



Research & Vehicle Technology
“Infotainment Systems Product Development”

Feature – OnBoard Scales

**APIM Infotainment Subsystem Part Specific
Specification (SPSS)**

Version 1.1

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	MD-REQ-368057/B-SHTPreChkTirePress_B_Stat	bganesa7:Updated the signal payload
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	OBS-REQ-367349/B-Feature Availability	bganesa7:Updated the Requirement
	OBS-REQ-377178/A-OnBoard Client wait Time for Response	bganesa7:Updated the Requirement
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	OBS-REQ-367361/B-Payload Screen - Post Launch	bganesa7:To update new requirement
	OBS-REQ-369705/B-OBS APP Launch Error	bganesa7:To update new requirement
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	OBS-UC-REQ-367466/B-Weight Unit - lbs Ignition cycle	bganesa7:Updated the requirement
	OBS-UC-REQ-361788/B-PreCheck Screen - Limited Power Mode	bganesa7:Updated the requirement
	OBS-UC-REQ-362950/B-PreCheck Screen - Full Run Mode	bganesa7:Updated the requirement
	OBS-UC-REQ-362942/B-Additive Mass Estimation	bganesa7:Updated the requirement
	OBS-UC-REQ-367500/B-Tail Light - Turn On	bganesa7:Updated the requirement
	OBS-UC-REQ-367501/B-Tail Light - Turn Off	bganesa7:Updated the requirement
	OBS-SD-REQ-361281/B-Vehicle Payload Measurement	bganesa7:Updated the diagram to reflect new requirement
	STR-696187/B-Requirements	bganesa7:Added new requirement for Additive Mass
	OBS-REQ-367366/B-Additive Mass Estimation Screen	bganesa7:Modified the requirement
	OBS-REQ-367385/B-Activate the Tare Function	bganesa7:Updated the requirement



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OBS-REQ-367367/B-Tare Operation	bganesa7:Updated the requirement
OBS-REQ-376181/A-Additive Mass Estimation	bganesa7:Modified the requirement
STR-696632/B-Requirements	bganesa7:Added new requirement
OBS-REQ-367393/B-Tail Light Switch	bganesa7:Updated the Requirement
OBS-REQ-367394/B-Toggle Taillight Switch	bganesa7:Updated the requirement
OBS-REQ-376227/A-Tail light Disabling	bganesa7:Added new requirement
STR-679745/B-Appendix: Reference Documents	bganesa7:Added new reference



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1 Overview

The OnBoard Scales (OBS) Feature provides the customer with the real time information of Load distribution and allowed weight limit for the vehicles. The feature makes it easier to follow best practices in loading by making this information available to users while they are inside and outside the vehicle.

1.1 Terminology and Abbreviations

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

Acronym	Description
BCM	Body Control Module
CAN	Controller Area Network
DID	Data Identifier
HMI	Human Machine Interface
IVIC	In Vehicle Infotainment Connectivity
OBS	OnBoard Scales
HMM	Smart Hitch Module
VDM	Vehicle Dynamics Control Module (OBS function resides)



2 Architectural Design

2.1 Physical Mapping of Classes

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

Logical Class	Physical Module (ECU)
OBS Server	VDM/BCM
OBS OnBoard Client	APIM

2.2 OBS-CLD-REQ-361267/B-OBS Server

The OnBoard Scale Server (OBS Server) also referred as 'Server' in the below spec is responsible for the task listed below:

- Read and Process OBS data and sensor values.
- Receive user commands from OBS OnBoard Client and act accordingly.
- Send vehicle OBS data and status to OBS OnBoard Client.

2.3 OBS-CLD-REQ-361734/B-OBS OnBoard Client

The OnBoard Scale OnBoard Client (OBS OnBoard Client) also referred as 'OnBoard Client' in the below spec is responsible for the task listed below:

- Receive OBS data from OBS Server and update user display.
- Receive user commands from Display and command OBS Server accordingly.
- Update Onboard display with appropriate OBS screen.

2.4 Logical Signal Mapping

Each logical name used in this document is mapped to its corresponding CAN signal. Please refer to the following mapping:

Logical name	CAN signal name
ObsActvDsplyLcl_D_Rq	VehPayloadScrn_D_Rq
SmrtLmp_D_Rq	TailLghtLoadMde_D_Rq
ObsTareMeasLcl_D_Rq	VehPayloadTare_D_Rq
ObsActvDsplyLcl_D_Stat	VehPayloadScrn_D_Stat
ObsPreChkGear_B_Stat	VehPayloadGear_B_Stat
ObsPreChkStw_B_Stat	VehPayloadStew_B_Stat
ObsPreChkFlat_B_Stat	VehPayloadFlat_B_Stat
ObsPreChkTirePress_B_Stat	VehPayloadTireP_B_Stat
ObsPayload_M_Est	VehPayload_M_Est
ObsPayload_Pc_Est	VehPayload_Pc_Est
ObsAddMeas_M_Est	VehPayloadAdd_M_Est
ObsTareMeasApp_D_Stat	VehPayloadTare_D_Stat
SmrtLmp_D_Stat	TailLghtLoadMde_D_Stat
Vehicle_Curb_Weight_St	VehCurb_M_Actl
Vehicle_Gross_Weight_St	VehGvwr_M_Actl



2.5 OBS OnBoardClient Interface

2.5.1 OBS-IIR-REQ-367303/A-OBS OnBoardClient_Tx

2.5.1.1 MD-REQ-367304/B-ObsTareMeasLcl_D_Rq

Message Type: Request

This signal is used to request the Tare the vehicle scaling.

Name	Literals	Value	Description
Type	-	-	User request to 'tare' the scale mode from display.
	No_Request	0x0	
	Tare_Request	0x1	

2.5.1.2 MD-REQ-367326/B-SmrtLmp_D_Rq

Message Type: Request

This signal is used to activate and deactivate the vehicle Tail lights.

Name	Literals	Value	Description
Type	-	-	User request to connect Tail Lamps.
	No_Request	0x0	
	Activate_OBS	0x1	Activate Onboard Scale light
	Activate_SMT	0x2	Activate Smart Hitch load light
	Activate_WDH	0x3	Activate Weight Distribution light
	Deactivate_All	0x4	Deactivate Light
	Not_Used1	0x5	
	Not_Used2	0x6	
	Not_Used3	0x7	

2.5.1.3 MD-REQ-367305/B-ObsActvDsplyLcl_D_Rq

Message Type: Request

This request signal is used to indicate the state of the active screen in On Board Client.

Name	Literals	Value	Description
Type	-	-	OBS screen open on the SYNC Screen.
	Inactive	0x0	No OBS display Screen Active
	OBS_Active	0x1	OBS Payload Estimation Screen Active
	ADM_Active	0x2	Additive Mass Estimation Screen Active
	WDH_Active	0x3	Weight Distribution Hitch Setup Screen Active



	SMHT_Active	0x4	5 th Wheel Hitch Setup Screen Active
	GNH_Active	0x5	Gooseneck Hitch Setup Screen Active
	WCS_Active	0x6	Weight Carry Screen Active
	CLS_Active	0x7	Check Load Screen Active

2.5.2 OBS-IIR-REQ-367306/B-OBS OnBoardClient_Rx

2.5.2.1 MD-REQ-367332/B-ObsDsplyLcl_D_Stat

Message Type: Status

This signal is used to indicate the status of the OBS Mode open on the display Screen.

Name	Literals	Value	Description
Type	-	-	Status of OBS Mode from the server.
	Inactive	0x0	Obs_Not_Active
	OBS_Active	0x1	Payload_Est_Active
	ADM_Active	0x2	AddMass Est Active
	WDH_Active	0x3	Weight Dist Hitch Active
	SMHT_Active	0x4	5 th WheelHitch Active
	GNH_Active	0x5	Gooseneck Hitch Active
	WCS_Active	0x6	Weight Carry Active
	CLS_Active	0x7	Check Load Active

2.5.2.2 MD-REQ-367333/B-ObsPayload_M_Est

Message Type: Status

This signal is used to indicate the status on Vehicle Payload in Kilograms (current weight - factory curb weight).

Name	Literals	Value	Description
Type	-	-	Status of Vehicle Payload.
	< Range>	0x000 – 0x3FD	0 to 1021 Kg (Resolution of 5 Kg)
	NoData	0x3FE	Data Not Available
	Fault	0x3FF	System Fault

2.5.2.3 MD-REQ-367336/B-ObsPayload_Pc_Est

Message Type: Status

This signal is used to indicate the status on Vehicle Payload in percentage.



Name	Literals	Value	Description
Type	-	-	Status of Vehicle Payload in %.
	< Range>	0x00 – 0x7D	0 to 125 % (Resolution of 1 %)
	NoData	0x7E	Data Not Available
	Fault	0x7F	System Fault

2.5.2.4 MD-REQ-367337/B-Vehicle_Curb_Weight_St

Message Type: Status

This signal is used to indicate the status on Vehicle Curb weight as reported by the OBS server.

Name	Literals	Value	Description
Type	-	-	Status of Vehicle curb weight.
	<Range>	0x0-0x3FD	0 to 1021 kg vehicle Curb weight. Resolution:10
	NoData	0x3FE	No Data Available
	Fault	0x3FF	System Fault

2.5.2.5 MD-REQ-367340/B-ObsTareMeas_D_Stat

Message Type: Status

This signal used to indicate the status on Tare operation from the OBS Server.

Name	Literals	Value	Description
ObsTareMeas_D_Stat	-	-	Status on Vehicle Tare operation
	NoRequest	0x0	
	Request	0x1	Request in progress
	NotUsed	0x2	
	Fault	0x3	

2.5.2.6 MD-REQ-368051/B-SHTPreChkGear_B_Stat

Message Type: Status

This signal used to indicate the status of Vehicle Gear. This signal shall serve as pre-check indicator from OBS Server.

Name	Literals	Value	Description
Type	-	-	Status on Vehicle Gear.
	Valid	0x0	pre-check condition Met.
	InValid	0x1	pre-check condition not met.

2.5.2.7 MD-REQ-368053/B-SHTPreChkStw_B_Stat

Message Type: Status

This signal used to indicate the status of Vehicle steering Wheel Angle. This signal shall serve as pre-check indicator from OBS Server.



Name	Literals	Value	Description
Type	-	-	Status on Vehicle steering Wheel Angle.
	Valid	0x0	pre-check condition met.
	InValid	0x1	pre-check condition not met.

2.5.2.8 MD-REQ-368056/B-SHTPreChkFlat_B_Stat

Message Type: Status

This signal used to indicate the status for Vehicle acceleration. This signal shall serve as pre-check indicator from OBS Server.

Name	Literals	Value	Description
Type	-	-	Status on Vehicle acceleration.
	Valid	0x0	pre-check condition met
	InValid	0x1	pre-check condition not met

2.5.2.9 MD-REQ-368057/B-SHTPreChkTirePress_B_Stat

Message Type: Status

This signal used to indicate the status of Vehicle Tire pressure. This signal shall serve as pre-check indicator from OBS Server.

Name	Literals	Value	Description
Type	-	-	Status on Vehicle Tire pressure.
	Valid	0x0	pre-check condition met
	InValid	0x1	pre-check condition not met

2.5.2.10 MD-REQ-376009/A-ObsAddMeas_M_Est

Message Type: Status

This signal is used to indicate the Calculated additive mass by OBS server.

Name	Literals	Value	Description
ObsPayload_Pc_Est	-	-	Status of additive Mass estimate from OBS server
	< Range>	0x000 – 0x7FD	-1024 to 1024 kg Resolution: 5
	Data Not Available	0x7FE	
	System Fault	0x7FF	

2.5.2.11 MD-REQ-376179/A-Vehicle_Gross_Weight_St

Message Type: Status

This signal is used to indicate the status on Vehicle Gross weight as reported by the OBS Server.

Name	Literals	Value	Description
Type	-	-	Status of Vehicle Gross weight.



	<Range>	0x0-0x3FD	0 to 1021 kg vehicle Gross weight. Resolution:10
	NoData	0x3FE	No Data Available
	Fault	0x3FF	System Fault

2.5.2.12 MD-REQ-376180/A-SmrtLmp_D_Stat

Message Type: Status

This signal is used to indicate the status of the Tail Lamp.

Name	Literals	Value	Description
Type	-	-	Status of Tail Lamp.
	No_Request	0x0	
	Active_OBS	0x1	Onboard Scale light is active
	Active_SMT	0x2	Smart Hitch load light is active
	Active_WDH	0x3	Weight Distribution light is active
	Deactivate_All	0x4	Tail light is not active
	Not_Used1	0x5	
	Not_Used2	0x6	
	Fault	0x7	



3 General Requirements

3.1 OBS-REQ-367348/A-OBS CAN

All CAN communication defined in the Ford databases provided by Ford. The components shall use the defined CAN messages to request, respond and gather information via CAN.

3.2 OBS-REQ-362359/A-Feature Configuration

The OBS Client shall have a configurable parameter/DID to allow the OBS feature to be enabled/disabled.

- When the parameter indicates that OBS is enabled, all the functionality and signals defined in this SPSS shall be supported.
- When the parameter indicates that OBS is disabled, OBS application shall not be available for the user to launch and the functionality defined in this SPSS shall be supported.

Refer to the Infotainment Diagnostic Specification for further details.

3.3 OBS-REQ-367349/B-Feature Availability

The OnBoard Client shall make OBS feature available (Launch able OBS Tile) to user only when

- Vehicle Ignition status in RUN (or)
- Vehicle Ignition Status in Limited Power Mode.

When the vehicle state changes then the OnBoard Client shall make OBS feature unavailable (Cannot launch OBS Tile) from Display screen.

3.4 OBS-REQ-377178/A-OnBoard Client wait Time for Response

The OnBoard Client shall wait Server module to respond for any command and control interface signals. The wait time on the OnBoard Client shall follow applicable Ford design standards and best practices.

In case of timeout and there is no response from the Server module the onboard client shall show error screen to the user.

Note: Need traceability and reference in the feature Spec.

3.5 OBS-REQ-377179/A-OnBoard Scale HMI content references

The references to HMI screen layouts and other related HMI content are for reference only and not intended to depict the actual text, graphical, or layout content. Refer to the released HMI specifications for further detail on this type of content.



4 Functional Definition

4.1 OBS-FUN-REQ-361274/A-OnBoard Scale Application

4.1.1 Requirements

4.1.1.1 OBS-REQ-367353/B-Vehicle State - Initialization

The OBS OnboardClient shall set below signals to default as part of initialization and when the system is booted up. When the payload measurement is not active the signals shall be set to their defaults.

Default values are:

- ObsActvDsplyLcl_D_Stat = Inactive (0x0)
- ObsTareMeasLcl_D_Rq = No_Request (0x0).
- SmrtLmp_D_Rq = No_Request (0x0).

4.1.1.2 OBS-REQ-367357/B-OBS APP Launch

The OnBoard Client shall make OBS feature available (Launch able OBS Tile) to user only when

- Vehicle Ignition status in RUN (or)
- Vehicle Ignition Status in Limited Power Mode.

When the vehicle changes its state then the OnBoard Client shall make OBS feature unavailable (Cannot launch OBS Tile) from Display screen and close the screen if the application is active before.

4.1.1.3 OBS-REQ-367355/B-Pre-Check Screen

The OBS OnBoard Client shall provide a pre-check screen (SYNC_ShowPreCheckScreen) to display the status of system pre-conditions as received from OBS Server.

When the user launches the OBS application from the display, the behavior of the pre-check screen shall be

- If pre-conditions are not met, the pre-check screen shall be shown every time.
- If preconditions are met, then the pre-check screen shall not be shown in the display.

The pre-check screen shall have Continue and CANCEL buttons:

1. When the user selects the CANCEL/Back button, the OBS app shall close.
2. The Continue Button shall grey out if the preconditions are not met.

Note: Need traceability and reference in the Feature spec.

4.1.1.4 OBS-REQ-367356/B-Display Pre-Check Conditions

When the OBS App is launched from the display screen, the OnBoardClient shall update the display with pre-check screen (SYNC_ShowPreCheckScreen) indicating if the pre-conditions for measurement are Met (or) Not met.

The OnBoardClient shall enable the Continue button on the pre-check screen (SYNC_ShowPreCheckScreen) to enable user to enter OBS_ShowPayloadScreen mode only when all the below preconditions are met.

- Is ObsPreChkGear_B_Stat == 0x0 (Transmission gear in PARK).
- Is ObsPreChkFlat_B_Stat == 0x0 (Vehicle in a leveled plane).
- Is ObsPreChkStw_B_Stat == 0x0 (Steering Wheel Aligned).
- Is ObsPreChkTirePress_B_Stat == 0x0 (Tire pressure in Limit).



4.1.1.5 OBS-REQ-367360/B-Payload Screen

OnBoard Client shall enter into payload screen (OBS_ShowPayloadScreen) only when it meets the requirement of "OBS-REQ-367357-OBS APP Launch" and "OBS-REQ-367356-Vehicle State - Display Pre-Check Conditions".

When OBS application is launched for the first time OnBoardClient shall enter payload screen and the signal shall be set to 'ObsActvDsplyLcl_D_Rq= 0x1' (OBS Active), meanwhile OnBoard Client shall expect response from the OBS server from the signal 'ObsDsplyLcl_D_Stat==0x1' (OBS_Active).

4.1.1.6 OBS-REQ-367361/B-Payload Screen - Post Launch

In the same Ignition cycle, when the OBS application is closed by user during an active measurement, the OnBoard Client shall not retain the last active session of OBS application for successive launch.

For a successive launch OnBoard Client shall set 'ObsActvDsplyLcl_D_Rq' accordingly

- ObsActvDsplyLcl_D_Rq = 0x1 (OBS Active).
- ObsActvDsplyLcl_D_Rq = 0x2 (Additive Mass Active).

The OnBoard Client shall expect the status signal 'ObsDsplyLcl_D_Stat' from the OBS server updated accordingly.

Note: Need reference and traceability in the feature spec.

4.1.1.7 OBS-REQ-369705/B-OBS APP Launch Error

When the user launches the OBS application from the display, the OnBoard Client shall notify the user with an Error screen (SYNC_ObsSystemFaultyScreen) when any of the signals from the OBS Server read as

- ObsPayload_M_Est == 0x3FF (Fault).
- ObsPayload_Pc_Est == 0x7F (Fault).
- ObsAddMeas_M_Est == 0x7FF (Fault).
- ObsTareMeasApp_D_Stat == 0x3 (Fault).

4.1.1.8 OBS-REQ-377187/A-OBS APP -User Quits

When the OBS application is launched and the user display screen is in any of the Hitch Screen modes as indicated by the 'ObsActvDsplyLcl_D_Rq' signal and the user decides to quit the OBS mode, Onboard Client shall exit the application and shall set the state of the signal 'ObsActvDsplyLcl_D_Rq=0x0' (Inactive).

4.2 OBS-FUN-REQ-367296/A-Determining Payload

4.2.1 Requirements

4.2.1.1 OBS-REQ-367362/B-Display Payload Estimation

When the OnBoard Client enters in to payload screen (SYNC_ShowPayloadScreen)

- OnBoard Client shall set 'ObsActvDsplyLcl_D_Stat=0x1' (OBS_Active).
- OnBoard Client shall expect a response from the OBS server as 'ObsDsplyLcl_D_Stat == 0x1'.

If the payload screen is active, the OnBoard Client shall make use 'ObsPayload_M_Est' and 'ObsPayload_Pc_Est' signal to display the estimated weight on the scale as received from OBS Server. However, the estimated weight from the OBS server is expected to be with in the range as specified in the requirement 'OBS-REQ-367363-Maximum Payload'. The OnBoard shall update the display graphics accordingly.

In case of Error response from OBS Server

1. When the response for the signal 'ObsPayload_M_Est== System Fault' and 'ObsPayload_Pc_Est== System Fault'.
2. The OnBoard Client shall show error screen as mentioned in the requirement 'OBS-REQ-369705-OBS APP Launch Error'

In case of No Data response from OBS Server

1. When the response for the signal 'ObsPayload_M_Est== No_Data' and 'ObsPayload_Pc_Est== No_Data'.
2. The OnBoard Client shall not update the display.

4.2.1.2 OBS-REQ-365767/A-Weight Unit Conversion

OBS OnBoard Client shall support to convert the scale units between Kgs and lbs. When switched between Kilograms to lbs, OnBoard Client shall internally convert the received kilogram values from OBS Server to lbs and shall update the display.

The default values of weight unit shall be part of Global Setting. The OBS OnBoardClient shall remember user preference and shall retain over ignition cycle.

4.2.1.3 OBS-REQ-367363/B-Maximum Payload

When in payload screen, the Onboard Client shall make use of 'Vehicle_Gross_Weight_St' and 'Vehicle_Curb_Weight_St' signal from OBS Server to estimate the maximum payload allowed for the Vehicle.

The maximum allowed payload for the vehicle is the difference of Vehicle Curb weight (Vehicle_Curb_Weight_St) and Vehicle Gross weight (Vehicle_Gross_Weight_St).

4.2.1.4 OBS-REQ-367364/A-Exit Payload Screen

When the user exits the OBS_ShowPayloadScreen, the OBS OnBoardClient shall quit the screen and shall set ObsActvDsplyLcl_D_Stat = 0x0 accordingly.

4.2.2 Use Cases**4.2.2.1 OBS-UC-REQ-361279/B-Weight Unit Kgs to lbs**

Actors	OBS User
Pre-conditions	<ol style="list-style-type: none">1. Vehicle Ignition ON or Limited Power Mode.2. Pre-Check condition all met.3. OBS Payload Estimation Screen Active.4. Display weight scale unit as Kg.
Scenario Description	<ol style="list-style-type: none">1. User Changes the Scale from kg to lbs.
Post-conditions	<ol style="list-style-type: none">1. OBS OnBoard Client internally converts the unit into lbs.2. Update the Display screen with lbs values.
List of Exception Use Cases	E1 – Vehicle Ignition OFF.
Interfaces	OBS Server, OBS OnBoard Client

4.2.2.2 OBS-UC-REQ-367466/B-Weight Unit - lbs Ignition cycle

Actors	OBS User
Pre-conditions	<ol style="list-style-type: none">1. Vehicle Ignition ON or Limited Power Mode.2. Pre-Check condition all met.3. OBS Payload Estimation Screen Active.



	4. Display weight scale unit as Kg.
Scenario Description	1. User Changes the Scale from kg to lbs. 2. User does Vehicle Ignition cycle. (Sleep Cycle). 3. OBS App launched from the Display. (When Vehicle ignition is ON).
Post-conditions	1. OnBoardClient shall remember the last desired unit and shall report weight scaling in lbs unit.
List of Exception Use Cases	
Interfaces	OBS Server, OBS OnBoard Client

4.2.2.3 OBS-UC-REQ-367467/A-Weight Unit lbs to Kgs

Actors	OBS User
Pre-conditions	1. Vehicle Ignition ON or Limited Power Mode. 2. Pre-Check condition all met. 3. OBS Payload Estimation Screen Active. 4. Display weight scale unit as lbs.
Scenario Description	1. User Changes the Scale from lbs to kg. 2. User does a Ignition Sleep cycle. 3. User launches the OBS app from display (when ignition is RUN).
Post-conditions	1. OBS OnBoard Client internally converts the weight unit into Kgs. 2. Update the Display screen with kgs values. 3. OnBoardclient shall retain the user preference on sleep cycle.
List of Exception Use Cases	
Interfaces	OBS Server, OBS OnBoard Server

4.2.2.4 OBS-UC-REQ-361788/B-PreCheck Screen - Limited Power Mode

Actors	OBS User
Pre-conditions	1. Vehicle Ignition is OFF (Vehicle bus in limited power Mode). 2. Vehicle Transmission = Not Park. 3. Steering Wheel > Range. 4. Level Surface = No. 5. Tire Pressure = Not In-Range.
Scenario Description	1. Pre-Check Notification screen. 2. Vehicle User aligns the vehicle to meet precondition. (Vehicle Transmission = Park, Tire Pressure = In Range, Level surface = In Range, Steering Wheel=In range).
Post-conditions	1. User Display updated with the Payload estimate screen (First time launch). 2. User Display updated with last active session (Successive launch).



List of Exception Use Cases	E1 – Vehicle Ignition OFF.
Interfaces	OBS Server, OBS OnBoard Client

4.2.2.5 OBS-UC-REQ-362950/B-PreCheck Screen - Full Run Mode

Actors	OBS User
Pre-conditions	<ol style="list-style-type: none">1. Vehicle Ignition is ON.2. Vehicle Transmission = Not Park.3. Steering Wheel > Range.4. Park Brake = Dis-Engaged.5. Level Surface = Not In Range.6. Tire Pressure = Not In-Range.
Scenario Description	<ol style="list-style-type: none">1. Pre-Check Notification screen.2. Vehicle User aligns the vehicle to meet precondition. (Vehicle Transmission = Park, Tire Pressure = In Range, Level surface = In Range).
Post-conditions	<ol style="list-style-type: none">1. User Display updated with the Payload estimate screen (First time launch).2. User Display updated with last active session (Successive launch).
List of Exception Use Cases	E1 – Vehicle Ignition OFF.
Interfaces	OBS Server, OBS OnBoard Client

4.2.2.6 OBS-UC-REQ-362942/B-Additive Mass Estimation

Actors	OBS User
Pre-conditions	<ol style="list-style-type: none">1. Vehicle Ignition ON or Limited Power Mode.2. Pre-Check condition all met.3. OBS Additive Mass Estimation Screen Active.4. Vehicle Occupied with two passenger each 150 lbs.5. Vehicle Trunk is empty. (No Loads)
Scenario Description	<ol style="list-style-type: none">1. User Tares the Vehicle.2. Start adding Load to the trunk.
Post-conditions	<ol style="list-style-type: none">1. When vehicle is Tare, OBS OnBoard Client shall get updated additive Mass from Server.2. Vehicle Maximum loads and preloads were adjusted accordingly.3. OnBoard Client shall update the display with the new values reported by the Server.
List of Exception Use Cases	E1 – Vehicle Ignition OFF.
Interfaces	OBS Server, OBS OnBoard Client

**4.2.2.7 OBS-UC-REQ-367500/B-Tail Light - Turn On**

Actors	OBS User
Pre-conditions	<ol style="list-style-type: none">1. Vehicle Ignition ON or Limited Power Mode.2. Pre-Check condition all met.3. OBS Payload Estimation Screen Active.4. Tail lighting Turned Off.
Scenario Description	<ol style="list-style-type: none">1. User Hit the button on screen to turns on the Tail Light.
Post-conditions	<ol style="list-style-type: none">1. OBS Server shall Turn ON the Tail Lights.
List of Exception Use Cases	E1- No error response from OBS server. E2 – Vehicle Ignition OFF.
Interfaces	OBS Server, OBS OnBoard Client

4.2.2.8 OBS-UC-REQ-367501/B-Tail Light - Turn Off

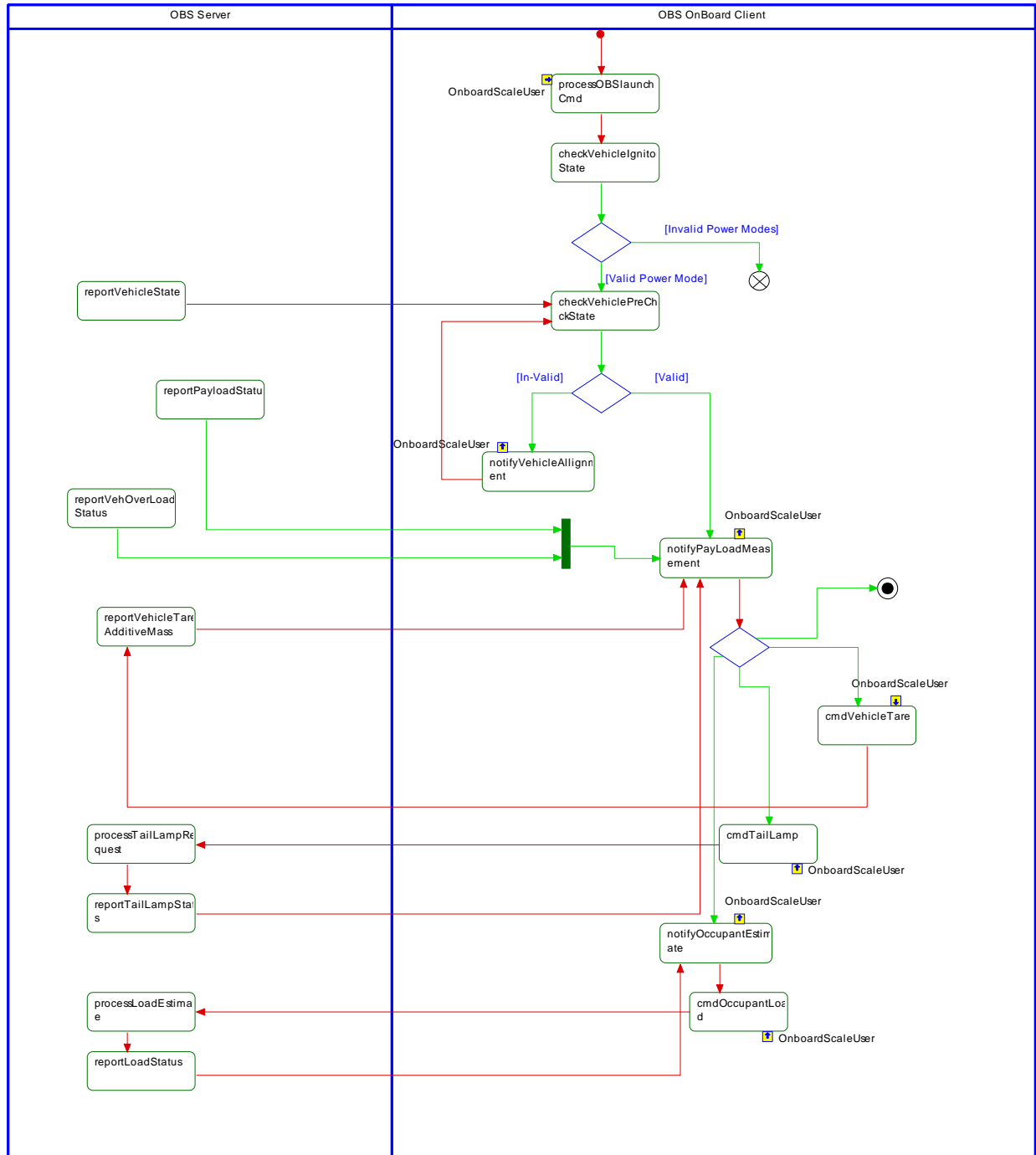
Actors	OBS User
Pre-conditions	<ol style="list-style-type: none">1. Vehicle Ignition ON or Limited Power Mode.2. Pre-Check condition all met.3. OBS Payload Estimation Screen Active.4. Tail lighting Turned ON.
Scenario Description	<ol style="list-style-type: none">1. User Hit the button on screen to turns Off the Tail Light.
Post-conditions	<ol style="list-style-type: none">1. OBS Server shall Turn OFF the Tail Lights.
List of Exception Use Cases	E1- No error response from OBS server. E2 – Vehicle Ignition OFF.
Interfaces	OBS Server, OBS OnBoard Client



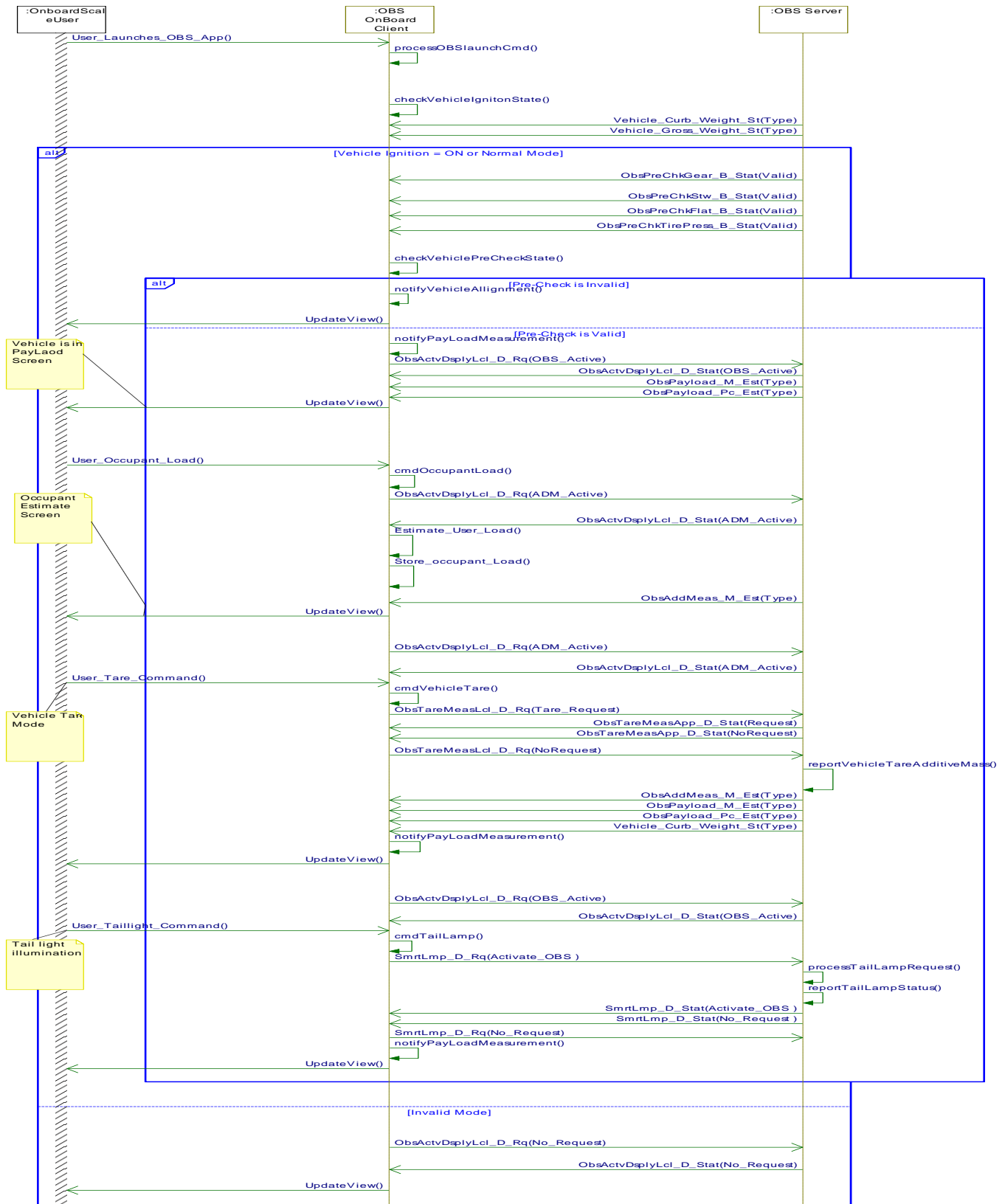
4.2.3 White Box View

4.2.3.1 Activity Diagrams

4.2.3.1.1 OBS-ACT-REQ-361280/A-Vehicle Payload Measurement



**4.2.3.2 Sequence Diagrams****4.2.3.2.1 OBS-SD-REQ-361281/B-Vehicle Payload Measurement**





4.3 OBS-FUN-REQ-367292/A-Determine Additive Mass

4.3.1 Requirements

4.3.1.1 OBS-REQ-367366/B-Additive Mass Estimation Screen

When the display is in payload screen (SYNC_ShowPayloadScreen) the user shall be able to enter additive mass estimation screen (SYNC_ShowScaleModeScreen).

- OnBoard Client shall set 'ObsActvDsplyLcl_D_Stat=0x2' (ADM_Active).
- OnBoard Client shall expect a response from the OBS server as 'ObsDsplyLcl_D_Stat == 0x2'.

While in additive mass estimation screen, the OnBoard Client shall make use of 'ObsAddMeas_M_Est' message from Server, to update the scale values.

The OBS OnBoardClient shall be in additive mass estimation screen with 'ObsActvDsplyLcl_D_Stat = 0x2', as long as it meets the requirement of "OBS-REQ-367357-OBS APP Launch" and "OBS-REQ-367356-Vehicle State - Display Pre-Check Conditions".

4.3.1.2 OBS-REQ-367385/B-Activate the Tare Function

The OnBoard Client shall allow user to activate Tare, when the display is in additive Mass screen. Tare shall be activated by pressing and holding the button (Tare_Button) for 3 seconds.

OBS OnBoardClient shall provide an option to Tare, when the OBS display is at OBS_ShowScaleModeScreen display.

- OnBoard Client shall set 'ObsTareMeasLcl_D_Rq=0x1' (Tare request).
- OnBoard Client shall expect a response from the OBS server as 'ObsTareMeasApp_D_Stat == 0x1'. (Tare in Progress)

'ObsTareMeasApp_D_Stat == 0x0'. (Tare Complete)

- Upon successful Tare operation the OnBoard Client shall set 'ObsTareMeasLcl_D_Rq=0x0' (Tare Complete).

In case of Error response from OBS Server

- The OnBoard Client shall show error screen as mentioned in the requirement 'OBS-REQ-369705-OBS APP Launch Error'
- Upon response the OnBoardClient shall set 'ObsTareMeasLcl_D_Rq' value as 'No_Request'.

4.3.1.3 OBS-REQ-367367/B-Tare Operation

The OBS OnBoard Client shall provide an option to Tare, when the Tare operation is completed as reported by 'ObsTareMeasApp_D_Stat', the OnBoard Client shall expect updated values from OBS server as part of Tare operation.

- ObsAddMeas_M_Est
- Vehicle_Curb_Weight_St
- ObsPayload_Pc_Est
- ObsPayload_M_Est
- ObsOvrld_D_Stat

The OnBoard Client shall clear the stored passenger weight estimation and set it to default and update the payload estimation screen (SYNC_ShowPayloadScreen) and additive mass estimation screen (SYNC_ShowAddMassScreen) accordingly with the updated values from OBS Server.

4.3.1.4 OBS-REQ-376181/A-Additive Mass Estimation

The OnBoard Client shall allow the user to estimate the number of passengers or estimated weight of the passengers who are present in the vehicle, when the user screen is on additive mass estimation screen (SYNC_ShowScaleModeScreen).



When the user estimates the weight of all the passengers, the OnBoard Client shall store the estimated weight of passenger's in its internal memory. The estimated passenger's weight shall be taken in to account to estimate the maximum allowed payload for the vehicle as described in requirement 'OBS-REQ-367362-Display Payload Estimation'. The display graphics for the user shall be updated accordingly.

OnBoard Client shall not retain the estimated weight of the passengers over ignition cycle.

4.3.1.5 OBS-REQ-369708/A-Payload Estimation - Unit Conversion

When OBS OnBoardClient is in OBS_ShowAddMassScreen, Onboard client shall allow user to toggle the display weight between lbs and kgs.

Onboard Client shall convert the units internally. OnboardClient shall remember user preference and shall retain the preference over ignition cycle.

4.3.1.6 OBS-REQ-367386/A-Exit Additive Mass Estimation Screen

When the OBS Additive Mass Screen is Active and the user decides to quit the OBS mode, Onboard Client shall update the ObsActvDsplyLcl_D_Stat accordingly.

4.4 OBS-FUN-REQ-367392/A-Tail Light Level

4.4.1 Requirements

4.4.1.1 OBS-REQ-367393/B-Tail Light Switch

The Onboard Client shall provide an option to switch ON/OFF Tail Light when in Payload screen

- When user switch ON Tail light, the OnBoardClient shall set 'SmrtLmp_D_Rq= 0x1' (Activate OBS Feature Mode) and remain until 'SmrtLmp_D_Stat == 0x1' (PayloadModeActive) received from the Server. Later then OnBoardClient shall switch back 'SmrtLmp_D_Rq = 0x0'(Not Active).
- When user switch OFF Tail light, the OnBoardClient shall set 'SmrtLmp_D_Rq= 0x4' (Deactivate All) and remain until 'SmrtLmp_D_Stat == 0x0' (Not Active) received from the Server. Later then OnBoardClient shall switch back 'SmrtLmp_D_Rq = 0x0'(Not Active).

4.4.1.2 OBS-REQ-367394/B-Toggle Taillight Switch

The OBS OnBoardClient shall allow user to toggle the tail light button (SYNC_ActivateTaillightSwitch) as long as the OBS Feature session is active on the display screen.

4.4.1.3 OBS-REQ-376227/A-Tail light Disabling

OnBoard Client shall turn off the Tail lights by using the signal 'SmrtLmp_D_Rq' when any of the below conditions are meet.

1. The OnBoard Client receives the pre-conditions as 'Invalid' for any of the signals from OBS server
 - a. ObsPreChkGear_B_Stat
 - b. ObsPreChkStw_B_Stat
 - c. ObsPreChkFlat_B_Stat
 - d. ObsPreChkTirePress_B_Stat
2. The user closes the OBS application from the display screen and re-launches the application.

Note: Need traceability and reference in the feature spec.



5 Appendix: Reference Documents

Reference #	Document Title
1	"OBS_FIS_version_1.1-Draft" or later
2	"New Signal Request OBS + SMHT - 12 5 2019 – AM" or later
3	
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