding here. Data values are in steps of 0.01 decimal units (ex. 0x08707 = 34567 = 345.67 Mb (or Kb or Gb)
			Data	0x000000-0x01869F	-
			Reserved	0x0186A0-0xFFFFFE	-
			Invalid	0xFFFFFF	-
R	DataUsedUnits	Enum	-	-	Units of measure used to report the data used
			Invalid	0x0	-
			KB	0x1	-
			MB	0x2	-
			GB	0x3	-
R	TotalData	Enum	-	-	Total data available in current Renewal Date. Use HEX encoding here. Data values are in steps of 0.01 decimal units (ex. 0x08707 = 34567 = 345.67 Mb (or Kb or Gb)
			Data	0x000000-0x01869F	
			Unlimited	0x0186A0	
			Reserved	0x0186A1-0xFFFFFE	
			Invalid	0xFFFFFF	
R	TotalDataUnits	Enum	-	-	Units of measure used to report the total data
			Invalid	0x0	
			KB	0x1	
			MB	0x2	
			GB	0x3	

R	DataUsedPercent	Enum	-	-	Data used (in percent) in current Renewal Date. Use HEX encoding here
			Data	0x00-0x64	
			Reserved	0x65-0xFE	
			Invalid	0xFF	
R	UserID	String	-	50 Chars.	Data array that consists of textual information up to 50 characters in length

1.9.1.9 MD-REQ-179298/B-DeviceList_Rq

Message Type: Request

This signal is used to request from the WifiHotSpotServer the current list of connected or blocked devices.

Name	Literals	Value	Description
ListType	-	-	Type of List being requested
	Null	0x00	
	ConnectedList	0x01	
	BlockedList	0x02	
	NotEntry	0x03	
	NotUsed	0x04-0x07	
StartingIndex	-	-	Starting point for the list
	Null	0x00	
	Start Index 1	0x01	
	Start Index 2	0x02	
	…	…	
	Start Index 255	0xFF	
ListSize	-	-	Size of the list
	Null	0x00	
	List Size 1	0x01	
	List Size 2	0x02	
	…	…	
	List Size 31	0x1F	

1.9.1.10 MD-REQ-454781/A-DeviceListCommand

Message Endpoint: SERVICES/REQUEST/TCU/WHSS/DEVICE LIST:

This API is used to request from the WifiHotSpotServer the current list of connected or blocked devices.

Method Type	One-Shot A-SYNC
QoS Level	1
Retained	No

R/O	Name	Type	Literals	Value	Description
Request					
R	ListType	Enum	-	-	Type of List being requested
			Null	0x00	
			ConnectedList	0x01	
			Blocked List	0x02	
Response					
R	CES	Enum	-	-	Return Code
			ErrorGeneral	0x0	Error/Failure
			Success	0x1	Success

			ErrorInvalidArgument	0x4	Error Invalid Argument
R	ListType	Enum	-	-	List type being sent
			Reserved	0x00	
			ConnectedList	0x01	Devices currently connected
			BlockedList	0x02	Devices actively blocked by driver
			Reserved	0x03-0x06	
			NoEntry	0x07	
R	ListSize	Enum	-	-	Number of items in List
			Inactive	0x00	
			List Size 1	0x01	
			List Size 2	0x02	
			…	…	
			List Size 31	0x1F	
			NoEntry	0xFF	
R	TotalNumberOfDevices Available	Enum	-	-	Total number of devices available for given list
			Inactive	0x00	
			1 Device Available	0x01	
			2 Devices Available	0x02	
			…	…	
			254 Devices Available	0xFE	
			NoEntry	0xFF	
Rep	Vector	vector	-	-	Repeated vector of record (IndexNumber, DeviceName, MAC) with TotalNumberOfDevices defined in ListSize
R	vector	IndexNumber	Enum	-	-	Index number of device
				Inactive	0x00	
				Index 1	0x01	
				Index 2	0x02	
				…	…	
				Index 255	0xFF	
		MAC	String	-	17 Chars.	Data array that consists of textual information fixed to 17 characters in length, NO END OF STRING.
		DeviceName	String	-	19 Chars.	Data array that consists of textual information up to 19 characters in length

1.9.1.11 MD-REQ-179302/A-RemoveDevice_Rq

Message Type: Request

This signal is used to request a removal of a device from the Connected or Blocked List from the WifiHotSpotServer

Name	Literals	Value	Description
ListType	-	-	Type of List being requested
	Null	0x00	
	FromConnectedList	0x01	
	FromBlockedList	0x02	

IndexNumber	-	-	What Index to remove
	Null	0x00	
	Index 1	0x01	
	Index 2	0x02	
	…	…	
	Index 255	0xFF	

1.9.1.12 MD-REQ-454782/A-RemoveDeviceCommand

Message Endpoint: SERVICES/REQUEST/TCU/WHSS/REMOVE_DEVICE

This API is used to request a removal of a device from the Connected or Blocked List from the WifiHotSpotServer.

Method Type	One-Shot A-SYNC
QoS Level	0
Retained	No

R/O	Name	Type	Literals	Value	Description
Request					
R	ListType	Enum	-	-	Type of List being requested
			None	0x0	
			FromConnectedList	0x1	
			FromBlockedList	0x2	
R	MAC Address	String	-	17 Chars.	Hardware Address of the Client
Response					
O	CES	Enum	-	-	Return Code
			ErrorGeneral	0x0	Error/Failure
			Success	0x1	Success
			ErrorInvalidArgument	0x4	Error Invalid Argument
R	ListType	Enum	-	-	List type being sent
			Reserved	0x00	
			ConnectedList	0x01	Devices currently connected
			BlockedList	0x02	Devices actively blocked by driver
			Reserved	0x03-0x06	
			NoEntry	0x07	
R	ListSize	Enum	-	-	Number of items in List
			Inactive	0x00	
			List Size 1	0x01	
			List Size 2	0x02	
			…	…	
			List Size 31	0x1F	
			NoEntry	0xFF	
R	TotalNumberOf Devices Available	Enum	-	-	Total number of devices available for given list
			Inactive	0x00	
			1 Device Available	0x01	
			2 Devices Available	0x02	
			…	…	
			254 Devices Available	0xFE	
			NoEntry	0xFF	
R	Vector	Enum			Repeated vector of record (IndexNumber, DeviceName, MAC) with

						TotalNumberOfDevices defined in ListSize
	Vector	Index Number	Enum	-	-	Index number of device
				Inactive	0x00	
				Index 1	0x01	
				Index 2	0x02	
				…	…	
				Index 255	0xFF	
		MAC	String	-	17 Chars.	Data array that consists of textual information fixed to 17 characters in length, NO END OF STRING.
		Device Name	String	-	19 Chars.	Data array that consists of textual information up to 19 characters in length

1.9.1.13 MD-REQ-179306/A-WifiInfo_Rq

Message Type: Request

This signal is used to request a Read/Write operation of the Password or SSID from/to the WifiHotSpotServer

Name	Literals	Value	Description
OpCode	-	-	Signifies whether the request is to receive or modify Wi-Fi HotSpot Info parameters
	Reserved	0x0	
	Read	0x1	Request used to read the current Password and SSID
	WriteSSID	0x2	Request used to create a new SSID
	WritePassword	0x3	Request used to create a new Password
	Reserved	0x4-0xFF	
Password	-	-	Data array that consists of textual information up to 64 characters in length, plus end of string
SSID	-	-	Data array that consists of textual information up to 32 characters in length, plus end of string

1.9.1.14 MD-REQ-454783/A-WifiInfo_Command

Message Endpoint: SERVICES/REQUEST/TCU/WHSS/WIFI_INFO

This API is used to request a Read/Write operation of the Password or SSID from/to the WifiHotSpotServer.

Method Type	One-Shot A-SYNC
QoS Level	0
Retained	No

R/O	Name	Type	Literals	Value	Description
Request					
R	OperationCode	Enum	-	-	Type of List being requested
			Read	0x01	Request used to read the current Password and SSID
			WriteSSID	0x02	Request used to create a new SSID
			WritePassword	0x03	Request used to create a new Password
			Reserved	0x4-0xFF	
O	SSID	String	-	65 Chars	Set Service ID
O	Password	String	-	33 Chars	Password

Response					
R	CES	Enum	-	-	Command execution status
			ErrorGeneral	0x0	Error/Failure
			Success	0x1	Success
			ErrorInvalidArgument	0x4	Error Invalid Argument
R	ResponseCode	Enum	-	-	Response code being sent
			Reserved	0x0	
			Data	0x1	Response used to provide both SSID & Password
			SSIDWritten	0x2	Response used to indicate SSID was written (CES to state success/fail)
			PasswordWritten	0x3	Response used to indicate Password was written (CES to state success/fail)
			Reserved	0x4-0xFF	
O	SSID	String	-	65 Chars	Set Service ID
O	Password	String	-	33 Chars	Password

1.9.1.15 MD-REQ-031265/A-FactoryReset_Rq (TcSE ROIN-221412-1)

EventReception : FactoryReset_Rq
Description :
Message Type: Request

Represents a request to reset the factory default settings.
If the user selects factory reset, this signal is used to communicate with OnBoardChargeScheduleWithPreConditioningServer.

Name	Literals	Value	Description
Type	-	-	Request to reset factory default settings.
	Inactive	0x0	
	ResetFactoryDefaults	0x1	

1.9.1.16 MD-REQ-027937/A-HMIMode_St (TcSE ROIN-229453-1)

Message Type: Status

This method holds the information about the HMI state of the multimedia system.

This attribute shows the HMI mode. The HMI mode is defined in the Network Management Strategy.

Name	Literals	Value	Description
Mode	-	-	Signal is used to indicate HMI state.
	Invalid	0x0	
	OffMode	0x1	
	On	0x2	
	Phone	0x3	
	Climate	0x4	
	Load_Shed_Active	0x5	

1.9.1.17 MD-REQ-195171/B-WifiHotspotMAC_Rq

Message Type: Request

This signal is used to request the STA MAC Address from the WifiHotSpotServer

Name	Literals	Value	Description
Type	-	-	Wi-Fi Hotspot MAC address request from center stack
	NoRequest	0x0	
	Request	0x1	

1.9.1.18 MD-REQ-454784/A-WifiHotspotMacCommand

Message Endpoint: SERVICES/REQUEST/TCU/WHSS/WIFI_HOTSPOT_MAC

This API is used to request the STA MAC Address from the WifiHotSpotServer.

Method Type	One-Shot A-SYNC
QoS Level	0
Retained	No

R/O	Name	Type	Literals	Value	Description
Request					
-	-	-	-	-	N/A
Response					
R	CES	Enum	-	-	Return Code
			ErrorGeneral	0x0	Error/Failure
			Success	0x1	Success
R	MacAddress	String	-	17 Chars.	HotspotServer Mac Address

1.9.1.19 MD-REQ-212570/A-HotspotTrialReminderSelection_Rq

Message Type: Request

This signal is sent from the WifiHotspotOnBoardClient to the WifiHotspotServer to request to either continue the Wifi Hotspot Trial reminders or stop them.

Name	Literals	Value	Description
Type	-	-	Request from the vehicle occupant to either stop trial reminders or to continue reminding them
	Null	0x00	
	Remind Me Later	0x01	
	Stop Reminders	0x02	

1.9.1.20 MD-REQ-454785/A-HotspotTrialReminderSelectionCommand

Message Endpoint: SERVICES/REQUEST/TCU/WHSS/HOTSPOT_TRIAL_REMINDER_SELECTION

This API is sent from the WifiHotspotOnBoardClient to the WifiHotspotServer to request to either continue the Wifi Hotspot Trial reminders or stop them.

Method Type	Fire and Forget
QoS Level	0
Retained	No

R/O	Name	Type	Literals	Value	Description
Request					

R	Type	Enum	-	-	Request from the vehicle occupant to either stop trial reminders or to continue reminding them
			None	0x0	
			RemindMeLater	0x1	
			StopReminders	0x2	
Response					
-	-	-	-	-	N/A

1.9.1.21 MD-REQ-263185/A-HotspotFrequencyBand_Rq

Message Type: Request

This signal is used to request a change to the Hotspot Frequency Band from the WifiHotSpotOnBoardClient

Name	Literals	Value	Description
Type	-	-	Frequency Band request from WifiHotSpotOnBoardClient
	Null	0x0	
	Band 1	0x1	(2.4GHz)
	Band 2	0x2	(5GHz)

1.9.1.22 MD-REQ-454786/A-HotspotFrequencyBandCommand

Message Endpoint: SERVICES/REQUEST/TCU/WHSS/HOTSPOT_FREQUENCY

This API is used to request a change to the Hotspot Frequency Band from the WifiHotSpotOnBoardClient.

Method Type	Fire and Forget
QoS Level	0
Retained	No

R/O	Name	Type	Literals	Value	Description
Request					
R	Type	Enum	-	-	Frequency Band request from WifiHotSpotOnBoardClient
			Band1	0x1	2.4 GHz
			Band2	0x2	5.0 GHz
Response					
-	-	-	-	-	N/A

1.9.2 WFHSv2-IIR-REQ-283542/D-WifiHotspotOnBoardClient_Rx

1.9.2.1 MD-REQ-179284/A-HotspotEnablement_St

Message Type: Status

This signal is used to inform the WifiHotSpotOnBoardClient the current state of the Hotspot Enablement

Name	Literals	Value	Description
Type	-	-	Wi-Fi chipset transmission status of Wi-Fi signal
	Null	0x0	
	Off	0x1	No Wi-Fi signal transmission on Wi-Fi chipset

	On	0x2	Wi-Fi chipset is transmitting Wi-Fi signal
	On-Disabled	0x3	Wi-Fi chipset shall transmit Wi-Fi signal once other defined conditions are met

1.9.2.2 MD-REQ-454787/A-HotspotEnablementStatus

Message Endpoint: SERVICES/DATA/TCU/WHSS/HOTSPOT_ENABLEMENT

This API is used to broadcast WifiHotSpot Enablement status.

Method Type	OnChange
QoS Level	0
Retained	No

R/O	Name	Type	Literals	Value	Description
Request					
-	-	-	-	-	N/A
Response					
R	Type	Enum	-	-	Wi-Fi chipset transmission status of Wi-Fi signal
			Unknown	0x0	Unknown
			Off	0x1	No Wi-Fi signal transmission on Wi-Fi chipset
			On	0x2	Wi-Fi chipset is transmitting Wi-Fi signal
			OnDisabled	0x3	Wi-Fi chipset shall transmit Wi-Fi signal once other defined conditions are met

1.9.2.3 MD-REQ-179291/A-HotspotSecurity_St

Message Type: Status

This signal is used to inform the WifiHotSpotOnBoardClient the current state of the Hotpot Security Algorithm

Name	Literals	Value	Description
Type	-	-	Current Security Algorithm in use
	Null	0x0	
	WPA2-WPA	0x1	
	WAPI	0x2	

1.9.2.4 MD-REQ-454788/A-HotspotSecurityStatus

Message Endpoint: SERVICES/DATA/TCU/WHSS/HOTSPOT_SECURITY

This API is used to broadcast the current state of the Hotpot Security Algorithm.

Method Type	OnChange
QoS Level	0
Retained	No

R/O	Name	Type	Literals	Value	Description
Request					
-	-	-	-	-	N/A
Response					
R	Type	Enum			Current Security Algorithm in use

			None	0x0	
			WPA2-WPA	0x1	
			WPA2/WPA3	0x2	

1.9.2.5 MD-REQ-179293/A-HotspotVisibility_St

Message Type: Status

This signal is used to inform the WifiHotSpotOnBoardClient the current state of the Hotpot Visibility

Name	Literals	Value	Description
Type	-	-	Wi-Fi chipset SSID transmission status
	Null	0x0	
	Off	0x1	Wi-Fi chipset excludes SSID in its beacon frames
	On	0x2	Wi-Fi chipset transmits SSID in its beacon frames

1.9.2.6 MD-REQ-454789/A-HotspotVisibilityStatus

Message Endpoint: SERVICES/DATA/TCU/WHSS/HOTSPOT_VISIBILITY

This API is used to broadcast the current state of the Hotpot Visibility.

Method Type	OnChange
QoS Level	0
Retained	No

R/O	Name	Type	Literals	Value	Description
Request					
-	-	-	-	-	N/A
Response					
R	Type	Enum	-	-	Wi-Fi chipset SSID transmission status
			Null	0x00	
			Off	0x01	Wi-Fi chipset excludes SSID in its beacon frames
			On	0x02	Wi-Fi chipset transmits SSID in its beacon frames

1.9.2.7 MD-REQ-179299/A-NewDeviceList_St

Message Type: Status

This signal is used to inform the WifiHotSpotOnBoardClient a new device has been added/removed to/from the WifiHotSpotServer

Name	Literals	Value	Description
Type	-	-	Status bit to indicate a device has connected/disconnected to the hotspot's network
	NotAvailable	0x0	
	Available	0x1	

1.9.2.8 MD-REQ-454790/A-NewDeviceListStatus

Message Endpoint: SERVICES/DATA/TCU/WHSS/NEW_DEVICE_LIST

This API is used to broadcast when a new device has been added/removed to/from the WifiHotSpotServer.

Method Type	OnChange
QoS Level	0
Retained	No

R/O	Name	Type	Literals	Value	Description
Request					
-	-	-	-	-	N/A
Response					
R	Type	Enum	-	-	Status bit to indicate a device has connected/disconnected to the hotspot's network
			NotAvailable	0x0	
			Available	0x1	

1.9.2.9 MD-REQ-179301/A-TCUSignalStrength_St

Message Type: Status

This signal is used to inform the WifiHotSpotOnBoardClient the status of the TCU signal strength

Name	Literals	Value	Description
Type	-	-	Quality of TCU's signal strength
	0 Bars	0x00	
	1 Bar	0x01	
	2 Bars	0x02	
	3 Bars	0x03	
	4 Bars	0x04	
	5 Bars	0x05	
	NotDetermined	0x06	

1.9.2.10 MD-REQ-212571/A-TCUTechnologyUsed2_St

Message Type: Status

This signal is used to inform the WifiHotSpotOnBoardClient the current state of the TCU technology being used (ver2).

Name	Literals	Value	Description
Type	-	-	Current TCU technology in use
	Null	0x00	
	No Network	0x01	
	GSM	0x02	
	GPRS	0x03	
	EDGE	0x04	
	UMTS	0x05	
	HSPA+	0x06	(includes HSPA, HSDPA and HSUPA)
	LTE	0x07	

1.9.2.11 MD-REQ-454791/A-CellularConnectivityMetricsInd

Message Endpoint: SERVICES/DATA/CELLULARCTRL/CELLULAR_CONNECTIVITY_METRICS_IND

This API indicates the updated Cellular Connectivity Metrics which contains the Cellular Signal Strength.

Method Type	OnChange
QoS Level	0
Retained	No

R/O	Name	Type	Literals	Value	Description
Request					
-	-	-	-	-	N/A
Response					
O	modem_power	Enum	-	-	Modem power status
				0x0	
				0x1	
O	nw_type	Enum	-	-	Network type
			NO_NW	0x0	
			GSM	0x1	
			GPRS	0x2	
			EDGE	0x3	
			UMTS	0x4	
			HSPA_P	0x5	
			LTE	0x6	
			NR5G	0x7	
O	signal_strength	int32	-	??	Signal strength
O	service_status	Enum	-	-	Cellular registration status
			NAS_NO_SERVICE	0x0	
			NAS_LIMITED_SERVICE	0x1	
			NAS_SERVICE	0x2	
			NAS_CS_ONLY	0x3	
			NAS_PS_ONLY	0x4	
			NAS_CS_PS	0x5	
O	mcc	uint32	-	??	PLMN information
O	mnc	uint32	-	??	PLMN information
O	three_digit_mnc	bool	-	0/1	PLMN information
O	cell_id	uint32	-	??	Cell Identity
O	lte_carrier_aggregated_bandwidth	bool	-	0/1	LTE only - indicates if carrier aggregation is active
O	lte_bandwidth	uint32	-	??	LTE bandwidth in MHz (i.e. 5, 10, 15, 20) if carrier aggregation is active [primary + secondary cell(s)] otherwise primary only
O	nr5G_bandwidth	uint32	-	??	NR5G bandwidth in MHz
O	endc_available	bool	-	0/1	ENDC available or not
O	restrict_dcnr	bool	-	0/1	Restrict DCNR or not
O	nr5g_fr_type	Enum	-	-	NR5G frequency type
			CELLCTRL_NR5G_FR_TYPE_SUB6	0x0	Sub6 frequency type
			CELLCTRL_NR5G_FR_TYPE_MMW	0x1	mmWave frequency type
O	nr5g_scs	uint32	-	??	NR5G subcarrier spacing in KHz
O	api_version	??	-	??	version info

1.9.2.12 MD-REQ-179304/B-CarrierDataNotification_St

Message Type: Status

This signal is used to inform the WifiHotSpotOnBoardClient the current state of the connected data plan's data availability.

Name	Literals	Value	Description

NotificationType	-	-	State of the hotspot's current data plan
	Null	0x00	
	Free Trial Period Waiting	0x01	
	Percent Data Used	0x02	
Percent	-	-	Percent data left on hotspot's current data plan
	50 percent	0x00	
	55 percent	0x01	
	60 percent	0x02	
	65 percent	0x03	
	…	…	
	100 Percent	0xA	
	Reserved	0xB-0xF	

1.9.2.13 MD-REQ-454792/A-CarrierDataNotificationStatus

Message Endpoint: SERVICES/DATA/TCU/WHSS/CARRIER_DATA_NOTIFICATION

This API is used to broadcast the current state of the connected data plan's data availability.

Method Type	OnChange
QoS Level	0
Retained	Yes

R/O	Name	Type	Literals	Value	Description
Request					
-	-	-	-	-	N/A
Response					
R	message	Enum	-	-	State of the hotspot's current data plan
			None	0x00	
			FreeTrialPeriodWaiting	0x01	
			PercentDataUsed	0x02	Percent data left on hotspot's current data plan
R	Percent	Enum	-	-	Percent data left on hotspot's current data plan
			50 percent	0x00	
			55 percent	0x01	
			60 percent	0x02	
			65 percent	0x03	
			…	…	
			100 Percent	0xA	
			Reserved	0xB-0xF	

1.9.2.14 MD-REQ-179305/B-TCUAvailability_St

Message Type: Status

This signal is used to inform the WifiHotSpotOnBoardClient the current state of the Wi-Fi Hotspot feature

Name	Literals	Value	Description
Type	-	-	Wi-Fi feature readiness status
	Null	0x0	
	Disable	0x1	

	Enable	0x2	

1.9.2.15 MD-REQ-454793/A-TcuAvailabilityStatus

Message Endpoint: SERVICES/DATA/TCU/WHSS/TCU_AVAILABILITY

This API is used to broadcast the current state of the Wi-Fi Hotspot feature.

Method Type	OnChange
QoS Level	0
Retained	Yes

R/O	Name	Type	Literals	Value	Description
Request					
-	-	-	-	-	N/A
Response					
R	Type	Enum	-	-	Wi-Fi feature readiness status
			None	0x0	
			Disable	0x1	
			Enable	0x2	

1.9.2.16 MD-REQ-179307/A-WifiInfo_Rsp

Message Type: Response

This signal is used to respond to the WifiHotSpotOnBoardClient with the SSID or Password upon a Read operation, or the successful/failed result of the Write operation.

Name	Literals	Value	Description
Response Code	-	-	Response code being sent
	Reserved	0x0	
	Data	0x1	Response used to provide both SSID & Password
	SSIDWritten	0x2	Response used to indicate SSID was written (CES to state success/fail)
	PasswordWritten	0x3	Response used to indicate Password was written (CES to state success/fail)
	Reserved	0x4-0xFF	
Password	-	-	Data array that consists of textual information up to 64 characters in length, plus end of string
SSID	-	-	Data array that consists of textual information up to 32 characters in length, plus end of string

1.9.2.17 MD-REQ-454783/A-WifiInfo_Command

Message Endpoint: SERVICES/REQUEST/TCU/WHSS/WIFI_INFO

This API is used to request a Read/Write operation of the Password or SSID from/to the WifiHotSpotServer.

Method Type	One-Shot A-SYNC
QoS Level	0
Retained	No

R/O	Name	Type	Literals	Value	Description

Request					
R	OperationCode	Enum	-	-	Type of List being requested
			Read	0x01	Request used to read the current Password and SSID
			WriteSSID	0x02	Request used to create a new SSID
			WritePassword	0x03	Request used to create a new Password
			Reserved	0x4-0xFF	
O	SSID	String	-	65 Chars	Set Service ID
O	Password	String	-	33 Chars	Password
Response					
R	CES	Enum	-	-	Command execution status
			ErrorGeneral	0x0	Error/Failure
			Success	0x1	Success
			ErrorInvalidArgument	0x4	Error Invalid Argument
R	ResponseCode	Enum	-	-	Response code being sent
			Reserved	0x0	
			Data	0x1	Response used to provide both SSID & Password
			SSIDWritten	0x2	Response used to indicate SSID was written (CES to state success/fail)
			PasswordWritten	0x3	Response used to indicate Password was written (CES to state success/fail)
			Reserved	0x4-0xFF	
O	SSID	String	-	65 Chars	Set Service ID
O	Password	String	-	33 Chars	Password

1.9.2.18 MD-REQ-179308/C-CarrierInfo_Rsp

Message Type: Response

This signal is used to respond to the WifiHotSpotOnBoardClient with a Ford or Lincoln Landing URL and Ford or Lincoln Hotline Phone Number upon request.

Name	Literals	Value	Description
Ford Landing page URL	-	-	Ford website displayed to update plan based on data availability and region. Data array that consists of textual information up to 192 characters in length, plus end of string
Lincoln Landing page URL	-	-	Lincoln website displayed to update plan based on data availability and region. Data array that consists of textual information up to 192 characters in length, plus end of string
Ford Phone Number	-	-	Ford specific phone number displayed to update plan. Data array that consists of textual information up to 24 characters in length, plus end of string
Lincoln Phone Number	-	-	Lincoln specific phone number displayed to update plan. Data array that consists of textual information up to 24 characters in length, plus end of string

1.9.2.19 MD-REQ-454779/A-CarrierInfoCommand

Message Endpoint: SERVICES/REQUEST/TCU/WHSS/CARRIER_INFO

This API is used to request the Carrier Information from the WifiHotSpotServer.

Method Type	One-Shot A-SYNC
QoS Level	0
Retained	No

R/O	Name	Type	Literals	Value	Description
Request					
-	-	-	-	-	N/A
Response					
R	Ford Landing page URL	String	-	0-191 Chars.	Ford website displayed to update plan based on data availability and region. Data array that consists of textual information up to 192 characters in length
R	Lincoln Landing page URL	String-	-	0-191 Chars.	Lincoln website displayed to update plan based on data availability and region. Data array that consists of textual information up to 192 characters in length
R	Ford Phone Number	String	-	0-23 Chars.	Ford specific phone number displayed to update plan. Data array that consists of textual information up to 24 characters in length
R	Lincoln Phone Number	String	-	0-23 Chars.	Lincoln specific phone number displayed to update plan. Data array that consists of textual information up to 24 characters in length
R	Error Execution Code	Enum	-	-	Return Code
			Error_Code	0x0	Error/Failure
			Success_Code	0x1	Success

1.9.2.20 MD-REQ-179309/C-DataUsage_Rsp

Message Type: Response

This signal is used to respond to the WifiHotSpotOnBoardClient with the current state of the connected plans data usage variables.

Name	Literals	Value	Description
CounterHour	-	-	Hour of the current data usage counter
	Hour	0x00-0x17	
	Reserved	0x18-0xFE	
	Invalid	0xFF	
CounterMinute	-	-	Minute of the current data usage counter
	Minute	0x00-0x3B	
	Reserved	0x3C-0xFE	
	Invalid	0xFF	
CounterSecond	-	-	Second of the current data usage counter
	Second	0x00-0x3B	
	Reserved	0x3C-0xFE	
	Invalid	0xFF	
PlanType	-	-	Plan type being used
	Invalid	0x0	

	Shared	0x1	
	Session	0x2	
Expiry/RenewalDate	-	-	The text used to differentiate between an Expiry and Renewal Date
	Invalid	0x0	
	Expiry Date	0x1	
	Renewal Date	0x2	
Expiry/RenewalMonth	-	-	Month of the next Expiry/Renewal Date
	Invalid	0x00	
	January	0x01	
	February	0x02	
	March	0x03	
	April	0x04	
	May	0x05	
	June	0x06	
	July	0x07	
	August	0x08	
	September	0x09	
	October	0x0A	
	November	0x0B	
	December	0x0C	
	Reserved	0x0D-0xFF	
Expiry/RenewalDay	-	-	Day of the next Expiry/Renewal Date
	Invalid	0x00	
	Day	0x01-0x1F	
	Reserved	0x20-0xFF	
Expiry/RenewalYear	-	-	Year of the next Expiry/Renewal Date. Offset of 2000
	Year	0x00-0xFE	
	Invalid	0xFF	
Expiry/RenewalHour	-	-	Hour of the Expiry/Renewal Date
	Hour	0x00-0x17	
	Reserved	0x18-0xFE	
	Invalid	0xFF	
Expiry/RenewalMinute	-	-	Minute of the Expiry/Renewal Date
	Minute	0x00-0x3B	
	Reserved	0x3C-0xFE	
	Invalid	0xFF	
Expiry/RenewalSecond	-	-	Second of the Expiry/Renewal Date
	Second	0x00-0x3B	
	Reserved	0x3C-0xFE	
	Invalid	0xFF	
DataUsed	-	-	Data used since start of last Renewal Date. Use HEX encoding here. Data values are in steps of 0.01 decimal units (ex. 0x08707 = 34567 = 345.67 Mb (or Kb or Gb)
	Data	0x000000-0x01869F	
	Reserved	0x0186A0-0xFFFFFE	
	Invalid	0xFFFFFF	
DataUsedUnits	-	-	Units of measure used to report the data used
	Invalid	0x0	
	KB	0x1	
	MB	0x2	
	GB	0x3	

TotalData	-	-	Total data available in current Renewal Date. Use HEX encoding here. Data values are in steps of 0.01 decimal units (ex. 0x08707 = 34567 = 345.67 Mb (or Kb or Gb)
	Data	0x000000-0x01869F	
	Unlimited	0x0186A0	
	Reserved	0x0186A1-0xFFFFFE	
	Invalid	0xFFFFFF	
TotalDataUnits	-	-	Units of measure used to report the total data
	Invalid	0x0	
	KB	0x1	
	MB	0x2	
	GB	0x3	
DataUsedPercent	-	-	Data used (in percent) in current Renewal Date. Use HEX encoding here
	Data	0x00-0x64	
	Reserved	0x65-0xFE	
	Invalid	0xFF	
OverageFlag	-	-	Overage Flag status
	Invalid	0x0	
	No	0x1	
	Yes	0x2	
DataPlanStatus	-	-	Status of the Carrier's Data Plan
	Invalid	0x0	
	Free Trial Period Waiting	0x1	
	Free Trial Period Active	0x2	
	No Active Subscription	0x3	
	Active Subscription	0x4	
UserID	-	-	Data array that consists of textual information up to 50 characters in length, plus end of string

1.9.2.21 MD-REQ-454780/A-DataUsageCommand

Message Endpoint: SERVICES/REQUEST/TCU/WHSS/DATA_USAGE

This API is used for the WifiHotSpotOnBoardClient to request the current data usage variables from the WifiHotSpotServer, to request a refresh of this data from the WifiHotSpotOffBoardClient with an expected response, or to request a refresh of this data from the WifiHotSpotOffBoardClient without an expected response.

Method Type	One-Shot A-SYNC
QoS Level	0
Retained	No

R/O	Name	Type	Literals	Value	Description
Request					
R	Type	Enum	-	-	Data Usage request from center stack
			Null	0x0	
			CurrentData	0x1	
			RefreshData	0x2	
			RefreshDataNoResponse	0x3	

Response					
O	CES	Enum	-	-	Command execution status
			Fail	0x0	Error_Code
			Success	0x1	Success_Code
			Wait	0x2	Immediate wait
O	TimeStamp	Long	-	-	The time stamp is FFF then the time stamp is invalid.
R	Expiry/ RenewalDate	Enum	-	-	DataUsage
			Invalid	0x0	The text used to differentiate between an Expiry and Renewal Date
			ExpiryDate	0x1	-
			RenewalDate	0x2	-
R	Expiry/ RenewalMonth	Enum	-	-	Month of the next Expiry/Renewal Date
			Invalid	0x00	
			January	0x01	
			February	0x02	
			March	0x03	
			April	0x04	
			May	0x05	
			June	0x06	
			July	0x07	
			August	0x08	
			September	0x09	
			October	0x0A	
			November	0x0B	
			December	0x0C	
			Reserved	0x0D-0xFF	
R	Expiry/ RenewalDay	Enum	-	-	Day of the next Expiry/Renewal Date
			Invalid	0x00	
			Day	0x01-0x1F	
			Reserved	0x20-0xFF	
R	Expiry/ RenewalYear	Enum	-	-	Year of the next Expiry/Renewal Date. Offset of 2000
			Year	0x00-0xFE	
			Invalid	0xFF	
R	Expiry/ RenewalHour	Enum	-	-	Hour of the Expiry/Renewal Date
			Hour	0x00-0x17	
			Reserved	0x18-0xFE	
			Invalid	0xFF	
R	Expiry/ RenewalMinute	Enum	-	-	Minute of the Expiry/Renewal Date
			Minute	0x00-0x3B	
			Reserved	0x3C-0xFE	
			Invalid	0xFF	
R	Expiry/ RenewalSecond	Enum	-	-	Second of the Expiry/Renewal Date
			Second	0x00-0x3B	
			Reserved	0x3C-0xFE	
			Invalid	0xFF	
R	PlanType	Enum	-	-	Plan type being used
			Invalid	0x0	-

			Shared	0x1	-
			Session	0x2	-
R	OverageFlag	Enum	-		Overage Flag status
			Invalid	0x0	-
			No	0x1	-
			Yes	0x2	-
R	DataPlanStatus	Enum	-	-	Status of the Carrier's Data Plan
			Invalid	0x0	-
			FreeTrialPeriodWaiting	0x1	-
			FreeTrialPeriodActive	0x2	-
			NoActiveSubscription	0x3	-
			ActiveSubscription	0x4	-
R	DataUsed	Enum	-	-	Data used since start of last Renewal Date. Use HEX encoding here. Data values are in steps of 0.01 decimal units (ex. 0x08707 = 34567 = 345.67 Mb (or Kb or Gb)
			Data	0x000000-0x01869F	-
			Reserved	0x0186A0-0xFFFFFE	-
			Invalid	0xFFFFFF	-
R	DataUsedUnits	Enum	-	-	Units of measure used to report the data used
			Invalid	0x0	-
			KB	0x1	-
			MB	0x2	-
			GB	0x3	-
R	TotalData	Enum	-	-	Total data available in current Renewal Date. Use HEX encoding here. Data values are in steps of 0.01 decimal units (ex. 0x08707 = 34567 = 345.67 Mb (or Kb or Gb)
			Data	0x000000-0x01869F	
			Unlimited	0x0186A0	
			Reserved	0x0186A1-0xFFFFFE	
			Invalid	0xFFFFFF	
R	TotalDataUnits	Enum	-	-	Units of measure used to report the total data
			Invalid	0x0	
			KB	0x1	
			MB	0x2	
			GB	0x3	
R	DataUsedPercent	Enum	-	-	Data used (in percent) in current Renewal Date. Use HEX encoding here
			Data	0x00-0x64	
			Reserved	0x65-0xFE	
			Invalid	0xFF	

R	UserID	String	-	50 Chars.	Data array that consists of textual information up to 50 characters in length

1.9.2.22 MD-REQ-179310/C-DeviceList_Rsp

Message Type: Response

This signal is used to respond to the WifiHotSpotOnBoardClient with the current list of connected or blocked devices.

Name	Literals	Value	Description
ListType	-	-	List type being sent
	Reserved	0x00	
	ConnectedList	0x01	Devices currently connected
	BlockedList	0x02	Devices actively blocked by driver
	Reserved	0x03-0x06	
	NoEntry	0x07	
ListSize	-	-	Number of items in List
	Inactive	0x00	
	List Size 1	0x01	
	List Size 2	0x02	
	…	…	
	List Size 31	0x1F	
	NoEntry	0xFF	
TotalNumberOf DevicesAvailable	-	-	Total number of devices available for given list
	Inactive	0x00	
	1 Device Available	0x01	
	2 Devices Available	0x02	
	…	…	
	254 Devices Available	0xFE	
	NoEntry	0xFF	
Vector			Array (1…N) of record (IndexNumber, DeviceName, MAC) with TotalNumberOfDevices defined in ListSize
IndexNumber	-	-	
	Inactive	0x00	
	Index 1	0x01	
	Index 2	0x02	
	…	…	
	Index 255	0xFF	
MAC	-	-	Data array that consists of textual information fixed to 17 characters in length, NO END OF STRING.
DeviceName	-	-	Data array that consists of textual information up to 19 characters in length, plus end of string

1.9.2.23 MD-REQ-454781/A-DeviceListCommand

Message Endpoint: SERVICES/REQUEST/TCU/WHSS/DEVICE LIST:

This API is used to request from the WifiHotSpotServer the current list of connected or blocked devices.

Method Type	One-Shot A-SYNC
QoS Level	1
Retained	No

R/O	Name	Type	Literals	Value	Description
Request					

R	ListType	Enum	-	-	Type of List being requested
			Null	0x00	
			ConnectedList	0x01	
			Blocked List	0x02	
Response					
R	CES	Enum	-	-	Return Code
			ErrorGeneral	0x0	Error/Failure
			Success	0x1	Success
			ErrorInvalidArgument	0x4	Error Invalid Argument
R	ListType	Enum	-	-	List type being sent
			Reserved	0x00	
			ConnectedList	0x01	Devices currently connected
			BlockedList	0x02	Devices actively blocked by driver
			Reserved	0x03-0x06	
			NoEntry	0x07	
R	ListSize	Enum	-	-	Number of items in List
			Inactive	0x00	
			List Size 1	0x01	
			List Size 2	0x02	
			…	…	
			List Size 31	0x1F	
			NoEntry	0xFF	
R	TotalNumberOfDevices Available	Enum	-	-	Total number of devices available for given list
			Inactive	0x00	
			1 Device Available	0x01	
			2 Devices Available	0x02	
			…	…	
			254 Devices Available	0xFE	
			NoEntry	0xFF	
Rep	Vector	vector	-	-	Repeated vector of record (IndexNumber, DeviceName, MAC) with TotalNumberOfDevices defined in ListSize
		IndexNumber	Enum	-	-	Index number of device
				Inactive	0x00	
				Index 1	0x01	
				Index 2	0x02	
				…	…	
				Index 255	0xFF	
R	vector	MAC	String	-	17 Chars.	Data array that consists of textual information fixed to 17 characters in length, NO END OF STRING.
		DeviceName	String	-	19 Chars.	Data array that consists of textual information up to 19 characters in length

1.9.2.24 MD-REQ-014025/A-VehicleSpeed_St (TcSE ROIN-223023-1)

Message Type: Status

Status used to indicate vehicle speed.

Name	Literals	Value	Description
Type	-	-	Indicates vehicle speed. Unit: kph Resolution:0.01 Offset:0
	kph	0x0 to 0xFFFF	

1.9.2.25 MD-REQ-110797/A-VehicleGGCCData

This signal contains the Vehicle Identification Number for use in the My Key Report Card Function.

Name	Literals	Value	Description
VehicleIdentificationNumber	-	-	Based on the Economized Central Vehicle Configuration Specification (8 Byte Signal) contains the Vehicle Identification Number. If CDID (1st two bytes) = C100 then last 6 bytes contain VIN characters 1 - 6 (ASCII Coded) If CDID (1st two bytes) = C101 then last 6 bytes contain VIN characters 7 - 12 (ASCII Coded) If CDID (1st two bytes) = C102 then last 6 bytes contain VIN characters 13 - 17 (ASCII Coded)

1.9.2.26 MD-REQ-195174/B-WifiHotspotMAC_Rsp

Message Type: Response

This signal is used to respond to the WifiHotSpotOnBoardClient with the STA MAC Address.

Name	Literals	Value	Description
MAC	-	-	Media Access Control address used to differentiate TCU hotspot from all other hotspots. Data array that consists of textual information up to 17 characters in length, plus end of string

1.9.2.27 MD-REQ-454784/A-WifiHotspotMacCommand

Message Endpoint: SERVICES/REQUEST/TCU/WHSS/WIFI_HOTSPOT_MAC

This API is used to request the STA MAC Address from the WifiHotSpotServer.

Method Type	One-Shot A-SYNC
QoS Level	0
Retained	No

R/O	Name	Type	Literals	Value	Description
Request					
-	-	-	-	-	N/A
Response					

R	CES	Enum	-	-	Return Code
			ErrorGeneral	0x0	Error/Failure
			Success	0x1	Success
R	MacAddress	String	-	17 Chars.	HotspotServer Mac Address

1.9.2.28 MD-REQ-180729/A-NumberOfConnectedDevices_St

Message Type: Status

This signal is used to inform the WifiHotSpotOnBoardClient the number of devices currently connected

Name	Literals	Value	Description
Type	-	-	Status bit to indicate the number of devices currently connected
	0 Devices	0x00	
	1 Device	0x01	
	2 Devices	0x02	
	…	…	
	255 Devices	0xFF	

1.9.2.29 MD-REQ-454794/A-NumberOfConnectedDeviceStatus

Endpoint: SERVICES/DATA/TCU/WHSS/NUMBER_OF_CONNECTED_DEVICES

This API is used to broadcast the number of devices currently connected.

Method Type	OnChange
QoS Level	0
Retained	Yes

R/O	Name	Type	Literals	Value	Description
Request					
-	-	-	-	-	N/A
Response					
R	message	Enum	-	-	Status bit to indicate the number of devices currently connected
			0 Devices	0x00	
			1 Device	0x01	
			2 Devices	0x02	
			…	…	
			255 Devices	0xFF	

1.9.2.30 MD-REQ-222048/A-TelematicsDTC_St

Message Type: Status

This signal is used to inform the WifiHotSpotOnBoardClient any currently active telematics DTCs.

Name	Literals	Value	Description
Type	-	-	Currently active Telematics DTC
	Null	0x000	
	Chipset Init. Failure	0x001	
	Runtime Error	0x002	
	Reserved	0x003 - 0xFFF	

1.9.2.31 MD-REQ-454795/A-TelematicsDtcStatus

Message Endpoint: SERVICES/DATA/TCU/WHSS/TELEMATICS_DTC

This API is used to broadcast any currently active telematics DTCs.

Method Type	OnChange
QoS Level	0
Retained	Yes

R/O	Name	Type	Literals	Value	Description
Request					
-	-	-	-	-	N/A
Response					
R	Type	Enum	-	-	Currently active Telematics DTC
			None	0x0	
			ChipsetInitFailure	0x1	
			RuntimeError	0x2	

1.9.2.32 MD-REQ-222050/A-DataUsageFeature_St

Message Type: Status

This signal is used to inform the WifiHotSpotOnBoardClient whether the Data Usage functionality is to be supported and shown to the customer.

Name	Literals	Value	Description
Type	-	-	Data Usage functionality status
	Null	0x00	
	Off	0x01	
	On	0x02	

1.9.2.33 MD-REQ-454796/A-DataUsageFeatureStatus

Message Endpoint: SERVICES/DATA/TCU/WHSS/DATA_USAGE_FEATURE

This API is used to broadcast whether the Data Usage functionality is to be supported and shown to the customer.

Method Type	OnChange
QoS Level	0
Retained	Yes

R/O	Name	Type	Literals	Value	Description
Request					
-	-	-	-	-	N/A
Response					
R	Type	Enum	-	-	Data Usage functionality status
			None	0x0	
			Off	0x1	
			On	0x2	

1.9.2.34 MD-REQ-222051/A-HotspotAPNConnection_St

Message Type: Status

This signal is used to inform the WifiHotSpotOnBoardClient of the WifiHotspot APN connection status.

Name	Literals	Value	Description
Type	-	-	Hotspot APN connection status

	Null	0x00	
	NotConnected	0x01	
	Connected	0x02	

1.9.2.35 MD-REQ-454797/A-HotspotApnConnectionStatus

Message Endpoint: SERVICES/DATA/TCU/WHSS/HOTSPOT_APN_CONNECTION

This API is used to broadcast the WifiHotspot APN connection status.

Method Type	OnChange				
QoS Level	0				
Retained	Yes				
R/O	**Name**	**Type**	**Literals**	**Value**	**Description**
Request					
-	-	-	-	-	N/A
Response					
R	Type	Enum	-	-	Hotspot APN connection status
			None	0x0	
			NotConnected	0x1	
			Connected	0x2	

1.9.2.36 MD-REQ-263183/A-HotspotAvailableBands_St

Message Type: Status

This signal is used to inform the WifiHotSpotOnBoardClient which Hotspot Frequency Bands are available for use.

Name	Literals	Value	Description
Type	-	-	Available Frequency Band
	Null	0x0	
	All Restricted	0x1	
	Band 1 only	0x2	(2.4GHz available)
	Band 2 only	0x3	(5GHz available)
	All Available	0x4	

1.9.2.37 MD-REQ-454798/A-HotspotAvailableBandStatus

Message Endpoint: SERVICES/DATA/TCU/WHSS/HOTSPOT_AVAILABLE_BANDS

This API is used to broadcast which Hotspot Frequency Bands are available for use.

Method Type	OnChange				
QoS Level	0				
Retained	Yes				
R/O	**Name**	**Type**	**Literals**	**Value**	**Description**
Request					
-	-	-	-	-	N/A
Response					
R	Type	Enum	-	-	Available Frequency Band
			None	0x0	
			AllRestricted	0x1	
			Band1Only	0x2	2.4GHz available

			Band2Only	0x3	5GHz available
			AllAvailable	0x4	

1.9.2.38 MD-REQ-263184/A-HotspotFrequencyBand_St

Message Type: Status

This signal is used to inform the WifiHotSpotOnBoardClient the current state of the Hotspot Frequency Band.

Name	Literals	Value	Description
Type	-	-	Current Frequency Band in use
	Null	0x0	
	Band 1	0x1	(2.4GHz)
	Band 2	0x2	(5GHz)

1.9.2.39 MD-REQ-454799/A-HotspotFrequencyBandStatus

Message Endpoint: SERVICES/DATA/TCU/WHSS/HOTSPOT_FREQUENCY_BAND

This API is used to broadcast the currently used Hotspot Frequency Band.

Method Type	OnChange				
QoS Level	0				
Retained	Yes				
R/O	**Name**	**Type**	**Literals**	**Value**	**Description**
Request					
-	-	-	-	-	N/A
Response					
R	Type	Enum	-	-	Current Frequency Band in use
			None	0x0	
			Band1	0x1	2.4 GHz
			Band2	0x2	5 GHz

1.9.2.40 MD-REQ-283639/A-WifiErrorCode_St

Message Type: Status

This signal is used to inform the WifiHotSpotOnBoardClient of any currently active WifiHotspot error.

Name	Literals	Value	Description
Type	-	-	Currently active WifiHotspot Error
	Null	0x0	
	Error1	0x1	
	Error2	0x2	
	…	…	
	Error15	0xF	

1.9.2.41 MD-REQ-454800/A-WifiErrorCodeStatus

Message Endpoint: SERVICES/DATA/TCU/WHSS/WIFI_ERROR_CODE

This API is used to broadcast any currently active WifiHotspot errors.

Method Type	OnChange
QoS Level	0

Retained	Yes

R/O	Name	Type	Literals	Value	Description
Request					
-	-	-	-	-	N/A
Response					
R	ErrorCode	Enum	-	-	Currently active WifiHotspot Error
			Null	0x0	
			Error1	0x1	
			Error2	0x2	
			…	…	
			Error15	0xF	

1.9.2.42 MD-REQ-304589/A-NewHotSpotCredentials_St

Message Type: Status

This signal is used to inform the WifiHotSpotOnBoardClient the SSID or Password has been changed in the WifiHotSpotServer

Name	Literals	Value	Description
Type	-	-	Status bit to indicate the hotspot has changed its SSID or Password
	NotAvailable	0x0	
	Available	0x1	

1.9.2.43 MD-REQ-454801/A-NewHotspotCredentialsStatus

Message Endpoint: SERVICES/DATA/TCU/WHSS/NEW_HOTSPOT_CREDENTIALS

This API is used to broadcast whether the SSID or Password has been changed in the WifiHotSpotServer.

Method Type	OnChange
QoS Level	0
Retained	Yes

R/O	Name	Type	Literals	Value	Description
Request					
-	-	-	-	-	N/A
Response					
R	Type	Enum	-	-	Status bit to indicate the hotspot has changed its SSID or Password
			NotAvailable	0x0	
			Available	0x1	

2 General Requirements

2.1 WFHS-HMI-REQ-192248/A-WifiHotspotOnBoardClient Transport Protocol Data Request

The WifiHotspotOnBoardClient shall request all Transport Protocol data required for a given WifiHotspot screen upon entry.

Example: When the user requests the Connected Device List screen, the WifiHotspotOnBoardClient shall make a request for the Device List from the WifiHotspotServer using DeviceList_Rq. The WifiHotspotServer shall respond with DeviceList_Rsp.

2.2 WFHSv2-REQ-283641/B-HMI Specification References

The HMI specifications may vary per module. Refer to the HMI specifications below per module for the actual implementation of screens, popups, screen names and icons.

Module	HMI Specification
SYNC	H31i_SYNC_Gen3_Wi-Fi_Settings
Sub-SYNC	TBD (actual name of the specification may be added to this document at a later time)
Phoenix	X31i_Hotspot

2.3 WFHSv2-REQ-283642/B-Diagnostic Specification References

The Diagnostics Part 2 specification may vary per module. Refer to the Diagnostic Part 2 specification below per module for relevant DID (diagnostic ID) values, DTC values, and address spaces.

Module	Diagnostic Part 2 Specification
SYNC/Phoenix	Infotainment Diagnostics Specification
Sub-SYNC	TBD (actual name of the specification may be added to this document at a later time)
TCU	TCU Subsystem Specification Diagnostic Specification (Part 2)

2.4 WFHSv2-SR-REQ-227355/B-Request/Response return to Null/NoRequest state

When updating on event, the following event-periodic signals listed below shall hold there signal encoding values for a period of time defined by T_ReturnToNull_NoRequest and then shall transit back to Null or NoRequest as shown in the sequence diagrams (TBD - diagrams will be updated at a later time):

- HotspotEnablement_Rq
- HotspotVisibility_Rq
- CarrierInfo_Rq
- DataUsage_Rq
- DeviceList_Rq
- RemoveDevice_Rq
- WifiHotspotMAC_Rq
- HotspotTrialReminderSelection_Rq
- HotspotFrequencyBand_Rq

The receiving modules of these signals shall act upon the event signal and shall not wait for the “Null” to act upon the signal request.

2.5 WFHS-REQ-454817/A-SoA Messages return to Null/NoRequest state

The current IDL implementation (google protocol buffers) requires defining such NULL values but there is no plan to use them. Any requirement in this SPSS that refers to the below logical signals using or reverting to NULL shall not be applicable to the mapped/equivalent SoA messages.

- HotspotEnablement_Rq
- HotspotVisibility_Rq
- CarrierInfo_Rq
- DataUsage_Rq
- DeviceList_Rq
- RemoveDevice_Rq
- WifiHotspotMAC_Rq
- HotspotTrialReminderSelection_Rq
- HotspotFrequencyBand_Rq
- TelematicsDTC_St
- WifiErrorCode_St

2.6 WFHS-TMR-REQ-226998/A-T_ReturnToNull_NoRequest

Name	Description	Units	Range	Resolution	Default
T_ReturnToNull_NoRequest	The nominal hold time before returning to a Null or NoRequest state. Use the default value +/- 10%.	sec	0.5-2	0.5	1

2.7 WFHS-REQ-274875/A-FTCP Specification References

The following FTCP specifications define the FTCP alerts/commands mentioned in this SPSS, as well as the protocol used to transmit them via the WifiHotspotGateway:

- Ford Telematics Communication Protocol Specification
- FNV2-FCI Protocol SPSS

2.8 WFHS-REQ-454818/A-WifiHotspotOnBoadClient Type Configuration

The WifiHotspotServer shall read a configurable parameter/DID from the WifiHotspotGateway to determine which type of WifiHotspotOnBoardClient is present.

- If the configuration indicates that APIM is present, the WifiHotspotServer shall utilize CAN based messaging
- If the configuration indicates that Phoenix is present, the WifiHotspotServer shall utilize SoA based messaging

3 Functional Definition

3.1 WFHSv2-FUN-REQ-274794/A-Wi-Fi General Usage

3.1.1 Requirements

3.1.1.1 WFHSv2-REQ-283726/A-WifiHotspotOnBoardClient identifies the vehicle brand

The WifiHotspotOnBoardClient shall be responsible for determining whether the vehicle brand is Ford or Lincoln. Refer to WFHSv2-REQ-283642-Diagnostic Specification Reference. The WifiHotspotOnBoardClient shall apply this information to other requirements defined throughout this document in order to fulfill the objectives of those requirements.

3.1.1.2 WFHSv2-REQ-283727/B-WifiHotspotOnBoardClient identifies the vehicle region

The WifiHotspotOnBoardClient shall be responsible for determining whether the vehicle region is NA, China, Europe or Brazil. Refer to WFHSv2-REQ-283642-Diagnostic Specification Reference. The WifiHotspotOnBoardClient shall apply this information to other requirements defined throughout this document in order to fulfill the objectives of those requirements.

3.1.1.3 WFHSv2-REQ-283728/B-WifiHotspotServer identifies the vehicle region

The WifiHotspotServer shall determine the vehicle region. The WifiHotspotServer shall be capable of determining if the vehicle is destined for NA, China, Europe, or Rest of World (RW). The WifiHotspotServer shall also know the vehicle's destination country code. Refer to WFHSv2-REQ-283642-Diagnostic Specification Reference. The WifiHotspotServer shall apply this information to other requirements defined throughout this document in order to fulfill the objectives of those requirements.

3.1.1.4 WFHSv2-REQ-283550/B-Monitoring Wi-Fi Hotspot feature availability

The WifiHotspotOnBoardClient shall be able to determine if the vehicle is equipped with a Wi-Fi Hotspot capable modem. If so, the vehicle has the Wi-Fi Hotspot feature. If the vehicle has a hotspot capable modem, the WifiHotspotOnBoardClient shall be required to display the Wi-Fi Hotspot HMI screens (all screens contained in the HMI specification; Refer to WFHSv2-REQ-283641-HMI Specification References) and shall be responsible for complying with the requirements in the rest of this specification. If the vehicle is not equipped with a Wi-Fi Hotspot capable modem, the vehicle does not have the Wi-Fi Hotspot feature and the WifiHotspotOnBoardClient shall not be required to comply with any of the requirements in this specification nor display the Wi-Fi Hotspot HMI screens. The WifiHotspotOnBoardClient shall contain a Hotspot capable modem DID that shall be used to determine if the vehicle has a hotspot capable modem or not. Refer to WFHSv2-REQ-283642-Diagnostic Specification Reference.

Although a vehicle may be Wi-Fi Hotspot capable, the feature may not be enabled. The Wi-Fi Hotspot feature may be enabled or disabled depending on the configuration on the WifiHotspotServer. The Wi-Fi Hotspot feature may be enabled/disabled at EOL or through an OTA update. The WifiHotspotOnBoardClient shall monitor the TCUAvailability_St CAN signal in order to determine if the Wi-Fi Hotspot feature is enabled or not.

If the Wi-Fi Hotspot feature is disabled (TCUAvailability_St = Disable), the WifiHotspotOnBoardClient shall not allow the vehicle occupant to navigate through the Wi-Fi Hotspot screens and shall not be required to monitor/transmit any of the CAN signals defined in this document (except TCUAvailability_St in order to determine if the feature becomes enabled, WifiHotspotMAC_Rq and WifiHotspotMAC_Rsp (refer to WFHSv2-REQ-274812-Transferring MAC Address)), unless separate features require the WifiHotspotOnBoardClient to and specify so in separate documents.

a. If the WifiHotspotServer changes its status to indicate the Wi-Fi Hotspot feature is Disabled while the vehicle occupant is in any Wi-Fi Hotspot screen, the WifiHotspotOnBoardClient shall exit the Wi-Fi Hotspot screens immediately and provide a popup. The Wi-Fi Hotspot menu shall not be accessible and any attempts from the vehicle occupant to enter into the Wi-Fi Hotspot menu shall trigger the same popup.

If the Wi-Fi Hotspot feature is Enabled (TCUAvailability_St = Enable), the WifiHotspotOnBoardClient shall display the Wi-Fi Hotspot feature screens and shall be required to monitor/transmit all client specified CAN signals defined in this document.

The vehicle occupant shall have access to the Wi-Fi Hotspot screens when the Wi-Fi Hotspot feature is available and enabled (except if vehicle is under driver restrictions, refer to WFHSv2-REQ-283647-Disabling driver restricted screens). If the feature is unavailable (TCUAvailability_St=NULL) or disabled (TCUAvailability_St=Disable) when the WifiHotspotOnBoardClient is

active the WifiHotspotOnBoardClient shall disable the Wi-Fi Hotspot screens. The Wi-Fi Hotspot feature may be unavailable due to any of the following:

a. WifiHotspotServer is asleep when WifiHotspotOnBoardClient is active due to lack of power mode synchronization,
b. Lost communication with WifiHotspotServer over CAN,
c. WifiHotspotServer reset,
d. ECU Reset, and
e. Wi-Fi Hotspot errors.

The WifiHotspotOnBoardClient shall monitor the CAN signal TCUAvailability_St and treat it as a heartbeat to determine whether to allow the user in the Wi-Fi Hotspot screens or not.

a. If the WifiHotspotServer reports that Wi-Fi is Enabled using the CAN signal TCUAvailability_St. the user shall be able to freely navigate through the Wi-Fi Hotspot screens.
b. If the WifiHotspotServer changes its status to “NULL” while the vehicle occupant is in any Wi-Fi Hotspot screen, the WifiHotspotOnBoardClient shall exit the Wi-Fi Hotspot screens immediately and provide a popup. The Wi-Fi Hotspot menu shall not be accessible and any attempts from the vehicle occupant to enter into the Wi-Fi Hotspot menu shall trigger the same popup.
c. If the CAN signal TCUAvailability_St is missing on the bus for 5 seconds (Lost CAN Communication timer) or more while the vehicle occupant is in any Wi-Fi Hotspot screen, the WifiHotspotOnBoardClient shall exit the Wi-Fi Hotspot screens immediately and provide a popup. The Wi-Fi Hotspot menu shall not be accessible and any attempts from the vehicle occupant to enter into the Wi-Fi Hotspot menu shall trigger the same popup when the TCUAvailability_St CAN signal is missing on the bus. If the WifiHotspotOnBoardClient detects TCUAvailability_St CAN signal is missing on the bus and has started the Lost CAN Communication timer and the timer has not yet expired when the vehicle occupant attempts to enter into the Wi-Fi Hotspot menu, the WifiHotspotOnBoardClient shall display a waiting symbol and lock the user out of the Wi-Fi screens.

The following popups are example WifiHotspotOnBoardClient popups that would be displayed if scenario (b) or (c) were to occur.

Figure. Settings not able to be displayed popup.

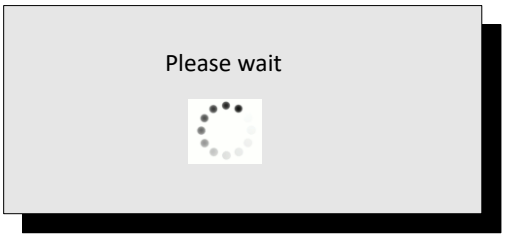


Figure. Waiting symbol.

3.1.1.5 WFHSv3-REQ-454819/A-Monitoring Wi-Fi Hotspot feature availability v3

The WifiHotspotOnBoardClient shall be able to determine if the vehicle is equipped with a Wi-Fi Hotspot capable modem. If so, the vehicle has the Wi-Fi Hotspot feature. If the vehicle has a hotspot capable modem, the WifiHotspotOnBoardClient shall be required to display the Wi-Fi Hotspot HMI screens (all screens contained in the HMI specification; Refer to WFHSv2-REQ-283641-HMI Specification References) and shall be responsible for complying with the requirements in the rest of this specification. If the vehicle is not equipped with a Wi-Fi Hotspot capable modem, the vehicle does not have the Wi-Fi Hotspot feature and the WifiHotspotOnBoardClient shall not be required to comply with any of the requirements in this specification nor display the Wi-Fi Hotspot HMI screens. The WifiHotspotOnBoardClient shall contain a Hotspot capable modem DID that

shall be used to determine if the vehicle has a hotspot capable modem or not. Refer to WFHSv2-REQ-283642-Diagnostic Specification Reference.

Although a vehicle may be Wi-Fi Hotspot capable, the feature may not be enabled. The Wi-Fi Hotspot feature may be enabled or disabled depending on the configuration on the WifiHotspotServer. The Wi-Fi Hotspot feature may be enabled/disabled at EOL or through an OTA update. The WifiHotspotOnBoardClient shall monitor the TCUAvailability_St signal in order to determine if the Wi-Fi Hotspot feature is enabled or not.

If the Wi-Fi Hotspot feature is disabled (TCUAvailability_St = Disable), the WifiHotspotOnBoardClient shall not allow the vehicle occupant to navigate through the Wi-Fi Hotspot screens and shall not be required to monitor/transmit any of the signals defined in this document (except TCUAvailability_St in order to determine if the feature becomes enabled, WifiHotspotMAC_Rq and WifiHotspotMAC_Rsp (refer to WFHSv2-REQ-274812-Transferring MAC Address)), unless separate features require the WifiHotspotOnBoardClient to and specify so in separate documents.

a. If the WifiHotspotServer changes its status to indicate the Wi-Fi Hotspot feature is Disabled while the vehicle occupant is in any Wi-Fi Hotspot screen, the WifiHotspotOnBoardClient shall exit the Wi-Fi Hotspot screens immediately and provide a popup. The Wi-Fi Hotspot menu shall not be accessible and any attempts from the vehicle occupant to enter into the Wi-Fi Hotspot menu shall trigger the same popup.

If the Wi-Fi Hotspot feature is Enabled (TCUAvailability_St = Enable), the WifiHotspotOnBoardClient shall display the Wi-Fi Hotspot feature screens and shall be required to monitor/transmit all client specified signals defined in this document.

The vehicle occupant shall have access to the Wi-Fi Hotspot screens when the Wi-Fi Hotspot feature is available and enabled (except if vehicle is under driver restrictions, refer to WFHSv2-REQ-283647-Disabling driver restricted screens). If the feature is unavailable (TCUAvailability_St=None) or disabled (TCUAvailability_St=Disable) when the WifiHotspotOnBoardClient is active the WifiHotspotOnBoardClient shall disable the Wi-Fi Hotspot screens. The Wi-Fi Hotspot feature may be unavailable due to any of the following:

a. WifiHotspotServer is asleep when WifiHotspotOnBoardClient is active due to lack of power mode synchronization
b. Lost communication with WifiHotspotServer
c. WifiHotspotServer reset
d. ECU Reset
e. Wi-Fi Hotspot errors

The WifiHotspotOnBoardClient shall receive the broadcasted TCUAvailability_St to determine whether to allow the user in the Wi-Fi Hotspot screens or not.

a. If the WifiHotspotServer reports that Wi-Fi is Enabled using the signal TCUAvailability_St. the user shall be able to freely navigate through the Wi-Fi Hotspot screens.
b. If the WifiHotspotServer changes its status to “None” while the vehicle occupant is in any Wi-Fi Hotspot screen, the WifiHotspotOnBoardClient shall exit the Wi-Fi Hotspot screens immediately and provide a popup. The Wi-Fi Hotspot menu shall not be accessible and any attempts from the vehicle occupant to enter into the Wi-Fi Hotspot menu shall trigger the same popup.
c. If the signal TCUAvailability_St has not been received, or if a connection loss is experienced for 5 seconds (Lost Communication timer) or longer with the WifiHotspotServer while the vehicle occupant is in any Wi-Fi Hotspot screen, the WifiHotspotOnBoardClient shall exit the Wi-Fi Hotspot screens immediately and provide a popup. The Wi-Fi Hotspot menu shall not be accessible and any attempts from the vehicle occupant to enter into the Wi-Fi Hotspot menu shall trigger the same popup when the TCUAvailability_St signal has not been received and the status in unknown. If the WifiHotspotOnBoardClient detects a connection loss between itself and the WifiHotspotServer and has started the Lost Communication timer and the timer has not yet expired when the vehicle occupant attempts to enter into the Wi-Fi Hotspot menu, the WifiHotspotOnBoardClient shall display a waiting symbol and lock the user out of the Wi-Fi screens.

The following popups are example WifiHotspotOnBoardClient popups that would be displayed if scenario (b) or (c) were to occur.

Figure. Settings not able to be displayed popup.

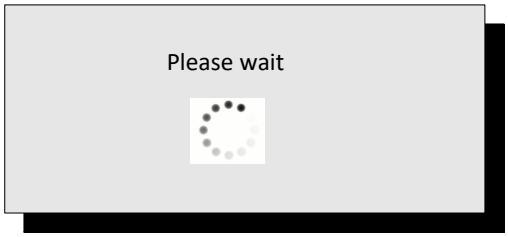


Figure. Waiting symbol.

3.1.1.6 WFHSv2-REQ-283647/B-Disabling driver restricted screens

The WifiHotspotOnBoardClient shall monitor the signal VehicleSpeed_St to determine the speed of the vehicle. If the vehicle travels above a certain speed, the WifiHotspotOnBoardClient shall disable the Wi-Fi Hotspot driver restricted screens. If the vehicle travels at or below a certain speed, the WifiHotspotOnBoardClient shall enable all Wi-Fi Hotspot driver restricted screens. Refer to the Driver Restriction SPSS and H21j specifications (per module) to determine speed thresholds and which screens require driver restrictions.

3.1.1.7 WFHS-REQ-191715/A-Responding to multiple requests

The WifiHotspotServer shall respond to Wi-Fi related requests in FIFO order.

3.1.1.8 WFHS-REQ-191778/A-CAN message requirements

The WifiHotspotServer and WifiHotspotOnBoardClient shall receive and transmit CAN messages as specified in the CAN database from FORD for Wi-Fi Hotspot feature.

3.1.1.9 WFHSv2-REQ-283611/A-Wi-Fi chipset

The Wi-Fi chipset shall support 802.11 a/b/g/n/ac and shall support both STA and AP mode.

3.1.1.10 WFHSv2-REQ-283612/B-Wi-Fi Hotspot traffic model

In order to define a set of Wi-Fi chipset performance requirements, Ford Motor Company has defined two traffic models as a baseline for testing. Traffic model A shall test all Number_Hotspot_Connected_Devices devices performing the most throughput and RSSI intensive activity and model B shall test 7 devices performing a combination of different activities. Both models are expected to meet the Wi-Fi performance requirements (WFHSv2-REQ-283613-Wi-Fi signal strength, WFHSv2-REQ-283614-Wi-Fi throughput, WFHSv2-REQ-283615-Modulation scheme and WFHSv2-REQ-283618-Wi-Fi range).

Model A:

a) Number_Hotspot_Connected_Devices devices performing Wi-Fi activities such as HD streaming in real time.

Model B:

a) 4 devices streaming HD video (example: iOS device streaming HD Netflix)
b) 2 devices using email
c) 1 device playing video games

3.1.1.11 WFHSv2-REQ-283613/A-Wi-Fi signal strength

The RSSI of the WIFI hotspot system may vary, but shall be no less than –45dBm inside the vehicle and shall be no less than –65dBm outside the vehicle in a range of a 50 foot radius as long as the throughput requirement is met (refer to WFHSv2-REQ-283614-Wi-Fi throughput).

3.1.1.12 WFHSv2-REQ-283614/B-Wi-Fi throughput

The Wi-Fi design shall perform at a minimum throughput of 120 Mbps on the 2.4GHz band and a minimum throughput of 120 Mbps on the 5GHz band. The Wi-Fi chipset shall never be the bottleneck of the system.

The WifiHotspotServer shall implement a fairness model to control the distribution of its throughput. This model shall ensure that all connected clients performing the same application type receives equal throughput.

Example)

- 6 devices are connected.
- 4 are streaming HD video (assumption: HD video requires ~4 Mbps).
- 2 are using email (assumption: email requires ~500 Kbps).
- The 4 streaming YouTube shall each receive ~4 Mbps.
- The 2 using email shall each receive ~500 Kbps.

3.1.1.13 WFHSv2-REQ-283615/B-Modulation scheme

The WifiHotspotServer shall dynamically adjust the modulation coding scheme depending on the measured SNR. The WifiHotspotServer Wi-Fi chipset design is required to meet a modulation scheme of MCS8 on both the 2.4GHz band and the 5GHz band as long as the appropriate SNR is achieved.

3.1.1.14 WFHSv2-REQ-283618/A-Wi-Fi range

The Wi-Fi Hotspot feature shall meet its minimum throughput (WFHSv2-REQ-283614-Wi-Fi throughput), RSSI (WFHSv2-REQ-283613-Wi-Fi Signal strength) and MCS requirements (WFHSv2-REQ-283615-Modulation scheme) up to 50 ft away from the vehicle, 360 degrees around. The RSSI and throughput shall be measured at 50 ft away from the vehicle and at 22 degree increments. The devices used to measure the throughput and RSSI may vary, but shall be kept consistent across all testing.

3.1.1.15 WFHSv2-REQ-283626/B-Wi-Fi certification

The supplier shall be responsible for certifying the Wi-Fi feature in the following areas as defined by the Wi-Fi alliance certification programs:

a. Access point and STA mode for:
    i. 802.11ac
    ii. WMM
    iii. WPA2/WPA (for non-Phoenix)
    iv. WPA2/WPA3 (for Phoenix)
    v. Tx and Rx on 2.4 GHz band & 5 GHz band

Ford Motor Company shall own the Wi-Fi certification in the areas mentioned above.

3.1.1.16 WFHS-REQ-191895/A-Quality of Service on the Wi-Fi chipset

The Wi-Fi chipset shall have Quality of Service enabled for WMM (wireless multimedia) and for Wi-Fi protocol.

3.1.1.17 WFHSv2-REQ-398697/A-FCC and international radio regulatory requirements

The Wi-Fi Hotspot shall meet all applicable FCC and international radio regulatory requirements. The Wi-Fi Hotspot shall also meet all Chinese, European and Brazil radio regulatory requirements.

3.1.1.18 WFHSv2-REQ-283627/A-Wi-Fi chipset and NAD communication interface

The interface between the access point and the NAD shall provide error recovery strategies to enable a robust system where the customer experiences no errors.

The Wi-Fi access point shall have a data communication interface to the NAD that shall allow it to receive Wi-Fi data at a minimum data rate that is greater than the Wi-Fi throughput.

3.1.1.19 WFHS-REQ-191898/A-Logging Wi-Fi debug messages

The Wi-Fi access point application and Wi-Fi NAD application shall log Wi-Fi debug messages such as Wi-Fi configurations, Wi-Fi parameters and other Wi-Fi data relevant to each station. Parameters such as RSSI, SNR, BER, MCS, number of devices connected, number of devices dropped and the traffic model indicating which device was performing what activity may be captured, for example. The debugging state shall be capable of being turned on or off.

3.1.1.20 WFHSv2-REQ-283628/E-Reporting out diagnostics

The WifiHotspotServer shall support Wi-Fi diagnostics messages for the Wi-Fi chipset and internal antenna. The diagnostics messages exchanged between the WifiHotspotServer processor and Wi-Fi chipset shall test the health of the Wi-Fi chipset software and hardware and shall also test the internal antenna. The WifiHotspotServer shall set DTCs that identify Wi-Fi related errors (refer to WFHSv2-REQ-283642-Diagnostic Specification Reference).

The WifiHotspotServer shall inform the WifiHotspotOnBoardClient when Wi-Fi Hotspot related DTCs are active by using the signal TelematicsDTC_St. If the WifiHotspotServer sets a Wi-Fi Hotspot related DTC, it shall also set the signal to its appropriate state based on the DTC that was set. The signal shall remain set only while the issue is ACTIVE. If the issue becomes no longer active, but the DTC remains set, the signal shall revert to NULL.

Example) If the Wi-Fi APN connectivity is required to fail 10 times before setting the Communication Link Performance or Incorrect Operation DTC, then the WifiHotspotServer shall report out the error over the TelematicsDTC_St signal on the 10th time when the DTC is set, NOT on the first time the issue was seen. If the APN then successfully connects to the network, the WifiHotspotServer shall set the signal back to NULL since the issue has been recovered.

The WifiHotspotServer shall categorize the Wi-Fi Hotspot related DTCs into two different categories: (1) Temporary failures and (2) Permanent failures. The signal TelematicsDTC_St contains two states: (1) Chipset Init. Failure and (2) Runtime Error. If a DTC is active that indicates a temporary failure, the WifiHotspotServer shall set the signal to “Chipset Init. Failure”. If a DTC is active that indicates a permanent failure, the WifiHotspotServer shall set the signal to “Runtime Error”. See table below. If DTCs are active from both types, the WifiHotspotServer shall set the signal to indicate a permanent failure.

DTC Type	Signal State
Temporary failure	Chipset Init. Failure
Permanent failure	Runtime Error

The table below lists the DTCs that, when active, would have an impact on the Wi-Fi Hotspot feature. Each DTC shall be categorized into either a “permanent failure” or a “temporary failure”.

DTC Number	Description	DTC Type
0xDA4B52 (U1A4B-52)	Control Module Processor B Not Activated	Temporary
0xDA4B56 (U1A4B-56)	Control Module Processor B Invalid / Incompatible Configuration	Temporary
0xDA0193 (U1A01-93)	Communication Link No Operation	Permanent
0xDA0192 (U1A01-92)	Communication Link Performance or Incorrect Operation	Permanent

3.1.1.21 WFHS-REQ-288215/B-Displaying Diagnostic Failures

If the Wi-Fi Hotspot Feature is enabled (refer to WFHSv2-REQ-283550-Monitoring Wi-Fi Hotspot feature availability for determining Feature availability), the HMI shall inform the user if there are any failures with the Wi-Fi Hotspot feature, regardless if the hotspot enablement status is On, On-disabled or Off. If the Wi-Fi Hotspot Feature is NOT enabled, the HMI shall not be required to inform the user of any failures. The signal TelematicsDTC_St shall be used by the WifiHotspotServer and WifiHotspotOnBoardClient for determining if there are any failures active. The WifiHotspotOnBoardClient shall monitor

the signal TelematicsDTC_St and detect when it changes its state to either “Chipset Init. Failure” or “Runtime Error”. If this occurs, the WifiHotspotOnBoardClient shall inform the user globally on the HMI (i.e. through a popup, transient message, etc.) that there is a failure. The signal will remain set to its failure state until the failure is no longer detected, at which point the signal will return to NULL. The HMI may continue to display the status of the failure to the customer while the failure is active (i.e. through a Wi-Fi icon). The failure strategy shall be defined within the HMI specification (refer to WFHSv2-REQ-283641-HMI Specification References).

The WifiHotspotOnBoardClient shall store the last received state of the signal TelematicsDTC_St during ignition cycles. There may be instances where the vehicle is turned to On and the bus/network becomes active, but the WifiHotspotServer is still powering up. If this occurs, both signals TCUAvailability_St and TelematicsDTC_St may be equal to NULL/NONE. If the TCUAvailability_St signal changes to Enabled and the TelematicsDTC_St signal changes to an active state (Chipset Init. Failure or Runtime Error), the WifiHotspotOnBoardClient shall check to see if the failure was active prior to the vehicle turning off. If the failure WAS active prior to the vehicle turning off and the WifiHotspotOnBoardClient already displayed a global failure alert (i.e. popup, transient message, etc.), the WifiHotspotOnBoardClient shall not be required to display another global failure alert. If it had not yet displayed the failure alert, it shall do so once the HMI screen becomes active.

The signal TelematicsDTC_St contains two active states: (1) Chipset Init. Failure and (2) Runtime Error. The WifiHotspotOnBoardClient shall display different messaging to the customer depending on which state the signal is set to. If the signal is set to “Chipset Init. Failure”, this shall indicate that a temporary failure has been detected. Therefore, the HMI may display messaging such as “Your vehicle hotspot is experiencing technical errors. Call the call center if the issue does not resolve itself”. If the signal is set to “Runtime Error”, this shall indicate a permanent failure has been detected. The HMI message may display messaging such as “A fatal error has been detected. Visit dealership for repair service”. Refer to the HMI specification for all final verbiage.

DTC Type	Signal State
Temporary failure	Chipset Init. Failure
Permanent failure	Runtime Error

3.1.1.22 WFHS-REQ-191900/B-Maximum Wi-Fi initialization time

If the WifiHotspotServer begins its initialization process, it shall also initialize the Wi-Fi chipset. The Wi-Fi initialization process, including initialization of the Wi-Fi chipset\SDIO\Wi-Fi antenna\Wi-Fi application, shall not exceed a maximum initialization limit of 12 seconds. After the initialization is complete the Wi-Fi functionality shall be available to the Wi-Fi stations that constitute the hotspot.

3.1.1.23 WFHS-REQ-191901/A-Wi-Fi initialization failure

In case of a Wi-Fi initialization failure, the Wi-Fi application shall implement a Wi-Fi power up recovery strategy such as resetting the Wi-Fi chipset, the SDIO or any appropriate function that may correct the error code.

3.1.1.24 WFHSv2-REQ-283648/C-APN connections

The Wi-Fi Hotspot feature shall utilize two APNs on the WifiHotspotServer. The first APN shall be referred to as the Ford APN, which is used for Ford-paid services such as remote features, OTA updates, etc. All Wi-Fi Hotspot related FTCP messages shall utilize the Ford APN.

The second APN, referred to as the Wi-Fi APN, shall never communicate with the WifiHotspotOffBoardClient and shall only be used to stream data to the outside Internet. Thus, only data streamed through the Wi-Fi access point shall use the Wi-Fi APN. This APN shall be stored in the WifiHotspotServer and shall be updateable via OTA or EOL.

The NA and China production Wi-Fi APN addresses shall already be written to the WifiHotspotServer when the modules are delivered to Ford. In EU and Rest of World, the country-specific Wi-Fi APN shall be written to the WifiHotspotServer at Ford Motor Company’s EOL once the vehicle’s destination country has been assigned to the vehicle.

If an FTCP request to update the Wi-Fi APN is received from the WifiHotspotOffBoardClient, the WifiHotspotServer shall follow the procedure below:

1) Receive the Wi-Fi APN update and send a successful response,

2) Store the APN into memory, but stay connected with the old Wi-Fi APN (if the Wi-Fi APN was connected at the time of the APN update request),
3) Send an alert to the WifiHotspotOffBoardClient,
4) If the WifiHotspotServer detaches from the network, it shall use the new APN when reattaching to the network.

The WifiHotspotServer shall control the Wi-Fi APN state and shall request for the Wi-Fi APN to be connected or disconnected through the Wireless Interface Router (WIR) application that is internal to the Telematics Control Unit. The WifiHotspotServer shall request to initialize the Wi-Fi APN anytime the Wi-Fi Hotspot enablement state is turned On. If the Wif-Fi Hotspot enablement state is turned to Off or On-Disabled, the WifiHotspotServer shall request for the Wi-Fi APN to be disconnected. In case the WIR application is unresponsive while the WifiHotspotServer is trying to request for the Wi-Fi APN state change, the WifiHotspotServer shall contain a retry strategy to ensure the request is completed.

If no data plan is active on the hotspot, the vehicle occupant shall still be able to connect to the Wi-Fi Hotspot. If the user attempts to stream data through their web browser while no data plan is active, the customer device shall be re-directed to a carrier provided landing page. The carrier shall be responsible for the landing page redirection. The landing page redirection shall utilize the Wi-Fi APN.

3.1.1.25 WFHS-REQ-358564/A-WifiHotspotServer detects the Customer Connectivity Settings

The WifiHotspotServer shall monitor the CCS Settings API via the SOA client to detect the Vehicle Connectivity Settings. Refer to the Customer Connectivity Settings Server SPSS, IIR-REQ-313614-Customer Connectivity Settings API for more information on the API.

The 'Vehicle Connectivity' setting is defined in EntityID 1, Type 0.
- If this setting is overall Enabled, the WifiHotspotServer shall assume the Vehicle Connectivity is On.
- If this setting is overall Disabled, the WifiHotspotServer shall assume the Vehicle Connectivity is Off.

The 'Cellular Connectivity' setting is defined in Entity ID 24, Type 0.
- If this setting is overal Enabled, the WifiHotspotServer shall assume the Cellular Connectivity is On.
- If this setting is overall Disabled, the WifiHotspotServer shall assume the Cellular Connectivity is Off.

The 'Vehicle Data' setting is defined in EntityID 5, Type 0.
- If this setting is overall Enabled, the WifiHotspotServer shall assume Vehicle Data is On.
- If this setting is overall Disabled, the WifiHotspotServer shall assume Vehicle Data is Off.

The 'Vehicle Authorization' setting is defined in EntityID 3, Type 0.
- If this setting is overall Enabled, the WifiHotspotServer shall assume the vehicle is Authorized.
- If this setting is overall Disabled, the WifiHotspotServer shall assume the vehicle is Not Authorized.

The WifiHotspotServer shall apply this information to other requirements defined throughout this document in order to fulfill the objectives of those requirements.

3.1.1.26 WFHS-REQ-358565/A-WifiHotspotOnBoardClient detects the Customer Connectivity Settings

The WifiHotspotOnBoardClient shall monitor the CCS Settings API via the SOA client to detect the Vehicle Connectivity Settings. Refer to the Customer Connectivity Settings Server SPSS, IIR-REQ-313614-Customer Connectivity Settings API for more information on the API.

The 'Vehicle Connectivity' setting is defined in EntityID 1, Type 0.
- If this setting is overall Enabled, the WifiHotspotOnBoardClient shall assume the Vehicle Connectivity is On.
- If this setting is overall Disabled, the WifiHotspotOnBoardClient shall assume the Vehicle Connectivity is Off.

The 'Vehicle Authorization' setting is defined in EntityID 3, Type 0.
- If this setting is overall Enabled, the WifiHotspotOnBoardClient shall assume the vehicle is Authorized.
- If this setting is overall Disabled, the WifiHotspotOnBoardClient shall assume the vehicle is Not Authorized.

The WifiHotspotOnBoardClient shall apply this information to other requirements defined throughout this document in order to fulfill the objectives of those requirements.

3.1.1.27 WFHS-REQ-315639/C-Wi-Fi Hotspot feature dependency on the Vehicle Connectivity state

If the Vehicle Connectivity has been turned OFF, the Wi-Fi Hotspot feature shall be disabled and TCUAvailability_St shall be set to Disable, meaning no traffic is allowed over the Wi-Fi APN and no Wi-Fi Hotspot information can be communicated to/from the WifiHotspotOffBoardClient (i.e. data usage or SSID/password information) over the Ford APN.

If Vehicle Connectivity is turned to On, the WifiHotspotServer shall set the Wi-Fi Hotspot feature and TCUAvailability_St back to the states they were set to prior to the Vehicle Connectivity setting getting set to Off. The requirements within this document assume that Vehicle Connectivity is ON, unless specified otherwise.

3.1.1.28 WFHS-REQ-358566/B-Wi-Fi Hotspot feature dependency on the Cellular Connectivity state

If the Cellular Connectivity has been turned OFF, the Wi-Fi Hotspot feature shall be disabled and TCUAvailability_St shall be set Disable, meaning no traffic is allowed over the Wi-Fi APN and no Wi-Fi Hotspot information can be communicated to/from the WifiHotspotOffBoardClient (i.e. data usage or SSID/password information) over the Ford APN.

If Cellular Connectivity is turned to On, the WifiHotspotServer shall set Wi-Fi Hotspot feature and TCUAvailability_St back to the states they were set to prior to the Cellular Connectivity setting getting set to Off. The requirements within this document assume that Cellular Connectivity is ON, unless specified otherwise.

3.1.1.29 WFHSv2-REQ-281701/B-Wi-Fi Hotspot feature dependency on the vehicle authorization state

The user shall be able to activate a Wi-Fi Hotspot data plan through the carrier when the vehicle is provisioned. Thus, the WifiHotspotServer shall allow connected clients to stream Internet data if a plan is active, even while the vehicle is not authorized.

However, the WifiHotspotServer shall not request or receive any data usage information (refer to WFHSv2-FUN-REQ-274802-Reporting Data Used and WFHSv2-FUN-REQ-274805-Carrier Data Notification) from the WifiHotspotOffBoardClient if the vehicle is NOT authorized.

No data usage information shall be required to be transmitted at the time the vehicle becomes authorized. If the vehicle becomes authorized, data usage information shall be transmitted upon a notification that is triggered from the carrier or from a request from the WifiHotspotServer.

If the vehicle is authorized, but becomes not authorized, there shall be no interruption to the customer's Wi-Fi Hotspot data plan or Wi-Fi service.

3.1.1.30 WFHSv2-REQ-283554/B-Shutting down and powering up the Wi-Fi chipset and WifiHotspotServer

If the Wi-Fi Hotspot feature is disabled (refer to WFHSv2-REQ-283553-WifiHotspotServer EOL configuration for determining Wi-Fi Hotspot feature enablement), the WifiHotspotServer shall set the signal TCUAvailability_St= Disable. If the WifiHotspotServer is powering up or down and unable to determine if the feature is enabled or disabled, the WifiHotspotServer shall default the signal TCUAvailability_St=NULL/NONE.

If Wi-Fi Hotspot feature is enabled, follow the requirements below:

> When the term "fully functional" is used within this requirement, it implies the WifiHotspotServer is capable of accessing and transmitting its stored Wi-Fi Hotspot settings and is capable of processing Wi-Fi Hotspot related requests from the WifiHotspotOnBoardClient. Note: the WifiHotspotServer shall be capable of updating settings in memory, but may not necessarily need to be capable of updating the Wi-Fi chipset, in order to be deemed "fully functional". The status of the cellular connection, APN initialization and Wi-Fi chipset connectivity and availability shall not be taken into consideration when determining if the WifiHotspotServer is "fully functional". For example, if the WifiHotspotServer has a dropped cellular connection it shall not be deemed "not fully functional". Also, if the Wi-Fi chipset has not yet initialized, the WifiHotspotServer may still be considered "fully functional".
>
> If the WifiHotspotServer is beginning to transition to low power registered mode, the Wi-Fi manager shall gracefully disconnect all clients and shutdown the Wi-Fi component, clear any unused memory and save any persistent memory. Once the WifiHotspotServer becomes "not fully functional" during the power down process, the WifiHotspotServer shall set the signal TCUAvailability_St to "NULL/NONE" until it fully powers down.

If the WifiHotspotServer is powering up to any full power mode and the WifiHotspotServer is not fully functional, the WifiHotspotServer shall set the signal TCUAvailability_St status to “NULL/NONE”. Once the WifiHotspotServer is fully functional, the WifiHotspotServer shall update its signal TCUAvailability_St = Enable.

3.1.1.31 WFHS-REQ-191905/A-Wi-Fi networking rules

The WifiHotspotServer shall implement a set of networking and firewall rules to generally restrict external network access while allowing users connected to the Wi-Fi network to access the public Internet. These requirements shall be defined in Internet Gateway Specification.

3.1.1.32 WFHSv2-REQ-315645/B-AP connection rules

WEP and WAP shall not be supported. Wi-Fi should default to operate with security enabled:

- Non-Phoenix default is WPA2
- Phoenix default is WPA2/WPA3

3.1.1.33 WFHSv2-REQ-281705/C-Wi-Fi Chipset AP and STA mode

The WifiHotspotServer shall enable the Wi-Fi chipset to be in Hotspot mode once the WifiHotspotServer has become provisioned. Refer to the Authorization Status DID to determine provisioning status. The Wi-Fi Hotspot shall be given top cellular bandwidth priority while the hotspot is in use.

3.1.1.34 WFHSv2-REQ-283570/B-Operating on the 2.4 GHz band in AP mode

The Wi-Fi chipset shall support both current and legacy Wi-Fi devices while in AP mode.

The WifiHotspotServer shall operate on the 2.4 GHz band and 5 GHz band simultaneously while in AP mode (refer to WFHSv2-REQ-281705-Wi-Fi Chipset AP and STA mode) to support all devices.

If the WifiHotspotServer is limited to operate on one band only, the WifiHotspotServer shall default to operate on the 5 GHz band while in AP mode. The WifiHotspotServer shall be capable of receiving an OTA update or a request to switch the Wi-Fi chipset from operating on the 2.4 GHz band to the 5 GHz band and vice versa (parameter Hotspot_Operational_Band). This parameter shall also be configurable via EOL.

3.1.1.35 WFHS-REQ-192124/A-Number of key strokes on WifiHotspotOnBoardClient display needed to view the Wi-Fi Hotspot feature

The vehicle occupant shall be able to locate the Wi-Fi Hotspot feature in the WifiHotspotOnBoardClient display in no more than 2 key strokes.

3.1.1.36 WFHSv2-REQ-283553/B-WifiHotspotServer EOL configuration for determining Wi-Fi Hotspot feature enablement

The parameter Wi-Fi_Hotspot_Feature_Enabled shall be configurable via Ford Motor Company’s EOL process or by an OTA update. The WifiHotspotServer shall be able to detect if it is Wi-Fi capable or not (i.e. by a part number or by detecting if there is a Wi-Fi chipset populated or not, etc.). Thus, a WifiHotspotServer may be Wi-Fi capable, but may have its Wi-Fi Hotspot feature not enabled.

If the Wi-Fi_Hotspot_Feature_Enabled configuration is set to No, the WifiHotspotServer shall disable the feature and shall not be required to monitor/transmit any of the signals (except TCUAvailability_St, WifiHotspotMAC_Rq and WifiHotspotMAC_Rsp) defined in this document, unless separate features require the WifiHotspotServer to and specify so in separate documents. The WifiHotspotServer shall always transmit the TCUAvailability_St signal regardless of the Wi-Fi Hotspot feature enablement state. The WifiHotspotServer shall also be required to monitor the signal WifiHotspotMAC_Rq and transmit the response signal WifiHotspotMAC_Rsp (refer to WFHSv2-REQ-274812-Transferring MAC Address). The Wi-Fi chipset shall be turned off and kept off, not allowing any transmission of Wi-Fi signals, while the feature is disabled. The WifiHotspotServer shall set the signal TCUAvailability_St=Disable.

If the configuration is set to Yes, the WifiHotspotServer shall enable the feature and meet all of the requirements in this document and shall be required to monitor/transmit all server specified signals defined in this document. The WifiHotspotServer shall set the signal TCUAvailability_St = Enable.

A WifiHotspotServer shall never be allowed to have its Wi-Fi Hotspot feature enabled if it is not Wi-Fi capable. If the WifiHotspotServer is NOT Wi-Fi capable but was mistakenly configured as Wi-Fi enabled via Ford's EOL process or via OTA, the WifiHotspotServer shall override the enabled configuration with the capable configuration.

If the WifiHotspotServer is configured as Wi-Fi capable but does not have its Wi-Fi Hotspot feature enabled, the WifiHotspotServer shall set the Wi-Fi_Hotspot_Feature_Enabled field as NOT Wi-Fi enabled.

If the WifiHotspotServer is configured as Wi-Fi capable AND Wi-Fi Hotspot enabled, the WifiHotspotServer shall set the Wi-Fi_Hotspot_Feature_Enabled field to Wi-Fi enabled.

The Wi-Fi_Hotspot_Feature_Enabled parameter shall be defaulted to Yes. The parameter shall also be configurable via OTA.

3.1.1.37 WFHSv2-REQ-283563/A-WifiHotspotServer over-the-air software updates

The Wi-Fi Hotspot feature shall be made up of different pieces of software components that may reside on the WifiHotspotServer processor as a Wi-Fi application manager, on the Wi-Fi chipset, SDIO drivers, etc. The OTA update process shall flash all Wi-Fi hotspot software components. There are two implementations for the Wi-Fi OTA updates:

The first approach that shall be implemented is:

1) The Wi-Fi OTA update shall be tied to the OTA update of the WifiHotspotServer software and they shall share the same part number

The second approach that shall be considered for future implementation is:

2) The Wi-Fi OTA update may be separate from the WifiHotspotServer software update where each may have its own software part number. This approach shall be considered for later WifiHotspotServer generations

If the WifiHotspotServer re-flashes its software due to an OTA SW update it shall gracefully disconnect all Wi-Fi clients. When the WifiHotspotServer finishes re-flashing its software, it shall restore all previous Wi-Fi settings listed in WFHSv2-REQ-283559-Wi-Fi Hotspot reset settings.

3.1.1.38 WFHSv2-REQ-274879/A-FTCP messaging between WifiHotspotServer and WifiHotspotOffBoardClient

All interactions between the WifiHotspotServer and WifiHotspotOffBoardClient shall follow the Ford Telematics Control Protocol (FTCP), in conjunction with the Ford Cloud Interface on the WifiHotspotGateway.

The FTCP Specification shall define all the alerts, queries, commands, and resposnes required for this feature, while the FNV2-FCI Protocol SPSS shall define the method by which these items are requested and transmitted using SoA.

3.1.1.39 WFHSv2-REQ-358568/A-Wi-Fi Hotspot parameters transmitted during provisioning

The following parameters shall be transmitted from the vehicle to the WifiHotspotOffBoardClient during the provisioning process:

1. VIN
2. ICCID (from WifiHotspotServer)
3. IMSI (from WifiHotspotServer)
4. Region (from WifiHotspotServer)
5. Country code (from WifiHotspotServer)

If any of these fields are blank in the provisioning message, the WifiHotspotOffBoardClient shall fail the provisioning process. Refer to the ECG Provisioning SPSS and the Embedded Modem Provisioning v2 SPSS for more details on how this shall be implemented.

3.1.1.40 WFHSv2-REQ-281706/B-Vehicle becomes not authorized

If the vehicle becomes not authorized, refer to WFHSv2-REQ-281701-Wi-Fi Hotspot feature dependency on the vehicle authorization state, the WifiHotspotServer shall clear all data usage information that is typically received in the FTCP data usage notification/response message (refer to WFHSv2-FUN-REQ-274802-Reporting Data Used and WFHSv2-FUN-REQ-274805-Carrier Data Notification). The parameter TrialEligible shall retain its current state and not reset it to "NULL/NONE" (i.e. if TrialEligible parameter="Yes", after the vehicle becomes not authorized, the parameter shall still equal "Yes").

There shall be no interruption to the customer's Wi-Fi Hotspot service if the vehicle becomes not authorized.

3.1.1.41 WFHS-REQ-263049/A-Broadcasting as a Vehicular AP

The WifiHotspotServer shall advertise its hotspot as being a vehicular AP. It shall broadcast this indicator using the Interworking Element, which includes:

- Venue Group Code = 10 (automotive)
- Venue Type Code = 1 (automotive or truck).

3.1.1.42 WFHS-REQ-263050/B-Broadcasting as a metered account

The WifiHotspotServer shall advertise its hotspot as being a metered account. It shall broadcast this indicator using the Interworking Element, which includes:

- Access Network Type = 2 (Chargeable Public Network).

Note: this requirement is still under investigation and may be removed later if deemed not needed.

3.1.1.43 WFHS-REQ-263051/A-Metering each connection

The WifiHotspotServer shall be capable of metering the data consumption of each connected client per session.

3.1.1.44 WFHSv2-REQ-283620/A-Throttling data consumption

The WifiHotspotServer shall have the ability to throttle a connected client's throughput. Identification of a client may be done by MAC address or some other identifiable parameter. If the WifiHotspotServer is throttling a particular device, then the fairness model defined in WFHSv2-REQ-283614-Wi-Fi throughput would not apply to that device.

3.1.1.45 WFHS-REQ-283629/A-Wi-Fi Hotspot operation during Extended Diagnostic Mode

The Wi-Fi Hotspot shall remain operational while extended diagnostic mode is ON.

3.1.1.46 WFHS-REQ-283630/D-ECU Reboot FTCP Command

In case a software issue occurs that impacts the Wi-Fi Hotspot feature, the WifiHotspotServer shall be capable of receiving and conducting an ECU reboot to resolve the issue. The request shall be in the form of a command/response/alert FTCP message.

If the WifiHotspotServer receives a command from the WifiHotspotOffBoardClient to conduct an ECU reboot, it shall determine if it is allowed or able to perform the action or not. If it is not allowed or not able to perform the action, it shall send a failure response back to the WifiHotspotOffBoardClient.

If the WifiHotspotServer is allowed and able to perform the reboot, it shall send a successful response back to the WifiHotspotOffBoardClient and proceed with the ECU reboot. While the reboot is active and the WifiHotspotServer is able to transmit on the bus/network, it shall set the signal TCUAvailability_St to "NULL/NONE" until the reboot is complete, at which point it shall set the signal back to its previous state (i.e. Enable or Disable). If the reboot completed successfully, the WifiHotspotServer shall send an alert to the WifiHotspotOffBoardClient, indicating a successful completion of the ECU reboot. If the reboot failed, the WifiHotspotServer shall send a failure alert to the WifiHotspotOffBoardClient and indicate it failed due to a WifiHotspotServer internal failure.

The WifiHotspotServer shall not be allowed to perform an ECU reboot if any of the following events are active when it receives the command:

- eCall Standby mode
- OTA update was received, downloaded and is currently being flashed (note, if an OTA update is being downloaded when the command is received, the WifiHotspotServer shall still be able to perform the ECU reboot).

Due to privacy reasons, the Failure response shall NOT specify that it failed due to an eCall Standby mode. If the ECU reboot failed due to the eCall Standby mode or the OTA update scenario, then the WifiHotspotServer shall indicate that the command failed because it is not permitted. The WifiHotspotServer shall be able to perform the ECU reboot regardless of the vehicle's authorization state.

3.1.1.47 WFHS-REQ-315646/A-Service Oriented Architecture Client

The system SHALL support a Service Oriented Architecture (SOA) client.

3.1.1.48 WFHS-REQ-315647/A-Sending country code to the WifiHotspotOnBoardClient

If the WifiHotspotServer receives a SOA request from any requesting application over Ethernet for the country code, the WifiHotspotServer shall respond with its current estimated country code. Refer to WFHSv2-REQ-283736/A-Estimating current vehicle location for more information on how to determine the current estimated country.

If the current estimated country code changes, the WifiHotspotServer shall send the new estimated country code to the WifiHotspotOnBoardClient over Ethernet using SOA.

3.1.2 Use Cases

3.1.2.1 WFHSv2-UC-REQ-283738/B-User wakes WifiHotspotOnBoardClient up before WifiHotspotServer wakes up

Actors	WifiHotspotServer WifiHotspotOnBoardClient User
Pre-conditions	WifiHotspotOnBoardClient is awake WifiHotspotServer is off
Scenario Description	User attempts to enter into Wi-Fi Hotspot screens in the in-vehicle WifiHotspotOnBoardClient
Post-conditions	User is presented either a waiting symbol or a popup and locked out of the screens until the Wi-Fi feature is functioning properly Any attempts the user makes to enter the Wi-Fi Hotspot screens shall be denied and shall trigger a popup (refer to WFHSv2-REQ-283641-HMI Specification References)
List of Exception Use Cases	
Interfaces	WifiHotspotServer WifiHotspotOnBoardClient CAN SoA

3.1.2.2 WFHSv2-UC-REQ-283739/B-User is navigating in the Wi-Fi Hotspot screens when WifiHotspotOnBoardClient loses communication with WifiHotspotServer

Actors	WifiHotspotServer WifiHotspotOnBoardClient
Pre-conditions	WifiHotspotOnBoardClient is awake WifiHotspotServer is on and reporting statuses on the CAN bus User is in the Wi-Fi Hotspot screens
Scenario Description	WifiHotspotOnBoardClient loses communication with WifiHotspotServer over CAN
Post-conditions	User is presented a popup and locked out of the screens until the WifiHotspotOnBoardClient establishes communication with the WifiHotspotServer Any attempts the user makes to enter the Wi-Fi Hotspot screens shall be denied and shall trigger a popup (refer to WFHSv2-REQ-283641-HMI Specification References)
List of Exception Use Cases	
Interfaces	WifiHotspotServer WifiHotspotOnBoardClient CAN SoA

3.1.2.3 WFHSv2-UC-REQ-283740/C-User is navigating in the Wi-Fi Hotspot screens when a Wi-Fi error occurs

Actors	WifiHotspotServer WifiHotspotOnBoardClient
Pre-conditions	WifiHotspotOnBoardClient is awake WifiHotspotServer is on User is in the Wi-Fi Hotspot screens
Scenario Description	Wi-Fi chipset experiences errors
Post-conditions	User is presented a popup indicating the WifiHotspotServer is experiencing technical errors (refer to WFHSv2-REQ-283641-HMI Specification References)
List of Exception Use Cases	
Interfaces	WifiHotspotServer WifiHotspotOnBoardClient CAN SoA

3.1.2.4 WFHSv1-UC-REQ-191988/A-Customer puts their vehicle in Valet Mode

Actors	WifiHotspotServer WifiHotspotOnBoardClient User
Pre-conditions	WifiHotspotServer is On
Scenario Description	User puts their vehicle in Valet Mode
Post-conditions	Wi-Fi Hotspot password may not be viewed on WifiHotspotOnBoardClient display
List of Exception Use Cases	
Interfaces	WifiHotspotOnBoardClient

3.1.2.5 WFHSv1-UC-REQ-191989/A-Customer sells their vehicle and a new customer takes ownership of the vehicle

Actors	WifiHotspotServer WifiHotspotOnBoardClient New owner
Pre-conditions	WifiHotspotServer is On Vehicle is sold Previous owner used the free trial period up
Scenario Description	New vehicle owner purchases the vehicle and accesses the landing page or call center and identifies their vehicle
Post-conditions	The landing page or carrier hotline operator instructs the new owner to purchase a data plan Vehicle is not eligible for a free trial period
List of Exception Use Cases	
Interfaces	WifiHotspotOnBoardClient WifiHotspotServer

3.1.2.6 WFHSv1-UC-REQ-191990/A-Customer does not activate their free trial period

Actors	WifiHotspotServer WifiHotspotOnBoardClient User
Pre-conditions	WifiHotspotServer is On

	Free trial period is waiting to be activated
Scenario Description	New vehicle owner purchases the vehicle and does not activate the trial period right away
Post-conditions	Customer is presented a free trial period popup reminder in the in-vehicle WifiHotspotOnBoardClient
List of Exception Use Cases	
Interfaces	WifiHotspotOnBoardClient WifiHotspotServer

3.1.2.7 WFHSv2-UC-REQ-283649/B-User enters a Wi-Fi Hotspot screen and the text display is delayed

Actors	User System
Pre-conditions	WifiHotspotServer is on
Scenario Description	User enters into Wi-Fi SSID/password screen, Connected Devices screen, Blocked devices screen, Manage my account screen, or Data Usage screen
Post-conditions	The WifiHotspotOnBoardClient displays an updating popup while the screen allows the user to exit out Text/images shall become populated and the popup shall disappear once the text is received
List of Exception Use Cases	
Interfaces	WifiHotspotOnBoardClient WifiHotspotServer CAN SoA

3.2 WFHSv2-FUN-REQ-274795/A-Displaying WifiHotspotServer icon

The WifiHotspotServer shall have a designated icon that shall be displayed on the in-vehicle WifiHotspotOnBoardClient display. The icon shall represent the cellular connection that the modem has with the network. It shall display the technology used to connect to the cellular network (i.e. 3G or 4G) and shall also display the WifiHotspotServer's signal strength by showing either 1-5 bars or "no service". The WifiHotspotOnBoardClient shall also display the status of the Wi-Fi APN connectivity.

The WifiHotspotServer Wi-Fi Hotspot feature, SYNC Wi-Fi feature and any other Wi-Fi related features existing in the vehicle shall be displayed to the customer in the WifiHotspotOnBoardClient display in a way such that the customer experiences minimum to no confusion. Distinct differentiation between the Wi-Fi features shall be made and customer education on all Wi-Fi features shall be achieved through the in-vehicle WifiHotspotOnBoardClient display.

3.2.1 Requirements

3.2.1.1 WFHSv2-REQ-398394/A-Reporting out technology used to connect to the cellular network

The WifiHotspotServer shall detect the technology it is using to connect to the cellular network and transmit this using the CAN signal TCUTechnologyUsed2_St. If the WifiHotspotServer does not have a connection established with the network (neither the Ford APN nor the Wi-Fi APN are connected), the WifiHotspotServer shall report out "no network".

If the WifiHotspotServer is unable to detect the technology being used to connect to the network, it shall set the CAN signal to NULL.

NA/China/EU:
If the WifiHotspotServer is configured for NA, China or EU region, it shall detect the radio access technology being used and report it out over the TCUTechnologyUsed2_St CAN signal. See a mapping of the technologies it shall detect and how it shall populate the CAN signal. Note, some CAN signal states are repurposed, so the literals may not match up to the actual technology that is being used.

Literals (of actual CAN signal)	Value that WifiHotspotServer shall set the CAN signal to	Technology being detected by the WifiHotspotServer	Icon WifiHotspotOnBoardClient shall display (refer to the HMI spec for the actual icons to use)
Null	0x00	Null	No signal
No Network	0x01	No Network	No signal
GSM	0x02	Throughput: 150 Mbps to 300 Mbps CA (2,3,4,5)	NA: LTE China: 4G+ EU: LTE
GPRS	0x03	GSM, GPRS	NA: N/A China: 2G EU: 2G
EDGE	0x04	EDGE	NA: N/A China: 2G EU: 2G
UMTS	0x05	UMTS	All regions: 3G
HSPA+ (includes HSPA, HSDPA and HSUPA)	0x06	HSPA+ (includes HSPA, HSDPA and HSUPA)	NA: 4G China: 4G EU: 3G+
LTE	0x07	LTE	NA: LTE China: 4G EU: LTE

Brazil Only:
If the WifiHotspotServer is configured for Brazil country, it shall detect more specific technologies to report out over the TCUTechnologyUsed2_St CAN signal. See a mapping of the technologies it shall detect and how it shall populate the CAN

signal. Note, some CAN signal states are repurposed for the Brazil market, so the literals may not match up to the actual technology that is being used.

For example, if the WifiHotspotServer detects the modem is using CA (2,3,4,5) with throughput between 150Mbps to 300Mbps, it shall set the CAN signal to state 0x02.

Literals (of actual CAN signal)	Value that WifiHotspotServer shall set the CAN signal to	Technology being detected by the WifiHotspotServer	Icon WifiHotspotOnBoardClient shall display (refer to the HMI spec for the actual icons to use)
Null	0x00	Null	No signal
No Network	0x01	No Network	No signal
GSM	0x02	Throughput: 150 Mbps to 300 Mbps CA (2,3,4,5)	4G+
GPRS	0x03	GSM, GPRS	2G
EDGE	0x04	EDGE	2G
UMTS	0x05	UMTS, HSDPA (3.6Mbps, 7.2 Mbps, 14.4 Mbps)	3G
HSPA+	0x06	HSPA+ (21Mbps)	3G+
LTE	0x07	LTE	4G

3.2.1.2 WFHSv3-REQ-454838/A-Reporting out technology used to connect to the cellular network v3

The WifiHotspotServer shall detect the technology it is using to connect to the cellular network and transmit this using the CellularConnectivityMetricsInd (nw_type). If the WifiHotspotServer does not have a connection established with the network (neither the Ford APN nor the Wi-Fi APN are connected), or is unable to detect the technology being used to connect to the network, the WifiHotspotServer shall report out “no network”.

NA/China/EU:

If the WifiHotspotServer is configured for NA, China or EU region, it shall detect the radio access technology being used and report it out over the CellularConnectivityMetricsInd (nw_type). See a mapping of the technologies it shall detect and how it shall populate the signal. **Note**: some signal states are repurposed, so the literals may not match up to the actual technology that is being used.

Literals (of actual signal)	Value that WifiHotspotServer shall set the signal to	Technology being detected by the WifiHotspotServer	Icon WifiHotspotOnBoardClient shall display (refer to the HMI spec for the actual icons to use)
No Network	0x00	No Network	No signal
GSM	0x01	Throughput: 150 Mbps to 300 Mbps CA (2,3,4,5)	NA: LTE China: 4G+ EU: LTE
GPRS	0x02	GSM, GPRS	NA: N/A China: 2G EU: 2G
EDGE	0x03	EDGE	NA: N/A China: 2G EU: 2G
UMTS	0x04	UMTS	All regions: 3G
HSPA+ (includes HSPA, HSDPA and HSUPA)	0x05	HSPA+ (includes HSPA, HSDPA and HSUPA)	NA: 4G China: 4G EU: 3G+
LTE	0x06	LTE	NA: LTE

			China: 4G EU: LTE
NR5G	0x07	5G	NA: 5G China: 5G EU: 5G

Brazil Only:

If the WifiHotspotServer is configured for Brazil country, it shall detect more specific technologies to report out over the CellularConnectivityMetricsInd (nw_type). See a mapping of the technologies it shall detect and how it shall populate the signal. **Note:** some signal states are repurposed for the Brazil market, so the literals may not match up to the actual technology that is being used.

For example, if the WifiHotspotServer detects the modem is using CA (2,3,4,5) with throughput between 150Mbps to 300Mbps, it shall set the signal to state 0x02.

Literals (of actual signal)	Value that WifiHotspotServer shall set the signal to	Technology being detected by the WifiHotspotServer	Icon WifiHotspotOnBoardClient shall display (refer to the HMI spec for the actual icons to use)
No Network	0x00	No Network	No signal
GSM	0x01	Throughput: 150 Mbps to 300 Mbps CA (2,3,4,5)	NA: LTE China: 4G+ EU: LTE
GPRS	0x02	GSM, GPRS	NA: N/A China: 2G EU: 2G
EDGE	0x03	EDGE	NA: N/A China: 2G EU: 2G
UMTS	0x04	UMTS	All regions: 3G
HSPA+ (includes HSPA, HSDPA and HSUPA)	0x05	HSPA+ (includes HSPA, HSDPA and HSUPA)	NA: 4G China: 4G EU: 3G+
LTE	0x06	LTE	NA: LTE China: 4G EU: LTE
NR5G	0x07	5G	NA: 5G China: 5G EU: 5G

3.2.1.3 WFHSv2-REQ-454839/A-Reporting out the number of devices connected to the Wi-Fi Hotspot v2

The WifiHotspotServer shall monitor the number of clients connected to the hotspot and transmit this number in the signal NumberOfConnectedDevices_St. If the number of connected devices increases or decreases the WifiHotspotServer shall update the signal accordingly.

If the WifiHotspotServer cannot detect how many devices are connected, the WifiHotspotServer shall default the signal to 0 devices.

3.2.1.4 WFHS-REQ-191712/D-Converting and reporting out the number of WifiHotspotServer signal strength bars

The WifiHotspotServer shall be responsible for detecting its current signal strength in:

a. RSRP (dBm) for LTE
b. RSCP (dBm) for UMTS and HSPA+
c. RSSI (dBm) for GSM, GPRS and EDGE.

The WifiHotspotServer shall transmit the number of bars depending on the current signal strength of the network connection using the CAN signal TCUSignalStrength_St. Refer to the conversion tables below. If the WifiHotspotServer is not connected to the network (neither the Ford APN nor the Wi-Fi APN are connected), the WifiHotspotServer shall report out 0 bars.

a. If the WifiHotspotServer is using the LTE network it shall convert the RSRP values to number of bars using the conversion table below.

LTE	
RSRP Thresholds (dBm)	**Signal Bar Strength Indicator**
RSRP > -85	5 bars
-85 ≥ RSRP > -95	4 bars
-95 ≥ RSRP > -105	3 bars
-105 ≥ RSRP > -115	2 bars
RSRP ≤ -115	1 bar
No reference signals	No service (0 bars)

b. If the WifiHotspotServer is using UMTS or HSPA+ it shall convert the RSCP values to number of bars using the conversion table below.

UMTS, HSPA+ (includes HSPA, HSDPA & HSUPA)	
RSCP Thresholds (dBm)	**Signal Bar Strength Indicator**
RSCP > -80	5 bars
-80 ≥ RSCP > -90	4 bars
-90 ≥ RSCP > -100	3 bars
-100 ≥ RSCP > -106	2 bars
RSCP ≤ -106	1 bar
No reference signals	No service (0 bars)

c. If the WifiHotspotServer is using GSM, GPRS or EDGE it shall convert the RSSI values to number of bars using the conversion table below.

GSM, GPRS, EDGE	
RSSI Thresholds (dBm)	**Signal Bar Strength Indicator**
RSSI > -80	5 bars
-80 ≥ RSSI > -89	4 bars
-89 ≥ RSSI > -98	3 bars
-98 ≥ RSSI > -104	2 bars
RSSI ≤ -104	1 bar
No reference signals	No service (0 bars)

3.2.1.5 WFHSv2-REQ-454840/A-Converting and reporting out the number of WifiHotspotServer signal strength bars v2

The WifiHotspotServer shall be responsible for detecting its current signal strength in:

a. RSRP (dBm) for LTE
b. RSCP (dBm) for UMTS and HSPA+
c. RSSI (dBm) for GSM, GPRS and EDGE

The WifiHotspotServer shall transmit cellular connectivity data in the CellularConnectivityMetricsInd. If the CellularConnectivityMetricsInd (nw_type = NO_NW) the WifiHotspotOnBoardClient shall display 0 bars, otherwise WifiHotspotOnBoardClient shall display the bars based on the conversation tables below.

a. If the CellularConnectivityMetricsInd (nw_type = LTE) WifiHotspotOnBoardClient shall convert the RSRP value via CellularConnectivityMetricsInd (signal_strength) to number of bars using the conversion table below.

LTE	
RSRP Thresholds (dBm)	**Signal Bar Strength Indicator**
RSRP > -85	5 bars
-85 ≥ RSRP > -95	4 bars
-95 ≥ RSRP > -105	3 bars
-105 ≥ RSRP > -115	2 bars
RSRP ≤ -115	1 bar
No reference signals	No service (0 bars)

b. If the CellularConnectivityMetricsInd (nw_type = UMTS, HSPA+) WifiHotspotOnBoardClient shall convert the RSCP value via CellularConnectivityMetricsInd (signal_strength) to number of bars using the conversion table below.

UMTS, HSPA+ (includes HSPA, HSDPA & HSUPA)	
RSCP Thresholds (dBm)	**Signal Bar Strength Indicator**
RSCP > -80	5 bars
-80 ≥ RSCP > -90	4 bars
-90 ≥ RSCP > -100	3 bars
-100 ≥ RSCP > -106	2 bars
RSCP ≤ -106	1 bar
No reference signals	No service (0 bars)

c. If the CellularConnectivityMetricsInd (nw_type = GSM, GPRS, EDGE) WifiHotspotOnBoardClient shall convert the RSSI value via CellularConnectivityMetricsInd (signal_strength) to number of bars using the conversion table below.

GSM, GPRS, EDGE	
RSSI Thresholds (dBm)	**Signal Bar Strength Indicator**
RSSI > -80	5 bars
-80 ≥ RSSI > -89	4 bars
-89 ≥ RSSI > -98	3 bars
-98 ≥ RSSI > -104	2 bars
RSSI ≤ -104	1 bar
No reference signals	No service (0 bars)

d. If the CellularConnectivityMetricsInd (nw_type = NR5G) WifiHotspotOnBoardClient shall convert the RSSI value via CellularConnectivityMetricsInd (signal_strength) to number of bars using the conversion table below.

NR5G	
RSSI Thresholds (dBm)	**Signal Bar Strength Indicator**
RSSI > -85	5 bars

-85 ≥ RSSI > -95	4 bars
-95 ≥ RSSI > -105	3 bars
-105 ≥ RSSI > -115	2 bars
RSSI ≤ -115	1 bar
No reference signals	No service (0 bars)

3.2.1.6 WFHSv2-REQ-283741/B-Displaying the dedicated WifiHotspotServer icon on the WifiHotspotOnBoardClient display

The WifiHotspotServer icon shall represent the status of the cellular connection of the WifiHotspotServer. The icon shall display the number of signal strength bars and the technology in use. The icon below is an example icon. Refer to the HMI specifications to view the actual icon and view the location of the icon (refer to WFHSv2-REQ-283641-HMI Specification References).

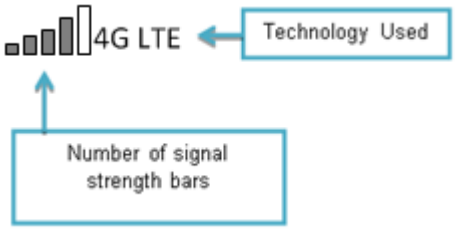


Figure. WifiHotspotServer icon

The WifiHotspotOnBoardClient shall display the current signal strength in number of bars based on the status of the CAN signal TCUSignalStrength_St.

The WifiHotspotOnBoardClient shall also display the technology used (i.e. 3G or 4G) to connect to the cellular network based on the status of the CAN signal TCUTechnologyUsed2_St. Refer to the table below to see which icon shall be displayed based on the value of the CAN signal. Note, the value of the CAN signal (i.e 0x00, 0x01, 0x02, etc.) shall be used to determine which icon to show and the CAN signal literals (i.e. GSM, GPRS, etc.) shall be ignored. WifiHotspotOnBoardClient may be required to display different technology icons for different regions or countries and shall refer to the vehicle's destination region or country (refer to WFHS-REQ-283727-WifiHotspotOnBoardClient identifies vehicle region).

NA, China, EU:

Literals (of actual CAN signal)	**Value that WifiHotspotServer shall set the CAN signal to**	**Technology being detected by the WifiHotspotServer**	**Icon WifiHotspotOnBoardClient shall display (refer to the HMI spec for the actual icons to use)**
Null	0x00	Null	No signal
No Network	0x01	No Network	No signal
GSM	0x02	Throughput: 150 Mbps to 300 Mbps CA (2,3,4,5)	NA: LTE China: 4G+ EU: LTE
GPRS	0x03	GSM, GPRS	NA: N/A China: 2G EU: 2G
EDGE	0x04	EDGE	NA: N/A China: 2G EU: 2G
UMTS	0x05	UMTS	All regions: 3G
HSPA+ (includes HSPA, HSDPA and HSUPA)	0x06	HSPA+ (includes HSPA, HSDPA and HSUPA)	NA: 4G China: 4G EU: 3G+
LTE	0x07	LTE	NA: LTE China: 4G EU: LTE

Brazil:

Literals (of actual CAN signal)	Value that WifiHotspotServer shall set the CAN signal to	Technology being detected by the WifiHotspotServer	Icon WifiHotspotOnBoardClient shall display (refer to the HMI spec for the actual icons to use)
Null	0x00	Null	No signal
No Network	0x01	No Network	No signal
GSM	0x02	Throughput: 150 Mbps to 300 Mbps CA (2,3,4,5)	4G+
GPRS	0x03	GSM, GPRS	2G
EDGE	0x04	EDGE	2G
UMTS	0x05	UMTS, HSDPA (3.6Mbps, 7.2 Mbps, 14.4 Mbps)	3G
HSPA+	0x06	HSPA+ (21Mbps)	3G+
LTE	0x07	LTE	4G

3.2.1.7 WFHSv3-REQ-454841/A-Displaying the dedicated WifiHotspotServer icon on the WifiHotspotOnBoardClient display v3

The WifiHotspotServer icon shall represent the status of the cellular connection of the WifiHotspotServer. The icon shall display the number of signal strength bars and the technology in use. The icon below is an example icon. Refer to the HMI specifications to view the actual icon and view the location of the icon (refer to WFHSv2-REQ-283641-HMI Specification References).

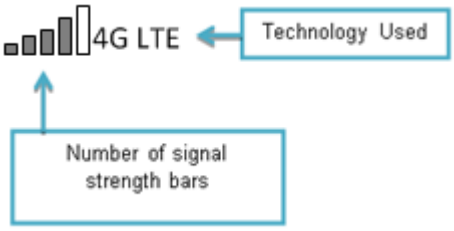


Figure. WifiHotspotServer icon

The WifiHotspotOnBoardClient shall display the current signal strength in number of bars based on the status as per REQ-454840.

The WifiHotspotOnBoardClient shall also display the technology used (i.e. 3G or 4G) to connect to the cellular network based on CellularConnectivityMetricsInd (nw_type). Refer to the table below to see which icon shall be displayed based on the value of the API. WifiHotspotOnBoardClient may be required to display different technology icons for different regions or countries and shall refer to the vehicle's destination region or country (refer to WFHS-REQ-283727-WifiHotspotOnBoardClient identifies vehicle region).

NA, China, EU:

Literals (of actual signal)	Value that WifiHotspotServer shall set the signal to	Technology being detected by the WifiHotspotServer	Icon WifiHotspotOnBoardClient shall display (refer to the HMI spec for the actual icons to use)
No Network	0x00	No Network	No signal
GSM	0x01	Throughput: 150 Mbps to 300 Mbps CA (2,3,4,5)	NA: LTE China: 4G+ EU: LTE

GPRS	0x02	GSM, GPRS	NA: N/A China: 2G EU: 2G
EDGE	0x03	EDGE	NA: N/A China: 2G EU: 2G
UMTS	0x04	UMTS	All regions: 3G
HSPA+ (includes HSPA, HSDPA and HSUPA)	0x05	HSPA+ (includes HSPA, HSDPA and HSUPA)	NA: 4G China: 4G EU: 3G+
LTE	0x06	LTE	NA: LTE China: 4G EU: LTE
NR5G	0x07	5G	NA: 5G China: 5G EU: 5G

Brazil:

Literals (of actual signal)	Value that WifiHotspotServer shall set the signal to	Technology being detected by the WifiHotspotServer	Icon WifiHotspotOnBoardClient shall display (refer to the HMI spec for the actual icons to use)
No Network	0x00	No Network	No signal
GSM	0x01	Throughput: 150 Mbps to 300 Mbps CA (2,3,4,5)	NA: LTE China: 4G+ EU: LTE
GPRS	0x02	GSM, GPRS	NA: N/A China: 2G EU: 2G
EDGE	0x03	EDGE	NA: N/A China: 2G EU: 2G
UMTS	0x04	UMTS	All regions: 3G
HSPA+ (includes HSPA, HSDPA and HSUPA)	0x05	HSPA+ (includes HSPA, HSDPA and HSUPA)	NA: 4G China: 4G EU: 3G+
LTE	0x06	LTE	NA: LTE China: 4G EU: LTE
NR5G	0x07	5G	NA: 5G China: 5G EU: 5G

3.2.1.8 WFHSv2-REQ-283650/B-Displaying the Wi-Fi Hotspot service state

There may be instances when the WifiHotspotServer is not connected to the cellular network at all or it is connected but the Wi-Fi service is not available because the Wi-Fi channel connection failed due to multiple reasons. Therefore, the in-vehicle occupant shall be informed when the Wi-Fi Hotspot service is not available. The in-vehicle HMI shall inform the customer when the Wi-Fi Hotspot is On, but the Wi-Fi APN is NOT connected. The HMI shall inform the customer that the Wi-Fi Hotspot service is not available through either some sort of transient message, popup, alert messaging center, etc. Refer to the HMI specification to view where and how this notification is presented to the customer (refer to WFHSv2-REQ-283641-HMI Specification References).

The WifiHotspotOnBoardClient shall monitor the signal HotspotEnablement_St to determine if the Wi-Fi Hotspot is On, On-disabled or Off.

The WifiHotspotOnBoardClient shall monitor the signal HotspotAPNConnection_St to determine when the Wi-Fi APN is and is not connected to the network. If the signal is equal to NULL/NONE or Not Connected, the Wi-Fi APN is NOT connected. If the signal is equal to Connected, the Wi-Fi APN IS connected.

The WifiHotspotOnBoardClient shall contain a configurable DID (Wi-Fi_APN_Initialization_Time) which shall be used to determine how long the HMI shall wait before informing the customer the Wi-Fi service is not available.

If the WifiHotspotOnBoardClient detects the Wi-Fi Hotspot has transitioned from either Null/None/Off/ On-Disabled to ON (via HotspotEnablement_St signal), it shall start a timer (WiFi_APN_Initialization_Time) and monitor the signal HotspotAPNConnection_St.

- If the signal is already reporting out that the APN is Connected OR it transitions to reflect that the APN is Connected prior to the timer expiring, the WifiHotspotOnBoardClient shall not report any Wi-Fi Hotspot service interruptions and shall end the timer.
- If the signal continues to report out the Wi-Fi APN is Not Connected or NULL/NONE when the timer expires, the WifiHotspotOnBoardClient shall inform the customer the Wi-Fi Hotspot service is not available.

If at any time while the HotspotEnablement_St=On, the signal HotspotAPNConnection_St transitions to NULL/NONE or Not Connected, the WifiHotspotOnBoardClient shall update the HMI to indicate the Wi-Fi Hotspot service failure. If the HotspotEnablement_St=Off, On-Disabled or NULL/NONE, the WifiHotspotOnBoardClient shall NOT report out any Wi-Fi Hotspot service interruptions.

3.2.1.9 WFHSv2-REQ-454837/A-Reporting out the Wi-Fi APN connectivity status

The WifiHotspotServer shall inform the WifiHotspotOnBoardClient of the Wi-Fi's APN connectivity status using the signal HotspotAPNConnection_St. If the Wi-Fi APN is NOT connected to the network, the WifiHotspotServer shall set the signal to Not Connected. If the Wi-Fi APN IS connected to the network, the WifiHotspotServer shall set the signal to Connected. If the WifiHotspotServer is unable to determine the connection status, it shall set the signal to NULL/NONE.

3.2.1.10 WFHSv2-REQ-283744/B-Displaying the number of connected devices

The WifiHotspotOnBoardClient shall display the number of devices connected to the hotspot. The signal NumberOfConnectedDevices_St shall be monitored to determine the number to display. Refer to the HMI specifications to determine where this is displayed (refer to WFHSv2-REQ-283641-HMI Specification References).

3.3 WFHSv2-FUN-REQ-274796/D-Turning Wi-Fi Hotspot On or Off

Users may turn the hotspot on or off through the in-vehicle WifiHotspotOnBoardClient or from the WifiHotspotOffBoardClient. If the Wi-Fi Hotspot is off, no Wi-Fi enabled devices may connect to the Wi-Fi Hotspot, and if the Wi-Fi Hotspot is on, a set amount of Wi-Fi enabled devices shall be allowed to connect to the Wi-Fi Hotspot (requirement WFHSv2-REQ-288222-Managing the connected devices list defines the max number of devices).

If the user turns the Wi-Fi Hotspot on or off from the WifiHotspotOnBoardClient display, the WifiHotspotServer shall receive a signal, check the Wi-Fi Hotspot enablement conditions, if necessary, save and update the Wi-Fi Hotspot's setting and respond to the WifiHotspotOnBoardClient by updating its status on a designated signal. If the WifiHotspotServer receives a request from the WifiHotspotOffBoardClient, it shall receive and process a command/response/alert message.

3.3.1 Requirements

3.3.1.1 WFHSv2-REQ-283564/C-Wi-Fi Hotspot enablement condition checks

The WifiHotspotServer shall report the Wi-Fi Hotspot in one of three enablement states through the signal HotspotEnablement_St:

Wi-Fi Hotspot Enablement State	Functionality
on	The WifiHotspotServer shall provide a Wi-Fi signal and enable clients to connect to the hotspot. This state can only be active when the Wi-Fi Hotspot enablement conditions are met.
on-disabled	The WifiHotspotServer shall provide no Wi-Fi signal which shall prohibit clients from connecting to the hotspot. If on-disabled state is active, the WifiHotspotServer shall turn the hotspot to on state as soon as the Wi-Fi Hotspot enablement conditions are all met.
off	The WifiHotspotServer shall provide no Wi-Fi signal which shall prohibit clients from connecting to the hotspot. This state can be active regardless of if the Wi-Fi Hotspot enablement conditions are met or not.

If the WifiHotspotServer is unable to detect the current enablement state of the Wi-Fi Hotspot, the WifiHotspotServer shall set the signal HotspotEnablement_St to NULL/UNKNOWN.

The WifiHotspotServer may be required to check the Wi-Fi Hotspot enablement conditions to determine if a specific state can be achieved. If all Wi-Fi Hotspot enablement conditions are met the hotspot is allowed to be turned on.

The on-disabled state implies the hotspot shall turn on as soon as the Wi-Fi Hotspot enablement conditions are met. The table below demonstrates how the WifiHotspotServer shall respond to requests according to different scenarios.

WifiHotspotOnBoardClient/ WifiHotspotOffBoardClient Request	WifiHotspotServer Response to a Request	
	Wi-Fi Hotspot enablement conditions not met at time of request	Wi-Fi Hotspot enablement conditions become met at time of request or at a later time

Hotspot off	Hotspot is turned to off state	Hotspot remains in off state
Hotspot on	Hotspot is turned to on-disabled state	Hotspot is turned to on state
Wi-Fi Hotspot Reset (refer to WFHSv2-REQ-283559-Wi-Fi Hotspot reset settings)	Hotspot is turned to on-disabled state	Hotspot is turned to on state

Table. Hotspot enablement state response from a request

a. Factory/Transport mode condition: The WifiHotspotServer shall be responsible for determining when the vehicle is in factory or transport mode via the signal CarMode_St. If the vehicle enters Factory or Transport mode, the WifiHotspotServer shall gracefully disconnect any connected clients and turn Off hotspot enablement mode. The hotspot enablement mode shall remain Off during Factory or Transport mode. If the vehicle exits out of Factory or Transport mode, the WifiHotspotServer shall default the enablement state to On, Off or On-disabled, depending on the status of the Wi-Fi Hotspot enablement conditions and the vehicle kilometers.

b. Kilometer Dependency condition (note: this is only applicable when vehicle is in Normal mode): The WifiHotspotServer shall default the hotspot enablement state to Off until the vehicle has reached a certain kilometers traveled (parameter Hotspot_Enablement_Kilometer_Dependency, default value is 16 kilometers). The WifiHotspotServer shall monitor the OdometerMasterValue signal for determining the vehicle kilometers. Once the vehicle has reached Hotspot_Enablement_Kilometer_Dependency kilometers, it shall default the hotspot enablement to On, assuming all other enablement conditions are met. The WifiHotspotServer shall allow and process any requests from the WifiHotspotOnBoardClient or WifiHotspotOffBoardClient to turn the hotspot enablement On or Off prior to the vehicle reaching the Hotspot_Enablement_Kilometer_Dependency kilometers. If the WifiHotspotServer receives a request to perform a Wi-Fi Hotspot reset, the WifiHotspotServer shall default the hotspot enablement to Off if the kilometers is under Hotspot_Enablement_Kilometers_Dependency and shall default it to On if the kilometers is at or above Hotspot_Enablement_Kilometers_Dependency.

c. Ignition Status condition

   i. Ignition= Off: If IgnitionStatus_St = Off, the WifiHotspotServer shall NOT allow the hotspot to be On. If the hotspot was On when the ignition transitions to Off, the WifiHotspotServer shall turn the hotspot to On-disabled until the ignition transitions to Run, Start or Accessory, at which point it shall turn back to On. If the hotspot is Off and the ignition status is Off when a user requests to turn the hotspot On, the WifiHotspotServer shall turn the hotspot to On-disabled.

   ii. Ignition= Run, Start or Accessory: If IgnitionStatus_St=Run, Start or Accessory the hotspot shall always be allowed to be on unless the WifiHotspotServer is required to turn Off due to a load shed event, etc. (refer to the 4G Telematics Control Unit Power Management Requirements specification for more information) at which point the WifiHotspotServer shall turn the hotspot to On-disabled.

The WifiHotspotServer shall perform the checks displayed in the diagrams below.

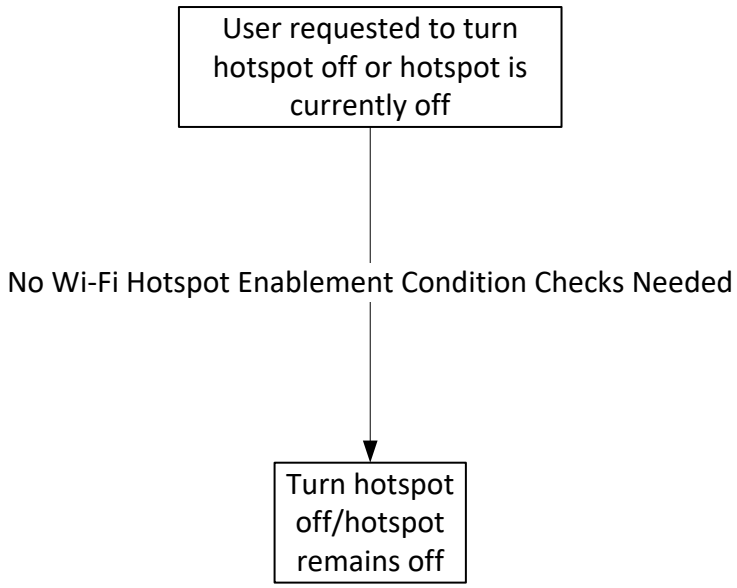


Figure. Wi-Fi Hotspot enablement condition checks needed if the hotspot shall be off

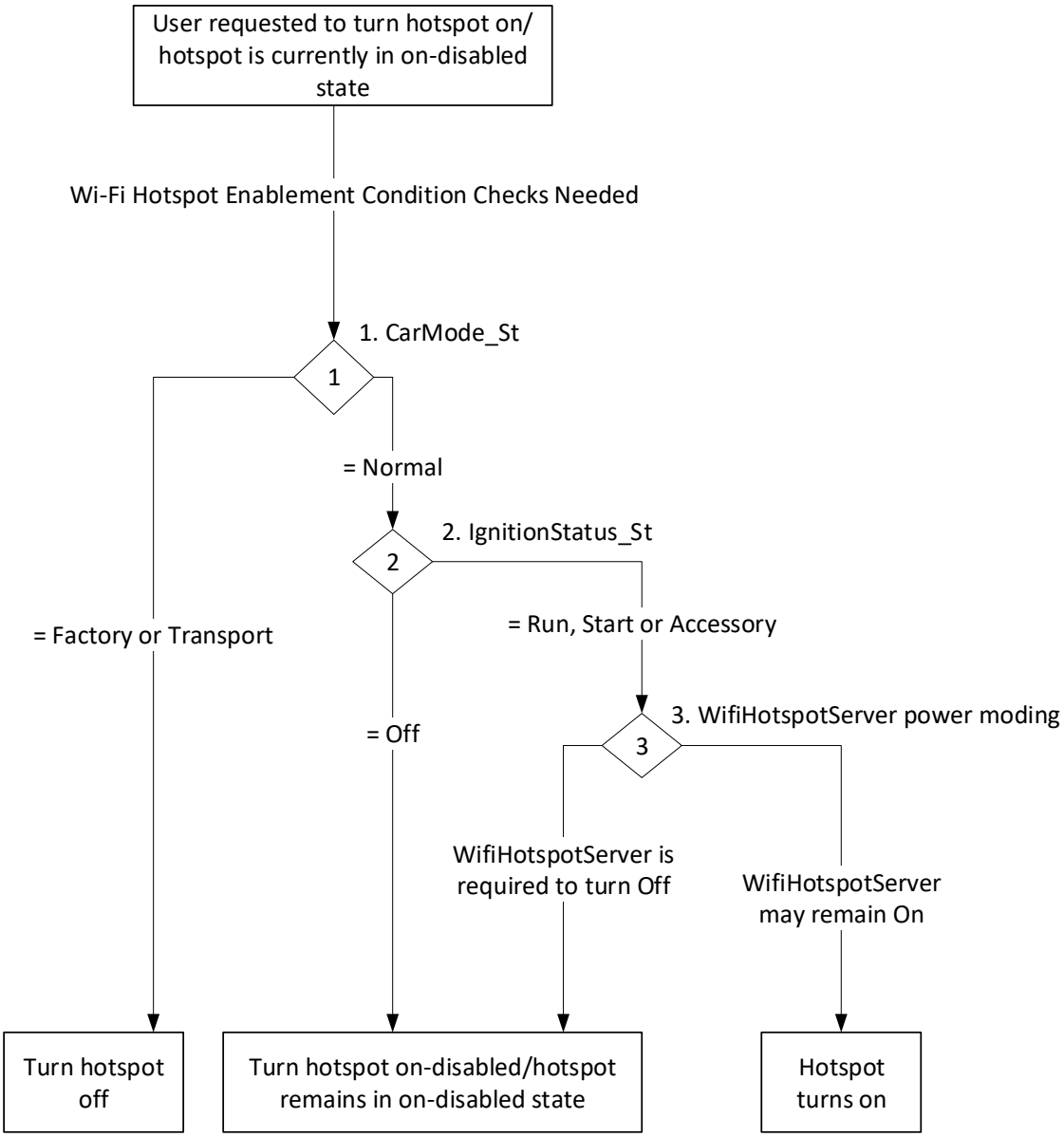


Figure. Wi-Fi Hotspot enablement condition checks needed if the hotspot shall be turned on

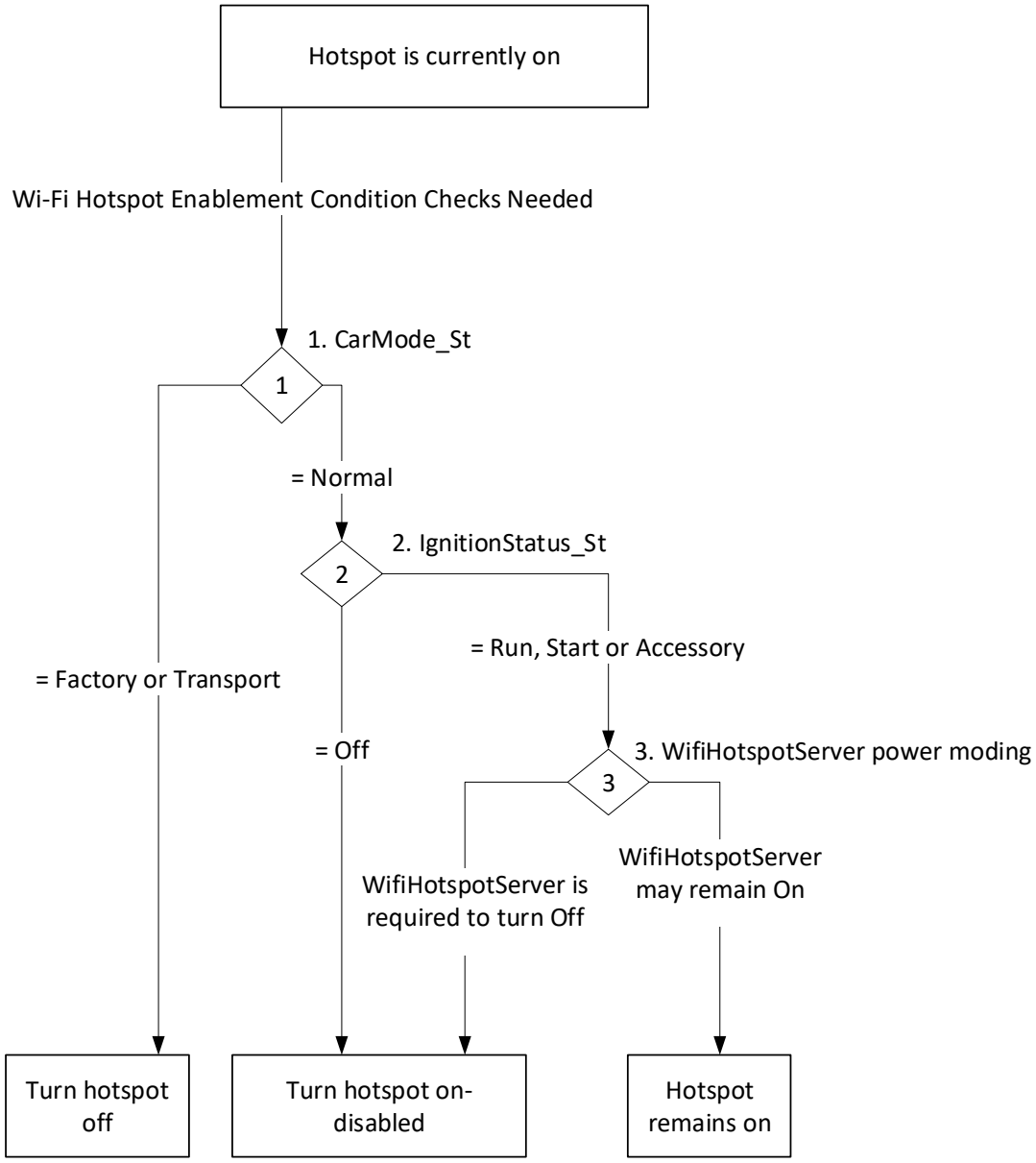


Figure. Wi-Fi Hotspot enablement condition checks needed if the hotspot is currently on

3.3.1.2 WFHSv2-REQ-283745/B-Displaying the Wi-Fi Hotspot's enablement state on the WifiHotspotOnBoardClient display

The WifiHotspotOnBoardClient shall display the current status of the Wi-Fi Hotspot's enablement state (signal HotspotEnablement_St). Refer to WFHSv2-REQ-283641-HMI Specification References). The following screens are example WifiHotspotOnBoardClient screens.

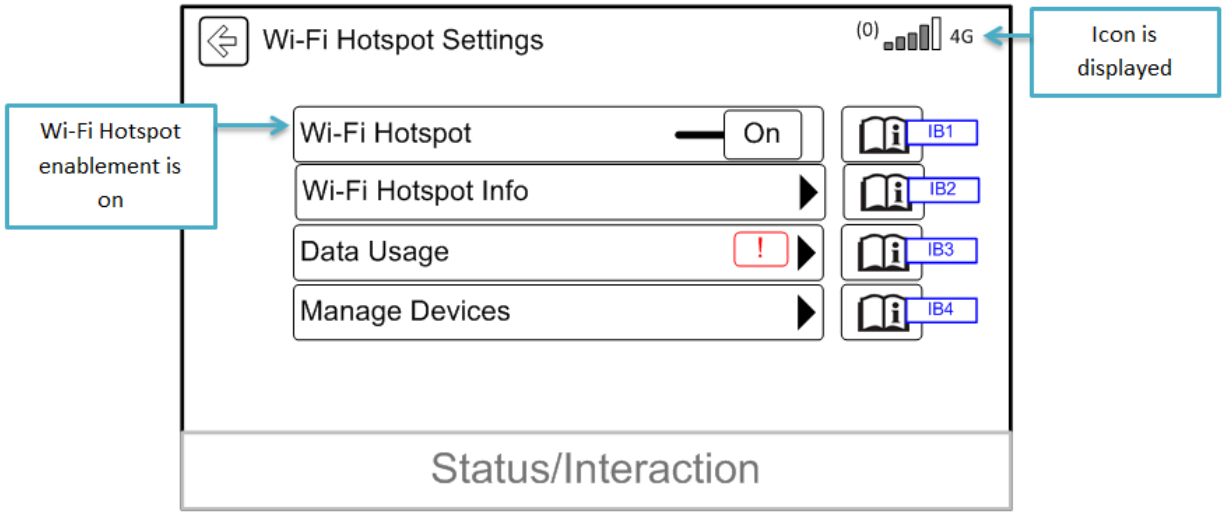


Figure. Wi-Fi Hotspot on screen

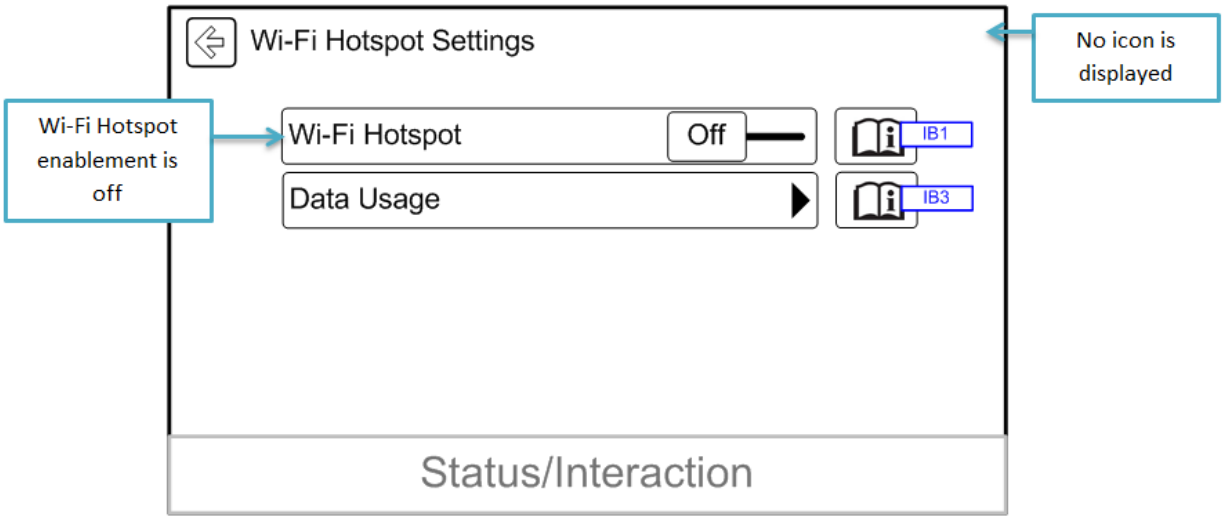


Figure. Wi-Fi Hotspot off screen

3.3.1.3 WFHSv2-REQ-454857/A-User requests to turn the Wi-Fi Hotspot on or off through the WifiHotspotOnBoardClient display

If the user requests to turn the Wi-Fi Hotspot on or off from the WifiHotspotOnBoardClient display, the WifiHotspotOnBoardClient shall transmit this request to the WifiHotspotServer using the signal HotspotEnablement_Rq.

3.3.1.4 WFHS-REQ-336814/A-Configurable Non-Correlated Enablement Alerts

The WifiHotspotServer shall contain a configurable parameter (Non-Correlated_Enablement_Alerts) which shall be used to determine whether or not it shall send non-correlated enablement alerts to the backend. This parameter shall have two states, Enable or Disable, and shall be defaulted to Disable. It shall be configurable at EOL as well as from the WifiHotspotOffBoardClient.

- If Non-Correlated_Enablement_Alerts is set to Disable, the WifiHotspotServer shall NOT send any non-correlated enablement alerts to the backend. It shall still send correlated enablement alerts in response to a command from the WifiHotspotOffBoardClient.
    - Example 1: if the WifiHotspotServer is required to turn the Wi-Fi Hotspot to On-Disabled due to the power moding conditions, the WifiHotspotServer shall NOT send an alert to the WifiHotspotOffBoardClient.
    - Example 2: if the WifiHotspotServer receives a request from the WifiHotspotOnBoardClient to change the enablement from Off to On, the WifiHotspotServer shall NOT send an alert to the WifiHotspotOffBoardClient.

- Example 3: if the WifiHotspotServer receives a request from the WifiHotspotOffBoardClient to change the enablement from Off to On, the WifiHotspotServer SHALL send an alert to the WifiHotspotOffBoardClient once it updates the enablement state.

- If Non-Correlated_Enablement_Alerts is set to Enable, the WifiHotspotServer shall send both non-correlated and correlated enablement alerts to the WifiHotspotOffBoardClient any time the enablement state changes.
  - Example 1: if the WifiHotspotServer is required to turn the Wi-Fi Hotspot to On-Disabled due to the power moding conditions, the WifiHotspotServer SHALL send an alert to the WifiHotspotOffBoardClient.
  - Example 2: if the WifiHotspotServer receives a request from the WifiHotspotOnBoardClient to change the enablement from Off to On, the WifiHotspotServer SHALL send an alert to the WifiHotspotOffBoardClient.
  - Example 3: if the WifiHotspotServer receives a request from the WifiHotspotOffBoardClient to change the enablement from Off to On, the WifiHotspotServer SHALL send an alert to the WifiHotspotOffBoardClient once it updates the enablement state

The requirements within the rest of this document assume Non-Correlated_Enablement_Alerts is set to Enable, unless stated otherwise.

3.3.1.5 WFHS-REQ-315657/B-Informing the WifiHotspotOffBoardClient of a Wi-Fi Hotspot Enablement change

The WifiHotspotServer shall send a non-correlated alert (and include the new enablement state) to the WifiHotspotOffBoardClient any time the Wi-Fi Hotspot changes its enablement state to On, Off or On-disabled. This could be due to the following, but not limited to:

- User requests to change the enablement state from the in-vehicle display,
- The Wi-Fi Hotspot was On when the enablement conditions became not met and thus turned to On-disabled,
- The WifiHotspotServer is required to enter low power registered mode

If the WifiHotspotServer attempts to send an enablement update alert to the WifiHotspotOffBoardClient and does not receive an acknowledgement, it shall perform a retry strategy. If the WifiHotspotServer detects that it is not connected to the network at the time of attempting to send the alert, it shall store this alert and send it the next time the WifiHotspotServer connects to the network. The alert shall survive ignition cycles. If the Wi-Fi Hotspot enablement state has since changed from the time of initial attempt to send the alert, the WifiHotspotServer shall send the newest state to the WifiHotspotOffBoardClient once the network becomes available.

Example)

- The customer is parked in an area with no coverage.
- The customer turns the Wi-Fi Hotspot Off from the in-vehicle display.
- The WifiHotspotServer is unable to send this alert to the WifiHotspotOffBoardClient.
- The customer ignitions off the vehicle, returns the next day, changes the enablement to On and drives to an area with cellular coverage.
- The WifiHotspotServer shall send the Wi-Fi Hotspot Enablement alert to the WifiHotspotOffBoardClient to inform that the state is On.

3.3.1.6 WFHS-REQ-315658/B-Authorization dependency on enablement updates from the WifiHotspotOffBoardClient

The WifiHotspotServer shall ONLY be allowed to send Wi-Fi Hotspot enablement alerts or receive and process enablement update commands to/from the WifiHotspotOffBoardClient if the following conditions are met:

- Vehicle Connectivity is ON, AND
- Cellular Connectivity is ON, AND
- VehicleData is ON, AND
- Vehicle is authorized.

If the above conditions are NOT met, the WifiHotspotServer shall ignore any commands from the WifiHotspotOffBoardClient to change the enablement state and shall also NOT send any alerts to the WifiHotspotOffBoardClient if the enablement state changes.

All requirements within this document which mention the WifiHotspotServer receiving or sending enablement update command/response/alerts to/from the WifiHotspotOffBoardClient shallassume the above conditions are met and the WifiHotspotServer is allowed to, unless it is stated otherwise.

3.3.1.7 WFHS-REQ-336938/B-Request from WifiHotspotOnBoardClient to turn the Wi-Fi Hotspot on or off

If the WifiHotspotServer receives a request from the WifiHotspotOnBoardClient to turn the Wi-Fi Hotspot off (signal HotspotEnablement_Rq), the WifiHotspotServer shall turn the Wi-Fi Hotspot enablement state to off, update the status signal and send a non-correlated alert to the WifiHotspotOffBoardClient.

If the WifiHotspotServer receives a request from the WifiHotspotOnBoardClient to turn the Wi-Fi Hotspot on (signal HotspotEnablement_Rq), the WifiHotspotServer shall check the Wi-Fi Hotspot enablement conditions, configure the Wi-Fi Hotspot to the appropriate enablement state, update the status signal and send a non-correlated alert to the WifiHotspotOffBoardClient.

Note: If the WifiHotspotServer fails to inform the WifiHotspotOffBoardClient (due to network connection issues, etc.), it shall still continue to update the enablement state and perform a retry strategy to ensure the WifiHotspotOffBoardClient is updated.

3.3.1.8 WFHS-REQ-315659/C-Request from WifiHotspotOffBoardClient to turn the Wi-Fi Hotspot on or off

The customer shall also have the ability to turn the Wi-Fi Hotspot On or Off from outside the vehicle through Ford-provided applications such as the mobile app or fleet portal, for example. The request shall be sent to the WifiHotspotServer by the WifiHotspotOffBoardClient through FTCP command/response/alert messages.

If the WifiHotspotServer receives a request from the WifiHotspotOffBoardClient to turn the Wi-Fi Hotspot off (Wi-Fi Hotspot Enablement FTCP command), the WifiHotspotServer shall:

- Send a successful acknowledgement response, assuming the request is valid and the WifiHotspotServer is allowed to process it,
- Update and save the new Wi-Fi Hotspot enablement configuration to memory (Enablement = Off),
- Update the HotspotEnablement_St signal to reflect the new status (only if the bus/network is awake and the WifiHotspotServer is transmitting on it, this is not a wake-up event),
- Respond to the WifiHotspotOffBoardClient with a correlated alert and indicate the new enablement state in the alert, and
- Configure the Wi-Fi chipset to Off (assuming the Wi-Fi chipset is powered up),

If the WifiHotspotServer receives a request from the WifiHotspotOffBoardClient to turn the Wi-Fi Hotspot on (Wi-Fi Hotspot Enablement FTCP command), the WifiHotspotServer shall:

- Send a successful acknowledgement response, assuming the request is valid and the WifiHotspotServer is allowed to process it
- Check the Wi-Fi Hotspot enablement conditions,
- Update and save the new Wi-Fi Hotspot enablement configuration to memory (Enablement = On or On-disabled),
- Update the HotspotEnablement_St signal to reflect the new status (only if the bus/network is awake and the WifiHotspotServer is transmitting on it, this is not a wake-up event),
- Respond to the WifiHotspotOffBoardClient with a correlated alert and indicate the new enablement state in the alert, and
- Configure the Wi-Fi Hotspot to the appropriate enablement state (assuming the Wi-Fi chipset is powered up).

If the WifiHotspotServer is unable to accept the command due to either of the following scenarios:
- The request was bad/invalid or
- The WifiHotspotServer is in extended diagnostics mode,

the WifiHotspotServer shall immediately respond with an unsuccessful response, indicating that the command failed because it is not permitted.

If the WifiHotspotServer attempts to process the request but fails, the WifiHotspotServer shall send a failure alert and indicate that the command failed due to a WifiHotspotServer internal failure.

If the WifiHotspotServer receives a request to update the enablement state to the state it is currently set to, the WifiHotspotServer shall still respond with a successful response and alert. For example, if the WifiHotspotOffBoardClient and the WifiHotspotServer became out of sync, the mobile app could show the hotspot as being set to Off, however, the WifiHotspotServer has the enablement set to On. If the customer requests to turn the hotspot On, the WifiHotspotServer shall send a successful response, then send an alert, so the mobile app can update its display accordingly.

The WifiHotspotServer shall be able to process an enablement configuration request, regardless if the Wi-Fi chipset is powered up or not. The WifiHotspotServer shall only be required to update and store the new enablement state in memory in order to process the request and send an alert.

Example)

- The Ignition is Off, the WifiHotspotServer is in low power registered mode and the enablement state is in Off.
- The customer sent a request from the mobile app to turn the Wi-Fi Hotspot On.
- Assuming the enablement request requires an SMS wake up, the WifiHotspotServer wakes up and connects to the WifiHotspotOffBoardClient.
- The WifiHotspotServer receives the enablement request from the WifiHotspotOffBoardClient, but the Wi-Fi chipset is powered off.
- The WifiHotspotServer shall send a successful response, check the enablement conditions and determine that the Wi-Fi enablement state is only allowed to be set to On-Disabled.
- Therefore, the WifiHotspotServer shall update its memory to On-Disabled and send an alert to the WifiHotspotOffBoardClient.

3.3.1.9 WFHS-REQ-315660/A-Receiving multiple enablement requests

It is possible the WifiHotspotServer could receive an enablement request from the WifiHotspotOnBoardClient and WifiHotspotOffBoardClient near the same time. The WifiHotspotServer shall process the requests in FIFO order. It shall not process the next request until it has finished processing and responding to the first request.

3.3.1.10 WFHS-REQ-315661/A-Request from the WifiHotspotOffBoardClient for the current enablement state

The WifiHotspotOffBoardClient shall have the ability to query the CURRENT enablement state, in case it does not have a record of the last known state. Therefore, if the WifiHotspotServer receives an FTCP request for the hotspot enablement state, the WifiHotspotServer shall respond with the current, stored enablement state (On, Off or On-Disabled). If the WifiHotspotServer is unable to detect the stored enablement state or if it is not allowed to respond, it shall send a failure response.

3.3.2 Use Cases

3.3.2.1 WFHS-UC-REQ-407972/A-User turns the Wi-Fi Hotspot enablement to ON when reset occurs and Kilometer Dependency is met

Actors	System
Pre-conditions	Vehicle kilometers is above Hotspot_Enablement_Kilometers_Dependency Hotspot enablement is OFF
Scenario Description	WifiHotspotServer receives a request from the WifiHotspotOnBoardClient or WifiHotspotOffBoardClient to turn the hotspot enablement to ON. WifiHotspotServer shall turn the enablement to ON. A subsequent request is made to perform a Wi-Fi Hotspot reset.
Post-conditions	The WifiHotspotServer defaults the hotspot enablement to ON
List of Exception Use Cases	
Interfaces	WifiHotspotOnBoardClient WifiHotspotOffBoardClient WifiHotspotServer CAN SoA

3.3.2.2 WFHS-UC-REQ-407973/A-User turns the Wi-Fi Hotspot enablement to ON when reset occurs and Kilometer Dependency is not met

Actors	System
Pre-conditions	Vehicle kilometers is under Hotspot_Enablement_Kilometers_Dependency Hotspot enablement is OFF

Scenario Description	WifiHotspotServer receives a request from the WifiHotspotOnBoardClient or WifiHotspotOffBoardClient to turn the hotspot enablement to ON. WifiHotspotServer shall turn the enablement to ON. A subsequent request is made to perform a Wi-Fi Hotspot reset.
Post-conditions	The WifiHotspotServer defaults the hotspot enablement to OFF
List of Exception Use Cases	
Interfaces	WifiHotspotOnBoardClient WifiHotspotOffBoardClient WifiHotspotServer CAN SoA

3.3.2.3 WFHS-UC-REQ-407974/A-User Controls the WiFi hotspot Enablement On/Off

Actors	System
Pre-conditions	Vehicle kilometers is under Hotspot_Enablement_Kilometers_Dependency Hotspot enablement is OFF
Scenario Description	WifiHotspotServer receives a request from the WifiHotspotOnBoardClient or WifiHotspotOffBoardClient to turn the hotspot enablement to ON. WifiHotspotServer shall turn the enablement to ON. A subsequent request is made from the WifiHotspotOnBoardClient or WifiHotspotOffBoardClient to turn the hotspot enablement to OFF.
Post-conditions	WifiHotspotServer to leave the hotspot enablement to OFF.
List of Exception Use Cases	
Interfaces	WifiHotspotOnBoardClient WifiHotspotOffBoardClient WifiHotspotServer CAN SoA

3.3.2.4 WFHS-UC-REQ-407975/A-Kilometer Dependency condition Met WiFi hotspot default turned on

Actors	System
Pre-conditions	Vehicle kilometers is under Hotspot_Enablement_Kilometers_Dependency Hotspot enablement is OFF
Scenario Description	Vehicle kilometers surpass Hotspot_Enablement_Kilometer_Dependency (dependency is met).
Post-conditions	WifiHotspotServer turns hotspot enablement to ON.
List of Exception Use Cases	
Interfaces	WifiHotspotOnBoardClient WifiHotspotOffBoardClient WifiHotspotServer CAN SoA

3.3.2.5 WFHSv2-UC-REQ-283574/C-User turns Wi-Fi Hotspot On

Actors	User System Cell phone
Pre-conditions	WifiHotspotServer is on

	Wi-Fi Hotspot enablement conditions as defined in WFHSv2-REQ-283564-Wi-Fi Hotspot enablement condition checks are met Wi-Fi Hotspot is off
Scenario Description	User turns the Wi-Fi Hotspot on through WifiHotspotOnBoardClient display or backend application such as the mobile app.
Post-conditions	Wi-Fi Hotspot is on and available Vehicle occupant may now connect a device to the Wi-Fi Hotspot WifiHotspotOnBoardClient shall update as defined in the HMI spec (refer to WFHSv2-REQ-283641-HMI Specification References). Backend application display shall update to reflect the update.
List of Exception Use Cases	WFHSv2-UC-REQ-454858-E4 Wi-Fi Hotspot configuration through WifiHotspotOnBoardClient fails WFHSv2-UC-REQ-454859-E11 WifiHotspotOnBoardClient update failed
Interfaces	WifiHotspotOnBoardClient WifiHotspotServer CAN SoA

3.3.2.6 WFHSv2-UC-REQ-283746/C-User turns Wi-Fi Hotspot Off

Actors	User System Cell phone
Pre-conditions	Hotspot on Up to Number_Hotspot_Connected_Devices devices connected to the Wi-Fi Hotspot
Scenario Description	User turns Wi-Fi Hotspot off through WifiHotspotOnBoardClient display or backend application such as the mobile app.
Post-conditions	Wi-Fi Hotspot is off All connected devices become disconnected from Wi-Fi Hotspot WifiHotspotOnBoardClient display shall update as defined in the HMI spec (refer to WFHSv2-REQ-283641-HMI Specification References). Backend application display shall update to reflect the update.
List of Exception Use Cases	WFHSv2-UC-REQ-454858-E4 Wi-Fi Hotspot configuration through WifiHotspotOnBoardClient fails WFHSv2-UC-REQ-454859-E11 WifiHotspotOnBoardClient update failed
Interfaces	WifiHotspotOnBoardClient WifiHotspotServer CAN SoA

3.3.2.7 WFHSv2-UC-REQ-283576/C-User attempts to turn the Wi-Fi Hotspot on when the Wi-Fi Hotspot enablement conditions are not met

Actors	User System Cell phone
Pre-conditions	WifiHotspotServer is on Wi-Fi Hotspot is off Wi-Fi Hotspot enablement conditions are not met (refer to WFHSv2-REQ-283564-Wi-Fi Hotspot enablement conditions check)
Scenario Description	User turns Wi-Fi Hotspot on through WifiHotspotOnBoardClient or backend application such as the mobile app.
Post-conditions	Wi-Fi Hotspot is turned to on-disabled Devices may not connect to Wi-Fi Hotspot

	WifiHotspotOnBoardClient shall update as defined in the HMI spec (refer to WFHSv2-REQ-283641-HMI Specification References). Backend application display shall update to reflect the update.
List of Exception Use Cases	WFHSv2-UC-REQ-454858-E4 Wi-Fi Hotspot configuration through WifiHotspotOnBoardClient fails WFHSv2-UC-REQ-454859-E11 WifiHotspotOnBoardClient update failed
Interfaces	WifiHotspotOnBoardClient WifiHotspotServer CAN SoA

3.3.2.8 WFHSv2-UC-REQ-283577/C-Wi-Fi Hotspot in On-disabled state when the Wi-Fi Hotspot enablement conditions become met

Actors	System Cell phone
Pre-conditions	Wi-Fi Hotspot is on-disabled Wi-Fi Hotspot enablement conditions as defined in WFHSv2-REQ-283564-Wi-Fi Hotspot enablement condition checks are not met
Scenario Description	Wi-Fi Hotspot enablement conditions become met
Post-conditions	Wi-Fi Hotspot is automatically turned to on Vehicle occupant may now connect a device to the Wi-Fi Hotspot WifiHotspotOnBoardClient display shall update as defined in the HMI spec (refer to WFHSv2-REQ-283641-HMI Specification References). Backend application display shall update to reflect the update.
List of Exception Use Cases	WFHSv2-UC-REQ-454859-E11 WifiHotspotOnBoardClient update failed
Interfaces	WifiHotspotOnBoardClient WifiHotspotServer CAN SoA

3.3.2.9 WFHSv2-UC-REQ-283579/C-Wi-Fi Hotspot is on when the Wi-Fi Hotspot enablement conditions become not met

Actors	System Cell phone
Pre-conditions	Wi-Fi Hotspot is on Wi-Fi Hotspot enablement conditions as defined in WFHSv2-REQ-283564-Wi-Fi Hotspot enablement condition checks are met Up to Number_Hotspot_Connected_Devices devices connected to the Wi-Fi Hotspot
Scenario Description	Hotspot enablement conditions are no longer met
Post-conditions	Wi-Fi Hotspot is automatically turned to on-disabled All connected devices are disconnected WifiHotspotOnBoardClient shall update as defined in the HMI spec (refer to WFHSv2-REQ-283641-HMI Specification References) Backend application display shall update to reflect the update.
List of Exception Use Cases	WFHSv2-UC-REQ-454859-E11 WifiHotspotOnBoardClient update failed
Interfaces	WifiHotspotOnBoardClient WifiHotspotServer CAN

	SoA

3.3.2.10 WFHSv1-UC-REQ-191930/A-E3 Wi-Fi Hotspot command through mobile app fails

Actors	User Mobile app
Pre-conditions	Same as normal use case
Scenario Description	The user's command through mobile app fails due to command/control failures defined in the Overview section of this document
Post-conditions	Page shows pending request until timed out Mobile app page indicates an unsuccessful attempt and returns to previous display
List of Exception Use Cases	
Interfaces	Mobile app Ford infrastructure Carrier infrastructure

3.3.2.11 WFHSv2-UC-REQ-454858/A-E4 Wi-Fi Hotspot configuration through WifiHotspotOnBoardClient fails

Actors	User WifiHotspotOnBoardClient WifiHotspotServer
Pre-conditions	Same as normal use case
Scenario Description	The user's configuration through the WifiHotspotOnBoardClient failed due to command/control failures defined in the Overview section of this document
Post-conditions	Old Hotspot settings are restored and displayed to the customer
List of Exception Use Cases	
Interfaces	WifiHotspotOnBoardClient WifiHotspotServer CAN SoA

3.3.2.12 WFHSv2-UC-REQ-454859/A-E11 WifiHotspotOnBoardClient update failed

Actors	User System Cell phone
Pre-conditions	Same as normal use case
Scenario Description	Wi-Fi Hotspot settings are updated by WifiHotspotServer or carrier and WifiHotspotOnBoardClient update failed due to command/control failures defined in the Overview section of this document
Post-conditions	WifiHotspotOnBoardClient displays old settings
List of Exception Use Cases	
Interfaces	Ford infrastructure Carrier infrastructure Mobile app WifiHotspotServer WifiHotspotOnBoardClient CAN SoA

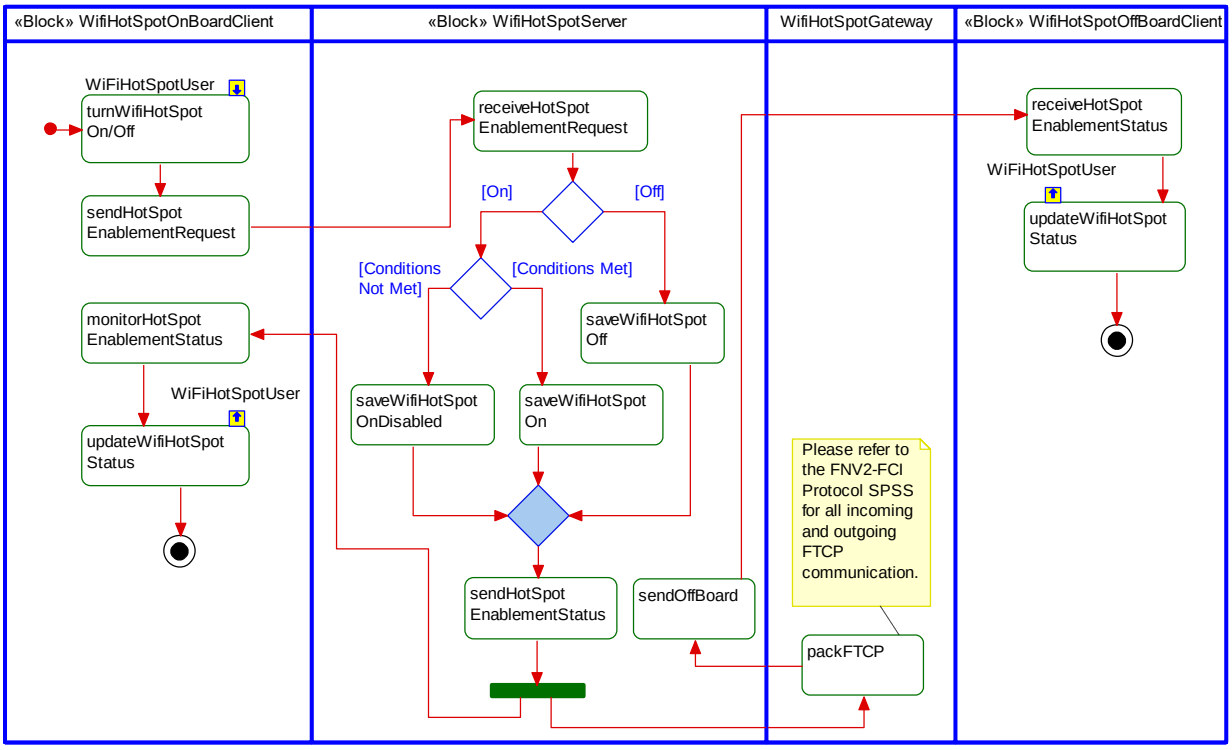
3.3.2.13 WFHSv1-UC-REQ-191974/A-E12 Mobile app update failed

Actors	User System Cell phone
Pre-conditions	Same as normal use case
Scenario Description	Wi-Fi Hotspot settings are updated by carrier, and mobile app update failed due to command/control failures defined in the Overview section of this document
Post-conditions	Mobile app WifiHotspotOnBoardClient displays old settings
List of Exception Use Cases	
Interfaces	Ford infrastructure Carrier infrastructure Mobile app

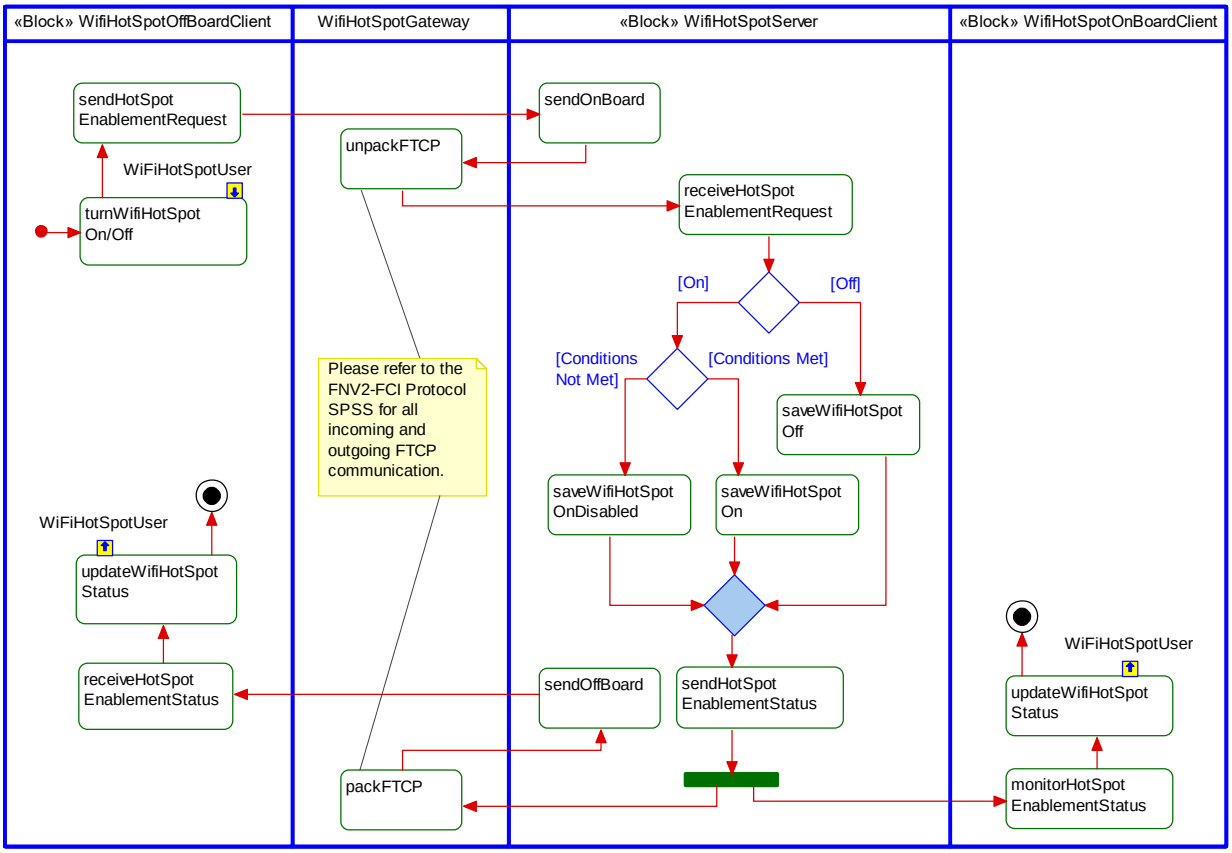
3.3.3 White Box Views

3.3.3.1 Activity Diagrams

3.3.3.1.1 WFHSv2-ACT-REQ-317275/A-User Turns Wi-Fi Hotspot On from WifiHotspotOnBoardClient

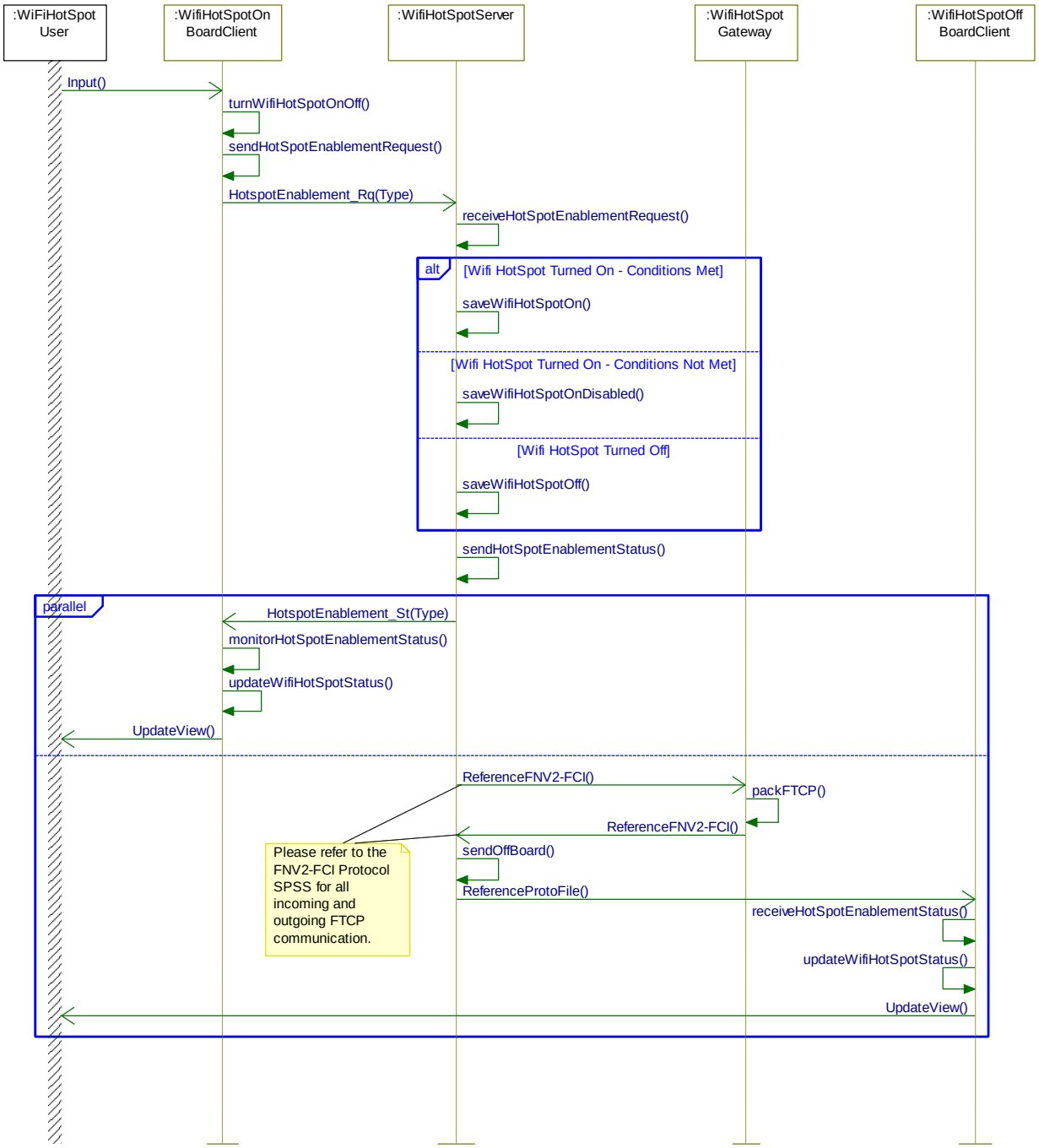


3.3.3.1.2 WFHSv2-ACT-REQ-317276/A-User Turns Wi-Fi Hotspot On from WifiHotspotOffBoardClient

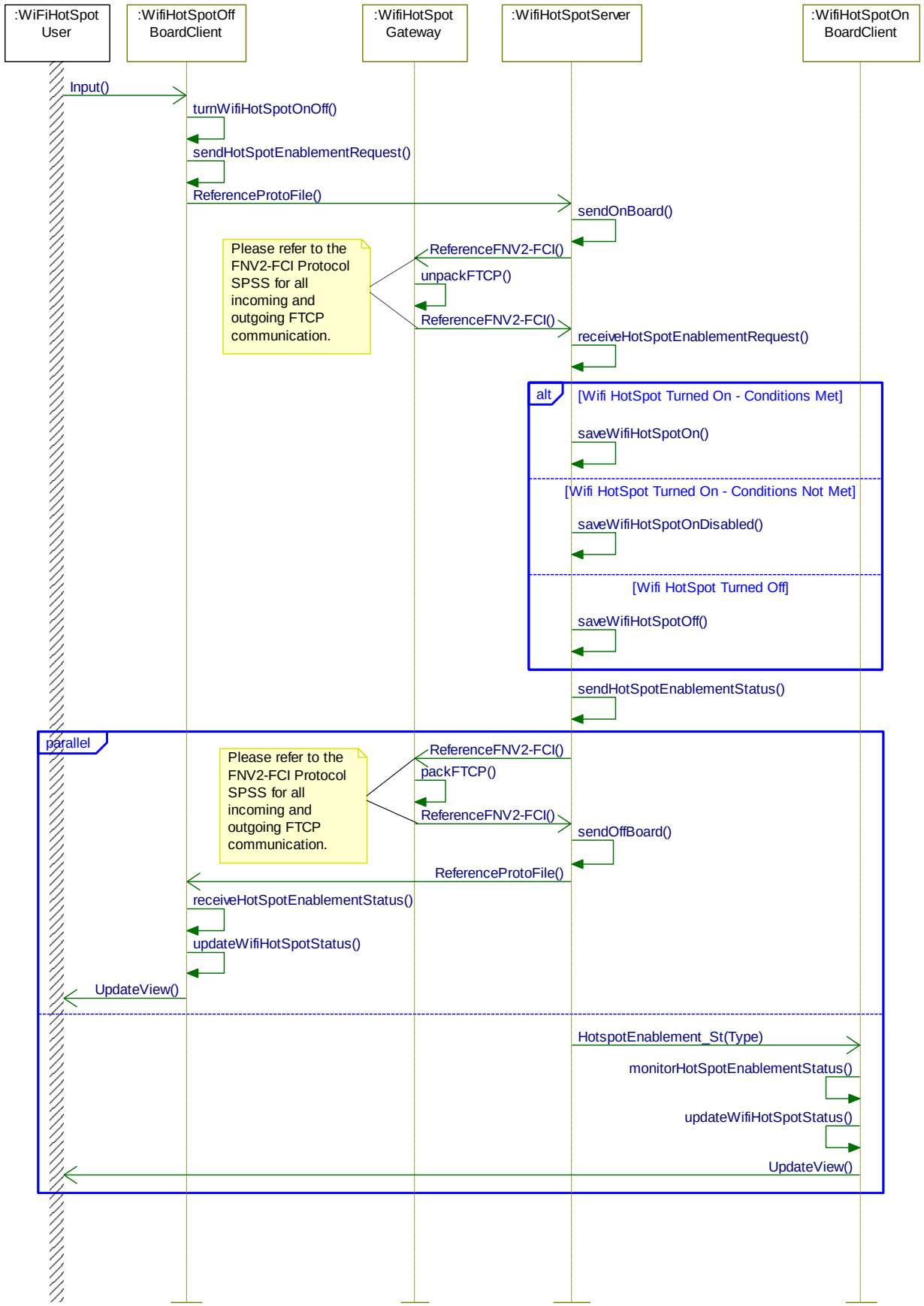


3.3.3.2 Sequence Diagrams

3.3.3.2.1 WFHSv2-SD-REQ-317513/A-User Turns Wi-Fi Hotspot On/Off from WifiHotspotOnBoardClient



3.3.3.2.2 WFHSv2-SD-REQ-317514/A-User Turns Wi-Fi Hotspot On/Off from WifiHotspotOffBoardClient



3.4 WFHSv2-FUN-REQ-274797/B-Managing SSID

The Wi-Fi Hotspot must have an SSID used to differentiate one WLAN from another. The SSID must be between 1-32 ASCII characters and may be configurable by the user from the in-vehicle WifiHotspotOnBoardClient or from the WifiHotspotOffBoardClient. The WifiHotspotOnBoardClient & WifiHotspotOffBoardClient shall be responsible for verifying that the customer input does not violate the SSID character length. Each WifiHotspotServer shall come with a default SSID.

If the user enters into a screen that displays the SSID, the WifiHotspotOnBoardClient shall transmit a Wi-Fi Info request to the WifiHotspotServer, and in turn, the WifiHotspotServer shall respond with the appropriate SSID and password characters. If the WifiHotspotServer receives a request from the WifiHotspotOffBoardClient, it shall receive and process a command/response/alert message.

3.4.1 Requirements

3.4.1.1 WFHS-REQ-162363/A-Assigning the SSID to each frequency band

The WifiHotspotServer shall assign the same SSID to both the 2.4 and 5 GHz band.

3.4.1.2 WFHSv2-REQ-399815/A-Generating the default SSID

Each WifiHotspotServer shall be delivered to Ford with a unique default SSID in the format below:

Default SSID	HotspotXXXX

The XXXX shall be four ASCII characters, randomly generated by the WifiHotspotServer. The same number generator used to generate the password may be used to generate the last four characters. Refer to WFHSv2-REQ-399814-Generating the initial password. The SSID shall also be updateable via EOL.

3.4.1.3 WFHSv2-REQ-283747/B-Displaying the SSID on the WifiHotspotOnBoardClient display

If the user enters into any screen that requires the WifiHotspotOnBoardClient to display the SSID characters, the WifiHotspotOnBoardClient shall send a request to the WifiHotspotServer to read the current SSID and password using the signal WifiInfo_Rq. Once the WifiHotspotOnBoardClient receives a response (WifiInfo_Rsp) from the WifiHotspotServer it shall populate the screen with the corresponding SSID, but keep the password hidden. Refer to WFHSv2-REQ-283753-Displaying the password on the WifiHotspotOnBoardClient display for more information on when to display the password. Refer to WFHSv2-REQ-283641-HMI Specification References. The following screen is an example WifiHotspotOnBoardClient screen.

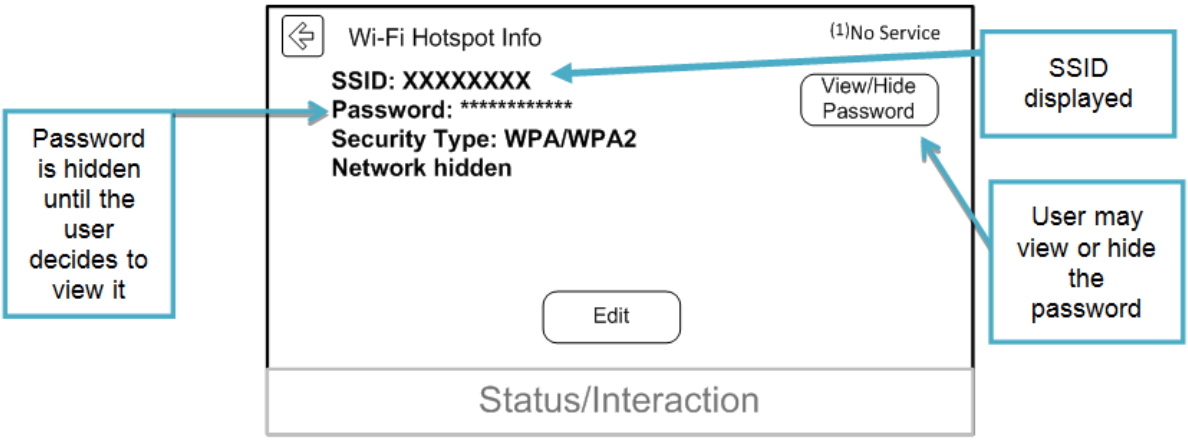


Figure. Screen Displaying the SSID and Password Characters

3.4.1.4 WFHSv2-REQ-283748/B-Keyboard used to edit the SSID through WifiHotspotOnBoardClient display

The Wi-Fi Hotspot SSID keyboard provided through the in-vehicle WifiHotspotOnBoardClient screen shall include only ASCII characters for all regions. Refer to WFHSv2-REQ-283641-HMI Specification References. The SSID keyboard shall inform the user of the appropriate SSID length (1-32 characters). The following screen is an example WifiHotspotOnBoardClient screen.

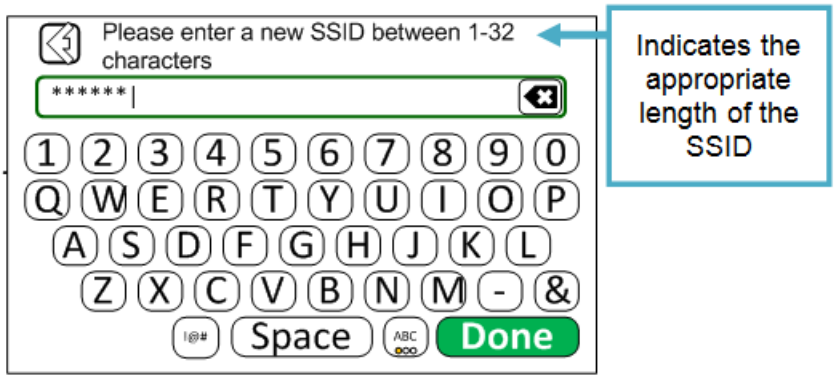


Figure. Wi-Fi Hotspot SSID Keyboard

3.4.1.5 WFHSv2-REQ-283749/B-Accepting and updating user SSID configurations

If the vehicle occupant updates the SSID through the WifiHotspotOnBoardClient the WifiHotspotOnBoardClient shall confirm the SSID is between 1-32 ASCII characters. The keyboard shall not allow the user to enter the SSID if it does not meet the required length. If the vehicle occupant has entered an SSID of the appropriate length the WifiHotspotOnBoardClient shall send this update to the WifiHotspotServer using the signal WifiInfo_Rq and wait for a response in the signal WifiInfo_Rsp. If the WifiHotspotServer sends back an unsuccessful response the WifiHotspotOnBoardClient shall notify the user and keep the user in the SSID keyboard screen. If the WifiHotspotServer sends back a successful response the WifiHotspotOnBoardClient shall notify the user and exit out of the keyboard screen.

If the vehicle occupant is on a screen that displays the SSID when the WifiHotspotOnBoardClient receives a WifiInfo_Rsp response = SSIDWritten, the WifiHotspotOnBoardClient shall request for the new data using WifiInfo_Rq = Read. Once the WifiHotspotOnBoardClient receives the updated SSID it shall reflect the update on the SSID screen.

Refer WFHSv2-REQ-283641-HMI Specification References. The following screens are example WifiHotspotOnBoardClient popups.

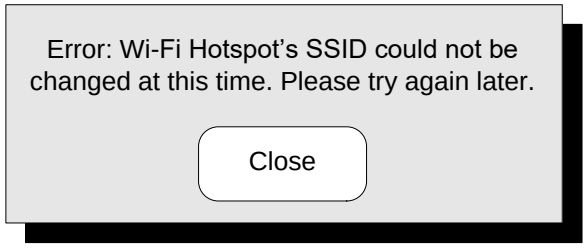


Figure. Unsuccessful SSID Update

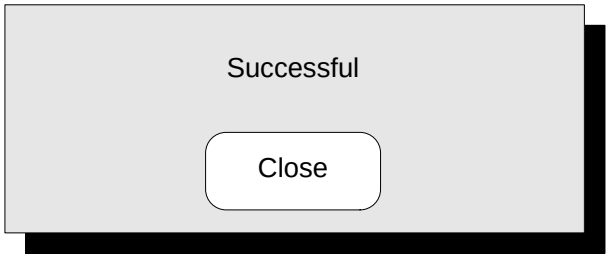


Figure. Successful SSID Update

3.4.1.6 WFHS-REQ-336815/A-Configurable Non-Correlated SSID Alerts

The WifiHotspotServer shall contain a configurable parameter (Non-Correlated_SSID_Alerts) which shall be used to determine whether or not it shall send non-correlated SSID alerts to the backend. This parameter shall have two states, Enable or Disable, and shall be defaulted to Disable. It shall be configurable at EOL as well as from the WifiHotspotOffBoardClient.

- If Non-Correlated_SSID_Alerts is set to Disable, the WifiHotspotServer shall NOT send any non-correlated SSID alerts to the backend. It shall still send correlated alerts in response to a command from the WifiHotspotOffBoardClient.
    - Example 1: if the WifiHotspotServer receives a request from the WifiHotspotOnBoardClient to change the SSID, the WifiHotspotServer shall NOT send an alert to the WifiHotspotOffBoardClient.
    - Example 2: if the WifiHotspotServer receives a request from the WifiHotspotOffBoardClient to change the SSID, the WifiHotspotServer SHALL send an alert to the WifiHotspotOffBoardClient once it updates the SSID.
- If Enablement_Alerts is set to Enable, the WifiHotspotServer shall send both non-correlated and correlated SSID alerts to the WifiHotspotOffBoardClient any time the SSID changes.

The requirements within the rest of this document assume Non-Correlated_SSID_Alerts is set to Enable, unless stated otherwise.

3.4.1.7 WFHS-REQ-315689/B-Informing the WifiHotspotOffBoardClient of an SSID change

The WifiHotspotServer shall send a non-correlated alert (and include the new SSID) to the WifiHotspotOffBoardClient any time the Wi-Fi Hotspot changes its SSID. This could be due to the following, but not limited to:

- User requests to change the SSID from the in-vehicle display,
- A Wi-Fi Hotspot reset.

If the WifiHotspotServer attempts to send an SSID update alert to the WifiHotspotOffBoardClient and does not receive an acknowledgement, it shall perform a retry strategy. If the WifiHotspotServer detects that it is not connected to the network at the time of attempting to send the alert, it shall store this alert and send it the next time the WifiHotspotServer connects to the network. The alert shall survive ignition cycles. If the Wi-Fi Hotspot SSID has since changed from the time of the initial attempt to send the alert, the WifiHotspotServer shall send the newest SSID to the WifiHotspotOffBoardClient once the network becomes available.

Example)

- The customer is parked in an area with no coverage.
- The customer changes the SSID to “Vehicle”.
- The WifiHotspotServer is unable to send this alert to the WifiHotspotOffBoardClient.
- The customer ignitions off the vehicle, returns the next day, changes the SSID to “Hotspot” and drives to an area with cellular coverage.
- The WifiHotspotServer shall send the SSID alert to the WifiHotspotOffBoardClient to inform that it has been changed to “Hotspot”.

3.4.1.8 WFHS-REQ-315690/A-SSID encryption

If the WifiHotspsotServer is required to transmit the SSID to the WifiHotspotOffBoardClient, it shall send the SSID with encryption.

Encryption type shall be SyncP.

3.4.1.9 WFHS-REQ-315691/B-Authorization dependency on SSID updates from the WifiHotspotOffBoardClient

The WifiHotspotServer shall ONLY be allowed to send SSID update alerts or receive and process SSID update commands to/from the WifiHotspotOffBoardClient if the following conditions are met:

- Vehicle Connectivity is ON, AND
- Cellular Connectivity is ON, AND
- VehicleData is ON, AND
- Vehicle is authorized.

If the above conditions are NOT met, the WifiHotspotServer shall ignore any commands from the WifiHotspotOffBoardClient to change the SSID and shall also NOT send any alerts to the WifiHotspotOffBoardClient if the SSID changes.

All requirements within this document which mention the WifiHotspotServer receiving or sending SSID update command/response/alerts to/from the WifiHotspotOffBoardClient shall assume the above conditions are met and the WifiHotspotServer is allowed to, unless it is stated otherwise.

3.4.1.10 WFHSv2-REQ-336816/B-SSID update request from WifiHotspotOnBoardClient

If the WifiHotspotServer receives a request from the WifiHotspotOnBoardClient to change the SSID (WifiInfo_Rq), the WifiHotspotServer shall update and store the new SSID. Once the WifiHotspotServer has successfully updated the SSID, it shall transmit a successful response to the WifiHotspotOnBoardClient (WifiInfo_Rsp). In case of an unsuccessful attempt, the WifiHotspotServer shall send an unsuccessful response. The WifiHotspotServer shall also send the new SSID to the WifiHotspotOffBoardClient in a non-correlated alert.

3.4.1.11 WFHS-REQ-191630/A-Disconnecting clients due to an SSID update

If the WifiHotspotServer changes the hotspot's SSID, the WifiHotspotServer shall gracefully disconnect all connected clients. Each user shall be required to search for the Wi-Fi Hotspot's new SSID on their client device and enter in the password in order to re-connect.

3.4.1.12 WFHS-REQ-315692/C-Request from WifiHotspotOffBoardClient to change the SSID

The customer shall also have the ability to change the SSID from outside the vehicle through Ford-provided applications such as the mobile app or fleet portal, for example. The request shall be sent to the WifiHotspotServer by the WifiHotspotOffBoardClient through FTCP command/response/alert messages.

If the WifiHotspotServer receives a request from the WifiHotspotOffBoardClient to change the SSID (Wi-Fi Hotspot SSID FTCP command), the WifiHotspotServer shall:

- Send a successful acknowledgement response, assuming the request is valid and the WifiHotspotServer is allowed to process it (example of an invalid request could be an invalid SSID length),
- Update and save the new SSID to memory,
- Set the Hotspot Credential update bit (only if the bus/network is awake and the WifiHotspotServer is transmitting on it, this is not a wake-up event),
- Respond to the WifiHotspotOffBoardClient with a correlated alert and indicate the new SSID in the alert, and
- Configure the Wi-Fi Hotspot to use the new SSID (assuming the Wi-Fi chipset is powered up),

If the WifiHotspotServer is unable to accept the command due to either of the following scenarios:

- The request was bad/invalid or
- The WifiHotspotServer is in extended diagnostics mode,

the WifiHotspotServer shall immediately respond with an unsuccessful response, indicating that the command failed because it is not permitted.

If the WifiHotspotServer attempts to process the request but fails, the WifiHotspotServer shall send a failure alert and indicate that the command failed due to a WifiHotspotServer internal failure.

If the WifiHotspotServer receives a request to update the SSID to a value that is already being used, the WifiHotspotServer shall still respond with a successful response and alert. For example, if the WifiHotspotOffBoardClient and the WifiHotspotServer became out of sync, the mobile app could show an old SSID, for example "Vehicle". However, the WifiHotspotServer is currently using the SSID "Hotspot". If the customer requests to change the SSID to "Hotspot", the WifiHotspotServer shall send a successful response, then send an alert, so the mobile app can update its display accordingly.

The WifiHotspotServer shall be able to process an SSID update request, regardless if the Wi-Fi chipset is powered up or not. The WifiHotspotServer shall only be required to update and store the new SSID in memory in order to process the request and send an alert.

Example)

- The Ignition is Off, the WifiHotspotServer is in low power registered mode and the SSID is set to "Vehicle".
- The customer sent a request from the mobile app to change it to "Hotspot".

- Assuming the SSID request requires an SMS wake up, the WifiHotspotServer wakes up and connects to the WifiHotspotOffBoardClient
- The WifiHotspotServer receives the new SSID request from the WifiHotspotOffBoardClient, but the Wi-Fi chipset is powered off.
- The WifiHotspotServer shall send a successful response, update its memory to “Hotspot” and send an alert to the WifiHotspotOffBoardClient.

3.4.1.13 WFHS-REQ-315693/B-Setting the SSID update bit

If the WifiHotspotServer changes the SSID due to a request from the WifiHotspotOffBoardClient, the WifiHotspotServer shall set an SSID update bit using the signal NewHotSpotCredentials_St (assuming the WifiHotspotServer is transmitting on the bus/network at the time of the SSID change). This bit shall remain set until any of the following scenarios occur:

a. the WifiHotspotServer receives a request from the WifiHotspotOnBoardClient for the current SSID through the signal WifiInfo_Rq,
b. The WifiHotspotServer transitions to low power registered mode (refer to WFHSv2-REQ-283554-Shutting down and powering up the Wi-Fi chipset and WifiHotspotServer) or
c. the WifiHotspotServer performs a Wi-Fi Hotspot reset (refer to WFHSv2-REQ-283559-Wi-Fi Hotspot reset settings)

at which point the WifiHotspotServer shall unset the bit.

3.4.1.14 WFHS-REQ-315694/B-Updating the SSID while the user is in the screen

If the user is in a screen that displays the Wi-Fi Hotspot SSID (refer to WFHSv2-REQ-283641-HMI Specification References) when the WifiHotspotServer indicates there is an update by setting the SSID update bit (signal NewHotSpotCredentials_St), the WifiHotspotOnBoardClient shall transmit another request for the current SSID (WifiInfo_Rq = Read). Once the WifiHotspotOnBoardClient receives the new SSID, it shall update the screen to show the new information.

If the user is NOT in the screen that displays the SSID when the WifiHotspotServer indicates there is an update, the WifiHotspotOnBoardClient shall ignore the update bit and not perform any additional actions.

3.4.1.15 WFHS-REQ-315695/A-Receiving multiple SSID requests

It is possible the WifiHotspotServer could receive an SSID update request from the WifiHotspotOnBoardClient and WifiHotspotOffBoardClient near the same time. The WifiHotspotServer shall process the requests in FIFO order. It shall not process the next request until it has finished processing and responding to the first request.

For example:

- The WifiHotspotServer received a request from the WifiHotspotOffBoardClient to change the SSID from “Wi-Fi” to “Hotspot” at 1:00:00
- The WifiHotspotServer received another request from the WifiHotspotOnBoardClient to change the SSID to “Vehicle” at 1:00:01
- The WifiHotspotServer shall:
    - Initiate the first request and send a successful response to the WifiHotspotOffBoardClient,
    - Update the SSID to “Hotspot”,
    - Send an alert to the WifiHotspotOffBoardClient to inform it of the successful update and include the new SSID,
    - Set the update bit to inform the WifiHotspotOnBoardClient of the new SSID,
    - Initiate the second request and update the SSID to “Vehicle”,
    - Respond to the WifiHotspotOnBoardClient with the Success response, and
    - Send an alert to the WifiHotspotOffBoardClient of the new update and include the new SSID.

3.4.1.16 WFHS-REQ-315696/A-Request from the WifiHotspotOffBoardClient for the current SSID

The WifiHotspotOffBoardClient shall have the ability to query the CURRENT SSID, in case it does not have a record of the last known value. Therefore, if the WifiHotspotServer receives an FTCP request for the SSID, the WifiHotspotServer shall respond with the current, stored SSID. If the WifiHotspotServer is unable to detect the stored SSID or if it is not allowed to respond, it shall send a failure response.

3.4.2 Use Cases

3.4.2.1 WFHSv2-UC-REQ-283780/C-User changes SSID from WifiHotspotOnBoardClient

Actors	User System
Pre-conditions	WifiHotspotServer is on SSID/password screen is not driver restricted Up to Number_Hotspot_Connected_Devices devices connected to the hotspot User is in the SSID edit screen
Scenario Description	User enters new SSID from WifiHotspotOnBoardClient that is between 1-32 characters long
Post-conditions	WifiHotspotOnBoardClient shall display a successful message and the new SSID shall be displayed on the appropriate screen All connected devices are disconnected Backend application display shall update to reflect the update
List of Exception Use Cases	WFHSv2-UC-REQ-283751-E5 User attempts to view SSID/password through WifiHotspotOnBoardClient while under driver restriction WFHSv1-UC-REQ-191934-E7 User attempts to enter SSID not between 1-32 characters long WFHSv2-UC-REQ-454858-E4 Wi-Fi Hotspot configuration through WifiHotspotOnBoardClient fails WFHSv2-UC-REQ-454897-E6 SSID update from WifiHotspotOnBoardClient failed
Interfaces	WifiHotspotServer WifiHotspotOnBoardClient CAN SoA

3.4.2.2 WFHSv2-UC-REQ-283751/C-E5 User attempts to view SSID/password through WifiHotspotOnBoardClient while under driver restriction

Actors	Vehicle occupant WifiHotspotServer In-vehicle WifiHotspotOnBoardClient
Pre-conditions	User is viewing the SSID/password screen on the WifiHotspotOnBoardClient display SSID/password screen is not under driver restriction
Scenario Description	Vehicle occupant drives the vehicle over a certain speed and the screen is placed under driver restriction
Post-conditions	The WifiHotspotOnBoardClient shall disable the toggle control and mask the password. Any attempts to turn it on shall give the restriction pop-up (as defined in H21). WifiHotspotOnBoardClient shall follow the driver restriction (H21j) (Refer to WFHSv2-REQ-283641-HMI Specification References)
List of Exception Use Cases	
Interfaces	WifiHotspotOnBoardClient CAN SoA PCM

3.4.2.3 WFHSv2-UC-REQ-454897/A-E6 SSID update from WifiHotspotOnBoardClient failed

Actors	User System
Pre-conditions	Same as normal use case

Scenario Description	User enters new SSID from WifiHotspotOnBoardClient that is between 1-32 characters long but the WifiHotspotServer was unable to successfully change the SSID
Post-conditions	An error message is displayed to the user The SSID is not changed
List of Exception Use Cases	
Interfaces	WifiHotspotServer WifiHotspotOnBoardClient CAN SoA

3.4.2.4 WFHSv1-UC-REQ-191934/A-E7 User attempts to enter SSID not between 1-32 characters long

Actors	User System Cell phone
Pre-conditions	Same as normal use case
Scenario Description	User types an SSID into the keyboard on the WifiHotspotOnBoardClient that is longer than 32 characters or less than 1 character
Post-conditions	Keyboard does not allow the user to enter the request The SSID is not changed
List of Exception Use Cases	
Interfaces	WifiHotspotOnBoardClient

3.4.2.5 WFHS-UC-REQ-315701/B-User changes SSID from WifiHotspotOffBoardClient when Vehicle is Off

Actors	User System
Pre-conditions	WifiHotspotServer is off
Scenario Description	User enters new SSID from the Ford backend application such as the mobile app
Post-conditions	The backend application shall show pending until the WifiHotspotServer turns on and processes the request, at which point the user shall be informed of a successful update.
List of Exception Use Cases	
Interfaces	WifiHotspotServer WifiHotspotOffBoardClient

3.4.2.6 WFHS-UC-REQ-315702/B-User changes SSID from WifiHotspotOffBoardClient when Vehicle is ON

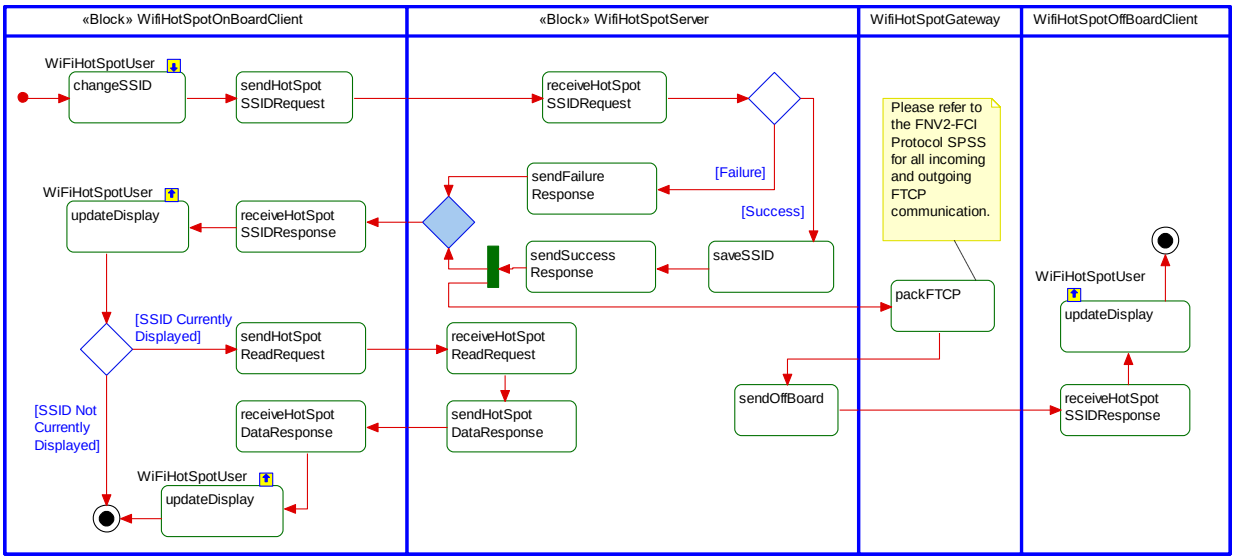
Actors	User System
Pre-conditions	WifiHotspotServer is On
Scenario Description	User enters new SSID from the Ford backend application such as the mobile app
Post-conditions	The backend application shall show pending and then show the successful response message. If the customer is on the in-vehicle HMI screen which shows the SSID, the SSID shall automatically update

List of Exception Use Cases	
Interfaces	WifiHotspotServer WifiHotspotOffBoardClient WifiHotspotOnBoardClient CAN SoA

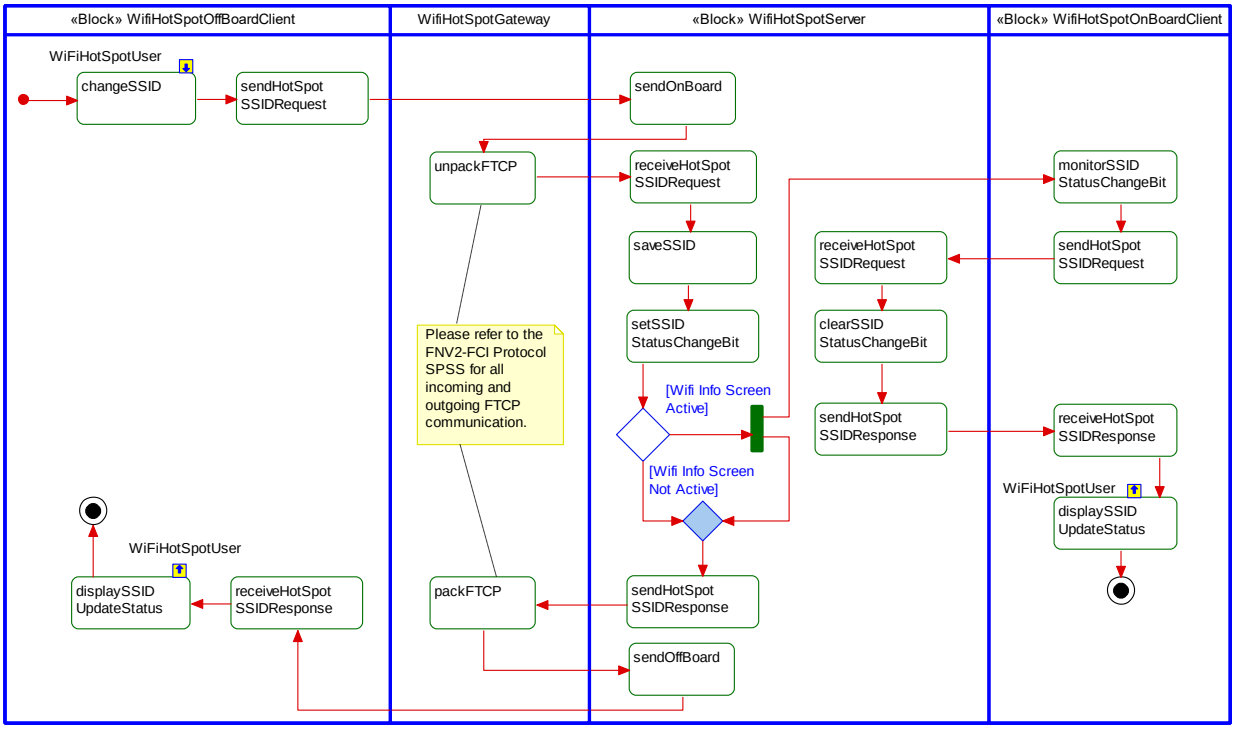
3.4.3 White Box Views

3.4.3.1 Activity Diagrams

3.4.3.1.1 WFHSv2-ACT-REQ-317273/A-User Changes SSID from WifiHotspotOnBoardClient

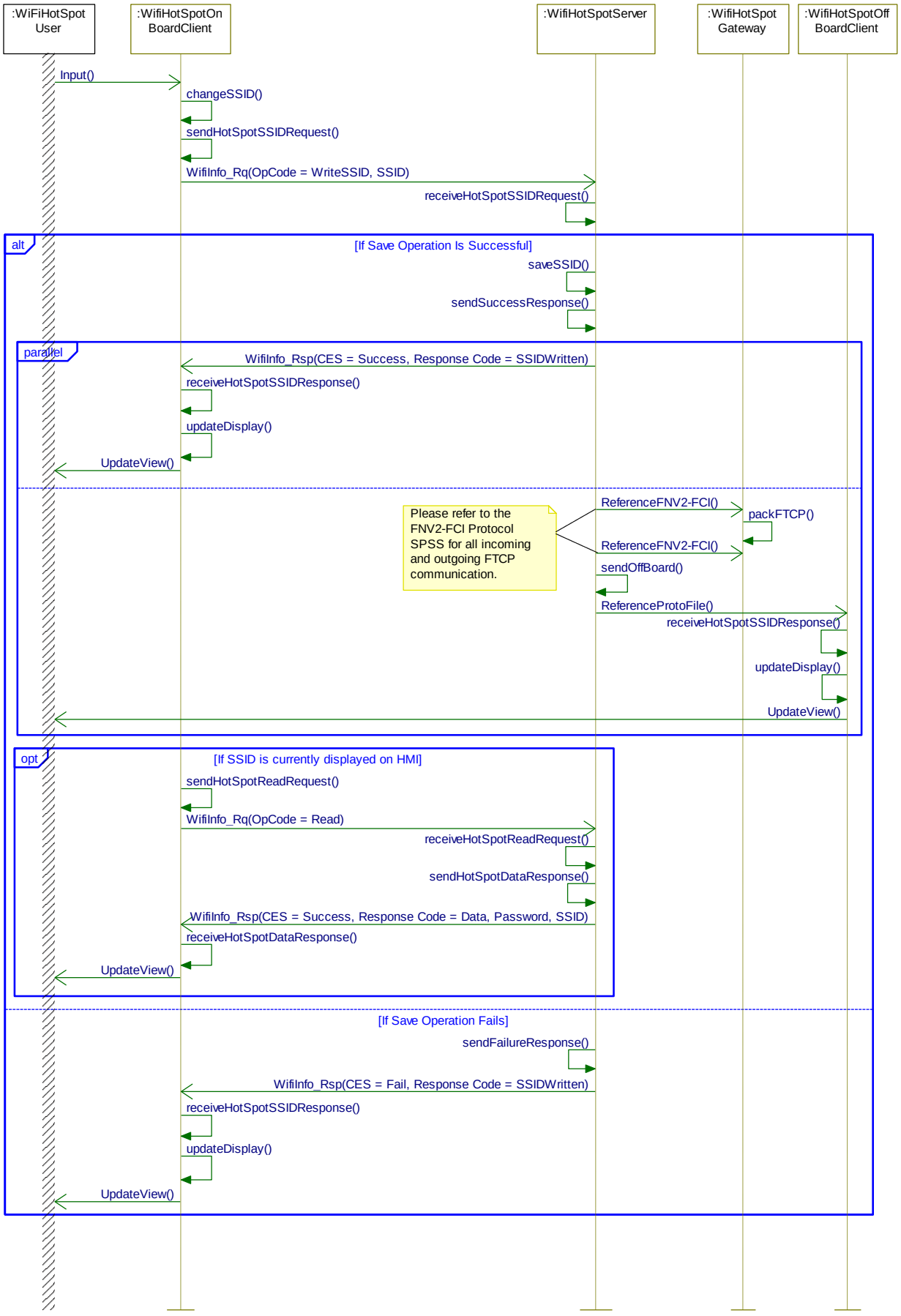


3.4.3.1.2 WFHSv2-ACT-REQ-317274/A-User Changes SSID from WifiHotspotOffBoardClient

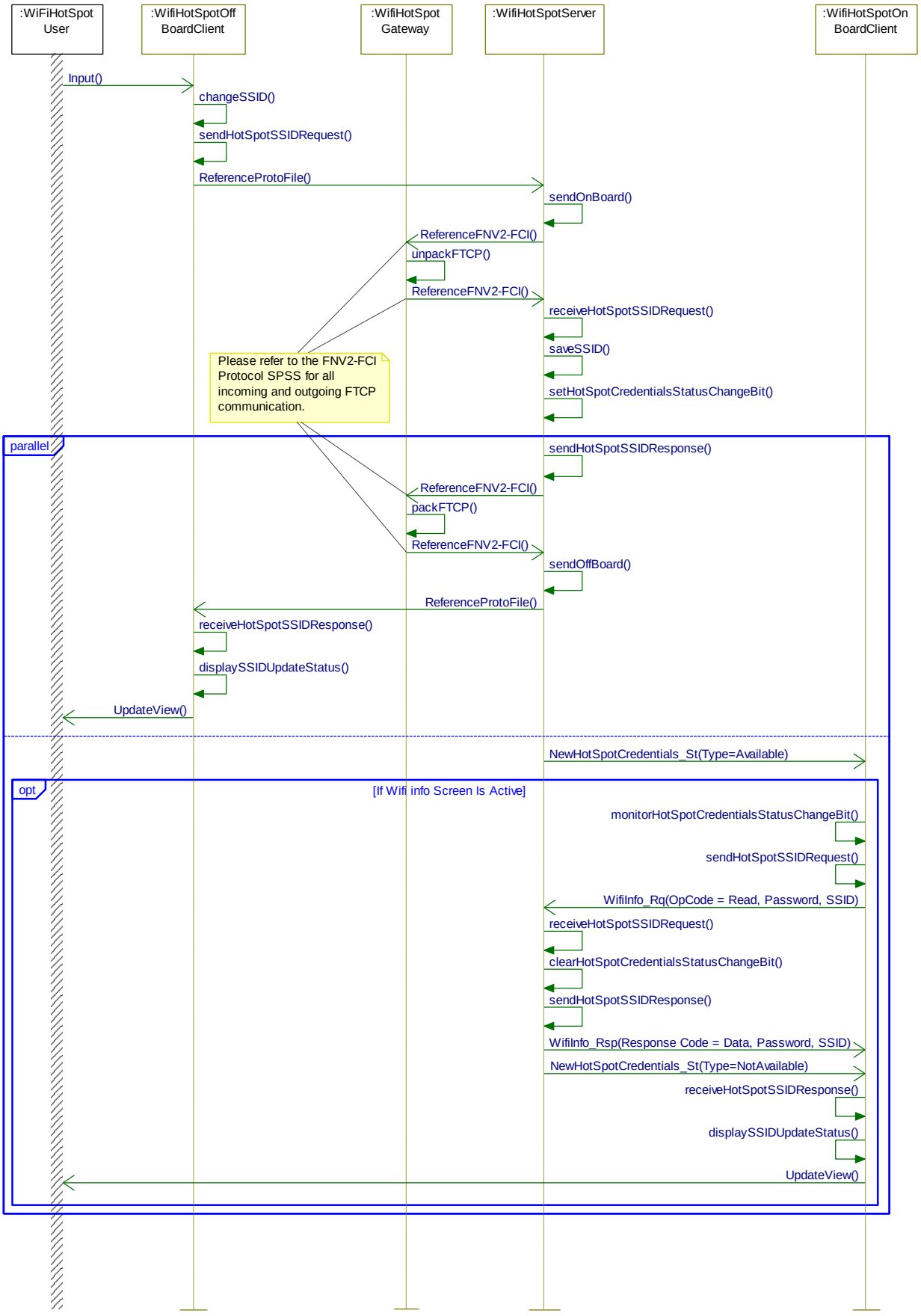


3.4.3.2 Sequence Diagrams

3.4.3.2.1 WFHSv2-SD-REQ-317511/A-User Changes SSID from WifiHotspotOnBoardClient


:WiFiHotSpot User
:WifiHotSpotOn BoardClient
:WifiHotSpotServer
:WifiHotSpot Gateway
:WifiHotSpotOff BoardClient
Input()
changeSSID()
sendHotSpotSSIDRequest()
WifiInfo_Rq(OpCode = WriteSSID, SSID)
receiveHotSpotSSIDRequest()
alt
[If Save Operation Is Successful]
saveSSID()
sendSuccessResponse()
parallel
WifiInfo_Rsp(CES = Success, Response Code = SSIDWritten)
receiveHotSpotSSIDResponse()
updateDisplay()
UpdateView()
ReferenceFNV2-FCI()
packFTCP()
Please refer to the FNV2-FCI Protocol SPSS for all incoming and outgoing FTCP communication.
ReferenceFNV2-FCI()
sendOffBoard()
ReferenceProtoFile()
receiveHotSpotSSIDResponse()
updateDisplay()
UpdateView()
opt
[If SSID is currently displayed on HMI]
sendHotSpotReadRequest()
WifiInfo_Rq(OpCode = Read)
receiveHotSpotReadRequest()
sendHotSpotDataResponse()
WifiInfo_Rsp(CES = Success, Response Code = Data, Password, SSID)
receiveHotSpotDataResponse()
UpdateView()
[If Save Operation Fails]
sendFailureResponse()
WifiInfo_Rsp(CES = Fail, Response Code = SSIDWritten)
receiveHotSpotSSIDResponse()
updateDisplay()
UpdateView()

3.4.3.2.2 WFHSv2-SD-REQ-317512/A-User Changes SSID from WifiHotspotOffBoardClient



3.5 WFHSv2-FUN-REQ-274798/B-Managing Password

The Wi-Fi Hotspot shall always be password protected to provide security to the network. The WifiHotspotServer shall come equipped with a randomly generated 12 ASCII character password. Users may view and change the password on the in-vehicle WifiHotspotOnBoardClient or WifiHotspotOffBoardClient. The password may be changed, but it must be 8-63 ASCII characters, and the WifiHotspotOnBoardClient and WifiHotspotOffBoardClient shall be responsible for verifying that the customer input does not violate this password character length.

If the user enters a screen that allows the password to be displayed, the WifiHotspotOnBoardClient shall transmit a Wi-Fi Info request to the WifiHotspotServer, and in turn, the WifiHotspotServer shall respond with the appropriate SSID and password characters. If the WifiHotspotServer receives a request from the WifiHotspotOffBoardClient, it shall receive and process a command/response/alert message.

3.5.1 Requirements

3.5.1.1 WFHS-REQ-191598/A-Assigning the password to each frequency band

The WifiHotspotServer shall assign the same password to both the 2.4 and 5 GHz band.

3.5.1.2 WFHSv2-REQ-399814/A-Generating the initial password

Each WifiHotspotServer shall be delivered to Ford with a password created for its hotspot. Each WifiHotspotServer shall randomly generate and store a 12 ASCII character string for its first password. The generated passwords shall be created using a quality random number generator. The supplier shall meet the requirements defined in A51t_Supplier_Feed_Specification_080.pdf spec, section 1.9.9 Requirements for Key Generation. Each password that the WifiHotspotServer randomly generates for the hotspot to use shall not include the following characters due to their similar appearance:

- Lowercase “l” (example: lincoln)
- Capital “I” (example: Ink)
- Capital “O” (example: Ocean)
- Lowercase “o” (example: ocean)
- Number “1” (number one)
- Number “0” (number zero)
- Vertical bar “|”
- Space

Therefore, the WifiHotspotServer shall implement an algorithm that can exclude these characters while generating the password.

3.5.1.3 WFHSv2-REQ-283753/C-Displaying the password on the WifiHotspotOnBoardClient display

If the user enters into any screen that requires the WifiHotspotOnBoardClient to display the password characters, the WifiHotspotOnBoardClient shall send a request to the WifiHotspotServer to read the current SSID and password using the signal WifiInfo_Rq. Once the WifiHotspotOnBoardClient receives a response (WifiInfo_Rsp) from the WifiHotspotServer it shall populate the screen with the corresponding SSID, but keep the password hidden per the rules defined in H21 6.2.3 Private Information. Masked password shall display a length of 12 characters so the true length of the password is not displayed while hidden. The screen shall provide the customer with a way to view and hide the password. The password shall always be hidden until the customer manually requests to view it. Should the customer choose to display the password, the WifiHotspotOnBoardClient shall display it until either the customer chooses to hide the password or exits the screen. The WifiHotspotOnBoardClient shall not store the password. Refer to WFHSv2-REQ-283641-HMI Specification References. The screen below is an example WifiHotspotOnBoardClient screen.

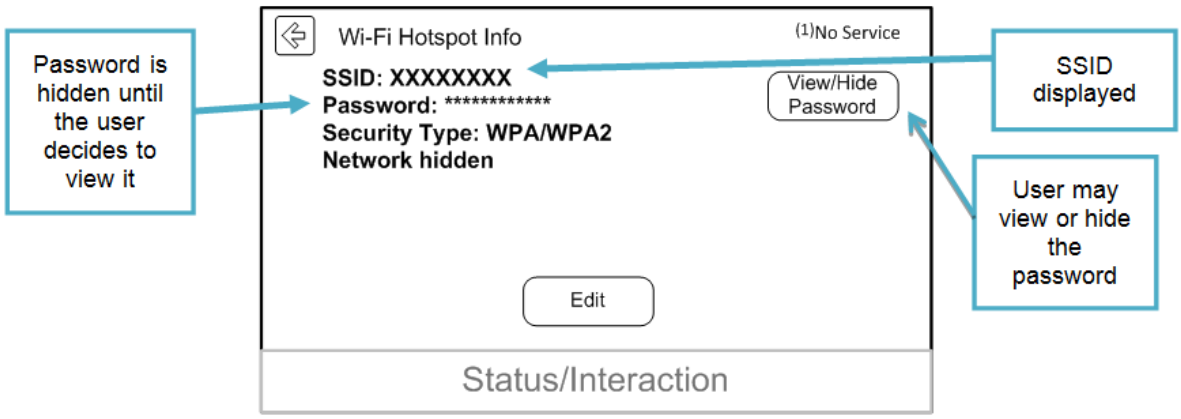


Figure. Screen Displaying the SSID and Password Characters

3.5.1.4 WFHSv2-REQ-283781/A-Hiding the password while vehicle is in Valet Mode

If the vehicle is in Valet Mode the WifiHotspotOnBoardClient shall hide the password and NOT allow the password to be viewable in the in-vehicle WifiHotspotOnBoardClient. If the vehicle is NOT in Valet Mode the password may be viewed upon the vehicle occupant's request (refer to WFHSv2-REQ-283753-Displaying the password on the WifiHotspotOnBoardClient display).

3.5.1.5 WFHSv2-REQ-454898/A-Reporting the SSID and password

If the WifiHotspotServer receives a request from the WifiHotspotOnBoardClient to read the current SSID and password (WifiInfo_Rq), the WifiHotspotServer shall transmit the SSID and password characters using the signal WifiInfo_Rsp.

Note: the Wi-Fi Hotspot password (WifiInfo_Rsp) shall not be routed out through the gateway to the OBD-II connector.

3.5.1.6 WFHSv2-REQ-283755/B-Keyboard used to edit the password through WifiHotspotOnBoardClient display

The Wi-Fi Hotspot password keyboard provided through the in-vehicle WifiHotspotOnBoardClient screen shall include only ASCII characters for all regions. Refer to WFHSv2-REQ-283641-HMI Specification References. The password keyboard shall inform the user of the appropriate password lengths (8-63 characters). The following screen is an example WifiHotspotOnBoardClient screen.

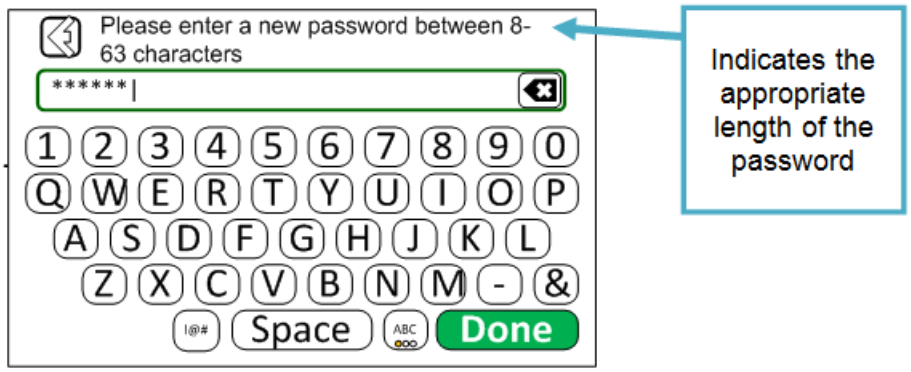


Figure. Wi-Fi Hotspot Password Keyboard

3.5.1.7 WFHSv2-REQ-283756/B-Accepting and updating user password configurations

If the vehicle occupant updates the password through the WifiHotspotOnBoardClient, the WifiHotspotOnBoardClient shall confirm the password is between 8-63 characters. The keyboard shall not allow the user to enter the password if it does not meet the required length. If the vehicle occupant has entered a password of the appropriate length the

WifiHotspotOnBoardClient shall send this update to the WifiHotspotServer using the signal WifiInfo_Rq and wait for a response in the signal WifiInfo_Rsp. If the WifiHotspotServer sends back an unsuccessful response the WifiHotspotOnBoardClient shall notify the user and keep the user in the password keyboard screen. If the WifiHotspotServer sends back a successful response the WifiHotspotOnBoardClient shall notify the user and exit out of the keyboard screen.

If the vehicle occupant is on a screen that displays the password when the WifiHotspotOnBoardClient receives a WifiInfo_Rsp response = PasswordWritten, the WifiHotspotOnBoardClient shall request for the new data using WifiInfo_Rq = Read. Once the WifiHotspotOnBoardClient receives the updated password it shall reflect the update on the password screen.

Refer to WFHSv2-REQ-283641-HMI Specification References. The following screens are example WifiHotspotOnBoardClient popups.

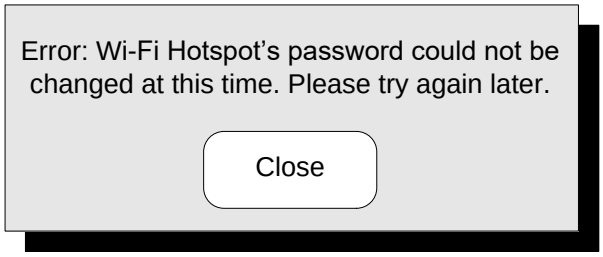


Figure. Unsuccessful Password Update

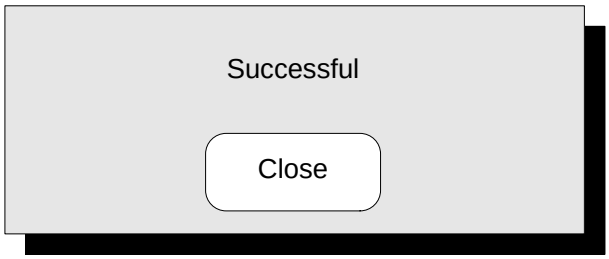


Figure. Successful Password Update

3.5.1.8 WFHS-REQ-336825/A-Configurable Non-Correlated Password Alerts

The WifiHotspotServer shall contain a configurable parameter (Non-Correlated_Password_Alerts) which shall be used to determine whether or not it shall send non-correlated password alerts to the backend. This parameter shall have two states, Enable or Disable, and shall be defaulted to Disable. It shall be configurable at EOL as well as from the WifiHotspotOffBoardClient.

- If Non-Correlated_Password_Alerts is set to Disable, the WifiHotspotServer shall NOT send any non-correlated password alerts to the backend. It shall still send correlated alerts in response to a command from the WifiHotspotOffBoardClient.
    - Example 1: if the WifiHotspotServer receives a request from the WifiHotspotOnBoardClient to change the password, the WifiHotspotServer shall NOT send an alert to the WifiHotspotOffBoardClient.
    - Example 2: if the WifiHotspotServer receives a request from the WifiHotspotOffBoardClient to change the password, the WifiHotspotServer SHALL send an alert to the WifiHotspotOffBoardClient once it updates the password.
- If Enablement_Alerts is set to Enable, the WifiHotspotServer shall send both non-correlated and correlated password alerts to the WifiHotspotOffBoardClient any time the password changes.

The requirements within the rest of this document assume Non-Correlated_Password_Alerts is set to Enable, unless stated otherwise.

3.5.1.9 WFHS-REQ-315704/B-Informing the WifiHotspotOffBoardClient of a password change

The WifiHotspotServer shall send a non-correlated alert (and include the new password) to the WifiHotspotOffBoardClient any time the Wi-Fi Hotspot changes its password. This could be due to the following, but not limited to:

- User requests to change the password from the in-vehicle display,

- A Wi-Fi Hotspot reset.

If the WifiHotspotServer attempts to send a password update alert to the WifiHotspotOffBoardClient and does not receive an acknowledgement, it shall perform a retry strategy. If the WifiHotspotServer detects that it is not connected to the network at the time of attempting to send the alert, it shall store this alert and send it the next time the WifiHotspotServer connects to the network. The alert shall survive ignition cycles. If the Wi-Fi Hotspot password has since changed from the time of the initial attempt to send the alert, the WifiHotspotServer shall send the newest password to the WifiHotspotOffBoardClient once the network becomes available.

3.5.1.10 WFHS-REQ-315705/A-Password encryption

The WifiHotspotServer shall store the Wi-Fi Hotspot password with encryption.

If the WifiHotspsotServer is required to transmit the password to the WifiHotspotOffBoardClient, it shall send the password with encryption.

If the WifiHotspotServer is required to transmit the password to the WifiHotspotOnBoardClient, it shall decrypt the password and transmit it. The WifiHotspotServer shall clear the decrypted password from memory within 5 seconds.

Encryption type shall be SyncP.

3.5.1.11 WFHS-REQ-315706/B-Authorization dependency on password updates from the WifiHotspotOffBoardClient

The WifiHotspotServer shall ONLY be allowed to send password update alerts or receive and process password update commands to/from the WifiHotspotOffBoardClient if the following conditions are met:

- Vehicle Connectivity is ON, AND
- Cellular Connectivity is ON, AND
- VehicleData is ON, AND
- Vehicle is authorized.

If either of the above conditions are NOT met, the WifiHotspotServer shall ignore any commands from the WifiHotspotOffBoardClient to change the password and shall also NOT send any alerts to the WifiHotspotOffBoardClient if the password changes.

All requirements within this document which mention the WifiHotspotServer receiving or sending password update command/response/alerts to/from the WifiHotspotOffBoardClient shallassume the above conditions are met and the WifiHotspotServer is allowed to, unless it is stated otherwise.

3.5.1.12 WFHSv2-REQ-336826/B-Password update request from WifiHotspotOnBoardClient

If the WifiHotspotServer receives a request from the WifiHotspotOnBoardClient to change the password (WifiInfo_Rq), the WifiHotspotServer shall update and store the new password. Once the WifiHotspotServer has successfully updated the password, it shall transmit a successful response to the WifiHotspotOnBoardClient (WifiInfo_Rsp). In case of an unsuccessful attempt, the WifiHotspotServer shall send an unsuccessful response. The WifiHotspotServer shall also send the new password to the WifiHotspotOffBoardClient in a non-correlated alert.

3.5.1.13 WFHS-REQ-191631/A-Disconnecting clients due to a password update

If the WifiHotspotServer changes the hotspot's password, the WifiHotspotServer shall gracefully disconnect all connected clients. Each user shall be required to search for the Wi-Fi Hotspot's SSID on their client device and enter in the new password in order to re-connect.

3.5.1.14 WFHS-REQ-315707/C-Request from WifiHotspotOffBoardClient to change the password

The customer shall also have the ability to change the password from outside the vehicle through Ford-provided applications such as the mobile app or fleet portal, for example. The request shall be sent to the WifiHotspotServer by the WifiHotspotOffBoardClient through FTCP command/response/alert messages.

If the WifiHotspotServer receives a request from the WifiHotspotOffBoardClient to change the password (Wi-Fi Hotspot Password FTCP command), the WifiHotspotServer shall:

- Send a successful acknowledgement response, assuming the request is valid and the WifiHotspotServer is allowed to process it (example of an invalid request could be an invalid password length),
- Update and save the new password to memory,
- Set the Hotspot Credential update bit (only if the bus/network is awake and the WifiHotspotServer is transmitting on it, this is not a wake-up event),
- Respond to the WifiHotspotOffBoardClient with a correlated alert and indicate the new password in the alert, and
- Configure the Wi-Fi Hotspot to use the new password (assuming the Wi-Fi chipset is powered up).

If the WifiHotspotServer is unable to accept the command due to either of the following scenarios:

- The request was bad/invalid or
- The WifiHotspotServer is in extended diagnostics mode,

the WifiHotspotServer shall immediately respond with an unsuccessful response, indicating that the command failed because it is not permitted.

If the WifiHotspotServer attempts to process the request but fails, the WifiHotspotServer shall send a failure alert and indicate that the command failed due to a WifiHotspotServer internal failure.

If the WifiHotspotServer receives a request to update the password to a value that is already being used, the WifiHotspotServer shall still respond with a successful response and alert.

The WifiHotspotServer shall be able to process a password update request, regardless if the Wi-Fi chipset is powered up or not. The WifiHotspotServer shall only be required to update and store the new password in memory in order to process the request and send an alert.

Example

- The Ignition is Off, the WifiHotspotServer is in low power registered mode and the Password is set to “Vehicle”.
- The customer sent a request from the mobile app to change it to “Hotspot”.
- Assuming the Password request requires an SMS wake up, the WifiHotspotServer wakes up and connects to the WifiHotspotOffBoardClient.
- The WifiHotspotServer receives the new Password request from the WifiHotspotOffBoardClient, but the Wi-Fi chipset is powered off.
- The WifiHotspotServer shall send a successful response, update its memory to “Hotspot” and send an alert to the WifiHotspotOffBoardClient.

3.5.1.15 WFHS-REQ-315708/B-Setting the password update bit

If the WifiHotspotServer changes the password due to a request from the WifiHotspotOffBoardClient, the WifiHotspotServer shall set a password update bit using the signal NewHotSpotCredentials_St (assuming the WifiHotspotServer is transmitting on the bus/network at the time of the password change). This bit shall remain set until any of the following scenarios occur:

a. the WifiHotspotServer receives a request from the WifiHotspotOnBoardClient for the current password through the signal WifiInfo_Rq,
b. The WifiHotspotServer transitions to low power registered mode (refer to WFHSv2-REQ-283554-Shutting down and powering up the Wi-Fi chipset and WifiHotspotServer) or
c. the WifiHotspotServer performs a Wi-Fi Hotspot reset (refer to WFHSv2-REQ-283559-Wi-Fi Hotspot reset settings)

at which point the WifiHotspotServer shall unset the bit.

3.5.1.16 WFHS-REQ-315718/B-Updating the password while the user is in the screen

If the user is in a screen that displays the Wi-Fi Hotspot password (refer to WFHSv2-REQ-283641-HMI Specification References) when the WifiHotspotServer indicates there is an update by setting the password update bit (NewHotSpotCredentials_St), the WifiHotspotOnBoardClient shall transmit another request for the current password (WifiInfo_Rq = Read). Once the WifiHotspotOnBoardClient receives the new password, it shall update the screen to show the new information.

If the user is NOT in the screen that displays the password when the WifiHotspotServer indicates there is an update, the WifiHotspotOnBoardClient shall ignore the update bit and not perform any additional actions.

3.5.1.17 WFHS-REQ-315709/A-Receiving multiple password requests

It is possible the WifiHotspotServer could receive a password update request from the WifiHotspotOnBoardClient and WifiHotspotOffBoardClient near the same time. The WifiHotspotServer shall process the requests in FIFO order. It shall not process the next request until it has finished processing and responding to the first request.

For example:

- The WifiHotspotServer received a request from the WifiHotspotOnBoardClient to change the password to “12345678” at 1:00:00
- The WifiHotspotServer received another request from the WifiHotspotOffBoardClient to change the password to “87654321” at 1:00:01
- The WifiHotspotServer shall:
    - Initiate the first request and update the password to “12345678”,
    - Respond to the WifiHotspotOnBoardClient with the Success response,
    - Send an alert to the WifiHotspotOffBoardClient of the new update and include the new password,
    - Initiate the second request and send a successful response to the WifiHotspotOffBoardClient,
    - Update the password to “87654321”,
    - Send an alert to the WifiHotspotOffBoardClient to inform it of the successful update and include the new password,
    - Set the update bit to inform the WifiHotspotOnBoardClient of the new password,

3.5.1.18 WFHS-REQ-315710/A-Request from the WifiHotspotOffBoardClient for the current password

The WifiHotspotOffBoardClient shall have the ability to query the CURRENT password, in case it does not have a record of the last known value. Therefore, if the WifiHotspotServer receives an FTCP request for the password, the WifiHotspotServer shall respond with the current, stored password. If the WifiHotspotServer is unable to detect the stored password or if it is not allowed to respond, it shall send a failure response.

3.5.2 Use Cases

3.5.2.1 WFHSv2-UC-REQ-454899/A-User enters into the Wi-Fi Hotspot screen that displays the SSID and password

Actors	User System
Pre-conditions	WifiHotspotServer is on SSID/password screen is not under driver restriction
Scenario Description	User enters into the Wi-Fi Hotspot screen that displays the SSID and password
Post-conditions	The SSID is displayed The password is hidden, but the WifiHotspotOnBoardClient screen displays the option to view the password Refer to the HMI spec to see the settings that are displayed
List of Exception Use Cases	
Interfaces	WifiHotspotServer WifiHotspotOnBoardClient

3.5.2.2 WFHSv2-UC-REQ-454900/A-User views the password on the WifiHotspotOnBoardClient

Actors	User System
Pre-conditions	WifiHotspotServer is on User is in the Wi-Fi Hotspot screen that displays the password on the WifiHotspotOnBoardClient display

	Password is hidden SSID/password screen is not under driver restriction
Scenario Description	User requests to view the password
Post-conditions	The password is displayed until the user exits out of the screen or until the user chooses to hide the password The option to hide the password is presented
List of Exception Use Cases	
Interfaces	WifiHotspotServer WifiHotspotOnBoardClient

3.5.2.3 WFHSv2-UC-REQ-454880/A-User changes password from WifiHotspotOnBoardClient

Actors	User System
Pre-conditions	WifiHotspotServer is on SSID/password screen is not under driver restriction Up to Number_Hotspot_Connected_Devices devices connected to the Wi-Fi Hotspot User is in the password edit screen
Scenario Description	User enters a new password into the keyboard on the WifiHotspotOnBoardClient that is between 8-63 characters long
Post-conditions	WifiHotspotOnBoardClient displays a successful message and the new password is displayed on the appropriate screen All connected devices are disconnected
List of Exception Use Cases	WFHSv1-UC-REQ-191940-E8 User attempts to enter password less than 8 characters long OR longer than 63 characters WFHSv2-UC-REQ-454901-E9 Password update from WifiHotspotOnBoardClient failed WFHSv2-UC-REQ-454859-E11 WifiHotspotOnBoardClient update failed
Interfaces	WifiHotspotServer WifiHotspotOnBoardClient

3.5.2.4 WFHS-UC-REQ-315719/B-User changes password from WifiHotspotOffBoardClient when Vehicle is Off

Actors	User System
Pre-conditions	WifiHotspotServer is off
Scenario Description	User enters new password from the Ford backend application such as the mobile app
Post-conditions	The backend application shall show pending until the WifiHotspotServer turns on and processes the request, at which point the user shall be informed of a successful update.
List of Exception Use Cases	
Interfaces	WifiHotspotServer WifiHotspotOffBoardClient

3.5.2.5 WFHS-UC-REQ-315720/B-User changes password from WifiHotspotOffBoardClient when Vehicle is ON

Actors	User System
Pre-conditions	WifiHotspotServer is On
Scenario Description	User enters new password from the Ford backend application such as the mobile app
Post-conditions	The backend application shall show pending and then show the successful response message. If the customer is on the in-vehicle HMI screen which shows the password, the password shall automatically update
List of Exception Use Cases	
Interfaces	WifiHotspotServer WifiHotspotOffBoardClient WifiHotspotOnBoardClient

3.5.2.6 WFHSv1-UC-REQ-191940/A-E8 User attempts to enter password less than 8 characters long OR longer than 63 characters

Actors	User System Cell phone
Pre-conditions	Same as normal use case
Scenario Description	User types in a password into the keyboard on WifiHotspotOnBoardClient that is not between 8-63 characters long
Post-conditions	The keyboard does not allow the password request to be entered The password is not changed
List of Exception Use Cases	
Interfaces	WifiHotspotOnBoardClient

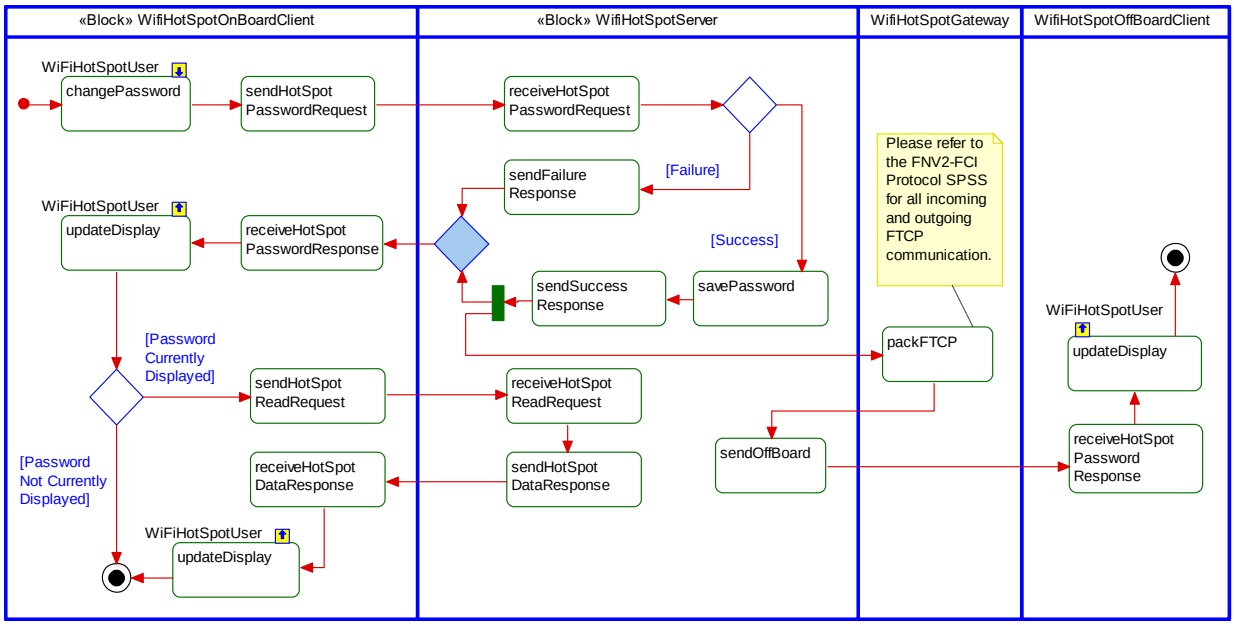
3.5.2.7 WFHSv2-UC-REQ-454901/A-E9 Password update from WifiHotspotOnBoardClient failed

Actors	User System
Pre-conditions	Same as normal use case
Scenario Description	User enters new password from WifiHotspotOnBoardClient that is between 8-63 characters long but the WifiHotspotServer was unable to successfully change the password
Post-conditions	An error message is displayed to the user The password is not changed
List of Exception Use Cases	
Interfaces	WifiHotspotServer WifiHotspotOnBoardClient

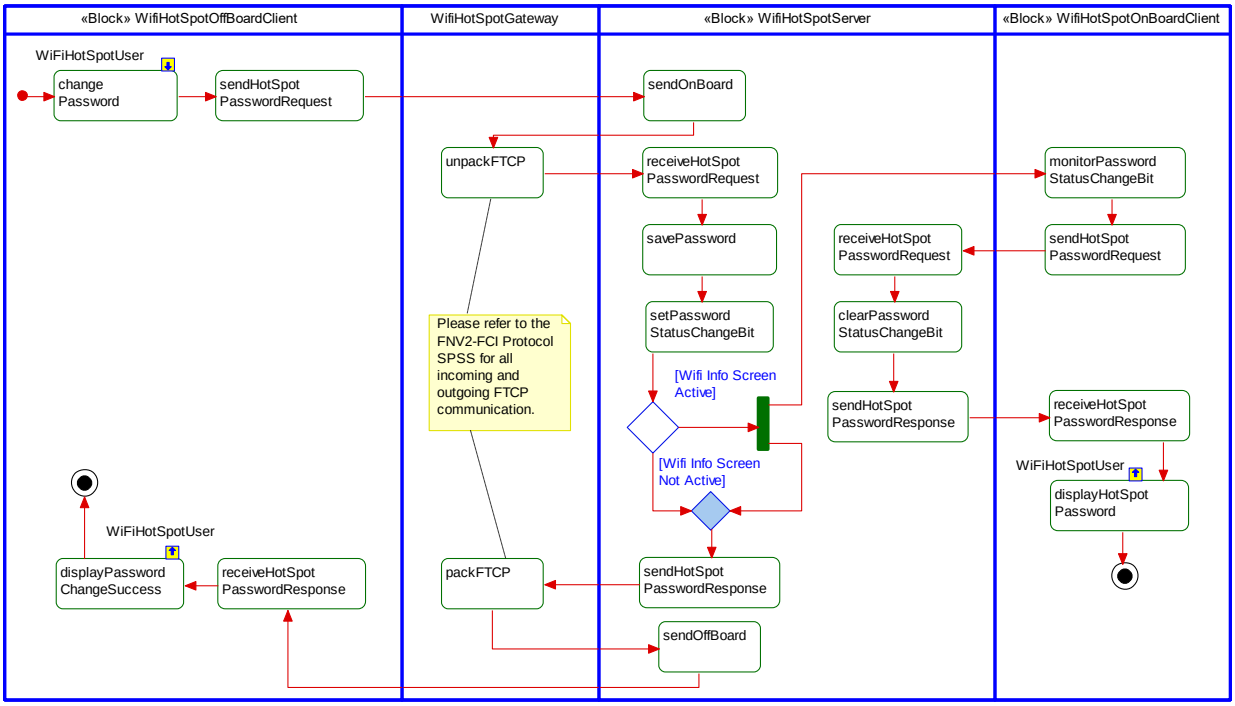
3.5.3 White Box Views

3.5.3.1 Activity Diagrams

3.5.3.1.1 WFHSv2-ACT-REQ-317271/A-User Changes Password from WifiHotspotOnBoardClient

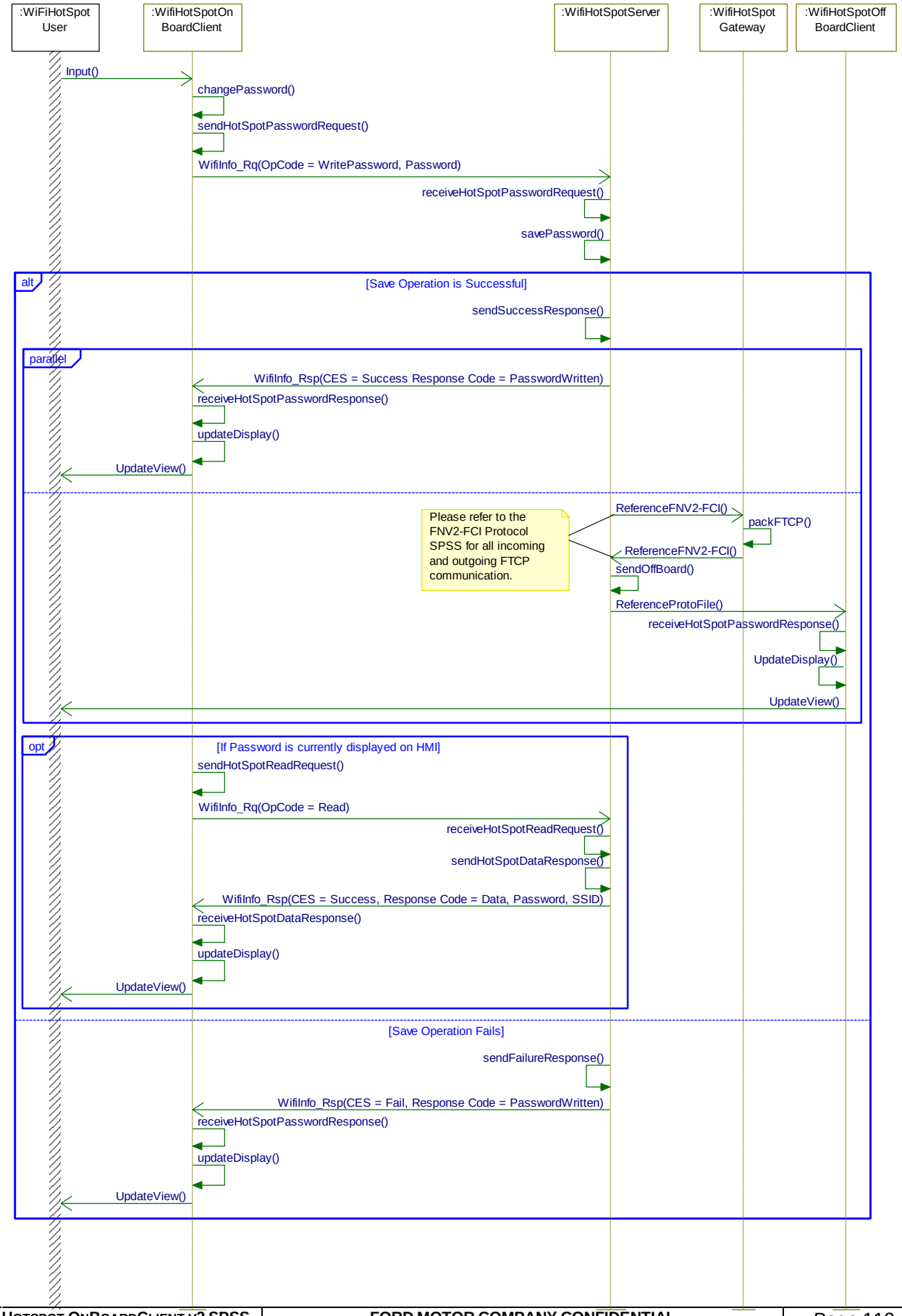


3.5.3.1.2 WFHSv2-ACT-REQ-317272/A-User Changes Password from WifiHotspotOffBoardClient

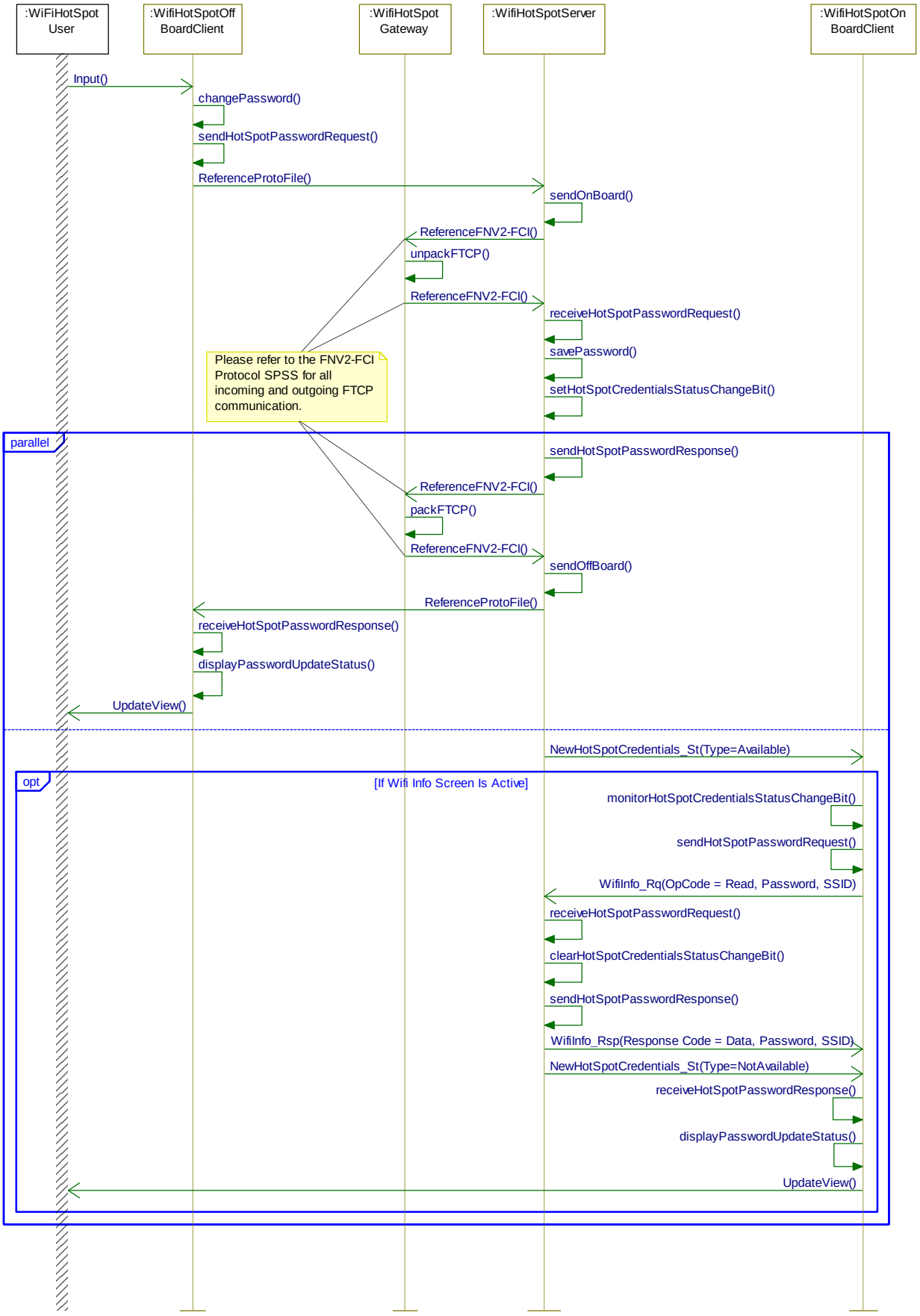


3.5.3.2 Sequence Diagrams

3.5.3.2.1 WFHSv2-SD-REQ-317509/A-User Changes Password from WifiHotspotOnBoardClient



3.5.3.2.2 WFHSv2-SD-REQ-317510/A-User Changes Password from WifiHotspotOffBoardClient


:WiFiHotSpot User
:WifiHotSpotOff BoardClient
:WifiHotSpot Gateway
:WifiHotSpotServer
:WifiHotSpotOn BoardClient
Input()
changePassword()
sendHotSpotPasswordRequest()
ReferenceProtoFile()
sendOnBoard()
ReferenceFNV2-FCI()
unpackFTCP()
ReferenceFNV2-FCI()
receiveHotSpotPasswordRequest()
savePassword()
setHotSpotCredentialsStatusChangeBit()
Please refer to the FNV2-FCI Protocol SPSS for all incoming and outgoing FTCP communication.
parallel
sendHotSpotPasswordResponse()
ReferenceFNV2-FCI()
packFTCP()
ReferenceFNV2-FCI()
sendOffBoard()
ReferenceProtoFile()
receiveHotSpotPasswordResponse()
displayPasswordUpdateStatus()
UpdateView()
NewHotSpotCredentials_St(Type=Available)
opt
[If Wifi Info Screen Is Active]
monitorHotSpotCredentialsStatusChangeBit()
sendHotSpotPasswordRequest()
WifiInfo_Rq(OpCode = Read, Password, SSID)
receiveHotSpotPasswordRequest()
clearHotSpotCredentialsStatusChangeBit()
sendHotSpotPasswordResponse()
WifiInfo_Rsp(Response Code = Data, Password, SSID)
NewHotSpotCredentials_St(Type=NotAvailable)
receiveHotSpotPasswordResponse()
displayPasswordUpdateStatus()
UpdateView()

3.6 WFHSv2-FUN-REQ-274799/C-Changing Security Algorithm

The WifiHotspotServer shall enable encryption algorithms for the Wi-Fi feature. The security encryption shall be defaulted to WPA2 for all regions:

- Non-Phoenix default is WPA2
- Phoenix default is WPA2/WPA3

3.6.1 Requirements

3.6.1.1 WFHSv2-REQ-317121/B-Security algorithm offerings per region

The WifiHotspotServer shall enable WPA2 (non-Phoenix) and WPA2/WPA3 (Phoenix) security encryption for all regions. The WifiHotspotServer shall report this security encryption using the signal HotspotSecurity_St.

If the WifiHotspotServer cannot detect the type of security that is enabled, it shall set the signal HotspotSecurity_St to NULL/NONE.

3.6.1.2 WFHSv2-REQ-283760/B-Displaying the security type

The WifiHotspotOnBoardClient shall display the current security encryption enabled, which is reported by the WifiHotspotServer through the signal HotspotSecurity_St. Refer to WFHSv2-REQ-283641-HMI Specification References. The following screen is an example WifiHotspotOnBoardClient screen.

Figure. Display of the Current Security Type

3.7 WFHSv2-FUN-REQ-274800/B-Turning Visibility ON or OFF

The visibility function controls the broadcast of the hotspot's SSID. If the visibility is set to ON, Wi-Fi enabled devices may search for the network without specifying the SSID. If the visibility is OFF the user must enter the network's SSID into the Wi-Fi enabled device, before searching, in order to find the network. Once the network is found, the user shall enter the security type and password to connect. The user may turn the visibility ON or OFF through the in-vehicle WifiHotspotOnBoardClient.

If the user changes the visibility from the in-vehicle WifiHotspotOnBoardClient the WifiHotspotServer shall receive a signal, save and update the hotspot's setting and respond to the WifiHotspotOnBoardClient by updating its status on a designated signal.

3.7.1 Requirements

3.7.1.1 WFHS-REQ-191647/C-Function of the visibility feature

If the visibility is set to ON the WifiHotspotServer shall broadcast the hotspot's SSID in the beacon frames. If the visibility is set to OFF the SSID shall not be broadcasted in the beacon frames. The visibility shall be configurable by the customer as well as via EOL.

3.7.1.2 WFHSv2-REQ-454902/A-Reporting the visibility status

The WifiHotspotServer shall report the current status of the visibility feature using the signal HotspotVisibility_St. If the WifiHotspotServer cannot detect the current visibility state, it shall set the signal to NULL.

3.7.1.3 WFHSv2-REQ-283761/B-Displaying the status of the visibility feature

The WifiHotspotOnBoardClient shall display the current status of the hotspot's visibility feature, which is reported from the WifiHotspotServer through the signal HotspotVisibility_St (refer to WFHSv2-REQ-283641-HMI Specification References). The following screens are example WifiHotspotOnBoardClient screens.

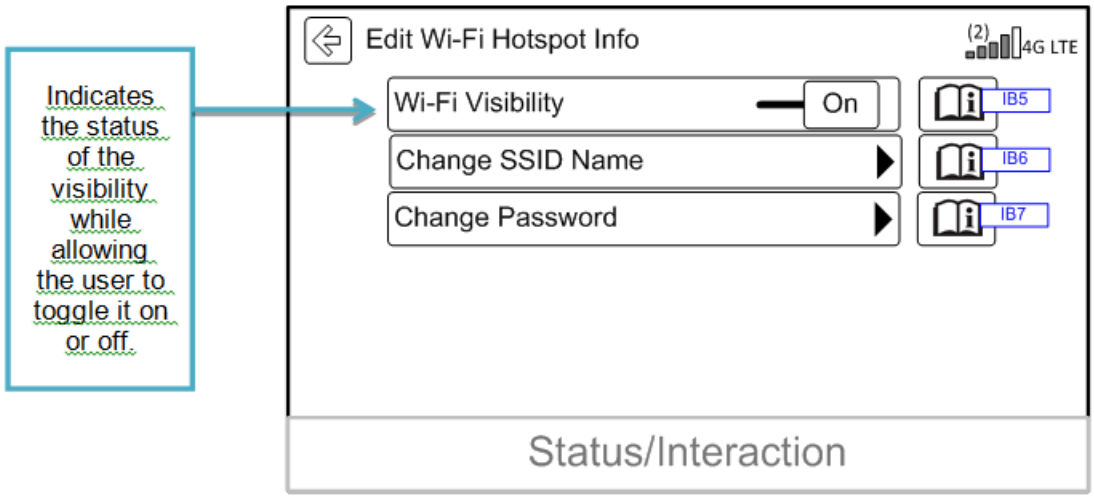


Figure. Viewing Visibility Status

3.7.1.4 WFHS-REQ-191651/B-User requests to configure visibility feature through WifiHotspotOnBoardClient display

If the user requests to turn the hotspot's visibility ON or OFF through the in-vehicle WifiHotspotOnBoardClient, the WifiHotspotOnBoardClient shall transmit this request to the WifiHotspotServer using the signal HotspotVisibility_Rq.

Note: Turning the SSID visibility OFF will disconnect all connected WiFi Devices, the user will have to reconnect the devices.

3.7.1.5 WFHSv2-REQ-454903/A-Visibility update request from WifiHotspotOnBoardClient

If the WifiHotspotServer receives a request from the WifiHotspotOnBoardClient (HotspotVisibility_Rq) to change the visibility status, the WifiHotspotServer shall update and save the visibility status. If the WifiHotspotServer's attempt was unsuccessful, the WifiHotspotServer shall continue reporting out the current status of the visibility feature using the signal HotspotVisibility_St.

3.7.2 Use Cases

3.7.2.1 WFHSv2-UC-REQ-283762/B-User turns the Wi-Fi Hotspot visibility ON

Actors	User System Cell phone
Pre-conditions	Wi-Fi Hotspot is ON Wi-Fi Hotspot visibility is OFF
Scenario Description	User turns Wi-Fi Hotspot visibility ON from WifiHotspotOnBoardClient
Post-conditions	The vehicle's Wi-Fi hotspot SSID will automatically appear when devices are searching for Wi-Fi networks nearby User may connect to the Wi-Fi Hotspot by entering the password WifiHotspotOnBoardClient display shall update as defined in the HMI spec (refer to WFHSv2-REQ-283641-HMI Specification References).
List of Exception Use Cases	WFHSv2-UC-REQ-454858-E4 Wi-Fi Hotspot configuration through WifiHotspotOnBoardClient fails WFHSv2-UC-REQ-454859-E11 WifiHotspotOnBoardClient update failed
Interfaces	WifiHotspotServer WifiHotspotOnBoardClient

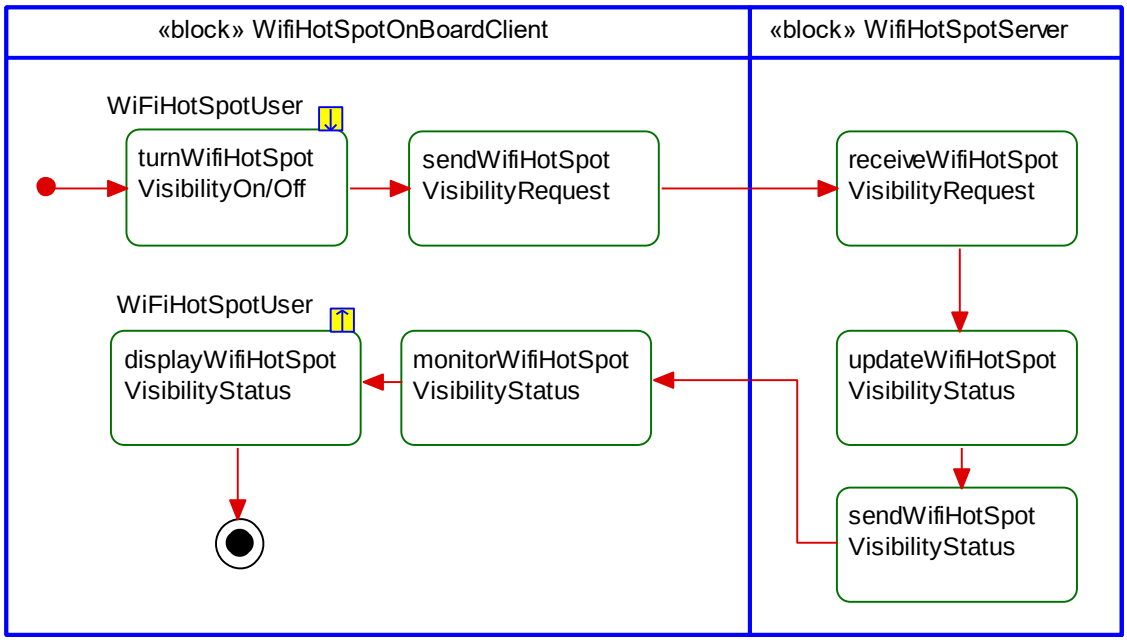
3.7.2.2 WFHSv2-UC-REQ-283763/B-User turns Wi-Fi Hotspot visibility OFF

Actors	User System Cell phone
Pre-conditions	Wi-Fi Hotspot is ON Wi-Fi Hotspot visibility is ON
Scenario Description	User turns the visibility OFF from WifiHotspotOnBoardClient
Post-conditions	Any connected devices will disconnect from WifiHotspotServer The vehicle's Wi-Fi Hotspot SSID will NOT appear when devices are searching for Wi-Fi networks nearby User must manually type SSID, security type, encryption type, & password into device to connect WifiHotspotOnBoardClient display shall update as defined in the HMI spec (refer to WFHSv2-REQ-283641-HMI Specification References)
List of Exception Use Cases	WFHSv2-UC-REQ-454858-E4 Wi-Fi Hotspot configuration through WifiHotspotOnBoardClient fails WFHSv2-UC-REQ-454859-E11 WifiHotspotOnBoardClient update failed
Interfaces	WifiHotspotServer WifiHotspotOnBoardClient

3.7.3 White Box Views

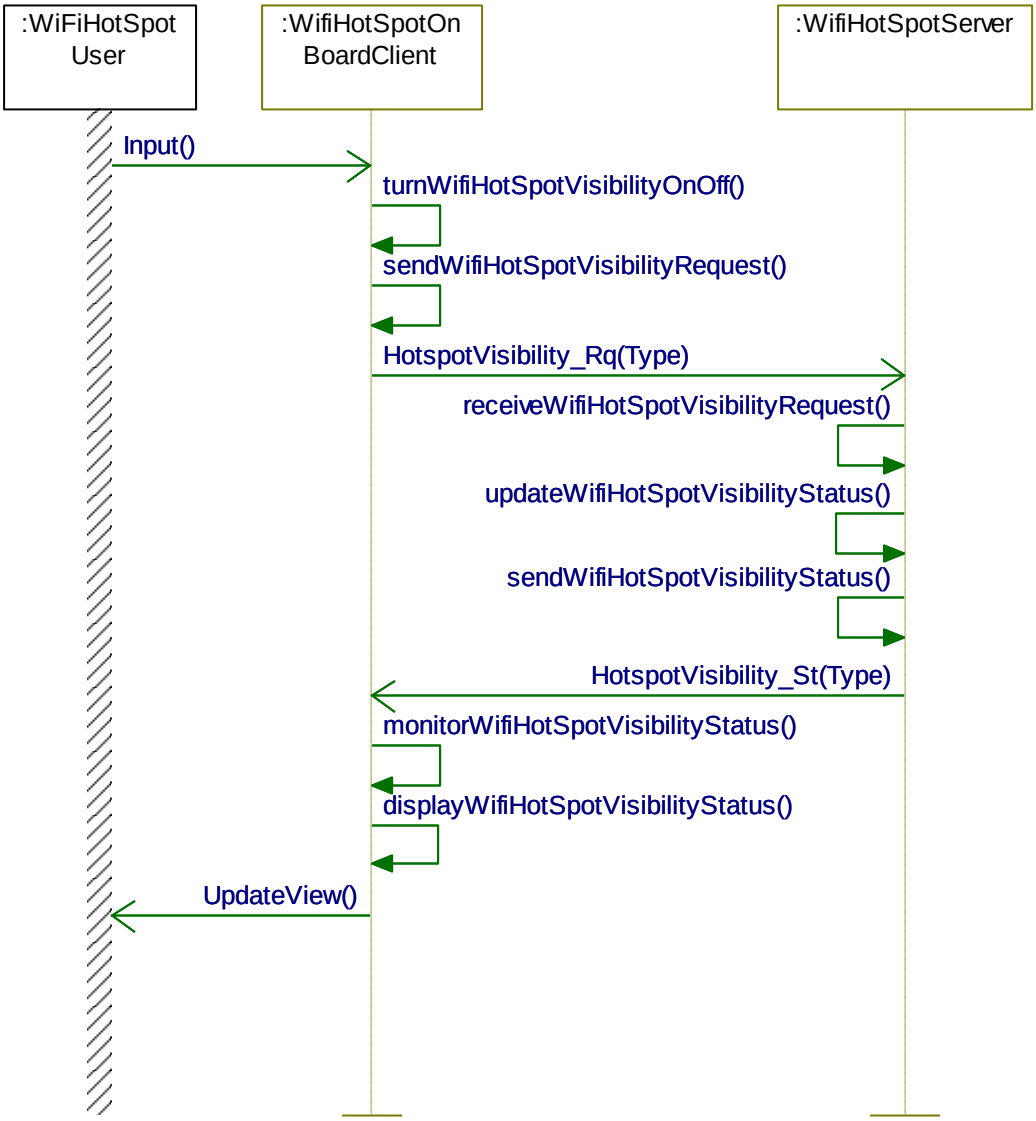
3.7.3.1 Activity Diagrams

3.7.3.1.1 WFHSv1-ACT-REQ-167129/A-Wi-Fi Visibility On From Centerstack



3.7.3.2 Sequence Diagrams

3.7.3.2.1 WFHSv1-SD-REQ-167146/A-User Turns Wi-Fi Visibility On Off From Centerstack



3.8 WFHSv2-FUN-REQ-274801/A-Manage Devices

The user shall be able to manage devices connected to their hotspot. The user may view the clients connected to the hotspot through the in-vehicle WifiHotspotOnBoardClient screen and disconnect any of the clients listed, placing those clients on the blocked list. The user may also view the blocked clients and delete any client off of the blocked list, allowing that client to connect again.

If the user enters into the Connected Devices or Blocked Devices screen the WifiHotspotOnBoardClient shall transmit a request for the device list and specify whether it is a request for the connected devices or a request for the blocked devices. If the WifiHotspotServer receives this request it shall respond with the appropriate list of devices. If a device connects to or disconnects from the WifiHotspotServer (except if initiated through the in-vehicle WifiHotspotOnBoardClient) the WifiHotspotServer shall set a connected device update bit. The WifiHotspotOnBoardClient shall monitor this bit and, if the user is in the Connected Devices screen when this bit is set, the WifiHotspotOnBoardClient shall request for the device list once again. The WifiHotspotServer may unset the update bit once it responds to the WifiHotspotOnBoardClient's request.

3.8.1 Requirements

3.8.1.1 WFHS-REQ-191652/B-Checklist for allowing a device to connect to the Wi-Fi Hotspot

The WifiHotspotServer shall manage two lists (Connected List and Blocked List) in order to determine if it shall allow a device to connect to the Wi-Fi Hotspot. The diagram below displays the checks that shall be performed by the WifiHotspotServer before allowing a device to connect to the Wi-Fi hotspot.

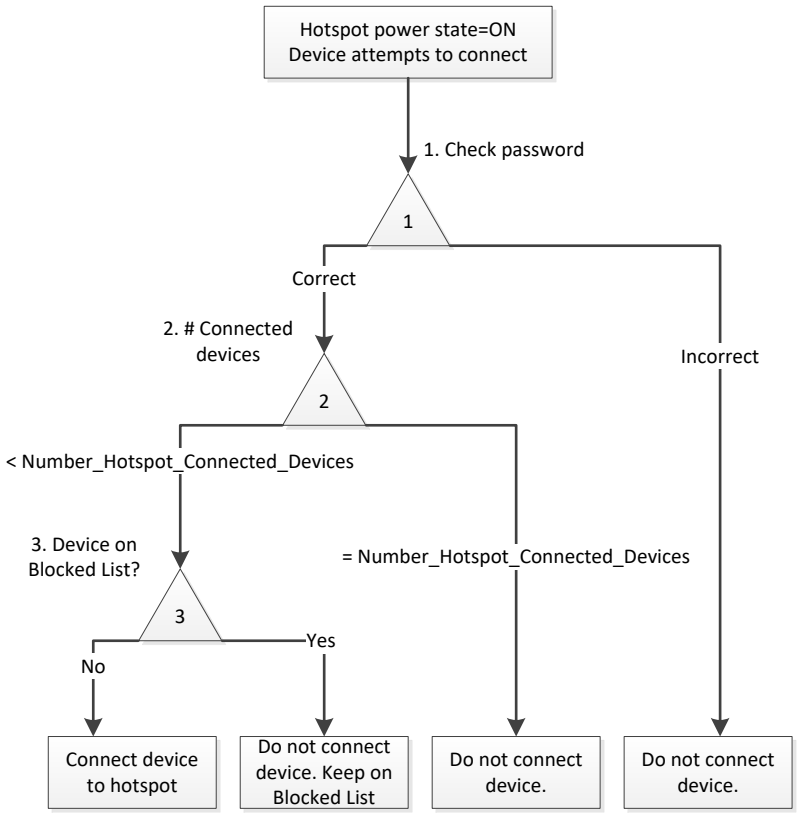


Figure. Checklist before allowing a device to connect to the Wi-Fi Hotspot

3.8.1.2 WFHSv2-REQ-288222/B-Managing the connected devices list

The WifiHotspotServer shall manage a list called the Connected List. This list shall store all the devices currently connected to the hotspot. The WifiHotspotServer shall limit the number of devices allowed to be connected at one time. This number (Number_Hotspot_Connected_Devices) shall be a configurable DID (default value is 10). All devices attempting to connect to

the hotspot that violate this number shall be denied access. Once the number of connected devices drops below Number_Hotspot_Connected_Devices, the devices may attempt to connect again.

The WifiHotspotServer shall detect when clients connect and disconnect from the hotspot. The WifiHotspotServer shall detect and store the entire MAC address and up to the first Device_Name_Characters_Length (EOL configurable number) characters of the device name per connected device. The default Device_Name_Characters_Length value shall be equal to the maximum number of allowable characters to be displayed that is listed in the following requirements (refer to the Bluetooth Connectivity SPSS and Media Player SPSS documents):

1. BTC-FUR-REQ-194148-Device Friendly Name
2. MP-FUR-REQ-205797-USB Device Name
3. MP-FUR-REQ-205793-Unnamed USB Device.

The WifiHotspotServer shall attempt to detect all device names in ASCII encoding. If the WifiHotspotServer cannot detect a device name in ASCII characters it shall only store the MAC address of that device. All devices on the connected devices list shall be assigned an index number, starting from index 1 to index N (N = the number of connected devices).

If a device has previously connected to the hotspot and the password remains unchanged, the WifiHotspotServer shall allow the device to automatically connect to the hotspot when in range, assuming the number of connected devices is less than the maximum number allowed.

3.8.1.3 WFHSv2-REQ-283764/B-Displaying the connected devices list on the WifiHotspotOnBoardClient display

If the user enters into the Connected Devices screen (refer to WFHSv2-REQ-283641-HMI Specification References), the WifiHotspotOnBoardClient shall request for the list of connected devices using the signal DeviceList_Rq. The WifiHotspotOnBoardClient shall specify how it wants the list to be sent (i.e. entire list, one device at a time, etc.). Refer to WFHSv2-REQ-454917-Reporting the connected devices list for more information on how to request for the list. The WifiHotspotOnBoardClient shall specify the size of the list and the starting index in its request. The WifiHotspotServer shall respond with the signal DeviceList_Rsp. Each device shall be assigned an index number, and the WifiHotspotOnBoardClient shall display the list of devices in chronological order. If the WifiHotspotServer does not transmit its response quick enough the WifiHotspotOnBoardClient shall populate the information as it is received and display a popup indicating that it is updating. The user shall not be able to click on the list of devices until the screen has finished updating, at which point the popup shall exit.

The WifiHotspotOnBoardClient shall display the device name and MAC address of each connected device per line. If the device name field was not populated in the signal, the WifiHotspotOnBoardClient shall only display the MAC address. The WifiHotspotOnBoardClient shall limit the number of device name characters that shall be displayed. The maximum device name characters length shall be equal to the maximum number of allowable characters to be displayed that is listed in the following requirements (refer to the Bluetooth Connectivity SPSS and Media Player SPSS documents):

1. BTC-FUR-REQ-194148-Device Friendly Name
2. MP-FUR-REQ-205797-USB Device Name
3. MP-FUR-REQ-205793-Unnamed USB Device.

The following is an example WifiHotspotOnBoardClient screen.

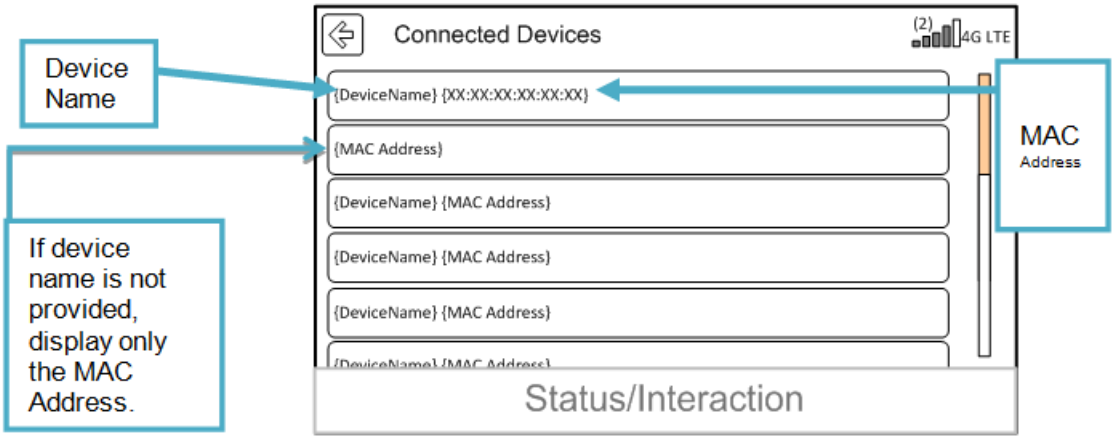


Figure. Screen displaying the list items of the connected devices list.

3.8.1.4 WFHSv2-REQ-454917/A-Reporting the connected devices list

The WifiHotspotOnBoardClient shall specify how it wants the Connected Devices list to be sent. It may request for the entire connected devices list or just a subset of the list using the signal DeviceList_Rq. The WifiHotspotServer shall respond with the desired list and include the MAC addresses and device names (up to Device_Name_Characters_Length characters) of all the requested devices currently connected using the signal DeviceList_Rsp. The connected devices' index numbers shall be referenced in the signal as well. If the WifiHotspotServer cannot detect the device name of a specific device, the WifiHotspotServer shall not populate the device name field in the signal.

Example 1)

- 10 devices are currently connected to the hotspot and the WifiHotspotOnBoardClient would like to request for the entire list.
- WifiHotspotOnBoardClient uses the DeviceList_Rq signal and sets the following:
  - ListType = ConnectedList
  - StartingIndex = Start Index 1
  - ListSize = List Size 31
- WifiHotspotServer responds with DeviceList_Rsp and includes the following:
  - ListType = ConnectedList
  - ListSize = List Size 10
  - TotalNumberOfDevicesAvailable = 10 Devices Available
  - IndexNumber = Index 1
  - MAC = {MAC address of device 1}
  - DeviceName = {Device name of device 1}
  - IndexNumber = Index 2
  - MAC = {MAC address of device 2}
  - DeviceName = {Device name of device 2}
  - …
  - IndexNumber = Index 10
  - MAC = {MAC address of device 10}
  - DeviceName = {Device name of device 10}

Example 2)

- 10 devices are currently connected to the hotspot and the WifiHotspotOnBoardClient would like to request for the first 5 devices (i.e. only 5 devices can be displayed at once).
- WifiHotspotOnBoardClient uses the DeviceList_Rq signal and sets the following:
  - ListType = ConnectedList
  - StartingIndex = Start Index 1
  - ListSize = List Size 5
- WifiHotspotServer responds with DeviceList_Rsp and includes the following:
  - ListType = ConnectedList
  - ListSize = List Size 5
  - TotalNumberOfDevicesAvailable = 10 Devices Available
  - IndexNumber = Index 1
  - MAC = {MAC address of device 1}
  - DeviceName = {Device name of device 1}
  - IndexNumber = Index 2
  - MAC = {MAC address of device 2}
  - DeviceName = {Device name of device 2}
  - …
  - IndexNumber = Index 5
  - MAC = {MAC address of device 5}
  - DeviceName = {Device name of device 5}

If the user continues to scroll on the Connected Devices screen, the WifiHotspotOnBoardClient may then wish to request for the next 5 devices, etc. by setting the StartingIndex = 6.

3.8.1.5 WFHSv2-REQ-283557/B-Setting the connected device update bit

If a device connects to or disconnects from the hotspot (except when initiated by the WifiHotspotServer from a Wi-Fi Hotspot reset (refer to WFHSv2-REQ-283559-Wi-Fi Hotspot reset settings) or from a request from the WifiHotspotOnBoardClient to block the device (RemoveDevice_Rq)) the WifiHotspotServer shall set a connected device update bit using the signal NewDeviceList_St. This bit shall remain set until any of the following scenarios occur:

a. the WifiHotspotServer receives a request from the WifiHotspotOnBoardClient for the current list of connected devices through the signal DeviceList_Rq,
b. The WifiHotspotServer transitions to low power registered mode (refer to WFHSv2-REQ-283554-Shutting down and powering up the Wi-Fi Chipset and WifiHotspotServer) or
c. the WifiHotspotServer performs a Wi-Fi Hotspot reset (refer to WFHSv2-REQ-283559-Wi-Fi Hotspot reset settings)

at which point the WifiHotspotServer shall unset the bit.

3.8.1.6 WFHSv2-REQ-283765/B-Updating the connected devices screen while the user is in the screen

If the user is in the Connected Devices screen (refer to WFHSv2-REQ-283641-HMI Specification References) when the WifiHotspotServer indicates there is an update by setting the connected devices update bit (NewDeviceList_St), the WifiHotspotOnBoardClient shall transmit another request for the list of connected devices. Once the WifiHotspotOnBoardClient receives the updated list it shall update the screen to show the new information. If the WifiHotspotOnBoardClient is in the process of updating the Connected Devices screen, the WifiHotspotOnBoardClient shall display a popup indicating that it is updating. The user shall not be able to click on the list of devices until the screen has finished updating, at which point the popup shall exit. The WifiHotspotOnBoardClient shall disregard any updates from the WifiHotspotServer regarding the connected devices list if the user has left the Connected Devices screen.

If the user is NOT in the Connected Devices screen when the WifiHotspotServer indicates there is an update, the WifiHotspotOnBoardClient shall ignore the update bit and not perform any additional actions.

3.8.1.7 WFHSv2-REQ-317122/B-Managing the blocked devices list

The WifiHotspotServer shall manage a list called the Blocked List. This list shall store all the devices that have been blocked. A device may only be added to the blocked list by the user through the in-vehicle WifiHotspotOnBoardClient. If the user selects a device from the connected devices list and chooses to block it, the device shall be stored on the blocked list and unable to connect to the hotspot until it is deleted from the blocked list. The WifiHotspotServer shall limit the number of devices added to the hotspot's blocked list. This number (Number_Blocked_Devices) shall be a configurable DID and defaulted to 10.

The WifiHotspotServer shall be responsible for saving the MAC addresses and device names (up to Device_Name_Characters_Length characters, configurable) of all the devices currently stored on the blocked list. Each blocked device shall all be assigned an index number, starting from index 1 to index M (M = the number of blocked devices). The hotspot's blocked list shall be managed in FIFO order. The newest blocked device shall be added to the top of the list and be assigned index 1. If the list becomes full and the WifiHotspotServer receives a request from WifiHotspotOnBoardClient to add a new device to the blocked list (RemoveDevice_Rq), the WifiHotspotServer shall delete the oldest blocked device (device on the bottom of the list with index M) to make room for the new blocked device and assign the newest blocked device index 1.

3.8.1.8 WFHSv2-REQ-283766/C-User requests to block a device from the hotspot through WifiHotspotOnBoardClient display

If the user clicks to unblock a device from the Connected Devices list, the WifiHotspotOnBoardClient shall transmit a request (using signal RemoveDevice_Rq) to remove the device by specifying the index number of the device. The WifiHotspotServer shall respond with the updated connected devices list using signal DeviceList_Rsp containing the updated list of connected devices. Additionally, to support UIs that display simultaneously both the Connected Devices and Blocked Devices lists (see: Dashcard UI / CX727), the WifiHotspotServer shall send a second signal DeviceList_Rsp containing the updated list of blocked devices, including the newly blocked device. For HMIs with simultaneous display of both lists (see: Dashcard UI / CX727), if functional logic to return both lists at once is not implemented, it may be necessary to once the updated Connected Devices list has been received, send DeviceList_Rq to also obtain an updated Blocked Devices list. This will likely be slower than if the second list is provided immediately, so for applicable versions of WifiHotspotOnBoardClient, both Connected Devices and Unblocked Devices lists shall delay showing either list until both are received, to avoid conflicts. While waiting,

they shall show a waiting indication on both list submenus, in place of contents. Refer to WFHSv2-REQ-283641-HMI Specification References.

3.8.1.9 WFHSv2-REQ-283566/B-Request from the WifiHostpotOnBoardClient to block a device from the Wi-Fi Hotspot

If the WifiHotspotServer receives a request from the WifiHotspotOnBoardClient to remove a device from the connected devices list by using the signal RemoveDevice_Rq and referencing the device by its index number, the WifiHotspotServer shall gracefully disconnect the connected device from the hotspot, add it onto the hotspot's blocked list and report back the new list of connected devices (DeviceList_Rsp). In the case of an unsuccessful attempt, the WifiHotspotServer shall report back unsuccessful (DeviceList_Rsp). A device (for example device A) shall remain on the blocked list until:

a. a Wi-Fi Hotspot reset (see WFHSv2-REQ-283559-Wi-Fi Hotspot reset settings),
b. the WifiHotspotServer receives a command from the WifiHotspotOnBoardClient to remove device A from the blocked list (RemoveDevice_Rq) or
c. the blocked list becomes full when a request to block a device is received and device A is the oldest blocked device on the list.

3.8.1.10 WFHSv2-REQ-283767/B-Displaying the blocked devices list on the WifiHotspotOnBoardClient display

If the user enters into the Blocked Devices screen (refer to WFHSv2-REQ-283641-HMI Specification References), the WifiHotspotOnBoardClient shall request for the list of blocked devices using the signal DeviceList_Rq. The WifiHotspotOnBoardClient shall specify how it wants the list to be sent (i.e. entire list, one device at a time, etc.). Refer to WFHSv2-REQ-454918-Reporting the blocked devices list for more information on how to request for the list. The WifiHotspotOnBoardClient shall specify the size of the list and the starting index in its request. The WifiHotspotServer shall respond with the signal DeviceList_Rsp. Each device shall be assigned an index number, and the WifiHotspotOnBoardClient shall display the MAC address and device name of each device in the list. The list of devices shall be displayed in chronological order (Index 1, …, Index M (M = total number of blocked devices)).

If the device name field was not populated in the signal the WifiHotspotOnBoardClient shall only display the MAC address. If the WifiHotspotServer does not transmit its response quick enough the WifiHotspotOnBoardClient shall populate the information as it is received and display a popup indicating that it is updating. The user shall not be able to click on the list of devices until the screen has finished updating, at which point the popup shall exit. The following screen is an example WifiHotspotOnBoardClient screen.

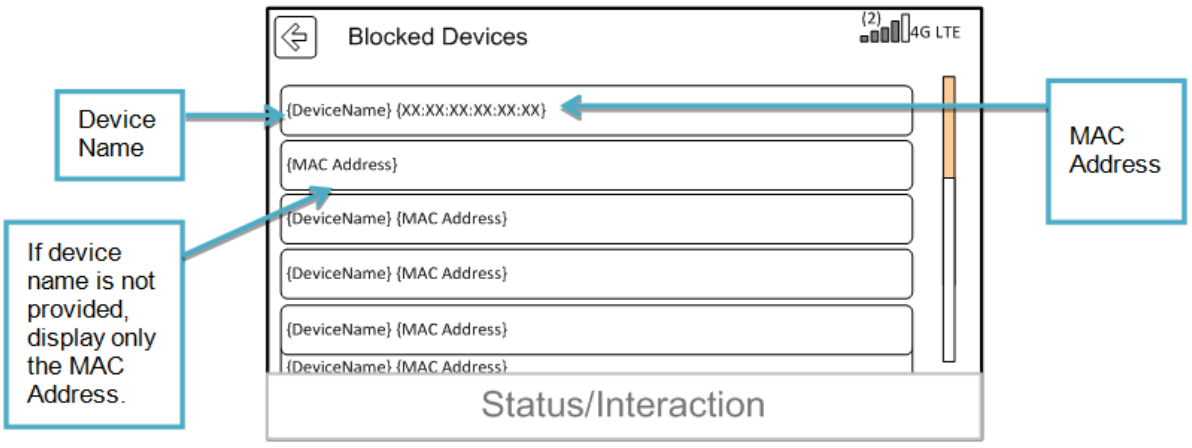


Figure. Screen displaying devices that the user has blocked

3.8.1.11 WFHSv2-REQ-454918/A-Reporting the blocked devices list

The WifiHotspotOnBoardClient shall specify how it wants the Blocked Devices list to be sent. It may request for the entire blocked devices list or just a subset of the list using the signal DeviceList_Rq. The WifiHotspotServer shall respond with the desired list and include the MAC addresses and device names (up to Device_Name_Characters_Length characters) of all the requested devices currently blocked using the signal DeviceList_Rsp. The blocked devices' index numbers shall be referenced in the signal as well. If the WifiHotspotServer cannot detect the device name of a specific device, the WifiHotspotServer shall not populate the device name field in the signal.

Example 1)

- 10 devices are currently blocked from the hotspot and the WifiHotspotOnBoardClient would like to request for the entire list.
- WifiHotspotOnBoardClient uses the DeviceList_Rq signal and sets the following:
  - ListType = BlockedList
  - StartingIndex = Start Index 1
  - ListSize = List Size 31
- WifiHotspotServer responds with DeviceList_Rsp and includes the following:
  - ListType = BlockedList
  - ListSize = List Size 10
  - TotalNumberOfDevicesAvailable = 10 Devices Available
  - IndexNumber = Index 1
  - MAC = {MAC address of device 1}
  - DeviceName = {Device name of device 1}
  - IndexNumber = Index 2
  - MAC = {MAC address of device 2}
  - DeviceName = {Device name of device 2}
  - …
  - IndexNumber = Index 10
  - MAC = {MAC address of device 10}
  - DeviceName = {Device name of device 10}

Example 2)

- 10 devices are currently blocked from the hotspot and the WifiHotspotOnBoardClient would like to request for the first 5 devices (i.e. only 5 devices can be displayed at once).
- WifiHotspotOnBoardClient uses the DeviceList_Rq signal and sets the following:
  - ListType = BlockedList
  - StartingIndex = Start Index 1
  - ListSize = List Size 5
- WifiHotspotServer responds with DeviceList_Rsp and includes the following:
  - ListType = BlockedList
  - ListSize = List Size 5
  - TotalNumberOfDevicesAvailable = 10 Devices Available
  - IndexNumber = Index 1
  - MAC = {MAC address of device 1}
  - DeviceName = {Device name of device 1}
  - IndexNumber = Index 2
  - MAC = {MAC address of device 2}
  - DeviceName = {Device name of device 2}
  - …
  - IndexNumber = Index 5
  - MAC = {MAC address of device 5}
  - DeviceName = {Device name of device 5}
- If the user continues to scroll on the Blocked Devices screen, the WifiHotspotOnBoardClient may then wish to request for the next 5 devices, etc. by setting the StartingIndex = 6.

3.8.1.12 WFHSv2-REQ-283768/C-User requests to unblock a device from the blocked list through WifiHotspotOnBoardClient display

If the user clicks to unblock a device from the Blocked Devices list, the WifiHotspotOnBoardClient shall transmit a request (using signal RemoveDevice_Rq) to remove the device by specifying the list type (blocked list) and index number of the device. The WifiHotspotServer shall respond with the updated blocked devices list using the signal DeviceList_Rsp, at which point the WifiHotspotOnBoardClient shall update the screen. Refer to WFHSv2-REQ-283641-HMI Specification References.

3.8.1.13 WFHSv2-REQ-454919/A-Request from the WifiHotspotOnBoardClient to remove a device from the blocked list

If the WifiHotspotServer receives a request from the WifiHotspotOnBoardClient to remove a device from the blocked list by using the signal RemoveDevice_Rq and referencing the device by its index number, the WifiHotspotServer shall delete that

device from the blocked list and report back the new list of blocked devices (DeviceList_Rsp). If a device is removed from the blocked list, the device shall be required to enter the vehicle's Wi-Fi Hotspot password before it can connect to the Wi-Fi Hotspot again.

3.8.2 Use Cases

3.8.2.1 WFHSv2-UC-REQ-454877/A-Vehicle occupant blocks a device from the Wi-Fi Hotspot through the WifiHotspotOnBoardClient

Actors	User WifiHotspotOnBoardClient WifiHotspotServer
Pre-conditions	Up to Number_Hotspot_Connected_Devices devices connected to the Wi-Fi Hotspot Up to (Number_Blocked_Devices – 1) devices placed on the Wi-Fi Hotspot's blocked list
Scenario Description	Vehicle occupant selects a device from the list of connected devices and chooses to block the device
Post-conditions	The selected device disconnects from the Wi-Fi Hotspot The selected device is listed under the blocked devices
List of Exception Use Cases	WFHSv2-UC-REQ-454858-E4 Wi-Fi Hotspot configuration through WifiHotspotOnBoardClient fails WFHSv2-UC-REQ-454859-E11 WifiHotspotOnBoardClient update failed
Interfaces	WifiHotspotServer WifiHotspotOnBoardClient

3.8.2.2 WFHSv2-UC-REQ-454878/A-User blocks a device from the Wi-Fi Hotspot through the WifiHotspotOnBoardClient while the blocked list is full

Actors	User In-vehicle WifiHotspotOnBoardClient WifiHotspotServer
Pre-conditions	Up to Number_Hotspot_Connected_Devices devices connected to the Wi-Fi Hotspot Number_Blocked_Devices devices are placed on the hotspot's blocked list
Scenario Description	Vehicle occupant selects a device from the list of connected devices and chooses to block the device
Post-conditions	The oldest device that was placed on the blocked list is removed from the blocked list The selected device disconnects from the hotspot The selected device is listed under the blocked devices at the top of the list
List of Exception Use Cases	WFHSv2-UC-REQ-454858-E4 Wi-Fi Hotspot configuration through WifiHotspotOnBoardClient fails WFHSv2-UC-REQ-454859-E11 WifiHotspotOnBoardClient update failed
Interfaces	WifiHotspotServer WifiHotspotOnBoardClient

3.8.2.3 WFHSv2-UC-REQ-454879/A-Vehicle occupant removes a device from the Wi-Fi Hotspot's blocked list through the WifiHotspotOnBoardClient

Actors	User WifiHotspotOnBoardClient WifiHotspotServer Cell phone

Pre-conditions	WifiHotspotServer is on Up to (Number_Hotspot_Connected_Devices – 1) devices connected to the Wi-Fi Hotspot Device(s) is/are listed in the blocked list menu
Scenario Description	Vehicle occupant selects a device from the list of blocked devices and chooses to remove the device from the list
Post-conditions	The device is deleted from the list The device is able to connect to the hotspot if the user enters the Wi-Fi Hotspot password
List of Exception Use Cases	WFHSv2-UC-REQ-454858-E4 Wi-Fi Hotspot configuration through WifiHotspotOnBoardClient fails WFHSv2-UC-REQ-454859-E11 WifiHotspotOnBoardClient update failed
Interfaces	WifiHotspotServer WifiHotspotOnBoardClient

3.8.2.4 WFHSv1-UC-REQ-191975/A-User connects a device

Actors	Vehicle occupant WifiHotspotServer Wi-Fi device
Pre-conditions	Wi-Fi Hotspot is on WifiHotspotServer has good cellular coverage Less than Number_Hotspot_Connected_Devices devices already connected to vehicle's Wi-Fi Hotspot Device A is within the 50 foot Wi-Fi range OR vehicle is traveling up to 70mph
Scenario Description	User enters vehicle's SSID/password into device A
Post-conditions	Device A shows established connection All connected devices may stream 35 Mbps not including overhead (or more or less depending on their applications)
List of Exception Use Cases	
Interfaces	WifiHotspotServer Wi-Fi device

3.8.2.5 WFHSv1-UC-REQ-191979/A-User tries to connect a device that exceeds the allowable number of devices

Actors	Vehicle occupant WifiHotspotServer User
Pre-conditions	Wi-Fi Hotspot is on Number_Hotspot_Connected_Devices devices already connected to vehicle's Wi-Fi Hotspot
Scenario Description	User enters vehicle's SSID/password into a Wi-Fi device
Post-conditions	Password is rejected
List of Exception Use Cases	
Interfaces	WifiHotspotServer Wi-Fi device

3.8.2.6 WFHSv1-UC-REQ-191980/A-Returning device connects to hotspot

Actors	WifiHotspotServer Wi-Fi device
Pre-conditions	Hotspot is on Wi-Fi visibility is set to on Device A has connected to the vehicle's hotspot before & user chose to have device always automatically connect to hotspot SSID & password has not been changed since Up to (Number_Hotspot_Connected_Devices – 1) devices already connected
Scenario Description	Device A enters the vehicle's Wi-Fi range
Post-conditions	Device A automatically connects to the vehicle's Wi-Fi
List of Exception Use Cases	
Interfaces	WifiHotspotServer Wi-Fi device

3.8.2.7 WFHSv1-UC-REQ-191981/A-SSID and/or password is changed

Actors	WifiHotspotServer Wi-Fi device
Pre-conditions	Hotspot is on Wi-Fi visibility is set to on Device A has connected to the vehicle's hotspot before & user chose to have device always automatically connect to hotspot SSID and/or password has been changed since
Scenario Description	Device A enters the vehicle's Wi-Fi range
Post-conditions	Device A is unable to connect to the Wi-Fi Hotspot
List of Exception Use Cases	
Interfaces	WifiHotspotServer Wi-Fi device

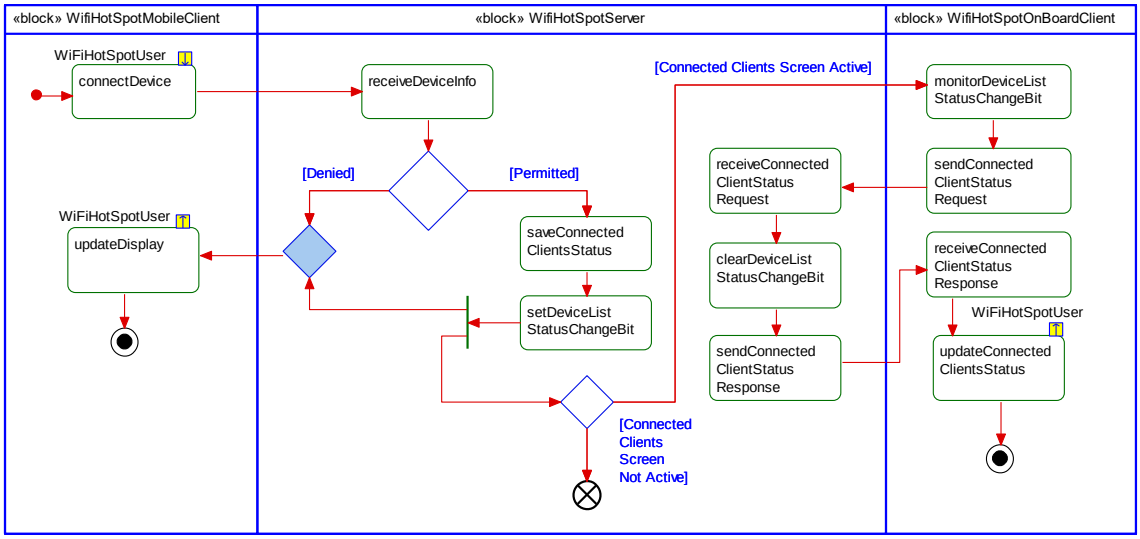
3.8.2.8 WFHSv1-UC-REQ-191982/B-Returning device configured to NOT automatically connect to hotspot

Actors	WifiHotspotServer Wi-Fi device
Pre-conditions	Hotspot is on Device A has connected to the vehicle's hotspot before & user chose to have device NOT automatically connect to hotspot
Scenario Description	Device A enters the vehicle's Wi-Fi range
Post-conditions	Device A does not connect to the vehicle's hotspot
List of Exception Use Cases	
Interfaces	WifiHotspotServer Wi-Fi device

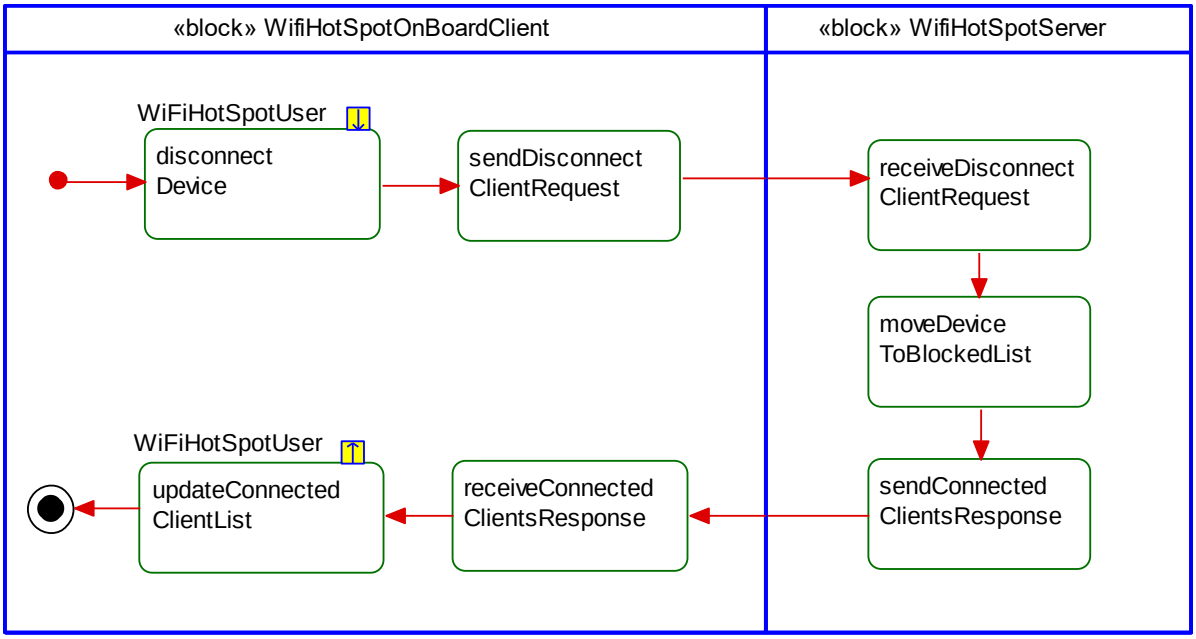
3.8.3 White Box Views

3.8.3.1 Activity Diagrams

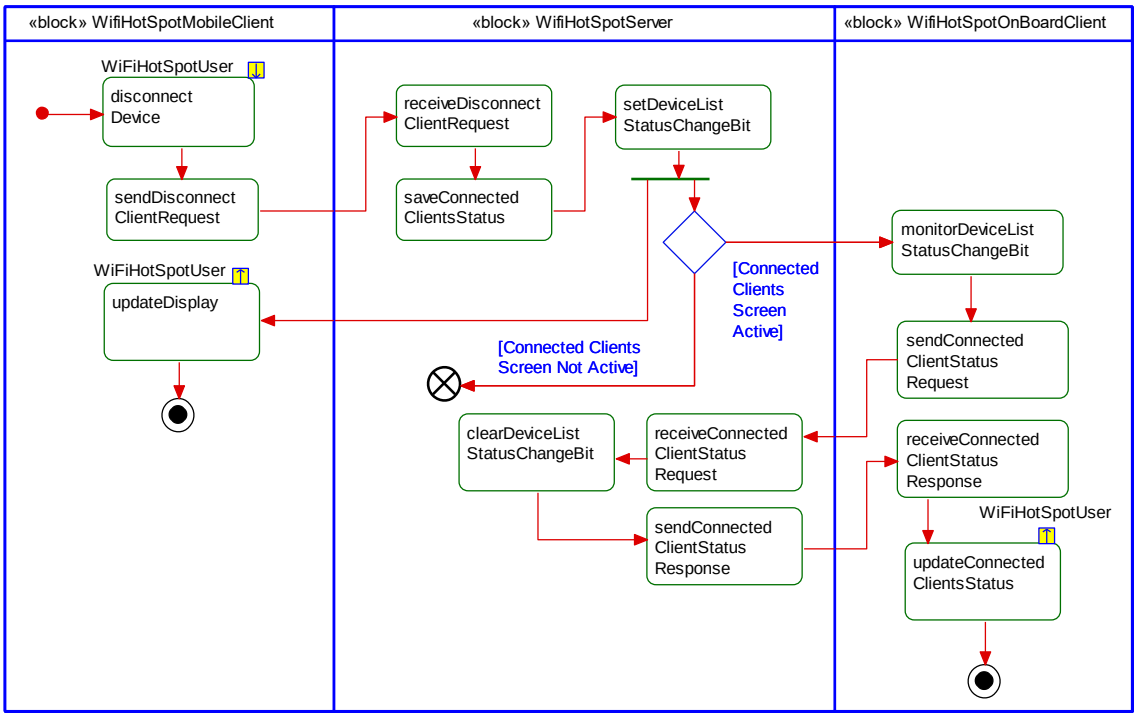
3.8.3.1.1 WFHSv1-ACT-REQ-167115/C-Connect A Device



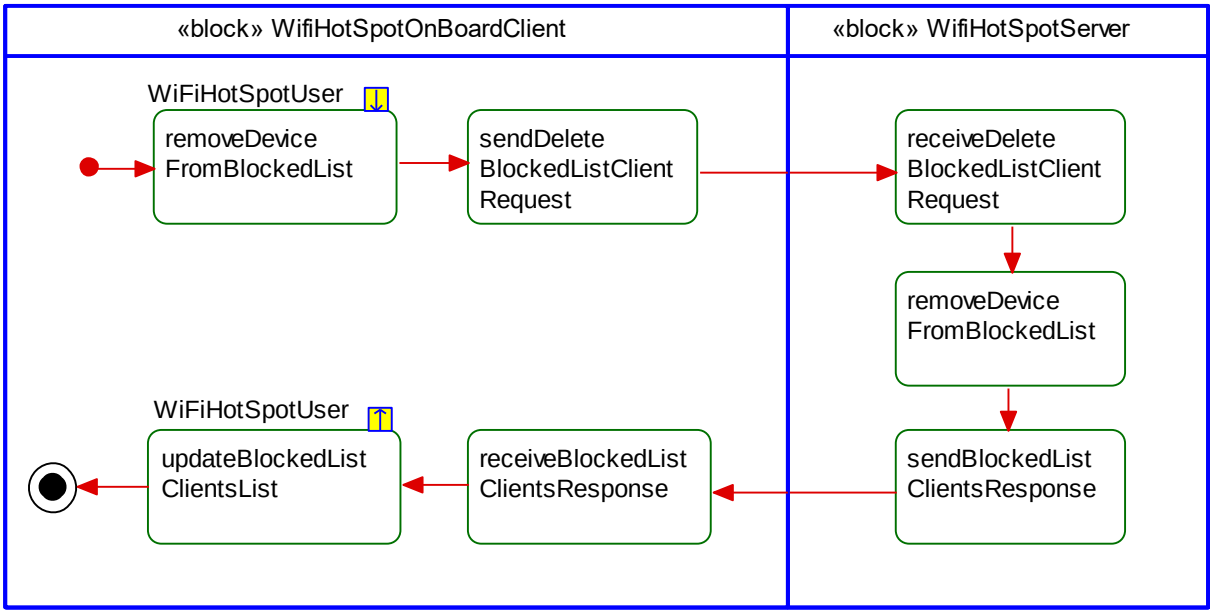
3.8.3.1.2 WFHSv1-ACT-REQ-167123/A-User Disconnects Device From Hotspot through the Centerstack



3.8.3.1.3 WFHSv1-ACT-REQ-167124/B-User Disconnects Device From Hotspot through the Device

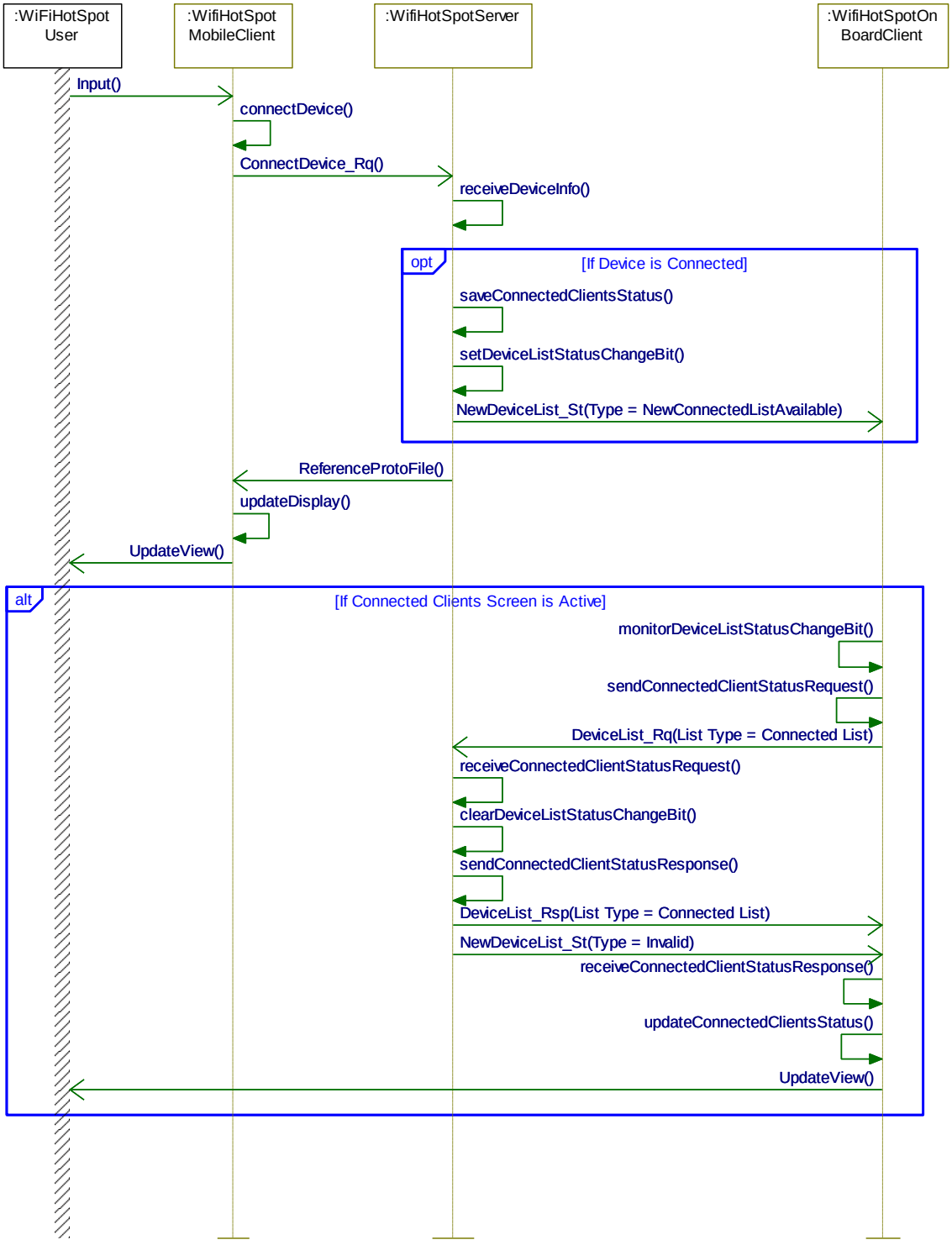


3.8.3.1.4 WFHSv1-ACT-REQ-167126/A-User Removes Device From Blocked List through Centerstack

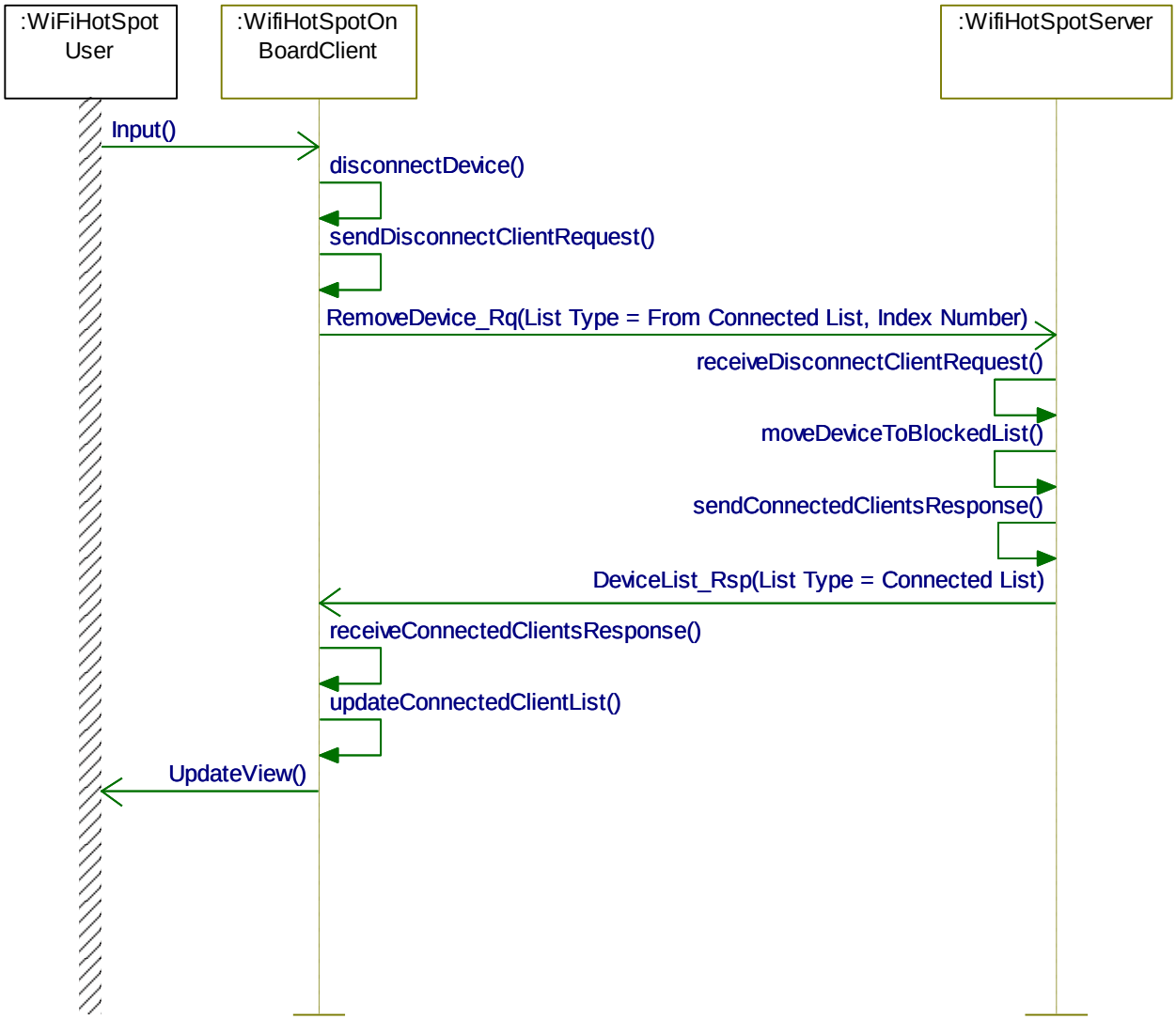


3.8.3.2 Sequence Diagrams

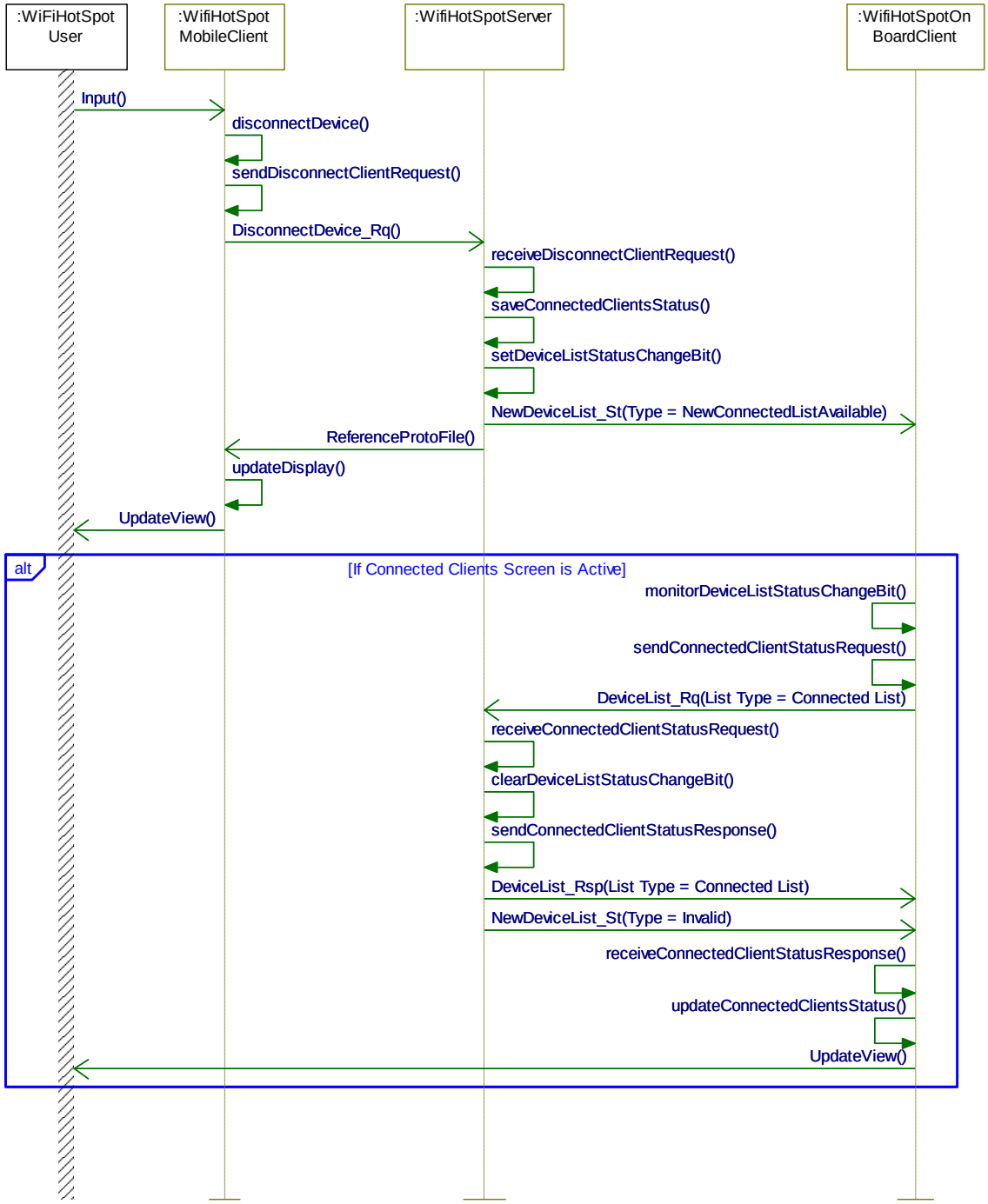
3.8.3.2.1 WFHSv1-SD-REQ-167138/C-Connect A Device



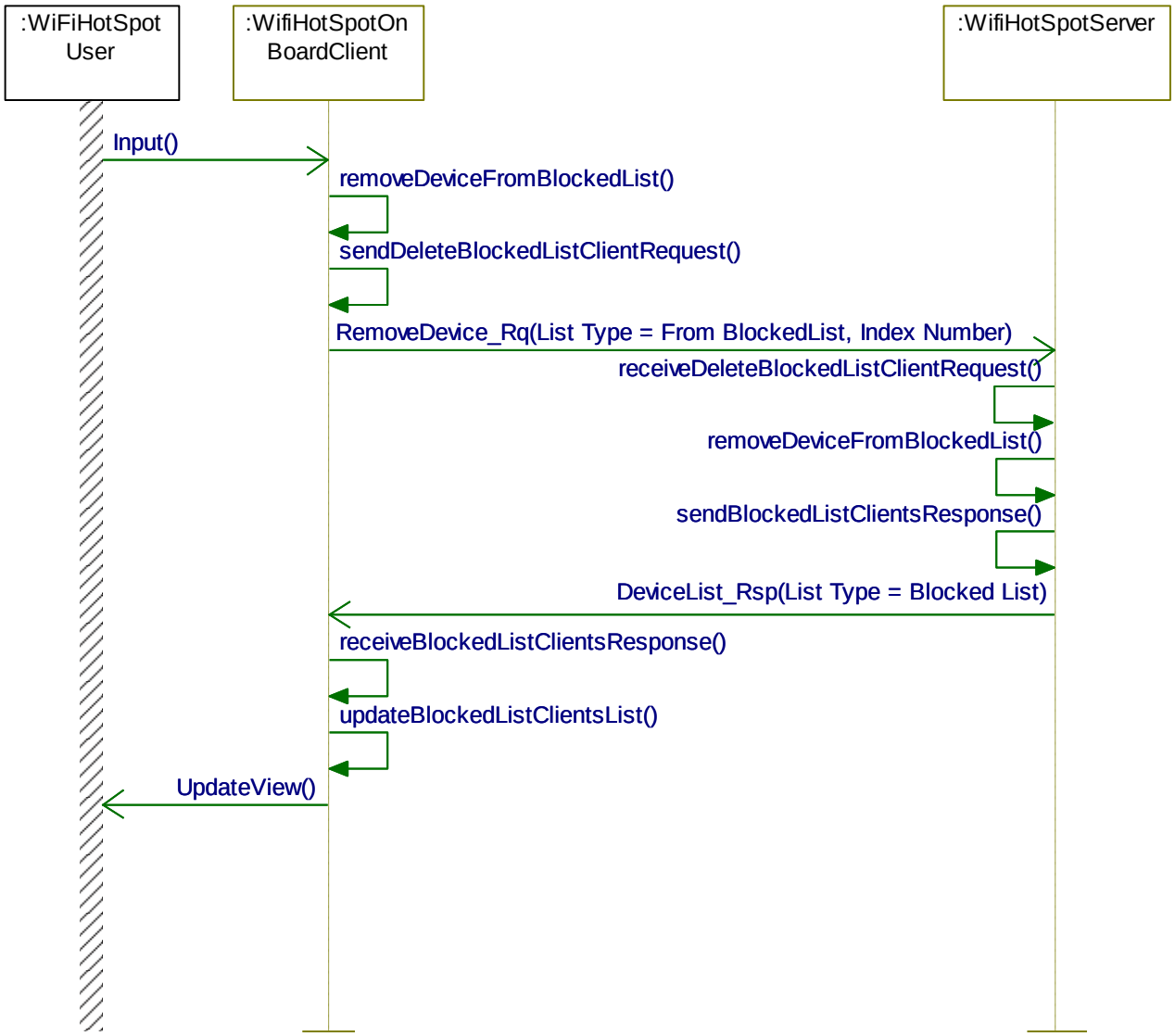
3.8.3.2.2 WFHSv1-SD-REQ-167140/A-User Disconnects Device From Hotspot through the Centerstack



3.8.3.2.3 WFHSv1-SD-REQ-167141/B-User Disconnects Device From Hotspot through the Device



3.8.3.2.4 WFHSv1-SD-REQ-167142/A-User Removes Device From Blocked List through Centerstack



3.9 WFHSv2-FUN-REQ-274802/B-Reporting Data Used

The WifiHotspotServer shall NOT transmit any requests to the WifiHotspotOffBoardClient if the vehicle is not authorized. If the vehicle is authorized, the WifiHotspotServer may transmit data usage requests and refreshes to the WifiHotspotOffBoardClient.

The WifiHotspotOnBoardClient shall be capable of graphically displaying data usage information. The data usage information reflects the data used through the vehicle's Wi-Fi Hotspot. This information MAY consist of the items listed below:

a. Plan type: session or shared
b. Specify if the plan is unlimited or not
c. Renewal or expiration date and time
d. Specify whether the date is a renewal date or an expiration date
e. Current amount of data used since the beginning of the billing cycle or the beginning of the package (in KB/MB/GB and in percentage). Note: this data amount shall reflect the total amount of data used on the plan, i.e. total amount of data used on a mobile share plan or total amount of data used through the vehicle if on an individual package.
f. Total amount of data per billing cycle or total amount of data on the package
g. Unit of measure for data used values (KB, MB or GB)
h. Unit of measure for total data (KB, MB or GB)
i. Overage flag
j. User ID
k. The current status of the hotspot:
    i. Free trial period waiting to be activated
    ii. Free trial period is active
    iii. No active subscription
    iv. Subscription active

Not all the data usage information listed above may be displayed to the customer. The information displayed depends on the type of data package the vehicle is tied to. The carrier shall decide what values to transmit.

If the user enters into the Wi-Fi Hotspot menu, the WifiHotspotOnBoardClient shall transmit a request to the WifiHotspotServer to refresh the data usage information without sending a response back. Therefore, no data usage response shall be sent from the WifiHotspotServer back to the WifiHotspotOnBoardClient.

If the user enters into the Wi-Fi Hotspot Data Usage screen the WifiHotspotOnBoardClient shall transmit a request to the WifiHotspotServer for the current data, and in turn, the WifiHotspotServer shall respond with its stored data usage information.

If the user chooses to refresh the data usage information the WifiHotspotOnBoardClient shall transmit a data usage refresh request. If the WifiHotspotServer receives a data usage refresh request it shall respond with updating, successful and/or fail. If the update was successful the new data usage info shall also be transmitted to the WifiHotspotOnBoardClient.

3.9.1 Requirements

3.9.1.1 WFHSv2-REQ-281707/B-Data usage feature flag

The WifiHotspotServer shall have a DID Data_Usage_Feature_Enablement which shall have two states (On/Off) and shall be defaulted to On. This DID shall be updateable via EOL and OTA. This DID shall be used to determine whether the WifiHotspotServer shall allow data usage queries and notifications to be transmitted to and from the WifiHotspotOnBoardClient and WifiHotspotOffBoardClient.

- Data_Usage_Feature_Enablement flag is set to On: If the Data_Usage_Feature_Enablement flag is set to On, the WifiHotspotServer shall inform the WifiHotspotOnBoardClient by setting the signal DataUsageFeature_St=On. If the WifiHotspotServer receives data usage queries from the WifiHotspotOnBoardClient, it shall accept and transmit them to the WifiHotspotOffBoardClient, assuming there are no other conditions that prohibit WifiHotspotServer from doing so (i.e. vehicle is not authorized). If the WifiHotspotServer receives data usage notifications from the WifiHotspotOffBoardClient, it shall accept them and inform the WifiHotspotOnBoardClient of these notifications (refer to section WFHSv2-FUN-REQ-274805-Carrier Data Notification), assuming there are no other conditions that prohibit WifiHotspotServer from doing so.

- Data_Usage_Feature_Enablement flag is set to Off: If the Data_Usage_Feature_Enablement flag is set to Off, the WifiHotspotServer shall inform the WifiHotspotOnBoardClient by setting the signal DataUsageFeature_St=Off. The WifiHotspotServer shall not have any data usage information stored if this flag is Off. If the WifiHotspotServer has data usage information stored when the DID is set from On to Off, the WifiHotspotServer shall clear the previously stored data usage information. If the WifiHotspotServer receives a data usage query from the WifiHotspotOnBoardClient, it shall ignore the query and NOT transmit any query to the WifiHotspotOffBoardClient. If the WifiHotspotServer receives a data usage notification from the WifiHotspotOffBoardClient, it shall ignore the notification and NOT inform the WifiHotspotOnBoardClient.

3.9.1.2 WFHSv2-REQ-283769/C-Hiding data usage screen based on data usage feature flag

The WifiHotspotOnBoardClient shall monitor the signal DataUsageFeature_St to determine if the Data Usage screens shall be enabled or disabled.

If the signal DataUsageFeature_St=On, the WifiHotspotOnBoardClient shall allow the user to navigate to the Data Usage screens (refer to WFHSv2-REQ-283641-HMI Specification References).

If the signal DataUsageFeature_St=Off or Null/None, the WifiHotspotOnBoardClient shall not present the user the option to access the Data Usage screens. Therefore, the Data Usage screens shall not be accessible or viewable by the user.

If the signal DataUsageFeature_St is missing from the bus/network, the WifiHotspotOnBoardClient shall allow the user to navigate to the Data Usage screens.

3.9.1.3 WFHSv2-REQ-283770/B-WifiHotspotOnBoardClient initiates data usage request due to user entering into Wi-Fi Hotspot menu

If the user enters into the Wi-Fi Hotspot main menu (refer to WFHSv2-REQ-283641-HMI Specification References) from outside the Wi-Fi Hotspot screens and the Wi-Fi Hotspot Data Usage Refresh Timeout timer is NOT ACTIVE (refer to WFHS-REQ-191874/D-User refreshes data usage screen), the WifiHotspotOnBoardClient shall transmit a request to the WifiHotspotServer to refresh the data usage information without sending a response back (signal DataUsage_Rq=RefreshDataNoResponse). Note: the request shall only be transmitted if the user enters into the Wi-Fi Hotspot main menu from outside the Wi-Fi Hotspot screens (i.e. If the user navigates to the Wi-Fi Hotspot menu screen from the WifiHotspotOnBoardClient home page, the WifiHotspotOnBoardClient shall transmit a request. If the user entered into the Wi-Fi Hotspot main menu screen and navigates to the Data Usage screen then back to the Wi-Fi Hotspot main menu screen, the WifiHotspotOnBoardClient shall not transmit a request).

If the user enters into the Wi-Fi Hotspot main menu from outside the Wi-Fi Hotspot screens and the Wi-Fi Hotspot Data Usage Refresh Timeout timer is ACTIVE, the WifiHotspotOnBoardClient shall NOT transmit any requests to the WifiHotspotServer to refresh the data usage information.

3.9.1.4 WFHSv2-REQ-281708/C-Request to refresh data usage info without a response required

If the WifiHotspotServer receives a request from the WifiHotspotOnBoardClient to refresh the data usage values without sending a response (DataUsage_Rq=RefreshDataNoResponse) while the vehicle is authorized, the WifiHotspotServer shall transmit an FTCP request to the WifiHotspotOffBoardClient to REFRESH the data usage information (Note: if the WifiHotspotOffBoardClient receives a Refresh request from the WifiHotspotServer, the WifiHotspotOffBoardClient will transmit a data usage refresh request to the carrier). Once the WifiHotspotServer has initiated the data usage request it shall start a data usage timer (Data_Usage_Info_Refresh_Timeout). If the WifiHotspotServer receives an update from the WifiHotspotOffBoardClient before the timer expires, it shall overwrite the previous data usage information with the new information, store the new information, and clear the timer. If the timer expires before the WifiHotspotServer receives the data usage values, the WifiHotspotServer shall clear the timer and end the updating process. Since the request from the WifiHotspotOnBoardClient was “RefreshDataNoResponse”, the WifiHotspotSever shall NOT transmit a data usage response signal to the WifiHotspotOnBoardClient. If a data usage response is received from the WifiHotspotOffBoardClient AFTER the timer expires, the WifiHotspotServer shall discard the response.

Example 1: WifiHotspotServer transmits data usage request A to WifiHotspotOffBoardClient and starts a timer. Timer expires. Data usage response A is received some time later. WifiHotspotServer shall discard the response.
Example 2: WifiHotspotServer transmits data usage request A to WifiHotspotOffBoardClient and starts a timer. Timer expires without receiving data usage response A. WifiHotspotServer initiates data usage request B and starts a timer.

During this window data usage response A is received. WifiHotspotServer shall discard response A and continue waiting for data usage response B.

The data usage timer (Data_Usage_Info_Refresh_Timeout) shall be configurable via EOL or OTA with a default value of 15 seconds for all regions. Refer to WFHSv2-REQ-283728-WifiHotspotServer identifies the vehicle region for more information on determining vehicle region.

If the WifiHotspotServer receives a request to refresh the data usage values without sending a response (DataUsage_Rq=RefreshDataNoResponse) while the vehicle is not authorized, the WifiHotspotServer shall ignore the request and not transmit any request to the WifiHotspotOffBoardClient nor send any response back to the WifiHotspotOnBoardClient.

3.9.1.5 WFHSv3-REQ-281851/D-Displaying data usage information

If the user requests to enter into the Wi-Fi Hotspot Data Usage screen and the Wi-Fi Hotspot Data Usage Refresh Timeout timer is NOT ACTIVE (refer to WFHS-REQ-191874-User refreshes data usage screen), the WifiHotspotOnBoardClient shall request for the current data usage information from the WifiHotspotServer (DataUsage_Rq=CurrentData) before populating the screen. The WifiHotspotServer shall report back the data usage information through the signal DataUsage_Rsp, and the WifiHotspotOnBoardClient shall display the appropriate information and screen (refer to WFHSv2-REQ-283641-HMI Specification References). If the user requests to refresh the screen, the WifiHotspotOnBoardClient shall transition to the appropriate screen upon receiving the update from the WifiHotspotServer.

If the user enters into the Wi-Fi Hotspot Data Usage screen and the Wi-Fi Hotspot Data Usage Refresh Timeout timer is ACTIVE, the WifiHotspotOnBoardClient shall NOT transmit a request for the current data. Instead, the WifiHotspotOnBoardClient shall display the previously stored data usage values, if any. The Refresh button shall be disabled while the timer is active.

The WifiHotspotOnBoardClient shall determine which region specific data usage screens to display (refer to WFHS-REQ-283727-WifiHotspotOnBoardClient identifies vehicle region). The WifiHotspotOnBoardClient shall also determine which Data Usage screen to display based on the information within the DataUsage_Rsp message. Refer to the table below for a mapping of the data usage screens to data usage response. Refer to WFHSv2-REQ-283641-HMI Specification References for other HMI specification references.

<table>
<tr><th>Data usage response FTCP message</th><th>DataUsage_Rsp</th><th>HMI Specification Screens</th></tr>
<tr><td>No data usage information stored in WifiHotspotServer</td><td>Invalid</td><td>Data usage error screen</td></tr>
<tr><td>Data plan type: trial; Data plan status: pending</td><td>Data plan status: Free trial period waiting</td><td>Trial eligible screen</td></tr>
<tr><td>Data plan type: trial; Data plan status: active</td><td>Data plan status: Free trial period active</td><td>Trial active screen</td></tr>
<tr><td>Data plan type: trial or paid-session or paid-shared or paid-session-unlimited or paid-shared-unlimited; Data plan status: expired</td><td rowspan="2">Data plan status: No subscription active</td><td rowspan="2">No active data plan screen</td></tr>
<tr><td>Data plan type: trial or paid-session or paid-shared or paid-session-unlimited or paid-shared-</td></tr>
</table>

unlimited; Data plan status: inactive		
Data plan type: paid-session or paid-shared; Data plan status: active	Data plan status: Active subscription	Screen may vary depending on the data usage percentage field
Data plan type: paid-session-unlimited or paid-shared-unlimited; Data plan status: active	Data plan status: Active subscription; Total data: unlimited	Unlimited data usage screen
Data plan type: paid-shared; Data plan status: active; Overage flag: yes	Overage flag: yes	Data overage screen

Table. Data usage/Manage account screen displayed depending on data plan status

The WifiHotspotOnBoardClient shall also determine the vehicle brand in order to determine what specific text to populate within the manage account screens (refer to WFHSv2-REQ-283726-WifiHotspotOnBoardClient identifies vehicle brand). The vehicle brand shall also be used to determine which app the vehicle is compatible with.

If the vehicle is a Ford vehicle, the vehicle is compatible with the Ford app. If the vehicle is a Lincoln, the vehicle is compatible with the Lincoln app. All Wi-Fi Hotspot popups and screens that reference a mobile app shall refer the customer to one of these apps based on vehicle brand. Refer to the HMI specifications for the final mobile app names.

The screen below is an example WifiHotspotOnBoardClient screen.

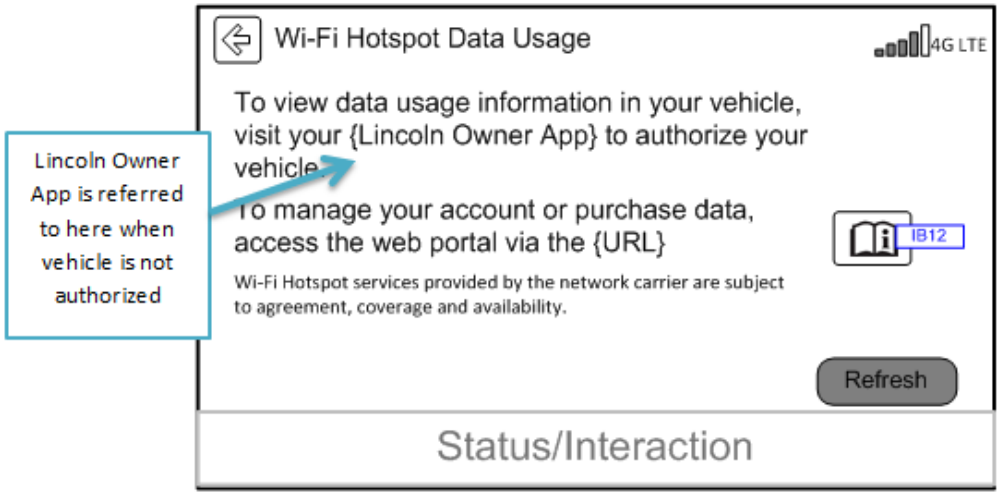


Figure. NA, Lincoln screen listing the corresponding app

If the WifiHotspotOnBoardClient is required to display the User ID (refer to the rules within the HMI specification), the WifiHotspotOnBoardClient shall be required to display a maximum length of 32 characters.

If the vehicle is NOT authorized the WifiHotspotOnBoardClient shall NOT allow the user to refresh the data usage screen.

If the WifiHotspotOnBoardClient receives all invalid values in the DataUsage_Rsp signal, but the vehicle is Authorized, the WifiHotspotOnBoardClient shall still allow the user to refresh the data usage screen.

The wireless carriers currently do not display the expiration/renewal **time** (hh:mm:ss), but have indicated that this may change in the future. To stay consistent, the WifiHotspotOnBoardClient shall display the expiration/renewal date, but shall NOT display the expiration/renewal time. The time shall, however, be included in the signal DataUsage_Rsp in order to protect for changes in the future. If the carriers decide to display time as well, this requirement shall be updated to allow the time to be displayed.

3.9.1.6 WFHSv2-REQ-283772/A-Displaying elapsed time since a data usage update

The WifiHotspotOnBoardClient shall display a time in the Wi-Fi Hotspot Data Usage screens that represents the amount of time that has elapsed since the WifiHotspotServer last received any data usage information (refer to WFHSv2-REQ-283641-HMI Specification References).

If the WifiHotspotOnBoardClient receives a data usage response from the WifiHotspotServer that includes a value for the data usage counter, the WifiHotspotOnBoardClient shall follow the rules below to determine how the elapsed time shall be displayed:

Counter Value (from DataUsage_Rsp)	Display Text
00:00:00 ≤ counter value < 00:01:00	Status as of: Now
00:01:00 ≤ counter value < 00:02:00	Status as of: 1 minute ago
00:02:00 ≤ counter value < 01:00:00	Status as of: xx minutes ago (xx = minute value)
01:00:00 ≤ counter value < 02:00:00	Status as of: 1 hour ago
02:00:00 ≤ counter value ≤ 72:00:00	Status as of: yy hours ago (yy = hour value)

The following screens are example WifiHotspotOnBoardClient screens.

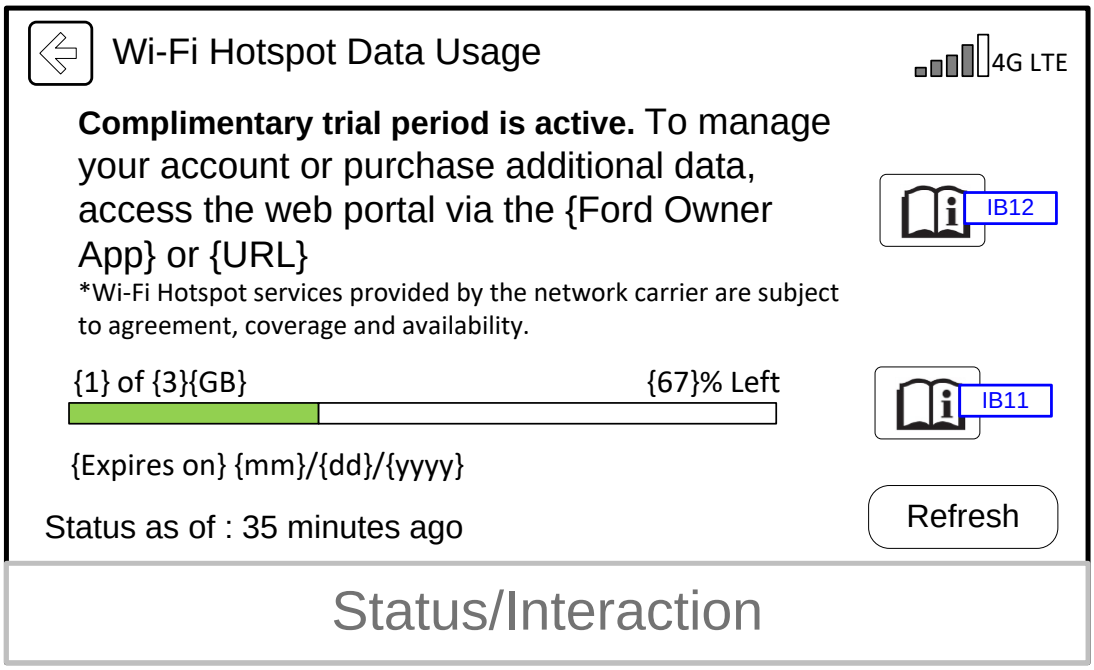


Figure. Screen displaying data usage information that was updated between 35 to 36 minutes ago

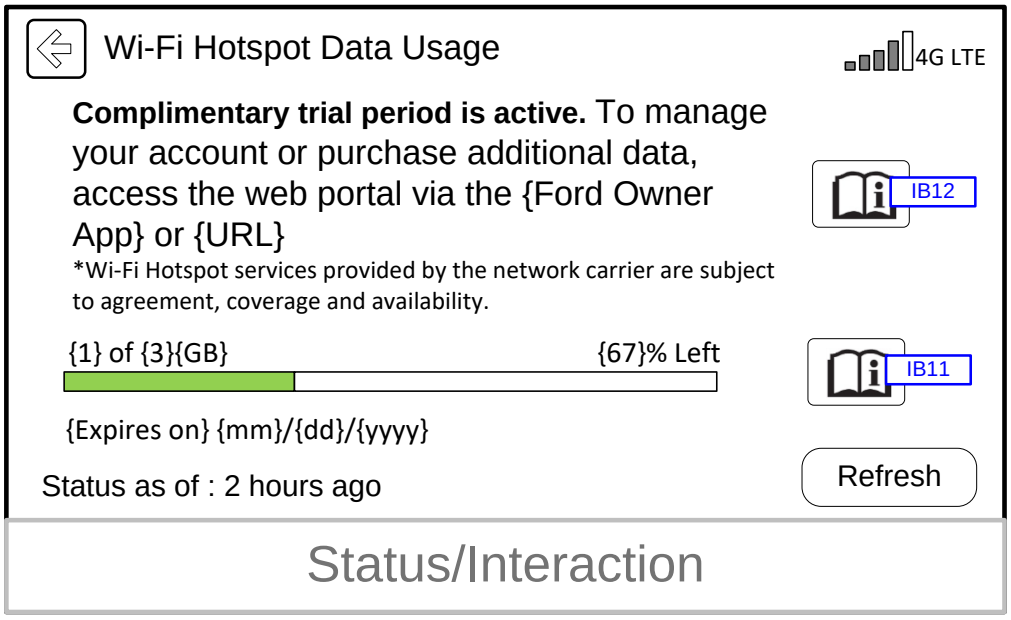


Figure. Screen displaying data usage information that was updated between 2 to 3 hours ago

3.9.1.7 WFHSv2-REQ-283773/A-Rounding data usage values

The WifiHotspotOnBoardClient shall receive the amount of data used and the total amount of data on the plan, along with the unit of measure for each (either KB, MB or GB).

The WifiHotspotOnBoardClient shall receive the data used value and total data value with two decimal places. If both decimal places hold zeros, the WifiHotspotOnBoardClient shall drop the zeros.

Example)

- Data used = 1.25, WifiHotspotOnBoardClient shall display “1.25”
- Data used = 1.00, WifiHotspotOnBoardClient shall display “1”

Refer to WFHSv2-REQ-283641-HMI Specification References.

3.9.1.8 WFHSv2-REQ-283651/B-Request from WifiHotspotOnBoardClient for the WifiHotspotServer's stored data usage information

If the WifiHotspotServer receives a request from the WifiHotspotOnBoardClient for the current data usage information (DataUsage_Rq=CurrentData) the WifiHotspotServer shall respond with its stored data usage information using the signal DataUsage_Rsp. If the WifiHotspotServer does not have any stored data usage information at the time of the request, the WifiHotspotServer shall transmit Invalid values in the response (DataUsage_Rsp). Note: the DataUsage_Rsp shall NOT indicate a CES=Failed response, but rather a Success response.

3.9.1.9 WFHSv2-REQ-283652/B-Request from WifiHotspotOnBoardClient for data usage while WifiHotspotServer is updating the data usage information

If the WifiHotspotServer has requested for the data usage information from the WifiHotspotOffBoardClient and is currently waiting for a response when it receives a request from WifiHotspotOnBoardClient for the CURRENT data usage information (DataUsage_Rq=CurrentData), the WifiHotspotServer shall transmit the previously stored data usage information to the WifiHotspotOnBoardClient using the signal DataUsage_Rsp and continue the updating process. If the WifiHotspotServer does not have any data usage information stored at the time of the request, the WifiHotspotServer shall respond with Invalid values. Note: the DataUsage_Rsp shall NOT indicate a CES=Failed response, but rather a Success response.

3.9.1.10 WFHSv2-REQ-456557/A-User refreshes data usage screen

If the user requests to refresh the data usage information the WifiHotspotOnBoardClient shall transmit this refresh request to the WifiHotspotServer using the signal DataUsage_Rq=RefreshData. The WifiHotspotServer may respond with “wait”, “failure” or the data usage values and “success” (DataUsage_Rsp). The WifiHotspotOnBoardClient shall also start a timer

(Wi-Fi Hotspot Data Usage Refresh Timeout timer; configurable and defaulted to 30 seconds) once it receives a request from the user to refresh the data usage information. The timer shall remain active until one of the following triggers occur:

1. The WifiHotspotServer sends a successful response using the signal DataUsage_Rsp.
2. The WifiHotspotServer sends a failure response using the signal DataUsage_Rsp.
3. The Wi-Fi Hotspot Data Usage Refresh Timeout timer expires.

If the WifiHotspotOnBoardClient's Wi-Fi Hotspot Data Usage Refresh Timeout timer is active while the user is in the Data Usage screen, the WifiHotspotOnBoardClient shall display an updating message to the user and the refresh button shall be disabled. If a successful message is received, the WifiHotspotOnBoardClient shall refresh the screen with the new data usage values. If a failure response is received while the user is still in the Data Usage screen, the screen shall inform the user of the failure and remain displaying the old data usage information. If the Wi-Fi Hotspot Data Usage Refresh Timeout timer expires while the user is still in the Data Usage screen, the screen shall inform the user of the failure and remain displaying the old data usage information. If the timer expires or a failure message is received while the user is NOT in the Data Usage screen, the user shall not be informed of the failure.

3.9.1.11 WFHS-REQ-283653/B-Displaying data usage response error messages

If the customer requests to refresh the data usage and it fails, the failure could have been caused for multiple different reasons. The error messaging to the customer on the HMI display may vary depending on the reason for failure. The WifiHotspotServer shall be responsible for transmitting the error code to the WifiHotspotOnBoardClient when this failure occurs. The WifiHotspotOnBoardClient shall receive this error code from the WifiHotspotServer via the signal WifiErrorCode_St and use this to display the corresponding error message. Refer to the HMI specifications in order to determine what error messaging shall be used for which error code.

The signal WifiErrorCode_St shall be defaulted to Null. If the WifiHotspotOnBoardClient has requested to Refresh the data usage screen and receives a DataUsage_Rsp message from the WifiHotspotServer with CES=Fail, it shall also expect the signal WifiErrorCode_St to be updated to reflect the data usage error code. The WifiHotspotServer shall transmit the DataUsage_Rsp Failure message and set and transmit the WifiErrorCode_St signal at the same time. The signal WifiErrorCode_St shall remain set to the current error code for 2 seconds before returning to Null to ensure the WifiHotspotOnBoardClient is able to detect the error code at the time of receiving the Failed DataUsage_Rsp message. If the WifiHotspotOnBoardClient receives a DataUsage_Rsp Failure from a Refresh and the signal WifiErrorCode_St remains at Null for up to 2 seconds after the response is received or the signal is missing altogether, the WifiHotspotOnBoardClient shall display the generic error message (refer to the HMI specification).

3.9.1.12 WFHSv2-REQ-281855/C-Request from WifiHotspotOnBoardClient to refresh the data usage values

If the WifiHotspotServer receives a request from the WifiHotspotOnBoardClient to Refresh the data usage information (DataUsage_Rq=RefreshData) and the vehicle is authorized, the WifiHotspotServer shall send an FTCP Refresh request to the WifiHotspotOffBoardClient for data usage information. The WifiHotspotServer shall also start a timer (Data_Usage_Info_Refresh_Timeout configurable with a default value of 15 seconds for all regions, refer to WFHSv2-REQ-283728-WifiHotspotServer identifies the vehicle region for more information on determining vehicle region) once it receives this request from the WifiHotspotOnBoardClient. Because the request from the WifiHotspotOnBoardClient was a Refresh request, the WifiHotspotServer shall transmit a "wait" response to the WifiHotspotOnBoardClient using the signal DataUsage_Rsp while it is finishing the updating process. Note: if the WifiHotspotOffBoardClient receives a Refresh request from the WifiHotspotServer, the WifiHotspotOffBoardClient will transmit a data usage refresh request to the carrier.

If the WifiHotspotServer receives the data usage information response from the WifiHotspotOffBoardClient before the timer expires, the WifiHotspotServer shall save and send over the data usage information to the WifiHotspotOnBoardClient (DataUsage_Rsp).

If the timer expires before the WifiHotspotServer receives a response from the WifiHotspotOffBoardClient the WifiHotspotServer shall send a failure message (DataUsage_Rsp) and end the data usage updating process. If a data usage response is received from the WifiHotspotOffBoardClient AFTER the timer expires, the WifiHotspotServer shall discard the response.

> Example 1: WifiHotspotServer transmits data usage request A to WifiHotspotOffBoardClient and starts a timer. Timer expires. Data usage response A is received some time later. WifiHotspotServer shall discard the response.
> Example 2: WifiHotspotServer transmits data usage request A to WifiHotspotOffBoardClient and starts a timer. Timer expires without receiving data usage response A. WifiHotspotServer initiates data usage request B and starts a timer.

During this window data usage response A is received. WifiHotspotServer shall discard response A and continue waiting for data usage response B.

If the WifiHotspotServer does not have a connection established with the WifiHotspotOffBoardClient at the time it receives a request from the WifiHotspotOnBoardClient to update the data usage information (DataUsage_Rq=RefreshData), the WifiHotspotServer shall immediately respond with a failure message (DataUsage_Rsp) and end the updating process.

If the WifiHotspotServer receives a request to Refresh the data usage information (DataUsage_Rq=RefreshData) and the vehicle is NOT authorized, the WifiHotspotServer shall ignore the request and NOT transmit a request to the WifiHotspotOffBoardClient. The WifiHotspotServer shall instead respond with “Failure” using the signal DataUsage_Rsp (note: all data usage information shall be invalid if the vehicle is unauthorized).

The WifiHotspotServer shall not expect all fields within the data usage FTCP message to be populated. Therefore, the WifiHotspotServer shall not reject a message if some data usage fields are missing. Fields may be missing because the active plan does not support a specific field, there is no active plan so all other fields do not apply, etc. For example, if the FTCP message indicates a Paid Session Plan is Inactive, then data used, % used, etc. would not apply and would therefore not be populated.

If the WifiHotspotServer is required to transmit a data usage response to the WifiHotspotOnBoardClient due to a request for its stored data usage information or due to a refresh request, the WifiHotspotServer shall populate the data plan status field in the signal DataUsage_Rsp based on the mapping defined in the table below. All other fields within the DataUsage_Rsp signal shall be populated based on the information stored in the WifiHotspotServer that was received by a data usage FTCP response or a carrier data notification. If the WifiHotspotServer does not have any data usage information stored, it shall set all fields in the DataUsage_Rsp signal as invalid. If the overage flag is set to Yes, the WifiHotspotServer shall set the data used percent value to Invalid. If the WifiHotspotServer does not have a complete set of data usage information to report in the DataUsage_Rsp TP message, it shall set the missing data to Invalid in the TP response message.

Example: The WifiHotspotServer receives an FTCP data usage message that contains the following:

- Data plan type = Trial
- Data plan status = Pending
- No other fields are populated.

The WifiHotspotServer shall:

- Populate the counter fields in the TP message.
- Populate DataPlanStatus to "Free trial period waiting".
- All other fields within the TP message shall be set to “Invalid”.

Data usage response/carrier data notification FTCP message: data plan type field	**Data usage responsecarrier data notification FTCP message: data plan status field**	**DataUsage_Rsp; data plan status field**
No data usage information stored in WifiHotspotServer	No data usage information stored in WifiHotspotServer	Invalid
trial	pending	Free trial period waiting
trial	active	Free trial period active
trial or paid-session or paid-shared or paid-session-unlimited or paid-shared-unlimited	expired	No subscription active
trial or paid-session or paid-shared or paid-session-unlimited or paid-shared-unlimited	inactive	
paid-session or paid-shared	active	Active subscription
paid-session-unlimited or paid-shared-unlimited	active	Active subscription (total data field shall be set to unlimited)

3.9.1.13 WFHS-REQ-283659/D-Reporting data usage response error messages for failed Refresh requests

If the WifiHotspotServer is required to Refresh the data usage due to a Refresh request from the WifiHotspotOnBoardClient (DataUsage_Rq=Refresh) and the refresh Fails, the WifiHotspotServer shall determine the reason for failure and report this out to the WifiHotspotOnBoardClient. The WifiHotspotServer shall use the signal WifiErrorCode_St to report out the failure. The default state of this signal shall be Null. When the refresh fails, the WifiHotspotServer shall perform the following:

- Prepare the DataUsage_Rsp message with CES=Fail and set the WifiErrorCode_St to the corresponding error code (see table below),
- Transmit both the DataUsage_Rsp and WifiErrorCode_St at the same time,
- Keep the WifiErrorCode_St set to the corresponding error code for 2 seconds, then
- Set the WifiErrorCode_St back to Null and continue transmitting.

The WifiHotspotServer shall either detect the failure (i.e. no cellular connection at time of refresh request) or relay the error code reported from the WifiHotspotOffBoardClient. If the WifiHotspotOffBoardClient determined the failure, it shall report this to the WifiHotspotServer through the FTCP data usage response message. The WifiHotspotServer shall report the failure to the WifiHotspotOnBoardClient using the lookup table below.

Data Usage Response Error Codes	
WifiErrorCode_St	**WifiHotspotServer Failure Description**
NULL	WifiHotspotServer has no stored data usage information at time of a request for the Current Data (DataUsage_Rq=Current Data)
Error1	WifiHotspotServer has no connection established with the WifiHotspotOffBoardClient
Error2	WifiHotspotServer refresh timed out with no response from the WifiHotspotOnBoardClient
Error3	WifiHotspotServer detects the vehicle is not authorized OR FTCP Response: Authorization Failure was received
Error4	FTCP Response: Temporary Failure
Error5	FTCP Response: Data Error
Error6	FTCP Response: Downstream Systems Error
Error7	FTCP Response: All other failure messages
Error8-15	Not Used

3.9.1.14 WFHSv2-REQ-454920/A-Request from WifiHotspotOnBoardClient for a data usage refresh while WifiHotspotServer is updating the data usage information

If the WifiHotspotServer is in the process of updating its data usage values (due to user entering into the Wi-Fi Hotspot main menu, refer to WFHSv2-REQ-281708-Request to refresh data usage info without a response required) when it receives a Refresh data usage command from the WifiHotspotOnBoardClient (DataUsage_Rq=RefreshData), the WifiHotspotServer shall respond with a “wait” status in the signal DataUsage_Rsp and continue the updating process. The WifiHotspotServer shall not initiate a new data usage request to the WifiHotspotOffBoardClient. If the WifiHotspotServer receives the data usage FTCP response, it shall send this information along with a success response to the WifiHotspotOnBoardClient. If the Data_Usage_Info_Refresh_Timeout (refer to WFHSv2-REQ-281708-Request to refresh data usage info without a response required) expires before the WifiHotspotServer received a data usage update, the WifiHotspotServer shall transmit a fail response to the WifiHotspotOnBoardClient.

3.9.1.15 WFHS-REQ-191865/A-Receiving a full data usage response

The WifiHotspotServer Wi-Fi application shall manage the data usage plan information for the Wi-Fi Hotspot received from the WifiHotspotOffBoardClient through a FTCP Ford cloud message exchange. The Wi-Fi subsystem shall manage two buffers. The active data usage buffer that contains the most recent copy last received from the WifiHotspotOffBoardClient and another buffer that is dedicated to receive the data plan usage information updates in real time via FTCP exchange. The active data usage buffer shall only be updated by the FTCP received data when integrity of the data is confirmed by the

WifiHotspotServer FTCP component. Otherwise the received data shall be ignored and the active data buffer shall retain its content.

3.9.1.16 WFHSv2-REQ-283545/B-Monitoring elapsed time since the data usage update

If the WifiHotspotServer receives a carrier data notification (refer to WFHSv2-FUN-REQ-274805-Carrier Data Notification) or data usage response FTCP message, the WifiHotspotServer shall note the time of when the message was received and start a counter. The WifiHotspotServer shall monitor this data usage counter to determine how long ago (in hour, minutes and seconds) the data usage message was received. If the WifiHotspotServer is required to transmit the data usage information (using signal DataUsage_Rsp) due to a refresh request or a current data request from the WifiHotspotOnBoardClient, the WifiHotspotServer shall include the value of the data usage counter in its response.

If the WifiHotspotServer has an active data usage counter when it receives a new data usage message from the WifiHotspotOffBoardClient, the WifiHotspotServer shall restart the counter. The counter shall only be counting the time from the last received data usage message. If the WifiHotspotServer clears the data usage information (refer to WFHSv2-REQ-283546-Clearing data usage information), the WifiHotspotServer shall also reset the data usage counter. The counter shall only be active when the WifiHotspotServer has data usage information stored.

The WifiHotspotServer shall store the time (hh:mm:ss) it received a data usage response or notification message from the WifiHotspotOffBoardClient in the DID Data_Usage_Reception_Time (refer to WFHSv2-REQ-283642-Diagnostic Specification Reference). The DID shall only reflect the time of the LAST received message. If the WifiHotspotServer does not have any data usage information stored, no time shall be reflected in the DID.

3.9.1.17 WFHSv2-REQ-283546/A-Clearing data usage information

The WifiHotspotServer shall clear any stored data usage information once the ignition transitions to off, the WifiHotspotServer goes into low powered registered (LPR) mode (refer to the WifiHotspotServer Power Management Requirements specification) or the data usage counter reaches 72 hours.

If the WifiHotspotServer has data usage information (received from a data usage response FTCP message or from a carrier data notification FTCP message) stored in memory, the WifiHotspotServer shall:

- monitor the ignition status (IgnitionStatus_St).
  - IgnitionStatus_St≠Off: If the ignition status transitions to off from any other state, the WifiHotspotServer shall clear all stored data usage information and clear the data usage counter.
  - IgnitionStatus_St=Off: If the WifiHotspotServer begins to transition to LPR mode, the WifiHotspotServer shall first clear all stored data usage information and clear the data usage counter.
- monitor the data usage counter (refer to WFHSv2-REQ-283545-Monitoring elapsed time since the data usage update).
  - If the data usage counter value < 72 hours, the WifiHotspotServer shall continue monitoring the counter and keep all data usage information stored.
  - If the data usage counter value = 72 hours, the WifiHotspotServer shall clear all data usage information from memory and clear the data usage counter.

The WifiHotspotServer shall clear the data usage information and counter as soon as any of the events stated above occurs.

If the WifiHotspotServer does not have any data usage information stored, the data usage counter shall not be active.

3.9.2 Use Cases

3.9.2.1 WFHSv2-UC-REQ-281857/B-User accesses the data usage screen in a good network coverage area

Actors	User System
Pre-conditions	WifiHotspotServer is On WifiHotspotServer has a good connection to the network Vehicle is authorized
Scenario Description	User enters the Wi-Fi Hotspot screen that displays the data usage
Post-conditions	The data usage information shows it was last updated at either the time:

	a. The user last refreshed it from WifiHotspotOnBoardClient during the current ignition cycle b. The user entered into the Wi-Fi Hotspot main menu screen from outside the Wi-Fi Hotspot screens during the current ignition cycle or c. A low balance notification was displayed in the vehicle during the current ignition cycle.
List of Exception Use Cases	WFHSv2-UC-REQ-454858-E4 Wi-Fi Hotspot configuration through WifiHotspotOnBoardClient fails
Interfaces	Ford infrastructure Carrier infrastructure WifiHotspotServer WifiHotspotOnBoardClient CAN SoA

3.9.2.2 WFHSv2-UC-REQ-281858/B-User accesses the data usage screen in a no network coverage area

Actors	User System
Pre-conditions	WifiHotspotServer is On WifiHotspotServer has no connection to the network Vehicle is authorized
Scenario Description	User enters the Wi-Fi Hotspot main menu from outside the Wi-Fi Hotspot screens and then into the Data usage screen
Post-conditions	The data usage information cannot be displayed or old data usage information is displayed
List of Exception Use Cases	WFHSv2-UC-REQ-454859-E11 WifiHotspotOnBoardClient update failed
Interfaces	Ford infrastructure Carrier infrastructure WifiHotspotServer In-vehicle WifiHotspotOnBoardClient CAN SoA

3.9.2.3 WFHSv2-UC-REQ-281859/B-User enters into the Wi-Fi Hotspot menu and refreshes the data usage screen immediately

Actors	User System
Pre-conditions	WifiHotspotServer is On WifiHotspotServer has a connection to the network WifiHotspotServer initiates its data usage update Vehicle is authorized
Scenario Description	User enters the Wi-Fi Hotspot screen that displays the data usage and refreshes the data usage values before the WifiHotspotServer has completed its data usage update
Post-conditions	The WifiHotspotOnBoardClient shows an updating popup

	When the data usage values are received the WifiHotspotOnBoardClient screen shall update
List of Exception Use Cases	WFHSv2-UC-REQ-454858-E4 Wi-Fi Hotspot configuration through WifiHotspotOnBoardClient fails WFHSv2-UC-REQ-454859-E11 WifiHotspotOnBoardClient update failed
Interfaces	Ford infrastructure Carrier infrastructure WifiHotspotServer WifiHotspotOnBoardClient CAN SoA

3.9.2.4 WFHSv2-UC-REQ-281860/B-User refreshes the data usage values from the WifiHotspotOnBoardClient

Actors	User System
Pre-conditions	WifiHotspotOnBoardClient is available WifiHotspotServer has a good connection to the network Vehicle is authorized
Scenario Description	User is in the Wi-Fi Hotspot screen that displays the data usage and presses the refresh button
Post-conditions	The screen informs the user of an update in progress and the refresh button is disabled. Data usage information is updated once the data is refreshed.
List of Exception Use Cases	WFHSv2-UC-REQ-454858-E4 Wi-Fi Hotspot configuration through WifiHotspotOnBoardClient fails WFHSv2-UC-REQ-454859-E11 WifiHotspotOnBoardClient update failed
Interfaces	Ford infrastructure Carrier infrastructure WifiHotspotServer WifiHotspotOnBoardClient CAN SoA

3.9.2.5 WFHSv2-UC-REQ-281861/B-User refreshes data usage values from WifiHotspotOnBoardClient when vehicle is in a no coverage area

Actors	User WifiHotspotOnBoardClient WifiHotspotServer
Pre-conditions	WifiHotspotServer is On Vehicle in a no coverage area Vehicle is authorized
Scenario Description	User enters the Wi-Fi Hotspot screen that displays the data usage and presses the refresh button
Post-conditions	A popup shall be displayed to the customer notifying them there are issues connecting to the network After the popup is closed, the screen shall show all the same values as it did prior to the refresh request.

List of Exception Use Cases	WFHSv2-UC-REQ-454858-E4 Wi-Fi Hotspot configuration through WifiHotspotOnBoardClient fails WFHSv2-UC-REQ-454859-E11 WifiHotspotOnBoardClient update failed
Interfaces	WifiHotspotServer WifiHotspotOnBoardClient CAN SoA

3.9.2.6 WFHSv2-UC-REQ-281862/B-User refreshes data usage values from WifiHotspotOnBoardClient when vehicle is in a poor coverage area

Actors	User In-vehicle WifiHotspotOnBoardClient WifiHotspotServer
Pre-conditions	WifiHotspotServer is On Vehicle is in a poor coverage area Vehicle is authorized
Scenario Description	User enters the Wi-Fi Hotspot screen that displays the data usage and presses the refresh button
Post-conditions	The screen shall inform the user of an update in progress. The refresh button shall not be accessible. A popup shall appear notifying the user there were issues connecting to the network Popup closes and old data usage information is displayed
List of Exception Use Cases	WFHSv2-UC-REQ-454858-E4 Wi-Fi Hotspot configuration through WifiHotspotOnBoardClient fails
Interfaces	WifiHotspotServer WifiHotspotOnBoardClient CAN SoA WifiHotspotOffBoardClient Carrier backend

3.9.2.7 WFHSv2-UC-REQ-281863/B-User refreshes the data usage values on the mobile app in a good coverage area

Actors	User Mobile App
Pre-conditions	Mobile app has good cellular coverage Vehicle is authorized
Scenario Description	User refreshes the data usage values from the mobile app
Post-conditions	The app updates and the new data usage information is displayed
List of Exception Use Cases	WFHSv1-UC-REQ-191974-E12 Mobile app update failed WFHSv1-UC-REQ-191930-E3 Wi-Fi Hotspot command through mobile app fails
Interfaces	Ford infrastructure Carrier infrastructure WifiHotspotOnBoardClient display

	CAN SoA

3.9.2.8 WFHSv2-UC-REQ-281864/B-User refreshes the data usage values on the mobile app in a no coverage area

Actors	User Mobile App
Pre-conditions	Mobile app has no cellular coverage
Scenario Description	The user refreshes the data usage values from the mobile app Vehicle is authorized
Post-conditions	The app times out, indicates an unsuccessful attempt and displays the previous data usage values
List of Exception Use Cases	WFHSv1-UC-REQ-191930-E3 Wi-Fi Hotspot command through mobile app fails
Interfaces	Ford infrastructure Carrier infrastructure WifiHotspotOnBoardClient display CAN SoA

3.9.2.9 WFHSv2-UC-REQ-281865/C-User refreshes the data usage values on the mobile app while in the Wi-Fi Hotspot screen on the WifiHotspotOnBoardClient display

Actors	User Mobile App WifiHotspotOnBoardClient
Pre-conditions	Mobile app has good cellular coverage User is in the Wi-Fi Hotspot screens on the WifiHotspotOnBoardClient display Vehicle is authorized
Scenario Description	User refreshes the data usage values from the mobile app
Post-conditions	The app updates and the new data usage information is displayed The WifiHotspotOnBoardClient continues to display the old data usage values
List of Exception Use Cases	WFHSv1-UC-REQ-191974-E12 Mobile app update failed WFHSv1-UC-REQ-191930-E3 Wi-Fi Hotspot command through mobile app fails
Interfaces	Ford infrastructure Carrier infrastructure WifiHotspotOnBoardClient display CAN SoA

3.9.2.10 WFHSv2-UC-REQ-281866/A-User accesses the mobile app while vehicle is not authorized

Actors	User System
Pre-conditions	Vehicle is NOT authorized User has downloaded the Ford/Lincoln Owner App, created an account and associated a VIN to the account

Scenario Description	User access the mobile app screen
Post-conditions	No Wi-Fi Hotspot data usage information is displayed in the mobile app A link to the carrier landing page is displayed or, if the vehicle is a China vehicle, the landing page and the carrier's hotline number (if vehicle is a Ford then the Ford specific number shall be displayed and if vehicle is a Lincoln then the Lincoln specific number shall be displayed) and vehicle's VIN are also displayed
List of Exception Use Cases	
Interfaces	WifiHotspotOffBoardClient Mobile app

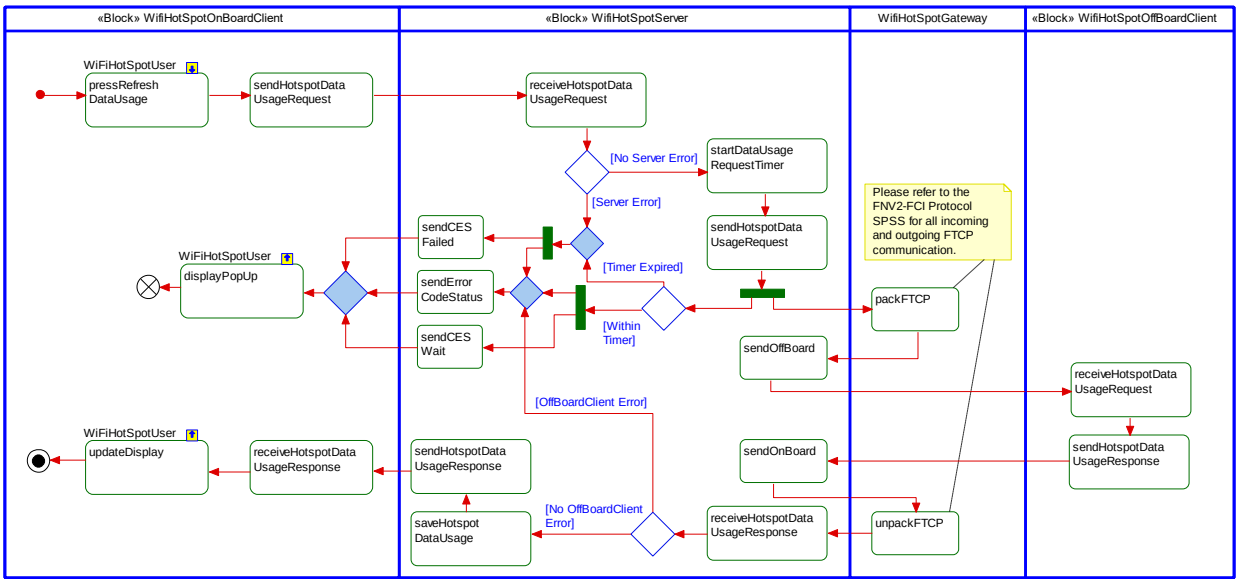
3.9.2.11 WFHSv2-UC-REQ-281867/A-User accesses the data usage screen while vehicle is un-authorized

Actors	User System
Pre-conditions	Vehicle is authorized WifiHotspotServer is on Wi-Fi Hotspot Data Usage screen displayed data usage information last time the user was in the screen
Scenario Description	User un-authorizes the vehicle through WifiHotspotOnBoardClient or mobile app and accesses the Wi-Fi Hotspot Data Usage screen
Post-conditions	No data usage information is displayed
List of Exception Use Cases	
Interfaces	WifiHotspotServer WifiHotspotOnBoardClient WifiHotspotOffBoardClient Mobile app

3.9.3 White Box Views

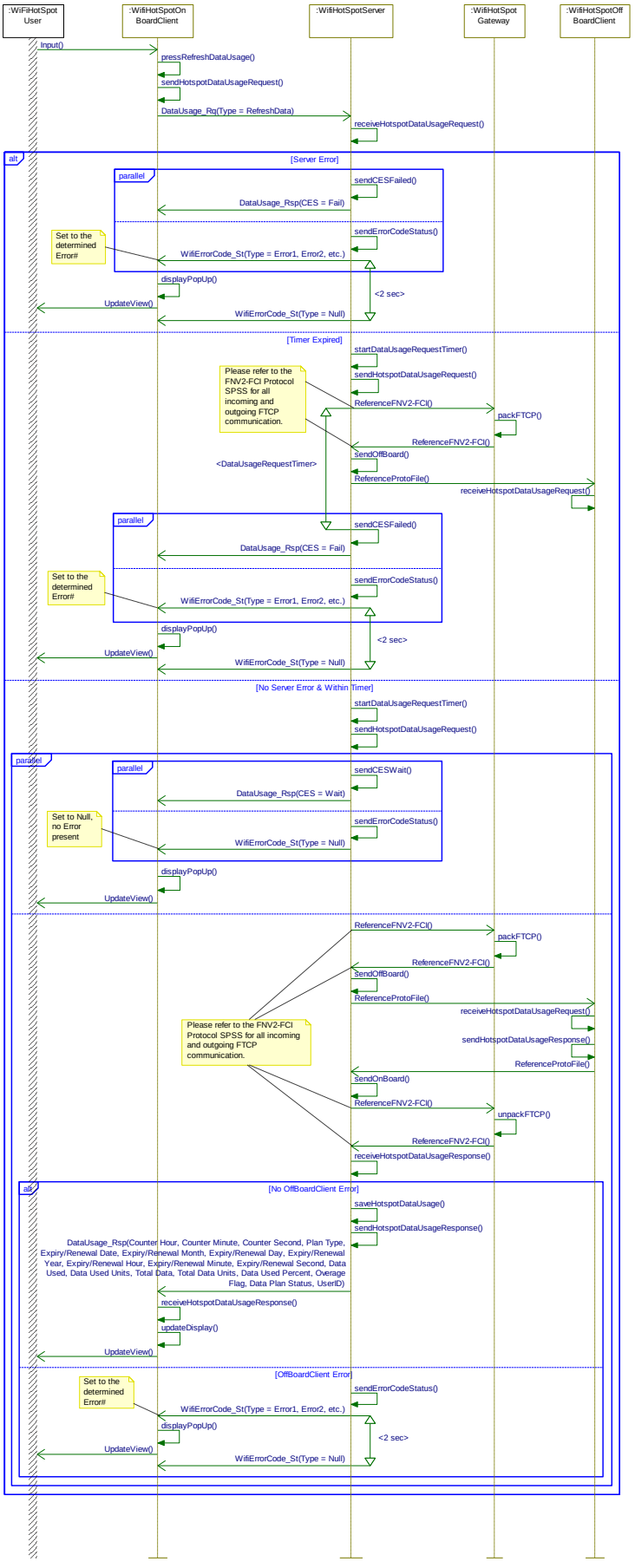
3.9.3.1 Activity Diagrams

3.9.3.1.1 WFHSv2-ACT-REQ-274803/B-User Refreshes Data Usage Values From Centerstack



3.9.3.2 Sequence Diagrams

3.9.3.2.1 WFHSv2-SD-REQ-274804/B-User Refreshes Data Usage Values From Centerstack


:WiFiHotSpot User
:WifiHotSpotOn BoardClient
:WifiHotSpotServer
:WifiHotSpot Gateway
:WifiHotSpotOff BoardClient
Input()
pressRefreshDataUsage()
sendHotspotDataUsageRequest()
DataUsage_Rq(Type = RefreshData)
receiveHotspotDataUsageRequest()
alt
[Server Error]
parallel
sendCESFailed()
DataUsage_Rsp(CES = Fail)
sendErrorCodeStatus()
Set to the determined Error#
WifiErrorCode_St(Type = Error1, Error2, etc.)
displayPopUp()
<2 sec>
UpdateView()
WifiErrorCode_St(Type = Null)
[Timer Expired]
startDataUsageRequestTimer()
sendHotspotDataUsageRequest()
Please refer to the FNV2-FCI Protocol SPSS for all incoming and outgoing FTCP communication.
ReferenceFNV2-FCI()
packFTCP()
ReferenceFNV2-FCI()
sendOffBoard()
<DataUsageRequestTimer>
ReferenceProtoFile()
receiveHotspotDataUsageRequest()
parallel
sendCESFailed()
DataUsage_Rsp(CES = Fail)
sendErrorCodeStatus()
Set to the determined Error#
WifiErrorCode_St(Type = Error1, Error2, etc.)
displayPopUp()
<2 sec>
UpdateView()
WifiErrorCode_St(Type = Null)
[No Server Error & Within Timer]
startDataUsageRequestTimer()
sendHotspotDataUsageRequest()
parallel
parallel
sendCESWait()
DataUsage_Rsp(CES = Wait)
sendErrorCodeStatus()
Set to Null, no Error present
WifiErrorCode_St(Type = Null)
displayPopUp()
UpdateView()
ReferenceFNV2-FCI()
packFTCP()
ReferenceFNV2-FCI()
sendOffBoard()
ReferenceProtoFile()
receiveHotspotDataUsageRequest()
Please refer to the FNV2-FCI Protocol SPSS for all incoming and outgoing FTCP communication.
sendHotspotDataUsageResponse()
ReferenceProtoFile()
sendOnBoard()
ReferenceFNV2-FCI()
unpackFTCP()
ReferenceFNV2-FCI()
receiveHotspotDataUsageResponse()
alt
[No OffBoardClient Error]
saveHotspotDataUsage()
sendHotspotDataUsageResponse()
DataUsage_Rsp(Counter Hour, Counter Minute, Counter Second, Plan Type, Expiry/Renewal Date, Expiry/Renewal Month, Expiry/Renewal Day, Expiry/Renewal Year, Expiry/Renewal Hour, Expiry/Renewal Minute, Expiry/Renewal Second, Data Used, Data Used Units, Total Data, Total Data Units, Data Used Percent, Overage Flag, Data Plan Status, UserID)
receiveHotspotDataUsageResponse()
updateDisplay()
UpdateView()
[OffBoardClient Error]
Set to the determined Error#
sendErrorCodeStatus()
WifiErrorCode_St(Type = Error1, Error2, etc.)
displayPopUp()
<2 sec>
UpdateView()
WifiErrorCode_St(Type = Null)

3.10 WFHSv2-FUN-REQ-274805/B-Carrier Data Notification

If the vehicle is not authorized, the WifiHotspotOffBoardClient shall not transmit any data usage notifications to the WifiHotspotServer. If the vehicle becomes authorized, the WifiHotspotOffBoardClient may start transmitting data usage notifications to the WifiHotspotServer.

The carrier shall transmit low balance notifications in real time to the WifiHotspotOffBoardClient (~2 seconds). If the vehicle is authorized, the notifications shall be transmitted from the WifiHotspotOffBoardClient to the WifiHotspotServer in real time (~2 seconds), assuming the WifiHotspotServer is awake. The carrier data notification message that is transmitted to the WifiHotspotServer shall utilize the same FTCP response message that the WifiHotspotServer receives from a data usage request (refer to WFHSv2-FUN-REQ-274802-Reporting Data Used). The notification shall include data usage information, but the message shall indicate it is a notification and not a data usage response. The WifiHotspotServer shall store the most recently received data usage information so that the current status stored in the WifiHotspotServer reflects the current status of the data plan. A carrier data notification shall be transmitted whenever a low balance threshold was met. These thresholds shall be pre-defined and communicated to the carrier.

The WifiHotspotServer shall be responsible for updating the WifiHotspotOnBoardClient of these notifications through CarrierDataNotifications_St. The WifiHotspotOnBoardClient shall display a popup to the customer if it receives a low balance notification from the WifiHotspotServer.

3.10.1 Requirements

3.10.1.1 WFHSv2-REQ-281868/B-Receiving carrier data notifications and data usage updates

The data usage FTCP message shall indicate whether the message is a notification or not. If the WifiHotspotServer receives a data usage FTCP notification, it shall be responsible for notifying the WifiHotspotOnBoardClient of the notification using the signal CarrierDataNotification_St only when the WifiHotspotOnBoardClient is available.

The WifiHotspotServer shall monitor the signal HMIMode_St to determine when the WifiHotspotOnBoardClient display is active. The WifiHotspotOnBoardClient screen is active when the signal HMIMode_St=0x2:On.

The WifiHotspotServer shall transmit the signal CarrierDataNotification_St in its default state (parameter notification type="NULL/NONE" and percentage="50 percent") until the WifiHotspotServer is triggered to set them to a different state.

If the WifiHotspotServer receives a carrier data notification, the WifiHotspotServer shall first store the data usage information transmitted within the notification message and note when the notification was received (refer to WFHSv2-REQ-283545-Monitoring elapsed time since the data usage update). The WifiHotspotServer shall then check the "data used" field to determine what threshold percentage it shall send to the WifiHotspotOnBoardClient. The WifiHotspotServer shall also check the status of the WifiHotspotOnBoardClient screen to determine if it is active or to determine when it becomes active. Once the WifiHotspotServer confirms the WifiHotspotOnBoardClient screen is active, the WifiHotspotServer shall perform the following two steps:

1) Set the signal CarrierDataNotification_St to "percent data used" and set the percentage parameter to the data used percentage identified within the notification and transmit both once (note: the notification type and percentage parameters within the signal CarrierDataNotification_St shall be set to the appropriate states and transmitted at the same time).
2) Unset the signal CarrierDataNotification_St back to NULL/NONE (and set the percentage back to 50%) and continue transmitting.

If the WifiHotspotServer receives multiple carrier data notifications from the WifiHotspotOffBoardClient while the WifiHotspotOnBoardClient display is not active, then once the display becomes active the WifiHotspotServer shall only set the signal CarrierDataNotification_St once and set the percentage to the data left percentage contained within the last received notification.

Note: WifiHotspotServer shall ignore data usage notifications if the Data_Usage_Feature_Enablement DID is set to Off. Refer to WFHSv2-REQ-281707-Data usage feature flag. The WifiHotspotServer shall also ignore data usage notifications if the vehicle is NOT authorized.

3.10.1.2 WFHSv2-REQ-283730/C-Triggering free trial period reminders

The WifiHotspotServer shall contain a parameter (TrialEligible) that shall be used to determine if the WifiHotspotServer is trial eligible or not. The WifiHotspotServer shall be delivered to Ford with the initial status of the parameter TrialEligible=Yes.

Parameter	State
TrialEligible	0) Yes 1) No

Table. TrialEligible parameter

If the WifiHotspotServer receives a data usage notification or a data usage response from a request that indicates the WifiHotspotServer is no longer trial eligible, or if Wi-Fi_Hotspot_Feature_Enabled = DISABLED, the WifiHotspotServer shall update the TrialEligible parameter to “No”. Once the parameter is changed to “No”, the parameter shall not be changed to “Yes” unless the WifiHotspotServer receives a notification or data usage response indicating that the vehicle is trial eligible. If the WifiHotspotServer receives a notification or data usage response with no indication on whether the vehicle is trial eligible or not, the TrialEligble parameter state shall remain in its previous state. If the WifiHotspotServer does not have any data usage information stored, the TrialEligible parameter shall remain in its previous state. Refer to the table below to see which data plan type and status combinations indicate if the TrialEligible parameter shall be changed to Yes or No.

Carrier data notification/data usage response: data plan type	Carrier data notification/data usage response: data plan status	TrialEligible parameter
WifiHotspotServer has no data usage information stored	WifiHotspotServer has no data usage information stored	Retain previous state
trial	pending	Yes
trial	active	No
trial or paid	expired	No
trial or paid	inactive	No
paid	active	No

Each VIN shall be granted ONE free trial period in its lifetime. Certain exceptions may be made (for example, call center operators may choose to reinstate trial periods after receiving customer complaints). To increase the Wi-Fi Hotspot free trial period awareness, free trial period reminders shall be displayed on the WifiHotspotOnBoardClient display. Refer to WFHSv2-REQ-283641-HMI Specification References. The trial period reminder popups shall be displayed at the next ignition cycle after the vehicle has reached a specific mileage. The user shall have the ability to select a “remind me later” option, at which point the popup will exit and will re-populate at a later time.

The WifiHotspotServer shall have a configuration (Wi-Fi_Trial_Reminder) that shall set the trial period reminders either Off or On (refer to WFHSv2-REQ-283642-Diagnostic Specification Reference). Wi-Fi_Trial_Reminder parameter shall also be configurable via OTA. If the trial reminders are set to ON and Wi-Fi_Hotspot_Feature_Enabled = ENABLED, the WifiHotspotServer shall follow the requirements stated within this requirement in order to display the trial period reminder popups. If the trial period reminders are set to OFF or Wi-Fi_Hotspot_Feature_Enabled =DISABLED, the WifiHotspotServer shall not follow the requirements stated within this requirement and no trial reminder popups shall be triggered.

Note: To trigger a trial reminder popup Wi-Fi_Hotspot_Feature_Enabled must be ENABLED. Wi-Fi_Hotspot_Feature_Enabled =DISABLED shall not trigger any trial reminder popups.
The trial period reminder shall be triggered once the vehicle has reached a certain mileage. The reminder mileage trigger (Wi-Fi_Trial_Reminder_Trigger, configurable via OTA) shall be stored in the WifiHotspotServer and the SW shall default it to:

- 1931 km (1200 miles) for NA and China and
- 1000 km for Europe and RW (refer to WFHSv2-REQ-283728-WifiHotspotServer identifies the vehicle region).

Once a trial period reminder popup is triggered, the reminder may be delayed. If the reminder is delayed, the reminder popup shall be re-populated Wi-Fi_Trial_Reminder_Delay kilometers after the last reminder popup was triggered. The Wi-Fi_Trial_Reminder_Delay parameter shall be configurable via OTA and shall be stored in the WifiHotspotServer and the SW shall default it to:

- 1287 km (800 miles) for NA and China and
- 1000 km for Europe and RW.

The WifiHotspotServer shall monitor the signal HotspotTrialReminderSelection_Rq to determine if it shall re-trigger the trial reminder popup at a later distance or end the trial reminder triggers altogether.

The WifiHotspotServer shall monitor the signal OdometerMasterValue to determine the current vehicle mileage.

The WifiHotspotServer shall monitor the signal IgnitionStatus_St to determine when the next ignition cycle occurs (next time IgnitionStatus_St=Run).

The WifiHotspotServer shall monitor the signal HMIMode_St to determine when the WifiHotspotOnBoardClient display is active. The WifiHotspotOnBoardClient screen is active when HMIMode_St=0x2:On.

If the WifiHotspotServer receives a command from the WifiHotspotOnBoardClient to end the trial reminder triggers (signal HotspotTrialReminderSelection_Rq =StopReminders), the WifiHotspotServer shall not trigger any more trial reminder popups.

If the WifiHotspotServer receives a command from the WifiHotspotOnBoardClient to re-trigger the reminder popup (signal HotspotTrialReminderSelection_Rq =RemindMeLater), the WifiHotspotServer shall replace the Wi-Fi_Trial_Reminder_Trigger value with the sum of the Wi-Fi_Trial_Reminder_Trigger value plus the Wi-Fi_Trial_Reminder_Delay value (Wi-Fi_Trial_Reminder_Trigger = Wi-Fi_Trial_Reminder_Trigger + Wi-Fi_Trial_Reminder_Delay). If the WifiHotspotServer never receives a command from the WifiHotspotOnBoardClient to re-trigger the popup, the WifiHotspotServer shall not update the Wi-Fi_Trial_Reminder_Trigger value.

If Wi-Fi_Trial_Reminder=On and the parameter TrialEligible=”Yes” and Wi-Fi_Hotspot_Feature_Enabled = ENABLED, the WifiHotspotServer shall monitor the vehicle mileage.

- If OdometerMasterValue < Wi-Fi_Trial_Reminder_Trigger, the WifiHotspotServer shall NOT set the CarrierDataNotification_St signal bit and it shall remain set to “NULL/NONE”.

- If OdometerMasterValue = Wi-Fi_Trial_Reminder_Trigger, the WifiHotspotServer shall wait until the next ignition cycle (next time IgnitionStatus_St=Run) and then check the status of the WifiHotspotOnBoardClient screen to determine if it is active or to determine when it becomes active. Once the WifiHotspotServer confirms the WifiHotspotOnBoardClient screen is active, the WifiHotspotServer shall perform the following two steps:

  1) Set the signal CarrierDataNotification_St to “free trial period waiting” and transmit it once

  2) Unset the signal CarrierDataNotification_St back to NULL/NONE and continue transmitting.

If Wi-Fi_Trial_Reminder=ON and the parameter TrialEligible=”YES” and Wi-Fi_Hotspot_Feature_Enabled = DISABLED, the WifiHotspotServer shall not display the trial reminder popup.

Note: if the TrialEligible parameter’s state is set to “No”, the WifiHotspotServer shall not trigger a trial reminder popup.

3.10.1.3 WFHSv2-REQ-283775/D-Displaying critical data plan related popups

The WifiHotspotOnBoardClient shall monitor the signal CarrierDataNotification_St and detect when it changes its status.

- If the status changes to “XX% data used” (note: the WifiHotspotOnBoard client shall only monitor the percentage values within the CarrierDataNotification_St signal if the signal CarrierDataNotification_St=Percent data used), the WifiHotspotOnBoardClient shall display a low balance popup. Refer to WFHSv2-REQ-283641-HMI Specification References.
  The popup below is an example WifiHotspotOnBoardClient popup.

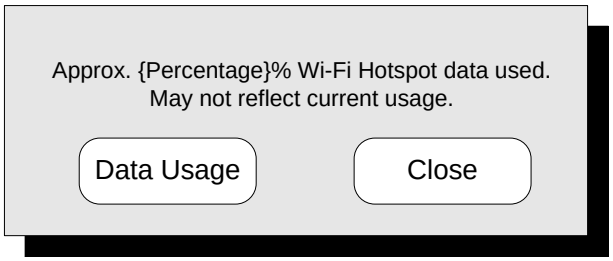


Figure. XX% data used popup for NA

- If the status changes to “free trial period waiting”, the WifiHotspotOnBoardClient shall display a trial reminder popup.

  The trial reminder popup shall have three different options listed on it:
  Option 1. Close: if the customer closes the popup then the popup shall NOT be re-triggered.
  Option 2. Remind me later: if the customer chooses the “remind me later” option, then the popup shall exit and re-populate at a later time.
  Option 3. More Info: if the customer selects the “More info” option, then the popup shall NOT be re-triggered.

  If the user selects the “Close” or “More Info” option, the WifiHotspotOnBoardClient shall notify WifiHotspotServer by setting the signal HotspotTrialReminderSelection_Rq to “StopReminders” once, transmitting, then unsetting back to NULL.

  If the user selects the “Remind me later” option, the WifiHotspotOnBoardClient shall notify the WifiHotspotServer by setting the signal HotspotTrialReminderSelection_Rq to “RemindMeLater” once, transmitting, then unsetting back to NULL.

  The trial reminder popups may be driver restricted depending on the content. Refer to H21j specification and the HMI specification (refer to WFHSv2-REQ-283641-HMI Specification References). The trial reminder popup shall remain displayed until the user closes the popup, selects the “More Info” option, or selects the “remind me later” option. If the driver restriction becomes enabled while the popup is displayed, the popup shall be hidden until the driver restriction is disabled, at which point the popup shall be displayed again. If the user has not closed out of the popup or chosen the “remind me later” or “More Info” option, the popup shall survive ignition cycles. The WifiHotspotServer shall only send the notification once at the time of trigger (using signal CarrierDataNotification_St=Free Trial Period Waiting). The WifiHotspotOnBoardClient shall be responsible for storing the notification and displaying the popup as long as needed until the user selects either the “Close”, “More Info” or “Remind Me Later” option.

  The popup below is an example WifiHotspotOnBoardClient popup.

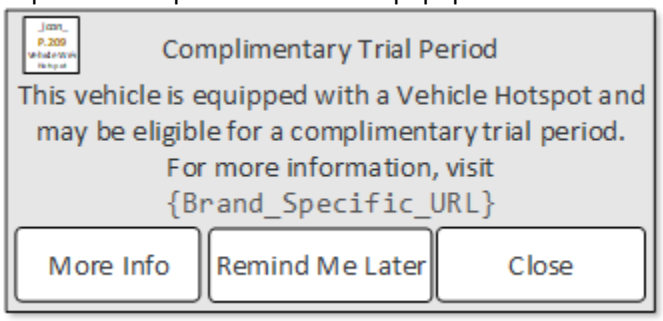


Figure. Free trial period waiting popup for NA

- If the signal CarrierDataNotification_St changes its status to “NULL/NONE”, the WifiHotspotOnBoardClient shall not display a popup nor request for the carrier information.

If the trial reminder or low balance popups are required to display the carrier information (i.e. landing page URL, hotline number, etc.), the WifiHotspotOnBoardClient shall request for and receive the carrier information (signal CarrierInfo_Rq and CarrierInfo_Rsp) before displaying the popups. Also, the XX% data used popups shall be dynamic and shall display the actual percentage value stated in the signal CarrierDataNotification_St. If the popup is required to display the VIN, the

WifiHotspotOnBoardClient shall find the VIN contained within the signal VehicleGGCCData. Refer to the HMI specifications to determine which popups need to display what information.

3.10.2 Use Cases

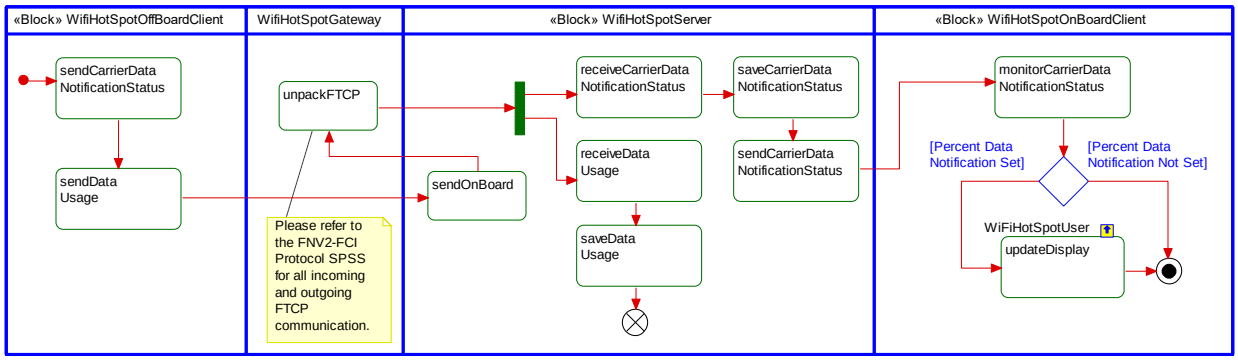
3.10.2.1 WFHSv2-UC-REQ-281869/B-The vehicle's Wi-Fi Hotspot data plan changes to a low balance or expired or trial period waiting status

Actors	User System
Pre-conditions	WifiHotspotServer is On WifiHotspotOnBoardClient display is available and on any screen Vehicle is authorized
Scenario Description	Any of the following scenarios occurred: - ignition starts when a trial period is waiting to be activated AND the vehicle reached a specified mileage AND driver distraction is not enabled - Low balance notification was triggered from the carrier
Post-conditions	The user shall be notified of the update via a popup on the WifiHotspotOnBoardClient display (refer to WFHSv2-REQ-283641-HMI Specification References)
List of Exception Use Cases	WFHSv2-UC-REQ-454859-E11 WifiHotspotOnBoardClient update failed
Interfaces	WifiHotspotServer WifiHotspotOnBoardClient CAN SoA Ford infrastructure Carrier infrastructure

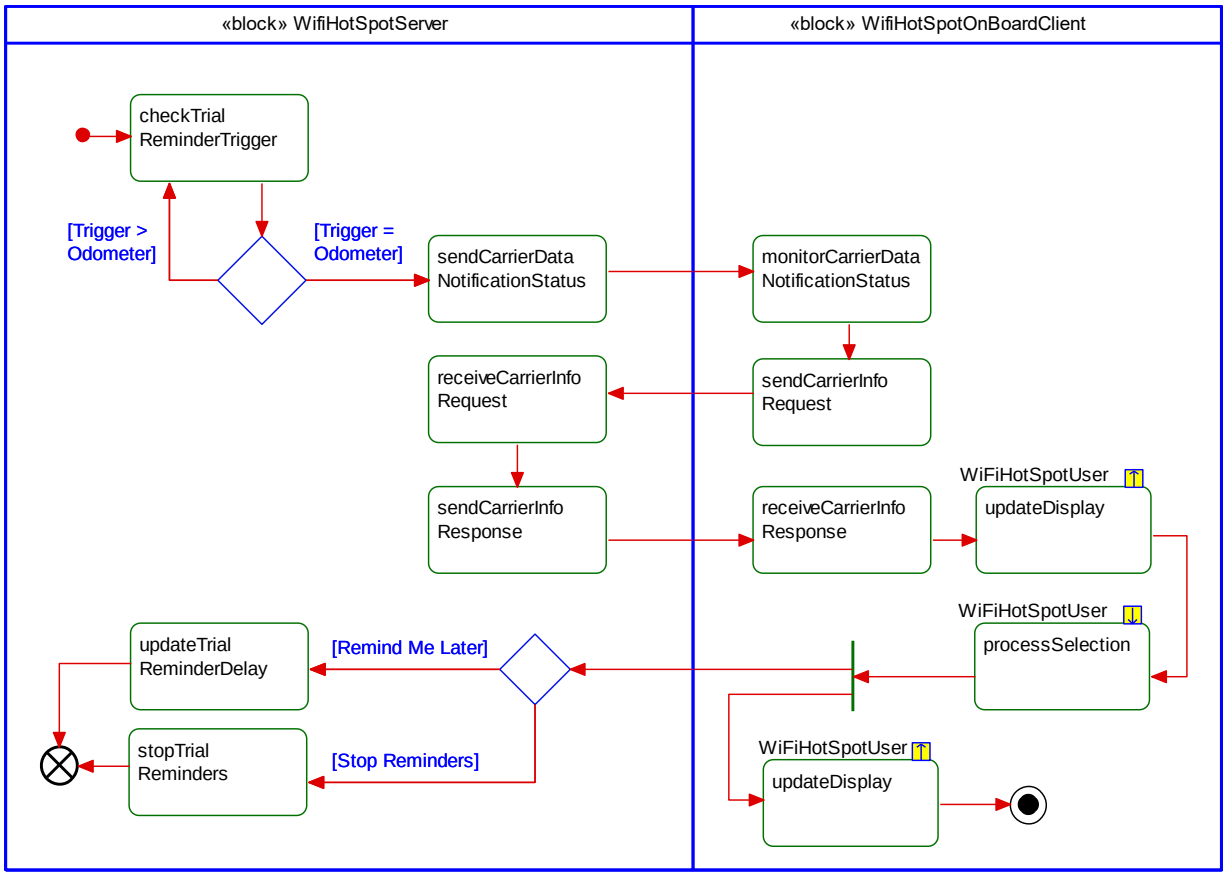
3.10.3 White Box Views

3.10.3.1 Activity Diagrams

3.10.3.1.1 WFHSv2-ACT-REQ-274806/A-Carrier Data Notification Received

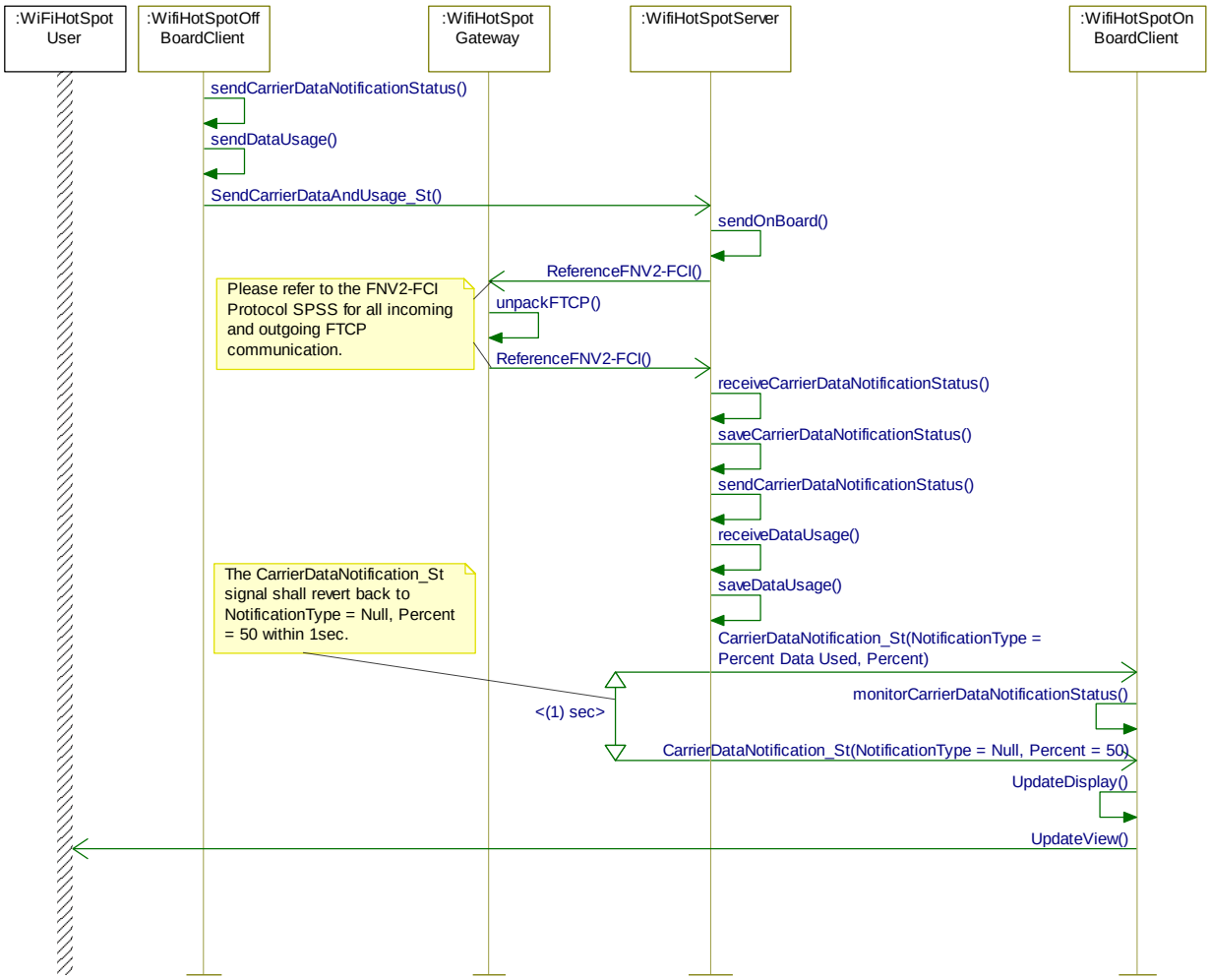


3.10.3.1.2 WFHSv1-ACT-REQ-212880/A-Free Trial Period Reminders

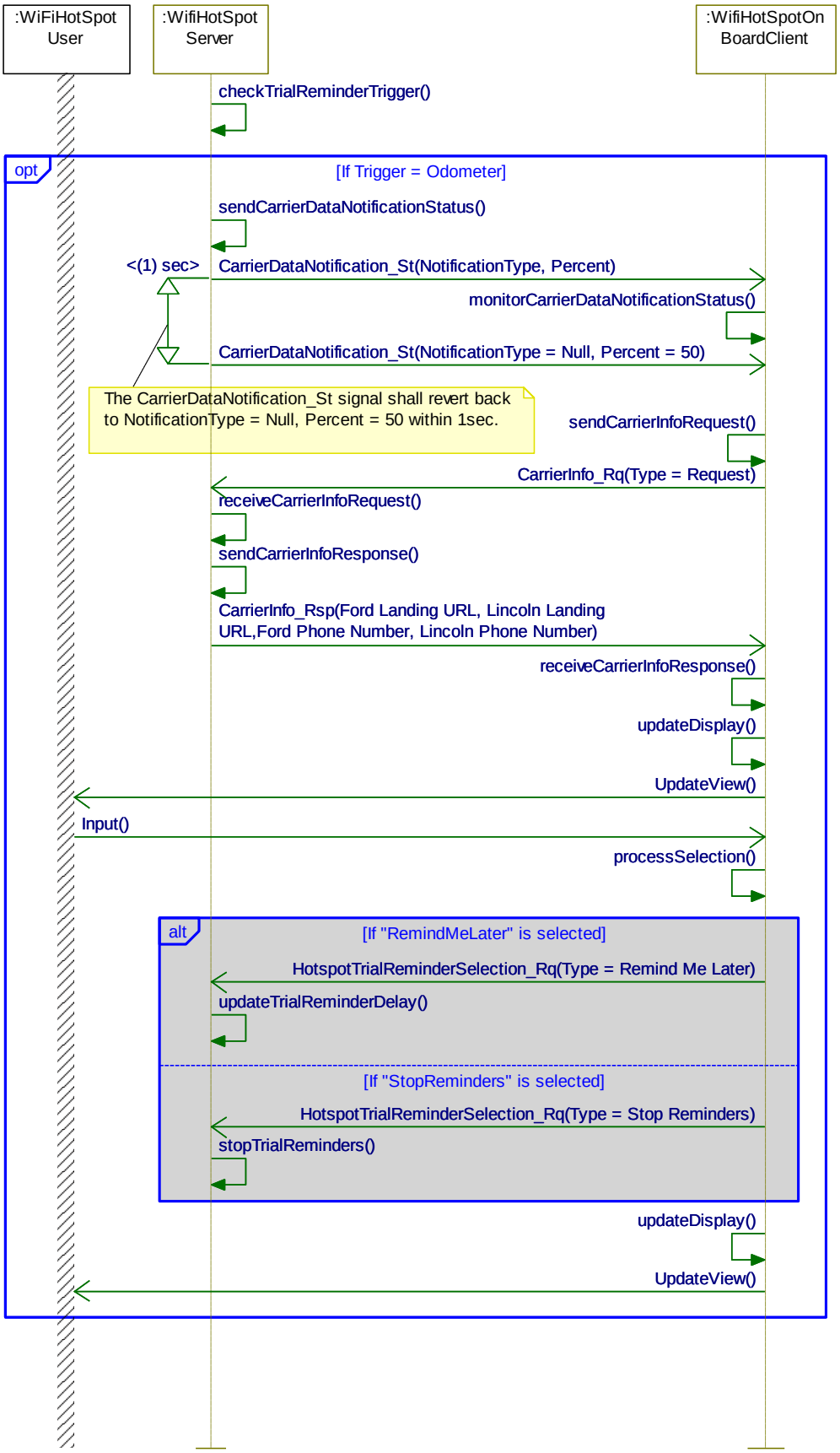


3.10.3.2 Sequence Diagrams

3.10.3.2.1 WFHSv2-SD-REQ-274807/A-Carrier Data Notification Received



3.10.3.2.2 WFHSv1-SD-REQ-212881/A-Free Trial Period Reminders



3.11 WFHSv2-FUN-REQ-274808/B-Managing Carrier Information

Customers may subscribe to the hotspot through a carrier provided landing page. The URL for this page shall be displayed to the user through the WifiHotspotOnBoardClient display. The landing page URL MAY be different, depending on region, for Ford versus Lincoln customers.

Customers in China may also subscribe to the hotspot by calling their carrier's hotline and providing their vehicle's VIN. Thus, the hotline's telephone number and the vehicle's VIN shall be displayed to the customer on the WifiHotspotOnBoardClient display of China vehicles. The hotline number for Ford customers shall be different than the hotline number for Lincoln customers. The in-vehicle WifiHotspotOnBoardClient screens of China vehicles shall also allow the customer to initiate a call to the hotline through their paired phone in the vehicle.

If a carrier ever decides to update the URL to the landing page or the carrier hotline number, the carrier backend shall transmit these notifications to Ford, via a manual process, and include the new URL characters or phone number included. The URL or hotline numbers shall be transmitted to the WifiHotspotServer via FTCP messages, and the WifiHotspotServer shall overwrite the previously stored parameters with the new ones.

If the user enters into a Wi-Fi Hotspot screen that requires a landing page URL or carrier hotline number to be displayed, the WifiHotspotOnBoardClient shall transmit a request for the carrier information. If the WifiHotspotServer receives this request it shall respond with the appropriate carrier information.

3.11.1 Requirements

3.11.1.1 WFHSv2-REQ-288270/B-Initial carrier hotline number

China: The WifiHotspotServer shall be delivered to Ford with two initial hotline numbers (one for Ford customers and one for Lincoln customers) preprogrammed into the WifiHotspotServer. The below values are examples:

China Carrier Service Hotline Number	
Ford	Lincoln
400-092-0198	400-093-0198

Refer to the WifiHotspotServer's Diagnostics Part 2 specification for the final values (refer to WFHSv2-REQ-283642-Diagnostic Specification References).

Each carrier service hotline number may be up to 24 characters in length.

3.11.1.2 WFHSv2-REQ-281870/B-Updating the carrier service hotline number

China: The WifiHotspotServer shall be capable of receiving updates to the carrier hotline numbers from the WifiHotspotOffBoardClient regardless of the vehicles authorization state. If the WifiHotspotServer receives a command from the WifiHotspotOffBoardClient to update the carrier service hotline numbers, the WifiHotspotServer shall overwrite the previously stored hotline numbers with the new numbers and store them. The updates shall specify which hotline number is the Ford number and which hotline number is the Lincoln number. The carrier hotline numbers shall also be configurable via EOL.

3.11.1.3 WFHSv2-REQ-281871/C-Updating the carrier landing page URL

The WifiHotspotServer shall be delivered to Ford with initial region and brand-specific carrier landing page URLs preprogrammed into the WifiHotspotServer. The values below are examples. Refer to the WifiHotspotServer's Diagnostics Part 2 specification for the final values (refer to WFHSv2-REQ-283642-Diagnostic Specification References):

Region	Carrier Landing Page URL	
	Ford	Lincoln
NA	att.com/ford	att.com/lincoln
China	https://mall.cu-sc.com/Ford	https://mall.cu-sc.com/Lincoln
Europe	www.ford.eu/wifi	n/a
Region = RW	www.claro.com.br/ford	n/a

Country code = Brazil		

Table. Carrier landing page URL lookup table

Each URL may be up to may be up to 192 characters in length.

The WifiHotspotServer shall be capable of receiving updates to the carrier landing page URLs from the WifiHotspotOffBoardClient regardless of the vehicle authorization state. If the WifiHotspotServer receives a command from the WifiHotspotOffBoardClient to update the carrier landing page URLs the WifiHotspotServer shall first determine which region it is in (refer to WFHSv2-REQ-283728-WifiHotspotServer identifies the vehicle region) to determine which region-specific landing page URLs to update. The update shall also specify which is the Ford URL and which is the Lincoln URL. The WifiHotspotServer shall then overwrite the previously stored region-specific landing page URLs with the new URLs and store it. The URLs shall also be updateable via EOL.

3.11.1.4 WFHSv2-REQ-283734/C-Requesting for carrier information due to the user entering a specific screen

If the user enters into a Wi-Fi Hotspot screen that displays the carrier hotline number or landing page URL, the WifiHotspotOnBoardClient shall request for the carrier information using the signal CarrierInfo_Rq. The WifiHotspotServer shall respond with the signal CarrierInfo_Rsp. The WifiHotspotOnBoardClient shall only display the information it needs based on the region and vehicle brand (refer to WFHSv2-REQ-283726-WifiHotspotOnBoardClient identifies vehicle brand and WFHSv2-REQ-283727-WifiHotspotOnBoardClient identifies vehicle region). If the vehicle is a China variant, the WifiHotspotOnBoardClient shall also display the 17 character VIN somewhere on the in-vehicle display. Note: the VIN may be displayed within a menu outside of the WiFi Hotspot menu or the dialing screen. In this case, the call center operator shall be educated and instruct the customer on how to navigate to the menu that displays the VIN. The VIN is contained within the signal VehicleGGCCData. Refer to the HMI specifications to view the screens and different parameters needed depending on the vehicle brand and region (refer to WFHSv2-REQ-283641-HMI Specification References).

3.11.1.5 WFHSv2-REQ-283581/C-Reporting out the carrier information to the WifiHotspotOnBoardClient

China: If the WifiHotspotOnBoardClient requests for the carrier information through the signal CarrierInfo_Rq, the WifiHotspotServer shall check the vehicle region (refer to WFHSv2-REQ-283728-WifiHotspotServer identifies the vehicle region). If the vehicle is a Chinese variant, the WifiHotspotServer shall

a. fetch both the stored China Ford and China Lincoln carrier hotline numbers,
b. fetch both the stored China Ford landing page URL and China Lincoln landing page URL from the landing page URL lookup table (refer to WFHSv2-REQ-281871-Updating the carrier landing page URL) and

populate all the above parameters into the signal CarrierInfo_Rsp and transmit.

NA: If the WifiHotspotOnBoardClient requests for the carrier information through the signal CarrierInfo_Rq, the WifiHotspotServer shall check the vehicle region (refer to WFHSv2-REQ-283728-WifiHotspotServer identifies the vehicle region). If the vehicle is a NA variant, the WifiHotspotServer shall

a. fetch both the stored NA Ford landing page URL and NA Lincoln landing page URL from the landing page URL lookup table (refer to WFHSv2-REQ-281871-Updating the carrier landing page URL) and

populate into the signal CarrierInfo_Rsp and transmit. (Note: the carrier hotline number field shall NOT be populated into the signal.)

EU or Brazil: If the WifiHotspotOnBoardClient requests for the carrier information through the signal CarrierInfo_Rq, the WifiHotspotServer shall check the vehicle region and country code (if region is RW) (refer to WFHSv2-REQ-283728-WifiHotspotServer identifies the vehicle region). If the vehicle is a EU variant or Brazil variant, the WifiHotspotServer shall:

a. fetch either the Ford EU landing page URL or the Ford Brazil landing page URL from the landing page URL lookup table (refer to WFHSv2-REQ-281871-Updating the carrier landing page URL) and populate into the signal CarrierInfo_Rsp and transmit. (Note: the carrier hotline number field shall NOT be populated into the signal.)

Vehicle Region	CarrierInfo_Rsp	
	Carrier hotline numbers field	Carrier landing page field
China	Populate both China Ford and Lincoln numbers	Populate both China Ford and Lincoln URLs
NA	Do not populate	Populate both NA Ford and Lincoln URLs

EU	Do not populate	Populate both EU Ford and Lincoln URLs
Region = RW Country code = Brazil	Do not populate	Populate both Brazil Ford and Lincoln URLs

Table. Populating the signal CarrierInfo_Rsp

If the WifiHotspotServer does not have a particular hotline number or URL stored, the WifiHotspotServer shall not populate that field in the CarrierInfo_Rsp message. For example) The WifiHotspotServer is placed on a European Ford vehicle. The WifiHotspotServer has an EU Ford URL stored, but no EU Lincoln URL stored. The WifiHotspotServer shall only populate the Ford URL in the signal. The WifiHotspotOnBoardClient shall automatically select the Ford URL to display since it is a Ford vehicle.

3.11.1.6 WFHSv2-REQ-283735/C-Displaying carrier information

Depending on the vehicle region (refer to WFHSv2-REQ-283727-WifiHotspotOnBoardClient identifies vehicle region), the WifiHotspotOnBoardClient may be required to display either the Ford or the Lincoln carrier hotline number (refer to WFHSv2-REQ-283726-WifiHotspotOnBoardClient identifies the vehicle brand) and the vehicle VIN in certain Wi-Fi Hotspot screens and popups (refer to the HMI specifications (WFHSv2-REQ-283641-HMI Specification References) to determine which regions and which screens or popups require this information). Both Ford and Lincoln hotline numbers may be populated in the response signal CarrierInfo_Rsp, and it shall be the responsibility of the WifiHotspotOnBoardClient to display the appropriate number depending on the brand.

The WifiHotspotOnBoardClient may also be required to display a landing page URL on certain screens and popups (refer to HMI specifications to determine which regions and which screens or popups require this information). Both Ford and Lincoln URLs may be populated in the response signal CarrierInfo_Rsp, and it shall be the responsibility of the WifiHotspotOnBoardClient to display the appropriate URL depending on the brand.

The following screen is an example WifiHotspotOnBoardClient screen.

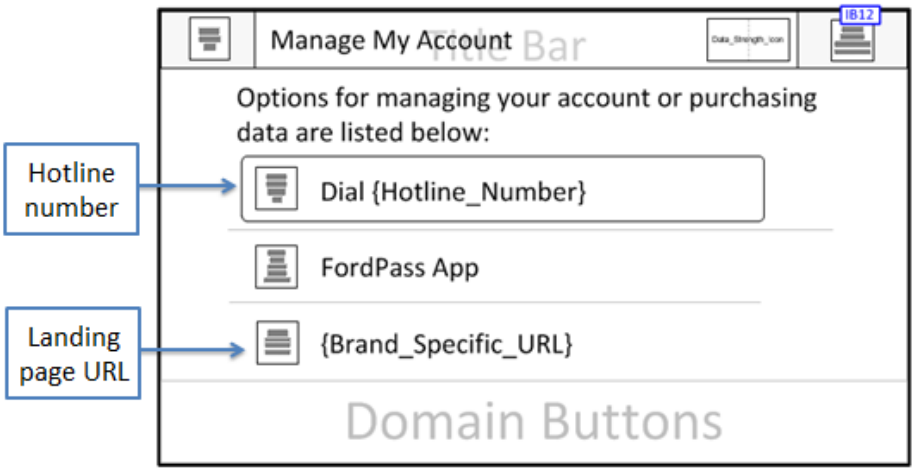


Figure. Screen to educate the customer on how to subscribe.

Note: If the WifiHotspotServer does not have a particular hotline number or URL stored, the WifiHotspotServer shall not populate that field in the CarrierInfo_Rsp message. For example) The WifiHotspotServer is placed on a European Ford vehicle. The WifiHotspotServer has an EU Ford URL stored, but no EU Lincoln URL stored. The WifiHotspotServer shall only populate the Ford URL in the signal. The WifiHotspotOnBoardClient shall automatically select the Ford URL to display since it is a Ford vehicle. The WifiHotspotServer shall always provide the minimum amount of information required by the WifiHotspotOnBoardClient to be displayed. The WifiHotspotServer MAY provide more information, at which point the WifiHotspotOnBoardClient shall select which information to display.

3.11.1.7 WFHSv2-REQ-283777/B-Initiating a call to the carrier hotline

The China Wi-Fi Hotspot screens and popups that display either the Ford or the Lincoln hotline number shall provide the user the option to initiate a call to purchase more data for their vehicle's hotspot. Refer to WFHSv2-REQ-283641-HMI Specification References. If the user selects the dial button the WifiHotspotOnBoardClient shall initiate a call using the customer's paired cellphone via Bluetooth. The WifiHotspotOnBoardClient shall dial either the Ford or the Lincoln hotline number provided by the WifiHotspotServer inside the signal CarrierInfo_Rsp. If the vehicle is a Ford, the WifiHotspotOnBoardClient shall dial the Ford specified carrier hotline number and if the vehicle is a Lincoln, the WifiHotspotOnBoardClient shall dial the Lincoln carrier hotline number. If the user selects the end button (populated on the screen after the dial button is pressed) the WifiHotspotOnBoardClient shall end the phone call. The following is an example WifiHotspotOnBoardClient screen.

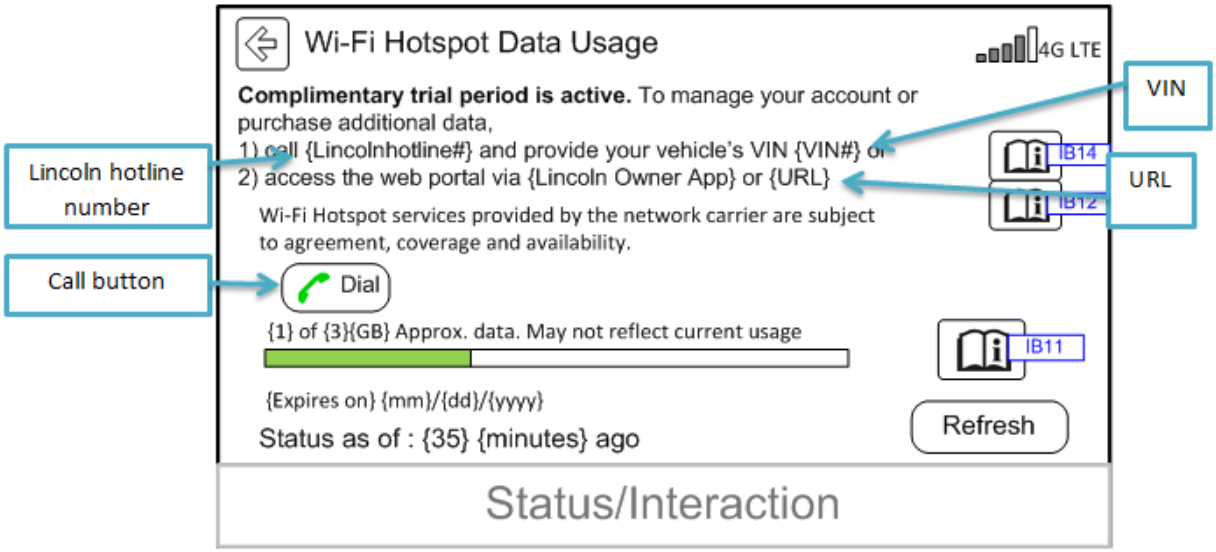


Figure. Carrier hotline dial screen

3.11.2 Use Cases

3.11.2.1 WFHSv2-UC-REQ-283778/D-China customer initiates a call to the carrier hotline though the WifiHotspotOnBoardClient display

Actors	User System Cell phone
Pre-conditions	WifiHotspotServer is On No Wi-Fi subscription is active Cell phone is connected to the vehicle via Bluetooth The WifiHotspotOnBoardClient is displaying a screen or popup that displays the Ford carrier hotline number if the vehicle is a Ford, or a Lincoln carrier hotline number if the vehicle is a Lincoln, and call button
Scenario Description	China customer presses the call button on the WifiHotspotOnBoardClient screen
Post-conditions	The paired phone and hands-free system begins calling the Ford or Lincoln carrier hotline number (depending on the vehicle brand) and the WifiHotspotOnBoardClient screens follow the process listed in the HMI spec (refer to WFHSv2-REQ-283641-HMI Specification References).
List of Exception Use Cases	
Interfaces	WifiHotspotServer WifiHotspotOnBoardClient CAN SoA

3.11.2.2 WFHSv2-UC-REQ-281872/B-China customer purchases data/activates trial period through the carrier hotline

Actors	User System Cell phone
Pre-conditions	WifiHotspotServer is On Up to Number_Hotspot_Connected_Devices devices connected to the hotspot Customer **may or may not** have created a mobile app account and authorized the vehicle
Scenario Description	China customer calls the carrier hotline, provides the vehicle VIN, agrees to Terms and Conditions, and purchases data/activates a trial period
Post-conditions	Customer may now browse the internet/stream data on the connected devices
List of Exception Use Cases	WFHSv2-UC-REQ-454937-E10 Carrier did not add data to the vehicle hotspot
Interfaces	WifiHotspotServer WifiHotspotOnBoardClient CAN SoA Ford WifiHotspotOffBoardClient Carrier infrastructure

3.11.2.3 WFHSv2-UC-REQ-281873/B-Customer purchases data/activates free trial period through connected device

Actors	User System Cell phone
Pre-conditions	Vehicle's hotspot is not tied to a data plan Hotspot On Device is connected to the hotspot Customer **may or may not** have created a mobile app account and authorized the vehicle
Scenario Description	User accesses the internet browser and is re-directed to the carrier's landing page where the customer activates the trial period/purchases data by agreeing to a set of Terms and Conditions. The vehicle occupant is not required to identify their vehicle.
Post-conditions	The user may browse the internet/stream data
List of Exception Use Cases	WFHSv2-UC-REQ-454937-E10 Carrier did not add data to the vehicle hotspot
Interfaces	WifiHotspotServer Carrier infrastructure Ford Infrastructure WifiHotspotOnBoardClient CAN SoA

3.11.2.4 WFHSv2-UC-REQ-454937/A-E10 Carrier did not add data to the Wi-Fi Hotspot

Actors	User System Cell phone
Pre-conditions	Same as normal use case
Scenario Description	User purchases more data for the hotspot or activates the free trial period but the carrier did not process the request correctly
Post-conditions	No data can be streamed through the hotspot

	User is redirected to a landing page
List of Exception Use Cases	
Interfaces	WifiHotspotServer WifiHotspotOnBoardClient CAN SoA

3.11.2.5 WFHSv2-UC-REQ-281866/A-User accesses the mobile app while vehicle is not authorized

Actors	User System
Pre-conditions	Vehicle is NOT authorized User has downloaded the Ford/Lincoln Owner App, created an account and associated a VIN to the account
Scenario Description	User access the mobile app screen
Post-conditions	No Wi-Fi Hotspot data usage information is displayed in the mobile app A link to the carrier landing page is displayed or, if the vehicle is a China vehicle, the landing page and the carrier's hotline number (if vehicle is a Ford then the Ford specific number shall be displayed and if vehicle is a Lincoln then the Lincoln specific number shall be displayed) and vehicle's VIN are also displayed
List of Exception Use Cases	
Interfaces	WifiHotspotOffBoardClient Mobile app

3.11.2.6 WFHSv2-UC-REQ-281875/A-User accesses the landing page from the mobile app when vehicle is not authorized

Actors	User System
Pre-conditions	Vehicle is NOT authorized Vehicle is a NA or China variant User has downloaded the Ford/Lincoln Owner App, created an account and associated a VIN to the account
Scenario Description	User clicks on the landing page link
Post-conditions	The user's device re-directs them to the landing page Customer does not need to enter VIN.
List of Exception Use Cases	
Interfaces	Mobile app Landing page

3.11.2.7 WFHSv2-UC-REQ-281876/A-User accesses the landing page from the mobile app when vehicle is authorized

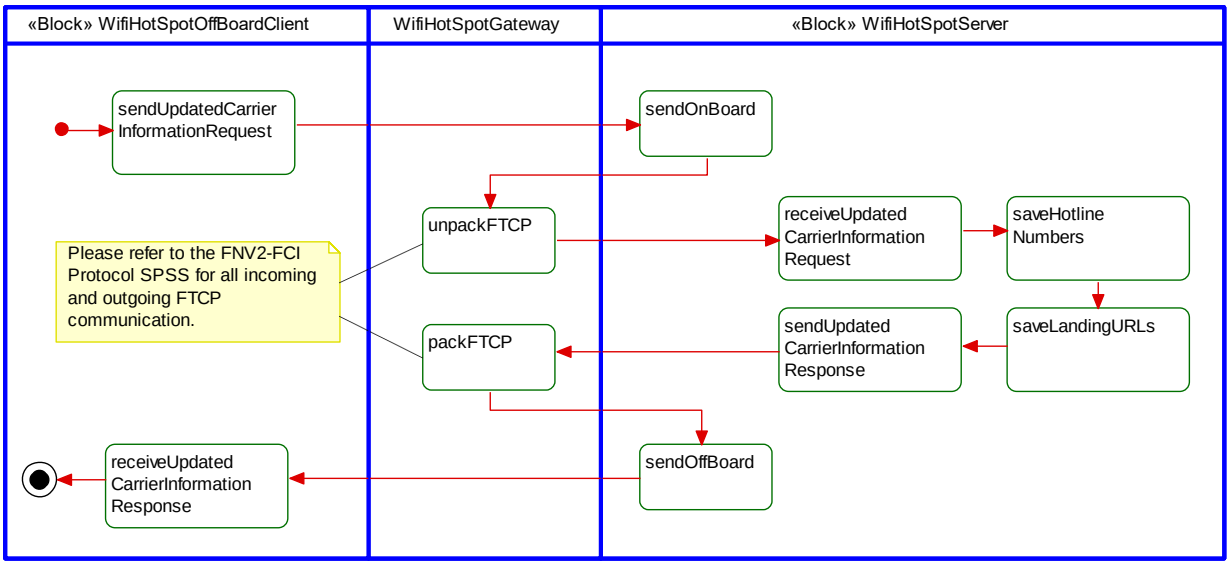
Actors	User System
Pre-conditions	Vehicle is authorized

	User has downloaded the Ford/Lincoln Owner App, created an account and associated a VIN to the account Vehicle is a NA or China variant.
Scenario Description	User clicks on the landing page link
Post-conditions	The user's device re-directs them to the landing page Some customer information, including VIN, is pre-populated in the customer information fields
List of Exception Use Cases	
Interfaces	WifiHotspotOffBoardClient Carrier infrastructure Mobile app Landing page

3.11.3 White Box Views

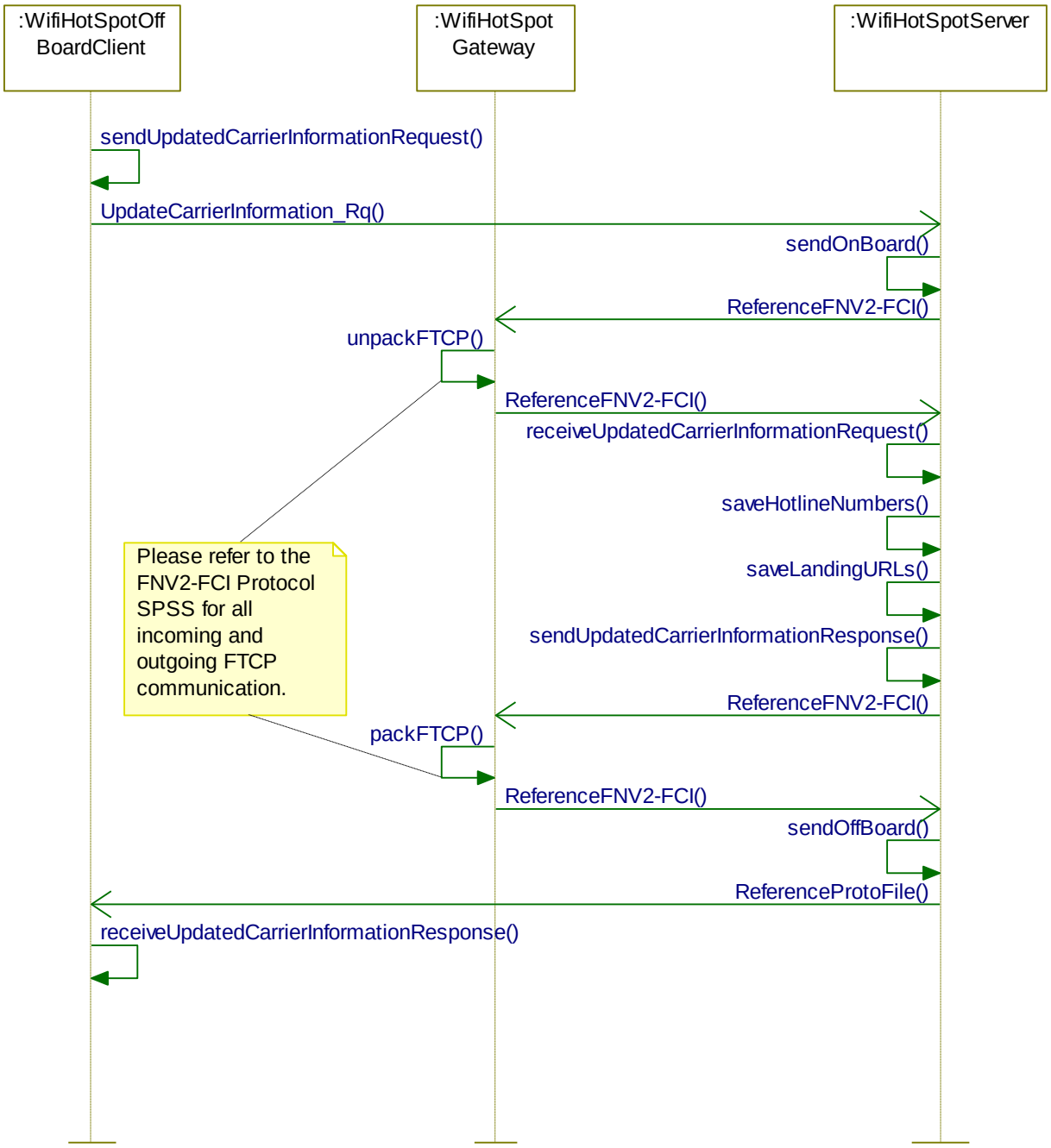
3.11.3.1 Activity Diagrams

3.11.3.1.1 WFHSv2-ACT-REQ-274809/A-Carrier Info Changes From Backend



3.11.3.2 Sequence Diagrams

3.11.3.2.1 WFHSv2-SD-REQ-274810/A-Carrier Info Changes From Backend



3.12 WFHSv2-FUN-REQ-274811/A-Wi-Fi Hotspot Reset

The user may reset its Wi-Fi Hotspot settings by performing a Master Reset from the in-vehicle WifiHotspotOnBoardClient or by removing a VIN from their mobile app. If either of these scenarios occurs, the WifiHotspotServer shall initiate a Wi-Fi Hotspot reset.

3.12.1 Requirements

3.12.1.1 WFHSv2-REQ-283560/A-Triggering a Wi-Fi Hotspot reset

If the WifiHotspotServer receives any of the following:

- A Master Reset FTCP command from the WifiHotspotOffBoardClient or
- A Master Reset or Wi-Fi-Hotspot Reset API call from the WifiHotspotGateway,

the WifiHotspotServer shall perform a Wi-Fi Hotspot reset (refer to WFHSv2-REQ-283559-Wi-Fi Hotspot reset settings). Refer to the Embedded Modem Reset v2 SPSS for all relevant requirements and information regarding the above mentioned API's, etc.

3.12.1.2 WFHSv2-REQ-454938/A-Reporting out a Wi-Fi Hotspot reset

If the WifiHotspotServer performs a Wi-Fi Hotspot reset it shall update its status in the signal TCUAvailability_St to "NULL/NONE" until the reset is complete.

3.12.1.3 WFHS-REQ-336918/A-Informing the WifiHotspotOffBoardClient of a Wi-Fi Hotspot reset

If the WifiHotspotServer performs a Wi-Fi Hotspot reset, it shall send non-correlated alerts to the WifiHotspotOffBoardClient if any of the following settings have changed (refer to WFHS-REQ-315657, WFHS-REQ-315689 & WFHS-REQ-315704):

- Hotspot enablement status
- SSID
- Password

Note: This assumes all of the authorization checks are met after the reset is performed (see WFHS-REQ-315658, WFHS-REQ-315691 & WFHS-REQ-315706). If the authorization checks are not met after the reset is performed, the alerts shall not be sent.

3.12.1.4 WFHSv2-REQ-283559/D-Wi-Fi Hotspot reset settings

The WifiHotspotServer shall be delivered to Ford with all of its Wi-Fi Hotspot settings and parameters set to their default values. The default values for each parameter may be found in separate sections within this specification. Note: The Wi-Fi Hotspot settings and parameters shall only be applied when the WifiHotspotServer enables access point mode (refer to WFHSv2-REQ-281705-Wi-Fi Chipset AP and STA mode).

If the WifiHotspotServer changes any of the hotspot settings and parameters listed in the table below it shall overwrite the previously stored settings/parameters with the new modified settings/parameters and save them.

If the WifiHotspotServer performs a Wi-Fi Hotspot reset (refer to WFHSv2-REQ-283560-Triggering a Wi-Fi Hotspot Reset), the WifiHotspotServer shall gracefully disconnect all connected clients and reset the Wi-Fi chipset. After the reset is completed all previously connected clients shall be required to enter the newly-generated password if they wish to connect. The WifiHotspotServer shall reset all the Wi-Fi Hotspot settings and parameters to the values listed in the table below.

Parameter Name	TCU power cycle, TCU OTA SW update, power reset, running reset and diagnostic reset settings	Wi-Fi Hotspot reset settings
Wi-Fi Hotspot enablement state	Restore customer modified setting	Off - if vehicle kilometers is under Wi-Fi_Hotspot_Enablement_ Kilometers_Dependency.

		On - if vehicle kilometers is at or above Wi-Fi_Hotspot_Enablement_Kilometers_Dependency.
Wi-Fi visibility state	Restore customer modified setting	Factory setting: On
Wi-Fi SSID	Restore customer modified setting	Factory default SSID HotspotXXXX (refer to WFHSv2-REQ-399815-Generating the default SSID)
Wi-Fi password	Restore customer modified setting	XXXXXXXXXXXX (refer to WFHSv2-REQ-399814-Generating the initial password)
Wi-Fi security algorithm	Restore customer modified setting	Factory setting: WPA2 (non-Phoenix) WPA2/WPA3 (Phoenix)
TrialEligible parameter	Restore last saved value	Restore last saved value
Blocked clients list	Restore last saved values	Factory setting: NULL
Landing page URLs	Restore last saved values	Restore last saved values
Ford/Lincoln carrier hotline numbers	Restore last saved values	Restore last saved values
Wi-Fi data usage	NULL	Factory setting: NULL
Wi-Fi APN	Restore last saved values	Restore last stored values
Wi-Fi_Trial_Reminder_Trigger	Restore last stored value	Restore last stored value
Wi-Fi_Trial_Reminder_Delay	Restore last stored value	Restore last stored value
Wi-Fi_Hotspot_Feature_Enabled	Restore last stored value	Restore last stored value
Data_Usage_Info_Refresh_Timeout timer	Reset timer	Reset timer
Data_Usage_Reception_Time	0:00:00	0:00:00
Wi-Fi_Trial_Reminder	Restore last stored value	Restore last stored value
Hotspot_Operational_Band	Restore last saved value	Factory setting: 5GHz
Estimated location	Restore last saved value	Factory setting: Null

Table. Wi-Fi Hotspot Default Settings

Note:

a. The WifiHotspotServer shall default the Wi-Fi Hotspot enablement state to on ONLY if all Wi-Fi Hotspot enablement conditions are met. If the conditions are not met the WifiHotspotServer shall set the Wi-Fi Hotspot enablement state to on-disabled (refer to WFHSv2-REQ-283564-Wi-Fi Hotspot enablement condition checks).

b. The SSID shall be reset to the default SSID that the WifiHotspotServer was delivered to Ford with (refer to WFHSv2-REQ-399815-Generating the default SSID).
c. The password shall be randomly re-generated to a 12 ASCII character password. The generated passwords shall be created using a quality random number generator. The supplier shall meet the requirements defined in A51t_Supplier_Feed_Specification_080.pdf spec, section 1.9.9 Requirements for Key Generation.
d. All blocked devices shall be deleted from the blocked list and shall be allowed to connect by entering the newly generated password.
e. All data usage information shall be cleared. If the WifiHotspotServer is in the process of updating the data usage values and waiting for a response from the WifiHotspotOffBoardClient when a request for a Wi-Fi Hotspot reset is received the WifiHotspotServer shall immediately initiate the reset. If the request for a data usage update was initiated by the WifiHotspotOnBoardClient (refer to WFHSv2-REQ-281855-Request from WifiHotspotOnBoardClient to refresh the data usage values) the WifiHotspotServer shall send an unsuccessful response (DataUsage_Rsp). The WifiHotspotServer shall not restart the updating process once the reset is complete.

3.12.2 Use Cases

3.12.2.1 WFHSv2-UC-REQ-281877/B-User performs a reset but does not deactivate their Wi-Fi Hotspot data plan

Actors	User WifiHotspotOnBoardClient WifiHotspotServer
Pre-conditions	WifiHotspotServer is on Customer has a data plan active on their vehicle
Scenario Description	Customer performs a Master reset from the WifiHotspotOnBoardClient or decommissions their VIN from their Owner App account
Post-conditions	The customer shall be locked out of the Wi-Fi Hotspot screens Any attempts the customer makes to enter the Wi-Fi Hotspot screens shall be denied and shall trigger a popup while the WifiHotspotServer is resetting (refer to WFHSv2-REQ-283641-HMI Specification References) WifiHotspotOnBoardClient display shall update according to the HMI spec. The user shall be informed through the WifiHotspotOnBoardClient display that their subscriptions MAY not be cancelled. All connected devices shall be disconnected from the Wi-Fi Hotspot and required to enter the new, randomly generated password Blocked devices shall be able to connect by entering the new, randomly generated password Vehicle shall remain tied to the customer's data plan No data usage information shall be displayed on the Wi-Fi Hotspot Data Usage screens in-vehicle or on the mobile app until the WifiHotspotServer/mobile app receives new data usage information from the WifiHotspotOffBoardClient (if vehicle is authorized)
List of Exception Use Cases	E3 Wi-Fi Hotspot command through mobile app fails E4 Wi-Fi Hotspot configuration through WifiHotspotOnBoardClient fails E11 WifiHotspotOnBoardClient update failed
Interfaces	WifiHotspotOnBoardClient WifiHotspotServer CAN SoA Mobile App Ford infrastructure

3.12.2.2 WFHSv2-UC-REQ-281878/C-Dealer replaces WifiHotspotServer while a Wi-Fi Hotspot data plan is active

Actors	User WifiHotspotOnBoardClient WifiHotspotServer
Pre-conditions	User has personalized their Wi-Fi Hotspot settings (such as SSID, on/off, etc.)

	WifiHotspotServer has malfunctioned Customer **may or may not** have created a mobile app account and authorized the vehicle A Wi-Fi data plan is active (trial or retail)
Scenario Description	Dealer replaces the old WifiHotspotServer with a new one and completes the provisioning process.
Post-conditions	If the vehicle is NA or China, the customer's data plan is active on the new WifiHotspotServer (trial or retail; if the trial period was already used up, the new WifiHotspotServer will not offer a new trial period) If the vehicle is EU, the customer shall be required to pair their account to the vehicle in order to utilize their data plan (if the trial period was already used up, the customer shall not be offered a new trial on the vehicle). No data usage information shall be displayed on the Wi-Fi Hotspot Data Usage screens in-vehicle or on the mobile app until the WifiHotspotServer/mobile app receives new data usage information from the WifiHotspotOffBoardClient (if vehicle is authorized) The Wi-Fi Hotspot settings are defaulted back to their default states
List of Exception Use Cases	
Interfaces	WifiHotspotOnBoardClient WifiHotspotServer CAN SoA Ford WifiHotspotOffBoardClient Carrier WifiHotspotOffBoardClient Mobile App

3.13 WFHSv2-FUN-REQ-274812/A-Transferring MAC Address

The WifiHotspotOnBoardClient has a Wi-Fi chipset configured in client mode. The WifiHotspotOnBoardClient Wi-Fi chipset shall never connect to the WifiHotspotServer's Wi-Fi AP. To prevent this, the WifiHotspotOnBoardClient shall detect the WifiHotspotServer Wi-Fi chipset's MAC address and never allow its chipset to connect.

The WifiHotspotOnBoardClient shall transmit a request for the MAC address every ignition cycle, and in turn, the WifiHotspotServer shall respond with the MAC address of its Wi-Fi chipset.

Refer to the Feature-WiFi Settings Max Level Infotainment Subsystem Part Specification (SPSS) to for more information on this requirement.

3.13.1 Requirements

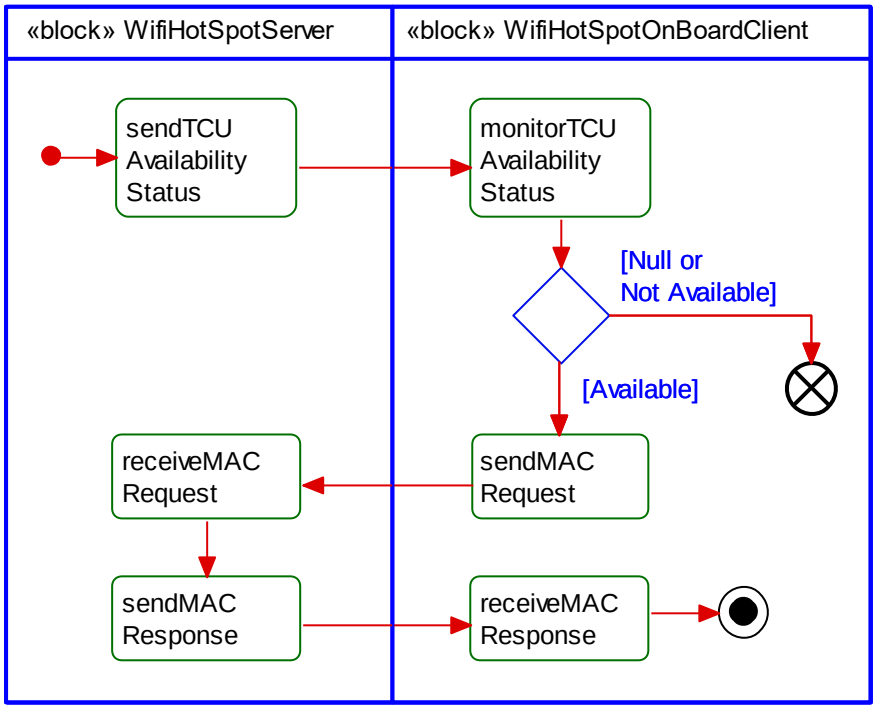
3.13.1.1 WFHSv2-REQ-454939/A-Reporting out the Wi-Fi chipset MAC address

The WifiHotspotServer shall monitor the signal WifiHotspotMAC_Rq. If the WifiHotspotServer receives a request for its Wi-Fi chipset's MAC address (WifiHotspotMAC_Rq), the WifiHotspotServer shall populate the MAC address of its Wi-Fi chipset into the signal WifiHotspotMAC_Rsp and transmit. If the Wi-Fi Hotspot feature is disabled, the WifiHotspotServer shall still respond to the request and populate the Wi-Fi chipsets MAC address. If the WifiHotspotServer is unable to read the Wi-Fi chipset's MAC address, it shall transmit a NULL response. Refer to the Feature-WiFi Settings Max Level Infotainment Subsystem Part Specification (SPSS) to for more information on how the WifiHotspotOnBoardClient processes the response.

3.13.2 White Box Views

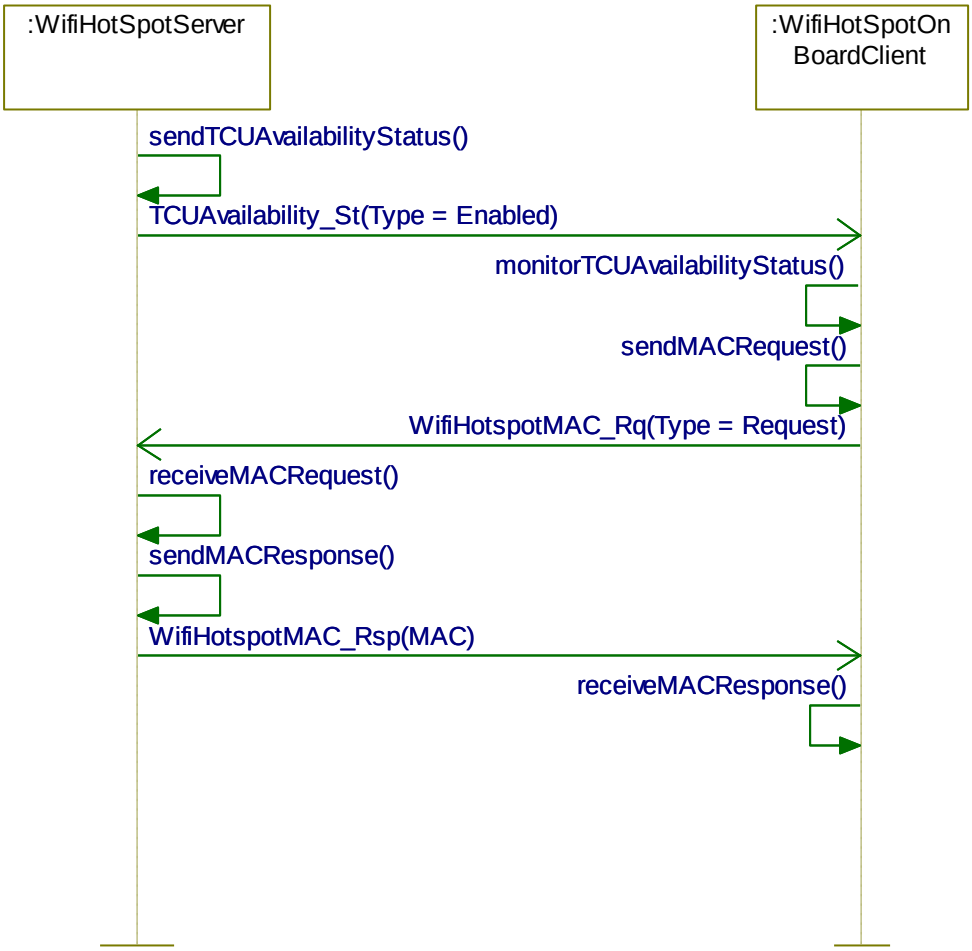
3.13.2.1 Activity Diagrams

3.13.2.1.1 WFHSv1-ACT-REQ-195130/A-Transmitting Wi-Fi Chipset MAC Address



3.13.2.2 Sequence Diagrams

3.13.2.2.1 WFHSv1-SD-REQ-195131/A-Transmitting Wi-Fi Chipset MAC Address



3.14 WFHSv2-FUN-REQ-274813/C-Switching Frequency Bands

If the vehicle is in a region/country that allows more than one frequency band to be used, the customer shall have the ability to select which frequency band they would like the Wi-Fi Hotspot feature to operate on. Therefore, the WifiHotspotOnBoardClient shall display the current frequency band in use, as well as provide the option of changing the band, assuming the hotspot is allowed to operate on more than one frequency band.

If the user changes the frequency band from the WifiHotspotOnBoardClient, the WifiHotspotServer shall receive a signal, save and update the hotspot's setting, and respond to the WifiHotspotOnBoardClient by updating its status on a designated signal.

3.14.1 Requirements

3.14.1.1 WFHSv2-REQ-283736/B-Estimating current vehicle location

The WifiHotspotServer shall contain an algorithm that estimates the vehicle's current location based on data it has available. Example) The WifiHotspotServer may reference the MCC in order to identify the location. The software development group shall create this algorithm and it shall be reviewed by the Feature Owner.

If there is no current data available for the WifiHotspotServer to utilize, it shall refer to the last estimated location. If there is no previously stored data to reference, the WifiHotspotServer shall reference its country configuration DID (refer to WFHSv2-REQ-283728-WifiHotspotServer identifies the vehicle region) to estimate the location.

The WifiHotspotServer shall use its estimated vehicle location in order to determine whether any frequency channels are required to be restricted or not. For more information, refer to WFHSv2-REQ-283737-Restricting frequency channels.

The estimated vehicle location shall be stored in a DID (Estimated_Location) and shall be stored as a country code.

3.14.1.2 WFHSv2-REQ-283737/C-Restricting frequency channels

Each region may have its own local regulatory restrictions on the 5 GHz frequency band that may be subject to change with time. Some examples of restrictions that may be placed on a particular channel include:

- No broadcasting at all
- Dynamic Frequency Selection shall be enabled
- Transmit Power Control shall be enabled
- AP can only broadcast indoors, etc.

The WifiHotspotServer shall utilize its estimated current vehicle location (refer to WFHSv2-REQ-283736-Estimating current vehicle location) in order to determine which frequency channels or entire band it is and is not allowed to operate on.

The WifiHotspotServer shall contain a lookup table that determines which frequency channels it is allowed to operate on per country. The software development group shall define the frequency restriction lookup table and it shall be reviewed by the Feature Owner. The table may be subject to change based on the fluctuating local regulations. This table shall be updateable OTA.

If the WifiHotspotServer's hotspot is turned On and configured to operate on the 5 GHz band or it receives a request to change to the 5 GHz band, it shall:

- Confirm the vehicle's current estimated location allows for 5 GHz operation,
- Reference the frequency restriction lookup table,
- Perform auto-channel selection on the allowed frequency channels and
- Select the least congested channel to operate on.

If the WifiHotspotServer is operating on the 5 GHz band when it detects a country change, it shall refer to the frequency restriction lookup table to determine if it needs to change the frequency channel or band.

The WifiHotspotServer may be restricted from operating on certain frequencies due to interference with other radio access technologies. The WifiHotspotServer shall have two DIDs (configurable via EOL) which shall specify which, if any, frequency

channels the WifiHotspotSever shall restrict itself from operating on per frequency band. Refer to DID “WLAN 2.4GHz Channel Restritions” and “WLAN 5GHz Channel Restrictions”.
Example)
There could be interference on channels 155, 159 and 165 on the 5GHz band due to DSRC or cV2X features.

Therefore, if the vehicle is equipped with a DSRC module, Ford shall update the WLAN 5GHz Channel Restrictions DID at EOL and set it to:

- Channel 1 = 155
- Channel 2 = 159
- Channel 3 = 165

The WifiHotspotServer shall thus not operate on any of these channels.

3.14.1.3 WFHS-REQ-263087/B-Reporting available bands

The WifiHotspotServer shall monitor its current estimated vehicle location and determine whether an entire frequency band shall be restricted or not based on the frequency restriction table. The WifiHotspotServer shall then report the frequency bands available for use with the signal HotspotAvailableBands_St. If the WifiHotspotServer cannot detect which frequency bands are available for use, it shall set the signal to NULL/NONE.

Note: The signal uses generic literals, so refer to the following:

- Band1 = 2.4 GHz
- Band2 = 5 GHz

Example 1) The WifiHotspotServer detects the vehicle is in a country where all frequency channels on the 5 GHz band are restricted. It shall therefore set HotspotAvailableBands_St = Band1.

Example 2) If the WifiHotspotServer is in a country where there are available channels to use on both the 2.4 GHz band and the 5 GHz band, it shall set HotspotRestrictedBand_St = All available.

3.14.1.4 WFHS-REQ-263088/B-Reporting the frequency band

The WifiHotspotServer shall report the current frequency band that the hotspot is operating on using the signal HotspotFrequencyBand_St. If the WifiHotspotServer cannot detect the current frequency band that it is configured for, it shall set the signal to NULL/NONE.

Note: The signal uses generic literals, so refer to the following:

- Band1 = 2.4 GHz
- Band2 = 5 GHz

3.14.1.5 WFHSv2-REQ-283779/D-Displaying the frequency band

The WifiHotspotOnBoardClient shall display the frequency band in use, which is reported from the WifiHotspotServer through the signal HotspotFrequencyBand_St. In order for the WifiHotspotOnBoardClient to remain backwards compatible with older WifiHotspotServer modules, the WifiHotspotOnBoardClient shall NOT display the frequency band that is in use nor provide the option for the user to change the frequency band (refer to WFHS-REQ-263090 -User changes the frequency band) on WifiHotspotOnBoardClient if the signal HotspotFrequencyBand_St is missing from the bus/network.

The WifiHotspotServer may disable certain frequency bands from being used based on the vehicle’s location. Therefore, the WifiHotspotOnBoardClient shall display the available frequency band options to the customer. If there is more than one option available for use, the WifiHotspotOnBoardClient shall allow the user to select which frequency band to use. The WifiHotspotOnBoardClient shall monitor the signal HotspotAvailableBands_St to determine which bands are available.

Note: The signal uses generic literals, so refer to the following:

- Band1 = 2.4 GHz
- Band2 = 5 GHz

Example 1) The vehicle is in a location where the entire 5 GHz band is restricted and only the 2.4 GHz band is available. The WifiHotspotServer shall set the signal HotspotAvailableBands_St = Band1 and HotspotFrequencyBand_St = Band1. The WifiHotspotOnBoardClient shall not allow the user to select the 5 GHz band.

Example 2) The vehicle is in a location where there are available channels to use on both the 2.4 GHz band and the 5 GHz band. The hotspot is currently using the 5 GHz band. The WifiHotspotServer shall set the signal HotspotAvailableBands_St = All available and HotspotFrequencyBand_St = Band2. The WifiHotspotOnBoardClient shall inform the user that the 5 GHz band is in use and it shall also provide the user the option to select the 2.4 GHz band.

Refer to WFHSv2-REQ-283641-HMI Specification References for how this shall be displayed to the customer.

3.14.1.6 WFHS-REQ-263090/B-User changes the frequency band on WifiHotspotOnBoardClient

If the user requests to change the frequency band through the in-vehicle WifiHotspotOnBoardClient (assuming the WifiHotspotOnBoardClient is allowed to display multiple options to the user), the WifiHotspotOnBoardClient shall transmit this request to the WifiHotspotServer using the signal HotspotFrequencyBand_Rq.

Note: The signal uses generic literals, so refer to the following:
- Band1 = 2.4 GHz
- Band2 = 5 GHz

3.14.1.7 WFHS-REQ-263091/B-Frequency band change request from WifiHotspotOnBoardClient

If the WifiHotspotServer receives a request from the WifiHotspotOnBoardClient (signal HotspotFrequencyBand_Rq) to change the frequency band, the WifiHotspotServer shall ensure the frequency band is allowed based on the vehicle's estimated location. If it is supported, the WifiHotspotServer shall immediately switch the AP's frequency to the desired band and update the signal HotspotFrequencyBand_St and corresponding Diagnostic ID (Hotspot_Operational_Band) when the transition is complete. If the WifiHotspotServer's attempt was unsuccessful, the WifiHotspotServer shall continue reporting out the current frequency band in use.

All user configurable Wi-Fi Hotspot parameters (i.e. SSID, password, etc.) shall remain the same once the WifiHotspotServer is operating on the new frequency band. The WifiHotspotServer shall keep as many of the AP parameters the same as possible in order to allow client devices to automatically reconnect to the new band.

Note: The signal uses generic literals, so refer to the following:
- Band1 = 2.4 GHz
- Band2 = 5 GHz

3.14.2 Use Cases

3.14.2.1 WFHSv1-UC-REQ-263187/B-User changes frequency band

Actors	User System Cell phone
Pre-conditions	WifiHotspotServer is on Vehicle is in a location that allows multiple frequency bands to be used Wi-Fi Hotspot is On and operating on the 5GHz band The SSID = 123 The Password = 12345678 Up to Number_Hotspot_Connected_Devices devices are connected
Scenario Description	User changes the frequency band from 5GHz to 2.4GHz band through the WifiHotspotOnBoardClient display
Post-conditions	Wi-Fi Hotspot is On and operating on the 2.4GHz band The SSID = 123 The Password = 12345678 All previously connected devices may automatically reconnect All other Wi-Fi Hotspot configurable parameters remain the same as before the frequency band switch (i.e. visibility status)

List of Exception Use Cases	WFHSv2-UC-REQ-454858-E4 Wi-Fi Hotspot configuration through WifiHotspotOnBoardClient fails WFHSv2-UC-REQ-454859-E11 WifiHotspotOnBoardClient update failed
Interfaces	WifiHotspotOnBoardClient WifiHotspotServer CAN SoA

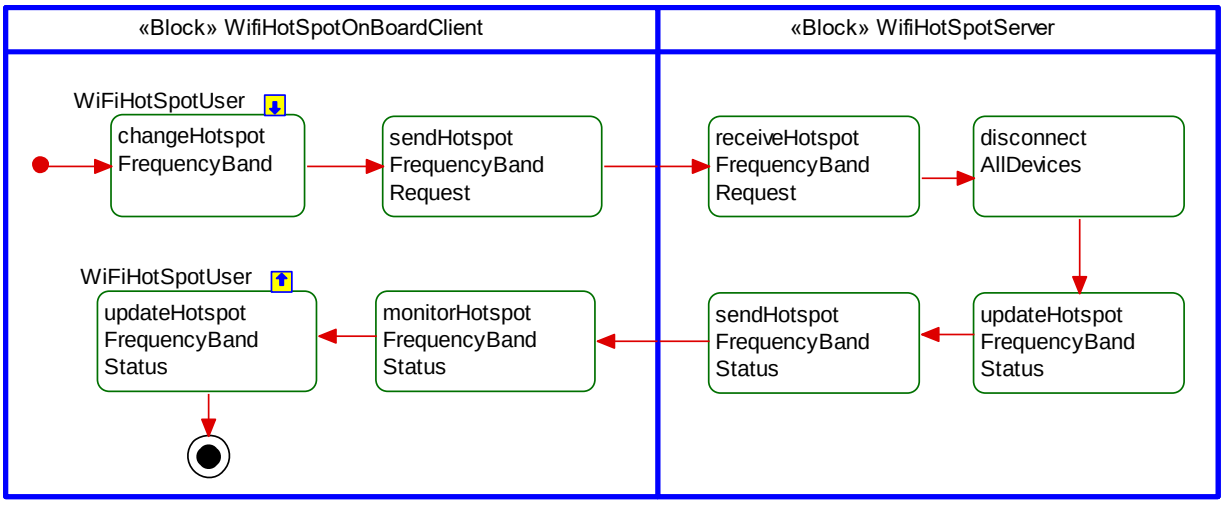
3.14.2.2 WFHSv1-UC-REQ-263186/B-User attempts to change to restricted frequency band

Actors	User System Cell phone
Pre-conditions	WifiHotspotServer is on Wi-Fi Hotspot is On and operating on the 2.4 GHz band The vehicle is in an area where the 5 GHz band is completely restricted
Scenario Description	User accesses the Vehicle Hotspot page where the frequency band would normally be displayed
Post-conditions	The user is NOT able to change the frequency to the 5 GHz band (not displayed, or interface is disabled, etc.)
List of Exception Use Cases	
Interfaces	WifiHotspotOnBoardClient WifiHotspotServer CAN SoA

3.14.3 White Box Views

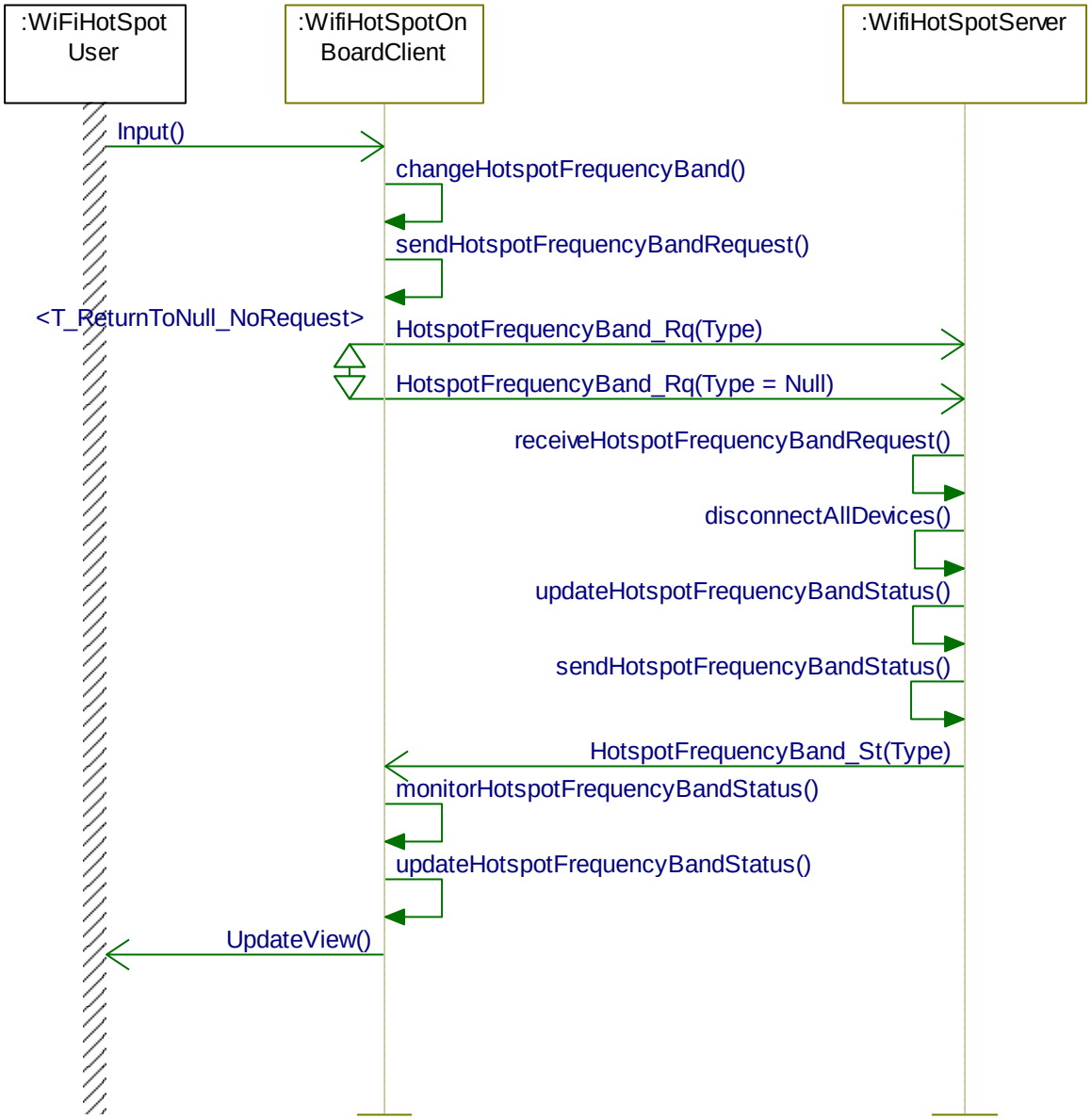
3.14.3.1 Activity Diagrams

3.14.3.1.1 WFHSv1-ACT-REQ-263190/A-User Changes Frequency Band From Centerstack



3.14.3.2 Sequence Diagrams

3.14.3.2.1 WFHSv1-SD-REQ-263192/A-User Changes Frequency Band From Centerstack



4 Appendix: Reference Documents

Reference #	Document Title
1	
2	
3	
4	
5	