Feature Document (FD)

Trailer Light Check

<<Feature>>
(F002052)

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1 INTRODUCTION

1.1 Document Purpose

A Feature Document (FD) document defines a Feature on Concept Level. It specifies **what** the feature shall do and how it shall behave from customer perspective. It should also provide reasoning and background **why** we have the feature in the vehicle.

The FD also serves as an Item Definition as defined by ISO26262 for those features, which follow the Ford Functional Safety process. Refer FFSG01.10 Feature Document Guideline for how to apply the Feature Doc template for Functional Safety.

1.2 Document Scope

This Feature Document (FD) specifies the following features:

Feature ID	Feature Name	Owner	Reference
F002052	Trailer Light Check	Eric Vieira (evieira1)	

Table 1: Features described in this FD

1.3 Document Audience

The FD is written by the feature owner of Trailer Light Check. All Stakeholders, i.e., all people who have a valid interest in the feature should read and, if possible, review the FD. It needs to be guaranteed, that all stakeholders have access to the currently valid version of the FD.

1.3.1 Stakeholder List

For the latest list of stakeholder of the feature and their influence refer to: Click here to open the latest Stakeholders List.

1.4 Document Organization

1.4.1 Document Context

Refer to the Specification Structure page in the Ford RE Wiki to understand how the FD relates to other Ford Requirements Documents and Specifications.

1.4.2 Document Structure

The structure of this document is explained below:

Introduction	–	Explains how to use this document including responsibilities and requisite documents. Explains the terminology. Gives a clarification of the definitions, concepts and abbreviations used in the document.
Feature Overview	–	States briefly the background and the purpose of the feature, feature variants and corresponding regions and markets. Also includes input requirements, assumptions, and constraints.
Feature Context	–	Describes all external entities, which have an influence on the feature.
Feature Modeling	–	Contains Use Case, Driving Scenarios, State Charts to describe the functional behavior of the feature.
Feature Requirements	–	Lists functional and non-functional requirements of the feature.
Functional Safety	–	Lists System Behaviors, Safety Goals and Safety Requirements of the feature.
CyberSecurity	–	Lists Security Goals and Security Requirements of the feature.
Architecture	–	Shows the coarse architecture, which the feature requirements are deployed to. Describes the elements and the boundary of the feature as well as the decomposition and distribution of associated functions.
Traceability Matrix	–	Traceability Matrix.
Open Concerns	–	List of Open Concerns
Revision History	–	Document Change History including a list of new or modified requirements. The requirements in this document are tagged, and this section contains different types of tables listing all, new, or changed requirements by their title and page no.
Appendix	–	Appendix

1.5 Document Conventions

1.5.1 Classification of Chapters

A chapter is considered mandatory, unless the chapter or its parent chapter(s) are categorized by using the tag:

*#**Classification:** Some Condition*

If no requirement/other content is known for a mandatory chapter, leave a statement “Not Applicable”

Some chapters have a follow certain rules in context of specific Ford processes, e.g. Functional Safety. This is indicated at the beginning of the corresponding chapter by the tags:

*#**Functional Safety:** Some process specific explanation*
*#**Cybersecurity:** Some process specific explanation*

1.5.2 Requirements Templates

Refer to “How to use the Specification Templates” on how to use the specification templates and the VBA macros to create/edit the requirements in the specifications.

1.5.2.1 Requirements Attributes

The templates provided by *Specification_Macros.dotm* define a list of attributes for each requirement. This helps to classify the requirement. The attributes are explained at RE Wiki - Requirements Attributes.

1.6 References

1.6.1 Ford Documents

List here all Ford internal documents, which are directly related to the feature.

Reference	Title	Doc. ID	Document Location	Revision
Spec 1	Functional Specification Body Control Module	FS-LU5T-14B476-AAA	VSEM	12.02
Spec 2	Functional Specification Body Control Module	FS-MU5T-14B476-ACJ	VSEM	
Spec 3	Functional Specification Body Control Module	FS-NU5T-14B476-AAF	VSEM	
Spec 4	Functional Specification Body Control Module	FS-PU5T-14B476-AGB	VSEM	15.07
Spec 5	AppLink	FDS004146	https://www.vsemweb.ford.com/tc/launchapp?-attach=true&-s=226TCSession&-o=y1hFbbzox3NrTDAAAAAAAAAAAA&servername=Production_Server	1.31
Spec 6	ECG Infotainment SPSS	VDOC076964-Trailer Light Check ECG SPSS	https://www.vsemweb.ford.com/tc/launchapp?-attach=true&-s=226TCSession&-o=NmdxdumXx3NrTDAAAAAAAAAAAA&servername=Production_Server	1.4
Spec 7	APIM Infotainment SPSS	VDOC079457-Trailer Light Check APIM SPSS	https://www.vsemweb.ford.com/tc/launchapp?-attach=true&-s=226TCSession&-o=mZR17lvhx3NrTDAAAAAAAAAAAA&servername=Production_Server	12.02
Spec 8	Functional Specification TTLM (GEN I)	VDOC012447-FS DG9T-19H517-AB	https://www.vsemweb.ford.com/tc/launchapp?-attach=true&-s=226TCSession&-o=DiQRAOHfx3NrTDAAAAAAAAAAAA&servername=Production_Server	AB
Spec 9	Functional Specification iTRM (TTLM GEN II)	VDOC088749-FS-NU5T-19H517-AA005	https://www.vsemweb.ford.com/tc/launchapp?-attach=true&-s=226TCSession&-o=DiQRAOHfx3NrTDAAAAAAAAAAAA&servername=Production_Server	1.4

Reference	Title	Doc. ID	Document Location	Revision
Spec 10	Functional Specification iTRM	VDOC081877-FS-MU5T-19J294-AC	https://www.vsemweb.ford.com/tc/launchapp?-attach=true&-s=226TCSession&-o=SRX53Gyfx3NrTDAAAAAAAAAAAAA&servername=Production_Server	1.8
Spec 11	BCM MY23 GEN III - FS & Model Releases	FDS051699	https://www.vsemweb.ford.com/tc/launchapp?-attach=true&-s=226TCSession&-o=T8a9lIvXx3NrTDAAAAAAAAAAAA&servername=Production_Server	R04[3]
Spec 12	BCM MY21 GEN I M - FS & Model Releases	FDS031885	https://www.vsemweb.ford.com/tc/launchapp?-attach=true&-s=226TCSession&-o=CkelYvBXx3NrTDAAAAAAAAAAAA&servername=Production_Server	RC02[3]
Spec 13	BCM MY22 GEN I M - FS & Model Releases	FDS042133	https://www.vsemweb.ford.com/tc/launchapp?-attach=true&-s=226TCSession&-o=hvcxDa4Qx3NrTDAAAAAAAAAAAA&servername=Production_Server	RC01.2[2]

Table 2: Ford internal Documents

1.6.2 External Documents and Publications

The list of external documents could include books, reports and online sources.

Reference	Document / Publication	Document Location
	ECE R/48 Rev.7 - Vehicles with Regard to The Installation of Lighting And Light Signaling Devices	
	FMVSS 108 - Lamps, Reflective Devices, And Associated Equipment	

Table 3: External documents and publications

1.7 Glossary

See Appendix for Definitions and Abbreviations.

1.7.1 Definitions

1.7.2 Abbreviations

1.7.3 Parameters / Values

No Parameters / Values specified.

2 FEATURE OVERVIEW

2.1 Purpose and Description of Feature

2.1.1 Feature Purpose and Description

The Trailer Light Check feature will allow the vehicle user to visually check the light operation of a towed trailer independently. Upon activation of feature through in-vehicle HMI or via FordPass/LincolnWay the vehicle and the trailer lights will illuminate in the following sequence: parking or position lights (remain on for the entire test), left turn indicator light, right turn indicator light, brake lights, reverse lights and rear fog lights. The lights illumination sequence repeats 5 times until its completion. If a light problem is detected, the user selects the Troubleshooting button to see instructions on how to proceed.

2.1.1.1 Background

2.1.1.1.1 Current State

Visually checking trailer lights function is currently a procedure that must be done before the start of a new adventure. This typically requires a vocal communication between two people, which conscious drivers feel obliged to do every time they hitch a trailer. In the other hand, non-conscious drivers will often skip it. There is a bulb out detection routine within the ITRM but it is only effective on ~90% of towed trailer lights and does neither check reverse nor rear fog lights or able to detect swapped left/right turn indicator circuitry.

The Trailer Light Check function will allow for one person to complete this visual light inspection and fill the above mentioned TTLM/ITRM bulb detection gap in addition to enhancing the customer's trailer towing user experience. Trailer Rear Fog Lights have been proposed for vehicles in ECE homologated markets.

2.1.1.1.2 Feature Opportunity

The Trailer Light Check feature opportunities are listed below:
• One-person visual inspection of towed trailer lights
• Close the TTLM bulb out detection gap (~10% incompatible LEDs, reverse lights, swapped left/right circuitry)
• Enhanced customer towing experience

2.1.1.2 Feature Goals

The primary goal of the Trailer Light Check is to enhance the customer trailer towing experience. In addition to provide/make a Trailer Light Check feature which can be used globally in all markets in all Ford/Lincoln product sold no matter whether it is a FMVSS or ECE homologated market.

2.1.1.3 Feature Planning

The pilot program for the feature is P702 for MY2021, the feature has been designed to support both FMVSS and ECE homologated markets – include trailer rear fog light in ECE markets and Brazil.

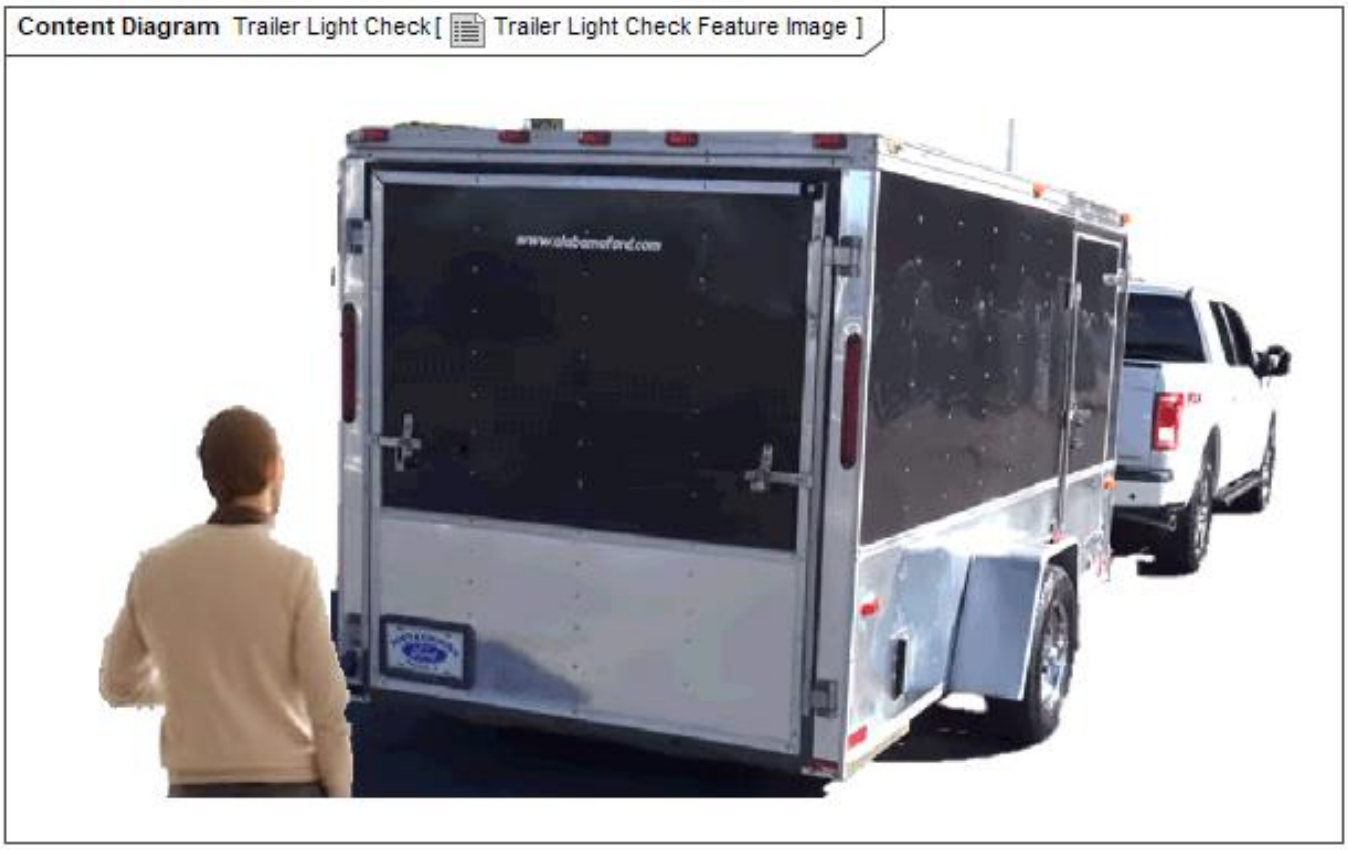

Figure 1: Trailer Light Check Feature Image

2.2 Feature Variants

Variant Name	Variant Description	Remarks
- ECE Homologated markets	It is applied to ECE Homologated markets.	
- FMVSS homologated markets with iTRM	It is applied to all FMVSS vehicles with iTRM.	
- FMVSS homologated markets without iTRM/ with PDBc driving trailer lamps	Relay based PDB solution on low series vehicles without iTRM	When iTRM is not available, the feature will still work but will not support trailer connected as a precondition.

Table 4: Feature Variants

2.2.1 Regions & Markets

Market / Region / Variant Name	North America	South America	Europe	Middle East/Africa	Asia / Pacific	China
	FMVSS-108	FMVSS-108 and ECE R/48 Rev. 7 compliant, except Brazil that complies with ECE R/48 Rev. 7 only.	ECE R/48 Rev. 7	FMVSS-108 and ECE R/48 Rev. 7 compliant	ECE R/48 Rev. 7	ECE R/48 Rev. 7

Table 5: Regions & Markets

2.3 Input Requirements/Documents

Reference (Reference as listed in ch. "References")	**Section/Requirement**	**Description**	**Derived Requirement** (optional – reference to requirement in ch. "Feature Requirements")
Attribute Requirements			
	User Feedback for Trailer Light Check Operation	Trailer Light Check feature shall provide user feedback via in-vehicle UI or Remote app UI when test is completed or interrupted by any preconditions not met	
	Trailer Light Check Operation	Once activated, Trailer Light Check feature shall start the vehicle and the trailer lights test illumination sequence in the following order: parking or position lights (remain on for the entire test), left turn indicator light, right turn indicator light, brake lights, reverse lights and rear fog lights.	
	Preconditions to activate Trailer Light Check	Trailer Light Check feature shall meet the required preconditions to be activated (ignition in RUN modes, Trailer electrically connected, All taillights must be Off, Battery SOC >=75% AND engine is OFF, Vehicle must be stationary, Other higher priority features that impact	

Reference (Reference as listed in ch. "References")	Section/Requirement	Description	Derived Requirement (optional – reference to requirement in ch. "Feature Requirements")
		vehicle exterior lighting must not be ON)	
	Trailer Light Check HMI Request	Trailer Light Check feature shall be activated / deactivated by user request thru in-vehicle UI HMI or remote app HMI	
	Trailer Light Check Objective	The primary goal of Trailer Light Check feature is to allow the vehicle user to visually check the lights operation of a towed trailer independently.	
Ford Engineering Standards			
	<Example: some SDS (requirement)>		
Legal Regulations			
	ECE R/48 Rev.7	Lighting and Light-signaling Installation to ECE - United Nations	
	FMVSS-108	Federal Motor Vehicle Safety Standard 108	
	Compliance with FMVSS101	The Feature shall comply with FMVSS101.	
Industry Standards			
	Compliance with FMVSS-108	Federal Motor Vehicle Safety Standard 108	
	ISO 26262/2018	Road Vehicles Functional Safety Standards	
	ECE R/48 Rev.7	Lighting and Light-signaling Installation to ECE - United Nations	
Other Sources			
	FAP03-150	Global Engineering Standards	

Table 6: Input Requirements/Documents

2.4 Lessons Learned

Global requirements such as rear fog lights should be considered when developing a feature. Must consider all activation paths for trailer lights – specifically that US low spec vehicles without a TRM/ITRM can still operate trailer lights via 4 pin plug where fitted, with circuits routed from the PDB.

Full iOS and Android testing are required. (a lot of Android was untested and not implemented) with MY21 P702. Since FNV3 architecture, BCM GEN3 uses CAN signals to communicate with ITRM/TTLM. Then ITRM/TTLM provide hardwired connection to trailer lights but are not end to end protected with current design and are not ASIL complaint. A deviation DVN-7039683 was approved for P708 (FNV3 lead Program) and a Conformance Plan has been established to have modules to be ASIL Complaint on FNV4 architecture.

2.5 Assumptions

Assumptions and constraints listed below are representative of current strategies and may be subject to change:

• The trailer light function feature will utilize existing hardware on the vehicle, no new hardware will be required
• Vehicle is at a minimum FNV2 or later architecture
• Vehicle has Ford factory/dealer installed trailer wiring, hitch and TRM/ iTRM/BCMc.
• When any action button command comes from in-vehicle HMI, the request shall be processed instantaneously
• When any action button command comes from remote Applink, the request shall be processed within 5 seconds
• When any action button command comes from remote app cellular connection, the request shall be processed within 25 seconds
• Manual Transmission vehicles shall have electronic parking brake
• BCM Gen I or Gen III are required for feature implementation (Gen II does not support the feature)

Purpose

3 FEATURE CONTEXT

3.1 Feature Context Diagram

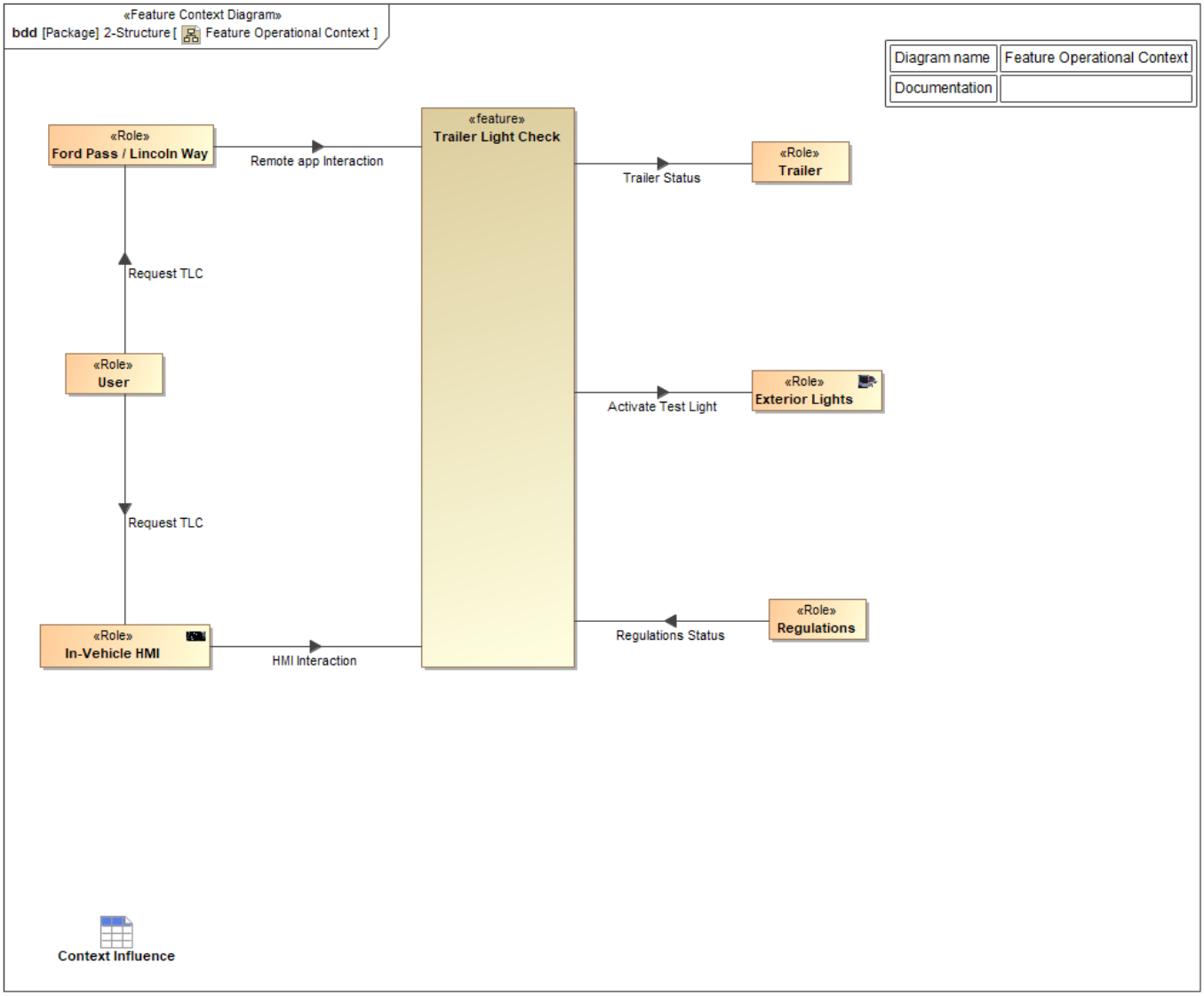

Figure 2: Feature Operational Context

3.2 List of Influences

ID	External Entity	Influence Description
Activate Test Light	Trailer Light Check To Exterior Lights	Trailer Light Check feature interaction with exterior lights (turning lights ON).
HMI Interaction	In-Vehicle HMI To Trailer Light Check	In-vehicle HMI to interact with Trailer Light Check.
Regulations Status	Regulations To Trailer Light Check	Need compliance to FMVSS-108 or ECE R/48 Rev. 7, ISO 26262:2018.
Remote app Interaction	Ford Pass / Lincoln Way To Trailer Light Check	Remote app HMI to interact with Trailer Light Check.

ID	External Entity	Influence Description
Request TLC	User To Ford Pass / Lincoln Way	User requests to activate Trailer Light Check.
	User To In-Vehicle HMI	User requests to activate Trailer Light Check.
Trailer Status	Trailer Light Check To Trailer	Trailer Light Check feature interaction with trailer.

Table 7: List of Influences

4 FEATURE MODELING

4.1 Operation Modes and States

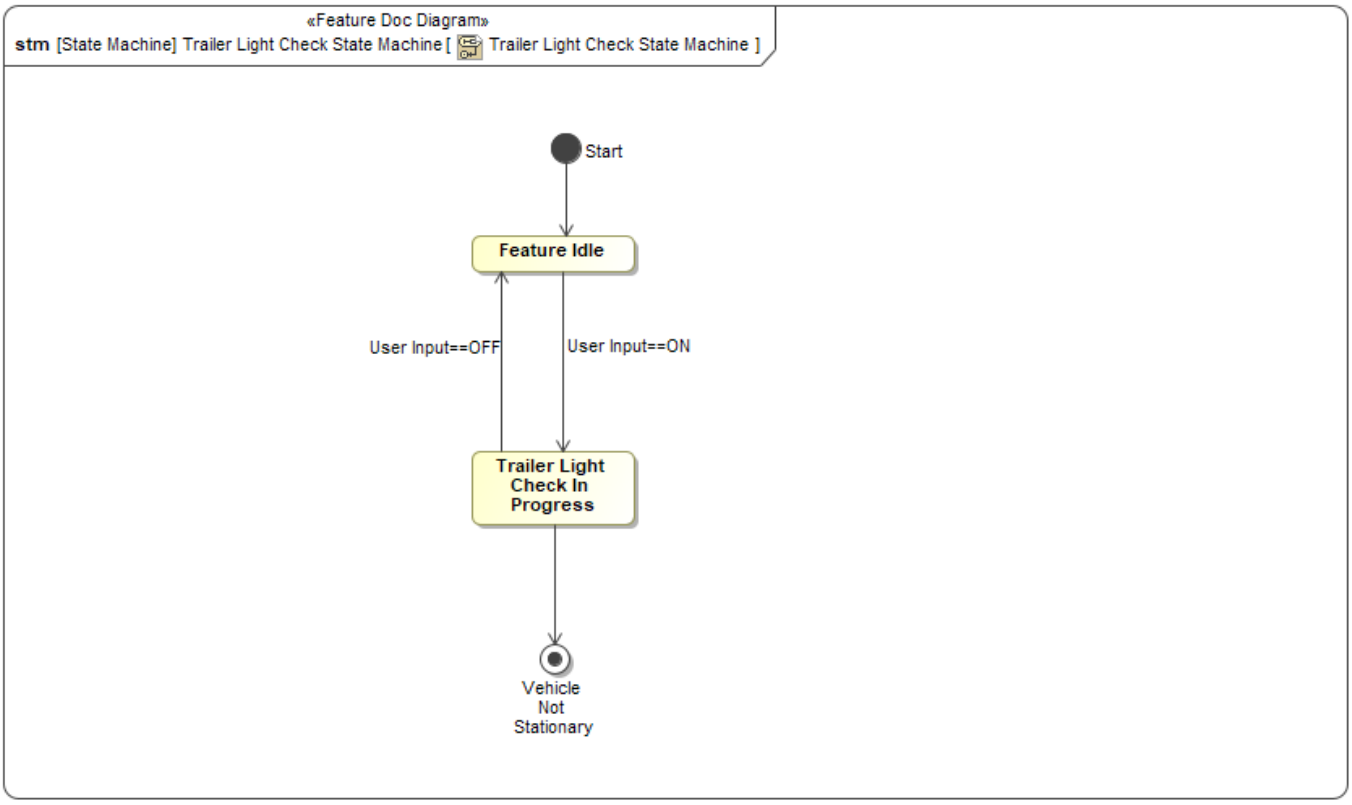

Figure 3: Trailer Light Check State Machine

State	Description	Requirements Reference (optional)
Feature Idle	Feature is idle	
Trailer Light Check In Progress	Feature is available and in operation	

Table 8: Operation Modes and States on Trailer Light Check State Machine

Transition ID	Source	Destination	Description	Requirements Reference (optional)
T1	Trailer Light Check In Progress	Feature Idle	Documentation: User requests to end Trailer Light Check, test ends normally, or pre-conditions are not met Trigger signal: User Input==OFF SignalEvent User Input==OFF	
T2	Start	Feature Idle		

Transition ID	Source	Destination	Description	Requirements Reference (optional)
T3	Feature Idle	Trailer Light Check In Progress	Documentation: User requests to initiate Trailer Light Check and pre-conditions are met. Trigger signal: User Input==ON SignalEvent User Input==ON	
T4	Trailer Light Check In Progress	Vehicle Not Stationary		

Table 9: Transitions between Operation Modes and States on Trailer Light Check State Machine

4.2 Use Cases

4.2.1 Use Case Diagram

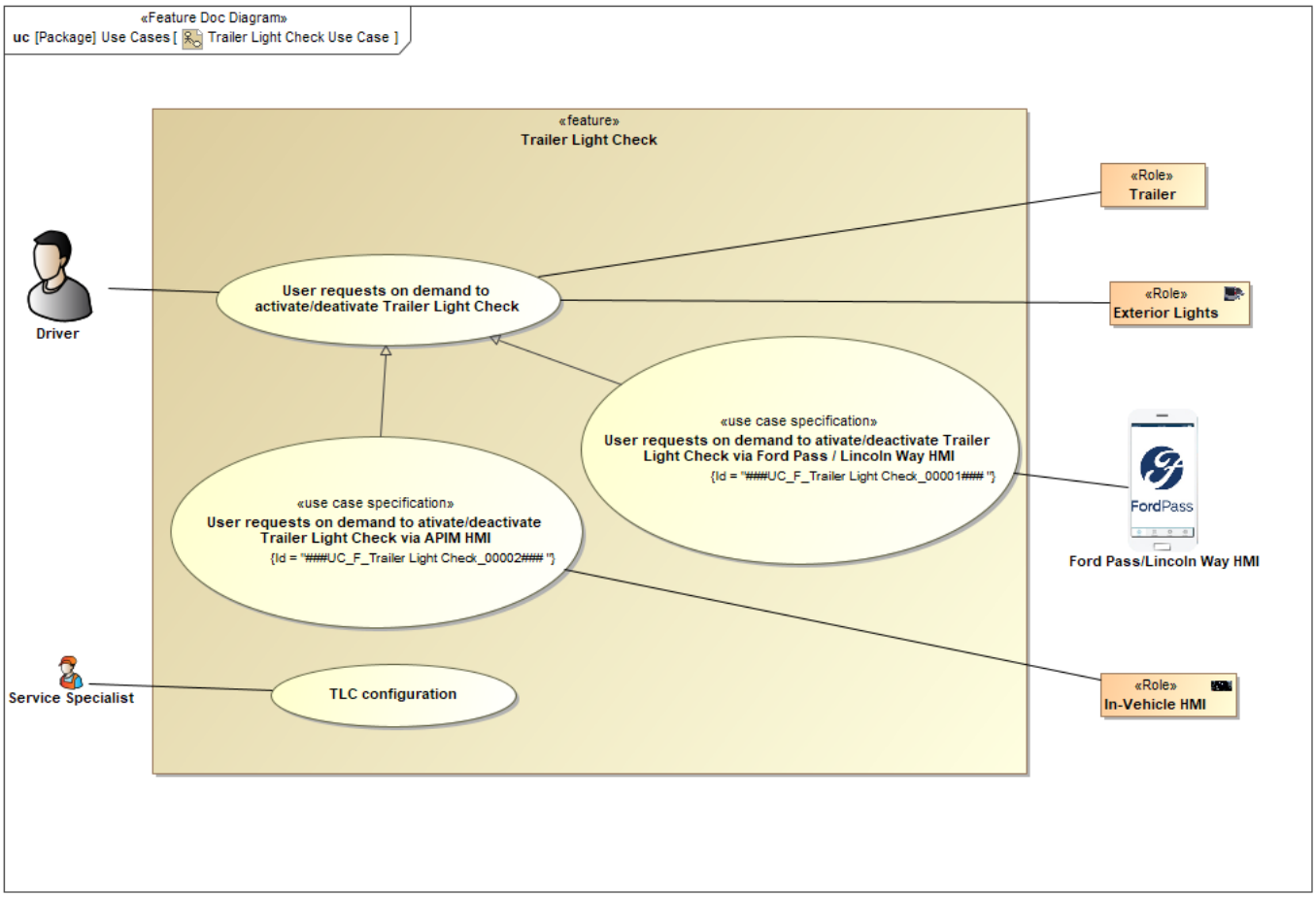

Figure 4: Trailer Light Check Use Case

4.2.2 Actors

Actor	Description
Driver	User requests to activate Trailer Light Check
Exterior Lights	Trailer Light Check feature interaction with exterior lights (turning lights ON).

Actor	Description
Ford Pass/Lincoln Way HMI	Remote app to activate/deactivate the feature.
In-Vehicle HMI	In-vehicle user interface to active/deactivate the feature.
Service Specialist	Technician who configures the feature parameters
Trailer	Trailer Light Check feature interaction with trailer lights.

Table 10: List of Actors

4.2.3 Use Case Descriptions

###UC_F_Trailer Light Check_00001### User requests on demand to ativate/deactivate Trailer Light Check via Ford Pass / Lincoln Way HMI

Actors	Primary	User
	Secondary	
Subject		Trailer Light Check
Description		User requests on demand to initiate Trailer Light Check via FordPass / Lincoln Way HMI.
Preconditions	PreC1	All trailer lamps are Off (except position / parking lamps)
	PreC2	Ignition is RUN
	PreC3	Trailer is connected to the Vehicle
	PreC4	User signed-in to the FordPass app
	PreC5	Vehicle 12v battery is >= 75% state of charge with engine off
	PreC6	Vehicle has factory or dealer installed trailer wiring
	PreC7	Vehicle is stationary
Main Flow Description		User requests on demand to activate/deativate Trailer Light Check via Ford Pass / Lincoln Way HMI
Main Flow	M1	From FordPass / LincolnWay HMI, user navigates to Vehicle Details screen and select Trailer Light Check
	M2	User selects START button to activate Trailer Light Check
	M3	User follows the lights sequence illumination in both vehicle and trailer
	M4	User waits until test is completed, then a message box Test Complete appears on screen.
	M5	If no problem has been detected, the user selects the Exit button and will return to the feature main screen.
	M6	<undefined>
Alternative Flow Steps	A1	After test has been initiated, the user can stop the test at any time by clicking Stop button.
	A2	If a problem has been detected, the user selects the Troubleshooting button to see instructions on how to proceed.
	A3	When all checks are complete, the user selects the Exit button and will return to the feature main screen.

###UC_F_Trailer Light Check_00002### User requests on demand to ativate/deactivate Trailer Light Check via APIM HMI

Actors	Primary	User
	Secondary	
Subject		Trailer Light Check
Description		User requests on demand to initiate Trailer Light Check via APIM HMI.
Preconditions	PreC1	All trailer lamps are Off (except position / parking lamps)
	PreC2	Ignition is RUN
	PreC3	Trailer is connected to the Vehicle

	PreC4	Vehicle 12v battery is >= 75% state of charge with engine off
	PreC5	Vehicle has factory or dealer installed trailer wiring
	PreC6	Vehicle is stationary
Main Flow Description		User requests on demand to activate/deativate Trailer Light Check via APIM HMI
Main Flow	M1	Via SYNC HMI, user clicks Towing, then selects Trailer Light Check button
	M2	User selects START button to activate Trailer Light Check
	M3	User follows the lights sequence illumination in both vehicle and trailer
	M4	User waits until test is completed, then a message box Test Complete appears on screen.
	M5	If no problem has been detected, the user selects the Exit button and will return to the feature main screen.
	M6	<undefined>
Alternative Flow Steps	A1	After test has been initiated, the user can stop the test at any time by clicking Stop button.
	A2	If a problem has been detected, the user selects the Troubleshooting button to see instructions on how to proceed.
	A3	When all checks are complete, the user selects the Exit button and will return to the feature main screen.

4.3 Driving and Operation Scenarios

Not applicable. Feature is 100% operational when the vehicle is not moving. There is no use case during driving or when the vehicle is in motion.

4.4 Decision Tables

Not applicable.

5 FEATURE REQUIREMENTS

5.1 Functional Requirements

00001 ###R_F_Trailer Light Check_00001### Feature Start / Stop

Trailer Light Check feature shall enable the user to Start or Stop the Trailer Light Check by pressing a control element.

Requirement ID: 00001					
Rationale	User ability to activate and deactivate the feature.				
Acceptance Criteria	By when user selects Start button, the feature shall be activated, and when user selects Stop button, the feature shall be deactivated.				
Notes	Functional Requirement				
Source				**Owner**	
Source Req.	• TLC_AR_001 Trailer Light Check HMI Request • TLC_AR_004 Trailer Light Check Operation			**V&V Method**	
Type		**Priority**		**Status**	In-Progress
Req. Template Version 6.0					End of Requirement

00002 ###R_F_Trailer Light Check_00002### Feature operation description

Upon selection of Trailer Light Check Feature Start button and all preconditions are met, the vehicle and trailer lights shall exhibit the below behavior:
1. Parking or position lamps on vehicle and trailer (including front and rear side markers) will turn ON and remain on through test sequences 1-8
1.1 Turn on license plate lights.
2. Wait 2.3* seconds with only parking or position lamps activated on vehicle and trailer (including front and rear side markers)
3. Left turn lights on vehicle and trailer will flash on and off 6* times
4. Right turn lights on vehicle and trailer will flash on and off 6* times
5. Brake lights on vehicle and trailer will turn ON for 4.5* seconds
6. Reverse lights on vehicle and trailer will turn ON for 4.5* seconds
7. Rear Fog Lights on trailer will turn ON for 4.5* seconds**
8. Wait 2.3* seconds with only parking or position lamps activated on vehicle and trailer (including front and rear side markers)
9. Turn off all parking or position lamps (including front and rear side markers)***
9.1 Turn off license plate lights
9.2 Wait 2.3 seconds*
10. Repeat steps 1-8 for 5* times or until user exits out
* Duration for each step shall be individually calibrated in addition to number of sequence repetitions.
**Step 7 is applicable only to vehicles in ECE homologated markets, in ECE homologated markets, the vehicle rear fog light will be lit if the trailer is connected.
*** If parking or position lamps have been turned on via a hard switch in vehicle, parking or position lamps shall remain on during this step.

Requirement ID: 00002			
Rationale	User knowledge about feature description on how it operates and its functionality.		
Acceptance Criteria			
Notes	Functional Requirement		
Source		**Owner**	
Source Req.	• TLC_AR_001 Trailer Light Check HMI Request • TLC_AR_002 Trailer Light Check Objective • TLC_AR_003 Preconditions to activate Trailer Light Check	**V&V Method**	

	• TLC_AR_004 Trailer Light Check Operation • TLC_AR_005 User Feedback for Trailer Light Check Operation				
Type		**Priority**		**Status**	In-Progress

Req. Template Version 6.0 End of Requirement

00003 ###R_F_Trailer Light Check_00003### Vehicle stationary status (Automatic transmission vehicles only)

For Trailer Light Check Feature, vehicle shall be defined as stationary if gearshift position is in Park and vehicle speed is less than or equal to 4 km/h (automatic transmission vehicles only).

Requirement ID: 00003

Rationale	Provides the definition of vehicle stationary status for automatic transmission vehicles.				
Acceptance Criteria					
Notes	Functional Requirement				
Source				**Owner**	
Source Req.	• TLC_AR_003 Preconditions to activate Trailer Light Check • TLC_AR_004 Trailer Light Check Operation • TLC_AR_005 User Feedback for Trailer Light Check Operation			**V&V Method**	
Type		**Priority**		**Status**	In-Progress

Req. Template Version 6.0 End of Requirement

00004 ###R_F_Trailer Light Check_00004### Vehicle stationary status (Manual transmission vehicles only)

For Trailer Light Check Feature, vehicle shall be defined as stationary if electric parking brake is applied and the vehicle speed is less than or equal to 4 km/h (manual transmission vehicles only).

Requirement ID: 00004

Rationale	Provides the definition of vehicle stationary status for manual transmission vehicles				
Acceptance Criteria					
Notes	Functional Requirement				
Source				**Owner**	
Source Req.	• TLC_AR_003 Preconditions to activate Trailer Light Check • TLC_AR_004 Trailer Light Check Operation • TLC_AR_005 User Feedback for Trailer Light Check Operation			**V&V Method**	
Type		**Priority**		**Status**	In-Progress

Req. Template Version 6.0 End of Requirement

00005 ###R_F_Trailer Light Check_00005### Feature Pre-Conditions not met

The Trailer Light Check feature shall not allow the user to start the trailer light sequence OR shall exit test if it has already begun if any of the below pre-condition
s are not met:
• Ignition is in RUN state
• (12V Battery SOC >= 75% AND engine status = OFF) OR engine status = RUN
• Vehicle is stationary
• Trailer is electrically connected to vehicle (only if iTRM/TRM is equipped to vehicle)
• All parking / position lamps are OFF (except parking/position lights) unless demanded by Trailer Light Check

• Other higher priority features that impact external vehicle lighting are not ON (i.e. Police Dark Car, Silent Car, Re PA etc.)

Requirement ID: 00005					
Rationale	Describes the preconditions for the feature to operate.				
Acceptance Criteria					
Notes	Functional Requirement				
Source				**Owner**	
Source Req.	• TLC_AR_003 Preconditions to activate Trailer Light Check • TLC_AR_004 Trailer Light Check Operation • TLC_AR_005 User Feedback for Trailer Light Check Operation			**V&V Method**	
Type		**Priority**		**Status**	In-Progress
Req. Template Version 6.0					End of Requirement

00006 ###R_F_Trailer Light Check_00006### Feature feedback when test is interrupted due to change in pre-condition status

The Trailer Light Check feature shall indicate to the user when the test is interrupted due to a change in feature pre-conditions:
1.Ignition is not in RUN state
2. Engine start is required
3. Vehicle is not stationary
4. Trailer is not electrically connected
5. Request for other higher priority feature active
6. Any Taillights (except parking lights) are On
7. Any other Trailer Light Check fault/error

Requirement ID: 00006					
Rationale	User receives a feedback when feature stops due to a precondition is not met.				
Acceptance Criteria					
Notes	Functional Requirement				
Source				**Owner**	
Source Req.	• TLC_AR_003 Preconditions to activate Trailer Light Check • TLC_AR_004 Trailer Light Check Operation • TLC_AR_005 User Feedback for Trailer Light Check Operation			**V&V Method**	
Type		**Priority**		**Status**	In-Progress
Req. Template Version 6.0					End of Requirement

00007 ###R_F_Trailer Light Check_00007### Feature behavior with multiple Start commands

Once Trailer Light Check feature has been initiated, the feature shall ignore any additional lower priority feature start commands.

Requirement ID: 00007					
Rationale	Once feature is activated, any other additional feature starting shall be ignored.				
Acceptance Criteria					
Notes	Functional Requirement				
Source				**Owner**	
Source Req.	• TLC_AR_001 Trailer Light Check HMI Request • TLC_AR_004 Trailer Light Check Operation			**V&V Method**	

Type		Priority		Status	In-Progress

Req. Template Version 6.0 End of Requirement

00009 ###R_F_Trailer Light Check_00009### Feature turn signal behavior

When the Trailer Light Check feature is testing turn signal function, the feature shall flash the turn signals at same rate the vehicle would normally do when commanded manually. Note – the flash rate is configurable in the BCM P2 (DE52: Feat360_FlashOffTime_Cfg, Feat360_FlashOnTime_Cfg)

Requirement ID: 00009

Rationale	It determines the trailer turn signal lights shall flash at the same rate as the turn signal lights in the vehicle.				
Acceptance Criteria					
Notes	Functional Requirement				
Source				**Owner**	
Source Req.	• TLC_AR_004 Trailer Light Check Operation			**V&V Method**	
Type		**Priority**		**Status**	In-Progress

Req. Template Version 6.0 End of Requirement

00010 ###R_F_Trailer Light Check_00010### Remote device out of cellular range

When remote app hosting device goes out of cellular range after Trailer Light Check feature has been initiated, the Trailer Light Check shall continue with normal test operation.

Requirement ID: 00010

Rationale	Feature shall not stop when cellular connection is out of range.				
Acceptance Criteria					
Notes	Functional Requirement				
Source				**Owner**	
Source Req.	• TLC_AR_004 Trailer Light Check Operation			**V&V Method**	
Type		**Priority**		**Status**	In-Progress

Req. Template Version 6.0 End of Requirement

00012 ###R_F_Trailer Light Check_00012### Remote device unpaired with vehicle

When remote app hosting device gets unpaired with vehicle after Trailer Light Check feature has been initiated, the Trailer Light Check shall continue with normal test operation.

Requirement ID: 00012

Rationale	Feature shall not stop when remote app device gets unpaired from vehicle.				
Acceptance Criteria					
Notes	Functional Requirement				
Source				**Owner**	
Source Req.	• TLC_AR_004 Trailer Light Check Operation			**V&V Method**	
Type		**Priority**		**Status**	In-Progress

Req. Template Version 6.0 End of Requirement

00013 ###R_F_Trailer Light Check_00013### Feature User Interface (UI)

The Trailer Light Check feature shall have a dedicated user interface screen on the in-vehicle and remote app displays.

Requirement ID: 00013

Rationale	Feature shall have a dedicated screen for user interaction.		
Acceptance Criteria			
Notes	Functional Requirement		
Source		**Owner**	

Source Req.	• TLC_AR_001 Trailer Light Check HMI Request • TLC_AR_005 User Feedback for Trailer Light Check Operation			**V&V Method**	
Type		**Priority**		**Status**	In-Progress

Req. Template Version 6.0 End of Requirement

00014 ###R_F_Trailer Light Check_00014### Feature feedback upon pre-condition violation that prevents feature to start

When the user selects start test and pre-conditions are not met, HMI feedback shall display the pre-condition that was not met:
1. Ignition is not in RUN state
2. Engine start required due to Battery SOC < 75%
3. Trailer is not connected
4. Vehicle is not stationary
5. Vehicle is not in Park (P)
6. Parking brake is not engaged (for Manual Transmission only)
7. Taillamps must be off (except for position / parking lamps)
8. Other higher priority features interaction

Requirement ID: 00014

Rationale	User receives a feedback when feature is not initiated due to a precondition is not met.				
Acceptance Criteria					
Notes	Functional Requirement				
Source				**Owner**	
Source Req.	• TLC_AR_003 Preconditions to activate Trailer Light Check • TLC_AR_004 Trailer Light Check Operation • TLC_AR_005 User Feedback for Trailer Light Check Operation			**V&V Method**	
Type		**Priority**		**Status**	In-Progress

Req. Template Version 6.0 End of Requirement

00015 ###R_F_Trailer Light Check_00015### Feature feedback upon Start/Stop command

When the user presses the Trailer Light Check Feature Start or Stop control element on in-vehicle UI or remote app, HMI shall behave as follows:
• Upon a valid Start test command, the screen shows a test description with the lights illumination sequence and test starts.
• Upon a valid Stop test command, the test will stop and the Start button will be displayed in the screen.

Requirement ID: 00015

Rationale	User ability to activate and deactivate the feature.				
Acceptance Criteria					
Notes	Functional Requirement				
Source				**Owner**	
Source Req.	• TLC_AR_001 Trailer Light Check HMI Request • TLC_AR_004 Trailer Light Check Operation			**V&V Method**	
Type		**Priority**		**Status**	In-Progress

Req. Template Version 6.0 End of Requirement

00017 ###R_F_Trailer Light Check_00017### Test Ended due to a precondition not being met after test is initiated

When Trailer Light Check test has been initiated, but it has ended due to preconditions not being met, HMI feedback shall display as like below:

Light Check Stopped
{unmet precondition text}

Preconditions as below:
1. Ignition is not in RUN state
2. Engine start required due to Battery SOC < 75%
3. Trailer is not connected
4. Vehicle is not stationary
5. Vehicle is not in Park (P)
6. Parking brake is not engaged (for Manual Transmission only)
7. Taillamps must be off
8. Other higher priority features interaction

Requirement ID: 00017

Rationale	User receives a feedback when feature is interrupted due to a precondition is not met.				
Acceptance Criteria					
Notes	Functional Requirement				
Source				**Owner**	
Source Req.	• TLC_AR_003 Preconditions to activate Trailer Light Check • TLC_AR_004 Trailer Light Check Operation • TLC_AR_005 User Feedback for Trailer Light Check Operation			**V&V Method**	
Type		**Priority**		**Status**	In-Progress

Req. Template Version 6.0 End of Requirement

00018 ###R_F_Trailer Light Check_00018### Trailer Lights Check Complete

When test is completed a message box shall appear asking to click Troubleshooting if any lamps did not turn on.

Requirement ID: 00018

Rationale	User is notified when test is completed and receives troubleshooting instructions.				
Acceptance Criteria					
Notes	Functional Requirement				
Source				**Owner**	
Source Req.	• TLC_AR_004 Trailer Light Check Operation • TLC_AR_005 User Feedback for Trailer Light Check Operation			**V&V Method**	
Type		**Priority**		**Status**	In-Progress

Req. Template Version 6.0 End of Requirement

5.2 Non-Functional Requirements

5.2.1 Security

No Security Requirements specified.

5.2.2 Reliability

No Reliability Requirements specified.

5.2.3 Performance

No Performance Requirements specified.

5.3 HMI Requirements

No HMI Requirements specified.

5.4 Other Requirements

5.4.1 Design Requirements

Not supported by MagicDraw report generation.

5.4.2 Manufacturing Requirements

No Manufacturing Requirements specified.

5.4.3 Service Requirements

5.4.3.1 Cloud Connectivity Data Analytics Requirements

###R_DA_Trailer Light Check_000001### Trailer not Connected Trailer Light Check Activated – Data Captured (feature outputs)

When Trailer Light Check changes states, the feature shall capture the trailer connected status and the completed and stopped modes.

Requirement ID:					
Rationale					
Acceptance Criteria					
Notes	Other Requirement - Service				
Source				**Owner**	
Source Req.				**V&V Method**	
Type		**Priority**		**Status**	Approved
Req. Template Version 6.0					End of Requirement

###R_DA_Trailer Light Check_000002### Trailer not Connected Trailer Light Check Activated – Data Upload (feature outputs)

When Trailer Light Check days worth of memory have been captured, the feature shall upload the events to the Cloud Manager, before the memory is full.

Requirement ID:					
Rationale					
Acceptance Criteria					
Notes	Other Requirement - Service				
Source				**Owner**	
Source Req.				**V&V Method**	
Type		**Priority**		**Status**	Approved
Req. Template Version 6.0					End of Requirement

###R_DA_Trailer Light Check_000003### Trailer not Connected Trailer Light Check Activated – Data Visualization (feature outputs)

When the Trailer Light Check feature has uploaded data to the cloud, the feature data shall be put into a data visualization.

Requirement ID:					
Rationale					
Acceptance Criteria					
Notes	Other Requirement - Service				
Source				**Owner**	
Source Req.				**V&V Method**	
Type		**Priority**		**Status**	Approved
Req. Template Version 6.0					End of Requirement

###R_DA_Trailer Light Check_000004### Trailer not Connected Trailer Light Check Feedback – Data Captured (feature outputs)

When Trailer Light Check preconditions change, the feature shall capture the popup displayed to the user.

Requirement ID:					
Rationale					
Acceptance Criteria					
Notes	Other Requirement - Service				
Source				**Owner**	
Source Req.				**V&V Method**	
Type		**Priority**		**Status**	Approved
Req. Template Version 6.0					End of Requirement

###R_DA_Trailer Light Check_000005### Trailer not Connected Trailer Light Check Feedback – Data Visualization (feature outputs)

When the Trailer Light Check feature has uploaded data to the cloud, the feature data shall be put into a histogram data visualization.

Requirement ID:					
Rationale					
Acceptance Criteria					
Notes	Other Requirement - Service				
Source				**Owner**	
Source Req.				**V&V Method**	
Type		**Priority**		**Status**	Approved
Req. Template Version 6.0					End of Requirement

###R_DA_Trailer Light Check_000006### Trailer not Connected Trailer Light Check Requested – Data Captured (feature inputs)

When Trailer Light Check is requested, the feature shall capture the mode requested.

Requirement ID:					
Rationale					
Acceptance Criteria					
Notes	Other Requirement - Service				
Source				**Owner**	
Source Req.				**V&V Method**	
Type		**Priority**		**Status**	Approved
Req. Template Version 6.0					End of Requirement

###R_DA_Trailer Light Check_000007### Trailer not Connected Trailer Light Check Requested – Data Visualization (feature inputs)

When the feature has uploaded data to the cloud, the feature data shall be put into a data visualization.

Requirement ID:	
Rationale	

Acceptance Criteria					
Notes	Other Requirement - Service				
Source				**Owner**	
Source Req.				**V&V Method**	
Type		**Priority**		**Status**	Approved

Req. Template Version 6.0 End of Requirement

###R_DA_Trailer Light Check_000008### Trailer not Connected Trailer Light Check Requested via SYNC – Data Captured (feature inputs)

When Trailer Light Check is requested, the feature shall capture the mode requested via SYNC.

Requirement ID:

Rationale					
Acceptance Criteria					
Notes	Other Requirement - Service				
Source				**Owner**	
Source Req.				**V&V Method**	
Type		**Priority**		**Status**	Approved

Req. Template Version 6.0 End of Requirement

###R_DA_Trailer Light Check_000009### Trailer not Connected Trailer Light Check Requested via Remote App – Data Capture (feature inputs)

When Trailer Light Check is requested, the feature shall capture the mode requested via Remote App (FordPass / Lincoln Way).

Requirement ID:

Rationale					
Acceptance Criteria					
Notes	Other Requirement - Service				
Source				**Owner**	
Source Req.				**V&V Method**	
Type		**Priority**		**Status**	Approved

Req. Template Version 6.0 End of Requirement

###R_DA_Trailer Light Check_000010### Trailer not Connected Trailer Light Check Requested – Data Visualization (feature inputs)

When the feature has uploaded data to the cloud, the feature data shall be put into a data visualization.

Requirement ID:

Rationale					
Acceptance Criteria					
Notes	Other Requirement - Service				
Source				**Owner**	
Source Req.				**V&V Method**	
Type		**Priority**		**Status**	Approved

Req. Template Version 6.0 End of Requirement

###R_DA_Trailer Light Check_000011### Trailer not Connected Trailer Light Check Requested – Data Captured (feature failure modes)

When the feature has uploaded data to the cloud, the feature data shall be put into a data visualization.

Requirement ID:

Rationale			
Acceptance Criteria			
Notes	Other Requirement - Service		
Source		**Owner**	

Source Req.				**V&V Method**	
Type		**Priority**		**Status**	Approved

Req. Template Version 6.0 End of Requirement

###R_DA_Trailer Light Check_000012### Trailer not Connected Trailer Light Check Requested by HMI – Data Captured (feature failure modes)

When the Trailer Light Check is requested by HMI, the feature shall capture the DTCs that prevent the feature from being Activated/Deactivated.

Requirement ID:

Rationale					
Acceptance Criteria					
Notes	Other Requirement - Service				
Source				**Owner**	
Source Req.				**V&V Method**	
Type		**Priority**		**Status**	Approved

Req. Template Version 6.0 End of Requirement

5.4.4 After Sales Requirements

After Sales Requirements

There are several factors which need to be considered in a program-by-program basis for After Sales TLC support.

A commonly occurring situation exists, where the owner may decide to fit a trailer/hitch post build. They may be the second owner, or the original owner simply had a lifestyle change which has now added a need to support towing capability, perhaps for camping, or boating for example.

The Trailer Light Check (TLC) feature can be offered to customers who fit up a genuine Ford towing hitch, trailer module (if required) and wiring. However, there are some constraints.

Some programs do not support wiring giveaways to the trailer circuits. The C1Cxx/C1Mxx/C1Dxx family represents available inclusions of trailer wiring and will differ by program. Usually, but not always, C1CAA will mean no towing support is offered. Some of the C1Cxx family will not include a TRM/ITRM (e.g. C1CAB), and others will. Check your program PDL. Note that FMVSS markets do give away 4pin trailer connectors standard, and don't require a TRM to enable TLC necessarily.

Additionally, not all markets are 'connected markets' or necessarily towing markets. FordPass is not available in all global markets and has a significant back-end organization requirement to support it. Please refer to the Enterprise Connectivity Group to understand the current rollout plan with respect to your export plan for your specific program. As of 2021, around 80 markets are connected, mostly in Europe, America, and IMG markets. You can still operate TLC using the touch screen only in non-connected markets however, so this is not a pre-requisite, necessarily.

The feature may be offered as a subscription-based service. Discuss this with the Enterprise Connectivity Team to determine monetary value and setup of the backend (CVBOP/Enrolment/Subscription Services) to support this. This may be constrained by available payment methods, which are still being worked through currently, particularly in the IMG region.

The program VSCS needs to support TLC activation through in column J "customer preference" in the VSCS having a 'Y' (Yes) so that the IDS/FDRS tool can pick up these parameters and turn them on post build. This will involve APIM, BCM and ECG tabs (latter if FordPass is to be activated). Note that there are many other trailer related configuration items to be turned on in general also, however these are outside the scope of the TLC activation specifically and should be referred to your Trailer Module D&R/Core Feature System Engineer if required.

5.4.5 Process Requirements

No Process Requirements specified.

6 FUNCTIONAL SAFETY

6.1 System Behaviors for HARA

ID	Name	Description
SB 01	Cancel Trailer Light Check	
SB 02	Activate Trailer Light Check	This system behavior describes the core function of the Trailer Light Check feature, in which the vehicle actuates a subset of lights in a pre-defined sequence, as described in the use case scenario.
SB 03	End of Test Question	
SB 04	Display Pre-condition Status	

Table 11: System Behaviors for HARA

6.2 Functional Safety Assumptions

No Safety Assumptions specified

6.3 Safety Goals

ID	Goal		
SG-01	**Goal Name**	Prevent trailer brake light loss due unintended TLC activation	
	Description	Loss of trailer brake lamps due the malfunctions of TLC shall be prevented.	
	Safety Goal Concept	Safety Goal Concept: Warning & Recovery Concept:	
	ASIL	A	**FTTI**
	Related FSR IDs	• FSR01 • FSR03 • FSR04 • FSR05 • FSR06 • REQ-475257/A	

Table 12: Functional Safety Goals

6.4 Functional Safety Requirements

6.4.1 Safety Goal: SG-01 Prevent trailer brake light loss due unintended TLC activation

Name: Prevent trailer brake light loss due unintended TLC activation
Purpose: Loss of Trailer Brake Lamps due the malfunctions can result in hazard event
Text: Loss of trailer brake lamps due the malfunctions of TLC shall be prevented.
ASIL: A

6.4.1.1 Safety Goal Concept

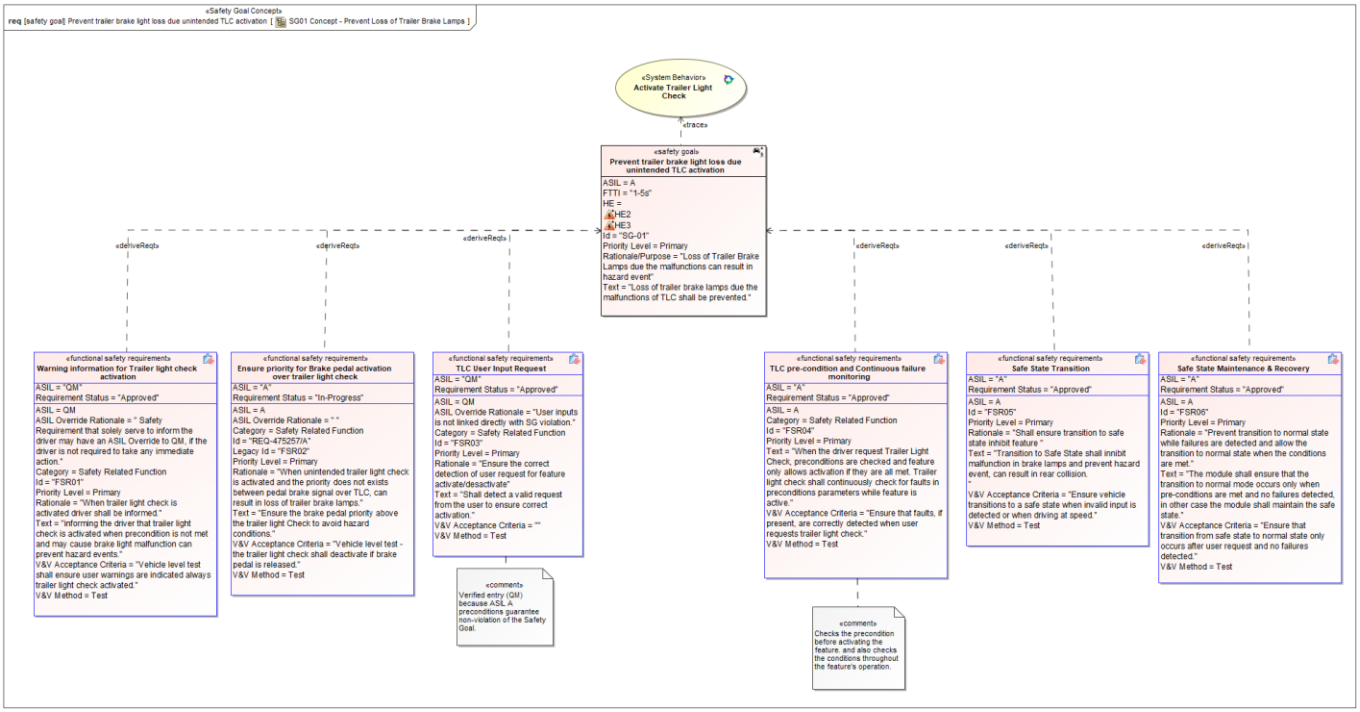

Figure 5: SG01 Concept - Prevent Loss of Trailer Brake Lamps – Prevent trailer brake light loss due unintended TLC activation

Note: The authoritative source for the Safety Goals is document "FFSD 02 Hazard Analysis and Risk Assessment". The documentation of Safety Goals in this chapter (In the Argumentation for Safety Goal achievement) is for information purposes only.
The authoritative source for the Functional Safety Requirements is section 2.1.x.3: of this document. The documentation of Functional Safety Requirements in the following chapter (complete or summarised) is for information purposes only.

6.4.1.2 Warning and Recovery Concept

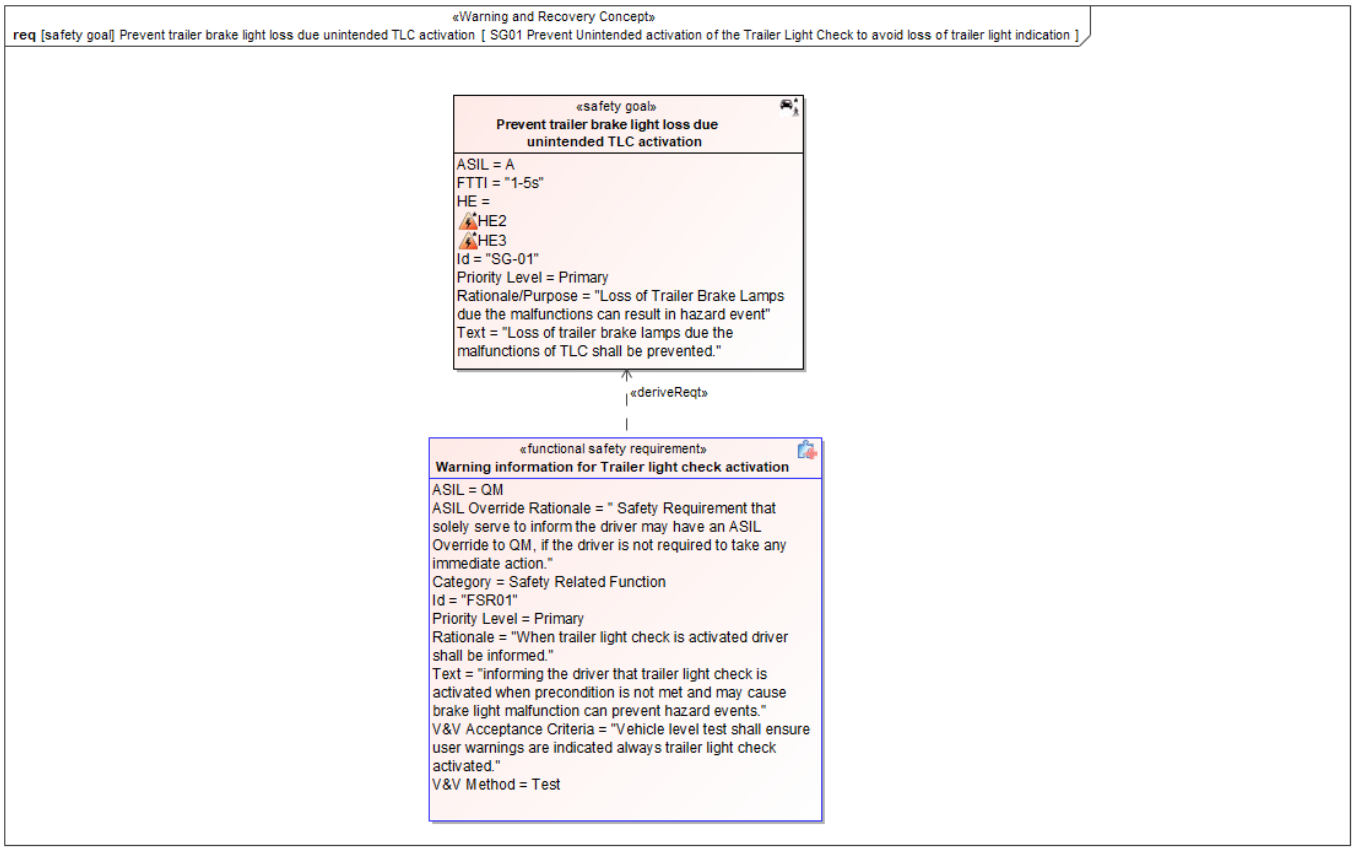

Figure 6: SG01 Prevent Unintended activation of the Trailer Light Check to avoid loss of trailer light indication – Prevent trailer brake light loss due unintended TLC activation

6.4.1.3 FSRs for SG-01 - Prevent trailer brake light loss due unintended TLC activation

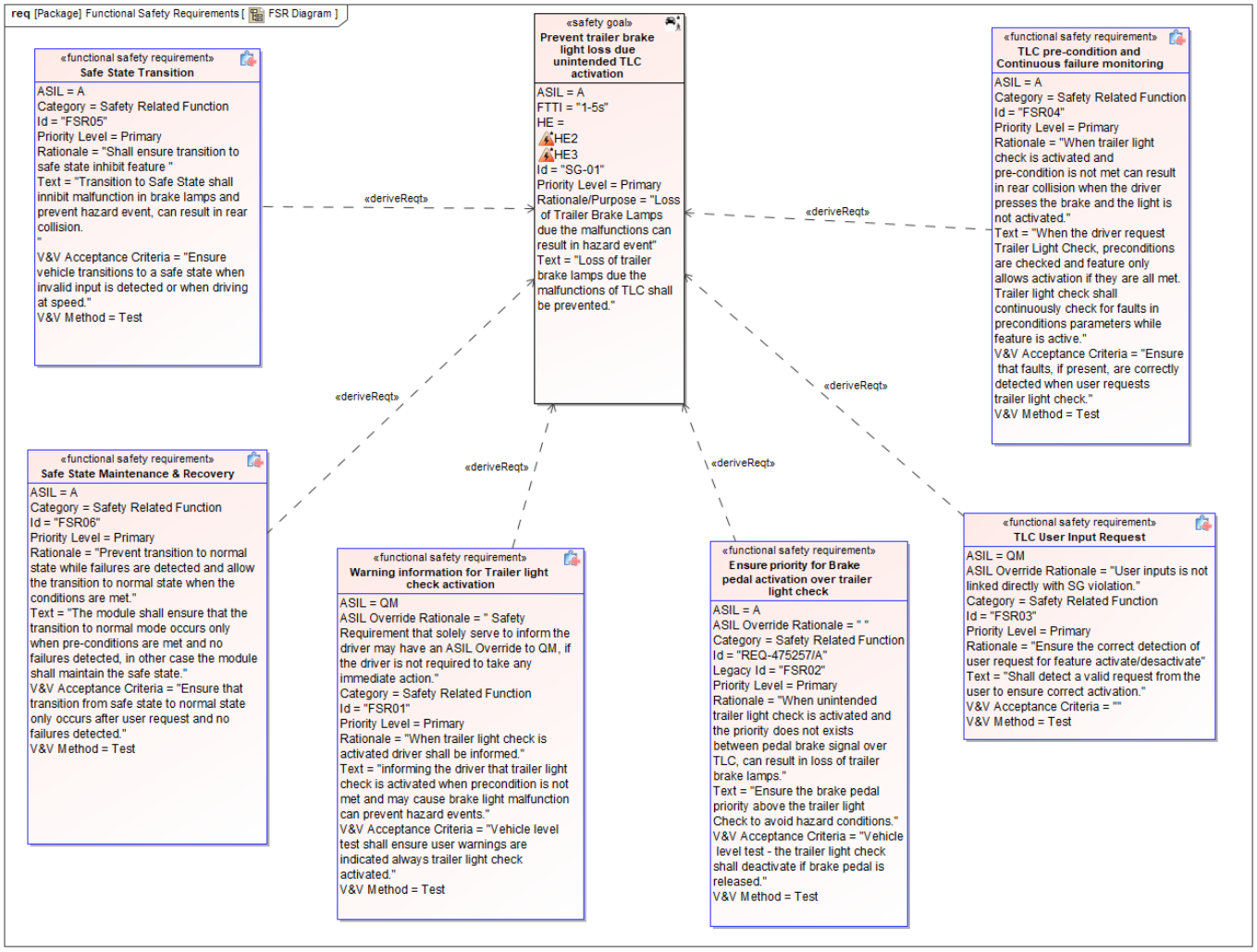

Figure 7: Prevent trailer brake light loss due unintended TLC activation

FSR01 Warning information for Trailer light check activation

informing the driver that trailer light check is activated when precondition is not met and may cause brake light malfunction can prevent hazard events.

Satisfied by:

- Logicals:
  - FordPass Logical
  - HMI Logical
  - Trailer Light Check Logical

Related to:

- Safe States:
  - Normal State
- Operating Modes:
  - Check failure
  - Normal State
  - Precondition Warning Check

Requirement ID: FSR01

Purpose	ASIL Override Rationale - Safety Requirement that solely serve to inform the driver may have an ASIL Override to QM, if the driver is not required to take any immediate action.				
V&V Acceptance Criteria	Vehicle level test shall ensure user warnings are indicated always trailer light check activated.				
Notes					
Source				**Owner**	
Source Req.	• SG-01 Prevent trailer brake light loss due unintended TLC activation			**V&V Method**	Test
Type	N/A	**Priority**	N/A	**Status**	Approved
ASIL	QM	**Category**	Safety Related Function	**Fault Handling Time**	N/A

Req. Template Version 6.0 End of Requirement

FSR03 TLC User Input Request

Shall detect a valid request from the user to ensure correct activation.

Satisfied by:

- Logicals:
  - FordPass Logical
  - HMI Logical
  - Trailer Light Check Logical

Related to:

- Operating Modes:
  - Check failure
  - Normal State
  - Safe State 1

Set Trailer Light Check to Aways off

Requirement ID: FSR03

Purpose	ASIL Override Rationale - User inputs is not linked directly with SG violation.				
V&V Acceptance Criteria					
Notes					
Source				**Owner**	
Source Req.	• SG-01 Prevent trailer brake light loss due unintended TLC activation			**V&V Method**	Test
Type	N/A	**Priority**	N/A	**Status**	Approved
ASIL	QM	**Category**	Safety Related Function	**Fault Handling Time**	N/A

Req. Template Version 6.0 End of Requirement

FSR04 TLC pre-condition and Continuous failure monitoring

When the driver request Trailer Light Check, preconditions are checked and feature only allows activation if they are all met. Trailer light check shall continuously check for faults in preconditions parameters while feature is active.

Satisfied by:

- Logicals:
  - FN01 Detect Ignition Status
  - FN02 Detect Taillight Status
  - FN03 Detect Battery State of Charge
  - FN04 Detect Vehicle Stationary Status
  - FN05 Detect Tow Connection Status
  - FN06 Asses Pre-conditions for trailer Light Check
  - Trailer Light Check Logical

Related to:

- Safe States:
  - Check failure
- Operating Modes:
  - Check failure
  - Normal State

Requirement ID: FSR04

Purpose					
V&V Acceptance Criteria	Ensure that faults, if present, are correctly detected when user requests trailer light check.				
Notes					
Source				**Owner**	
Source Req.	• SG-01 Prevent trailer brake light loss due unintended TLC activation			**V&V Method**	Test
Type	N/A	**Priority**	N/A	**Status**	Approved
ASIL	A	**Category**	Safety Related Function	**Fault Handling Time**	N/A

Req. Template Version 6.0 End of Requirement

FSR05 Safe State Transition

Transition to Safe State shall innibit malfunction in brake lamps and prevent hazard event, can result in rear collision.

Satisfied by:
- Logicals:
  - Trailer Light Check Logical

Related to:
- Safe States:
  - Safe State 1

    Set Trailer Light Check to Aways off
- Operating Modes:
  - Check failure
  - Normal State
  - Safe State 1

    Set Trailer Light Check to Aways off

Requirement ID: FSR05

Purpose					
V&V Acceptance Criteria	Ensure vehicle transitions to a safe state when invalid input is detected or when driving at speed.				
Notes					
Source				**Owner**	
Source Req.	• SG-01 Prevent trailer brake light loss due unintended TLC activation			**V&V Method**	Test
Type	N/A	**Priority**	N/A	**Status**	Approved
ASIL	A	**Category**	Safety Related Function	**Fault Handling Time**	N/A

Req. Template Version 6.0 End of Requirement

FSR06 Safe State Maintenance & Recovery

The module shall ensure that the transition to normal mode occurs only when pre-conditions are met and no failures detected, in other case the module shall maintain the safe state.

Satisfied by:
- Logicals:
  - Trailer Light Check Logical

Related to:

- Safe States:
  - Check failure
  - Normal State
  - Safe State 1

    Set Trailer Light Check to Aways off
- Operating Modes:
  - Check failure
  - Normal State
  - Safe State 1

    Set Trailer Light Check to Aways off

Requirement ID: FSR06

Purpose					
V&V Acceptance Criteria	Ensure that transition from safe state to normal state only occurs after user request and no failures detected.				
Notes					
Source				**Owner**	
Source Req.	• SG-01 Prevent trailer brake light loss due unintended TLC activation			**V&V Method**	Test
Type	N/A	**Priority**	N/A	**Status**	Approved
ASIL	A	**Category**	Safety Related Function	**Fault Handling Time**	N/A

Req. Template Version 6.0 End of Requirement

REQ-475257/A Ensure priority for Brake pedal activation over trailer light check

Ensure the brake pedal priority above the trailer light Check to avoid hazard conditions.

Satisfied by:

- Logicals:
  - Trailer Light Check Logical

Related to:

- Operating Modes:
  - Check failure
  - Normal State
  - Safe State 1

    Set Trailer Light Check to Aways off

Requirement ID: REQ-475257/A

Purpose					
V&V Acceptance Criteria	Vehicle level test - the trailer light check shall deactivate if brake pedal is released.				
Notes					
Source				**Owner**	
Source Req.	• SG-01 Prevent trailer brake light loss due unintended TLC activation			**V&V Method**	Test
Type	N/A	**Priority**	N/A	**Status**	In-Progress
ASIL	ASIL Override Rationale - A	**Category**	Safety Related Function	**Fault Handling Time**	N/A

Req. Template Version 6.0 End of Requirement

6.4.2 Derivation of Functional Safety Requirements on Assumptions

No Functional Safety Requirements tracing to Assumptions specified.

6.4.3 ASIL Decomposition of Functional Safety Requirements

No Functional Safety Requirements with ASIL Decompositions specified.

7 CYBERSECURITY

Feature/Module Name	Non Relevant		Cyber Relevancy						
	Private Network	Public CAN Basic	CR1	CR 2	CR 3	CR 4	CR5	CR6	CR7
Trailer Light Check			X	X			X		

Cybersecurity Relevancy Assessment:	Cyber Relevant (Full)
Description	This feature/ECU is cyber relevant and must complete the cybersecurity deliverables including a Threat Model.

	Does the feature or ECU:	ANSWER *Y or N*	Comments Provide Justification
A	Reside ONLY on a vehicle private bus (LIN or Private CAN) or not networked (e.g. Hardwired)? *=(Private_Bus) **OR** (Not_Networked) or (Hardwaried)*	N	only CAN communication
B	Have E/E Technology and has External Interfaces for data exchange (external to vehicle or devices brought in from outside, etc.)?	Y	conection over SDN/ cloud with cellphone
C.1	Have E/E technology that contributes to safe operation of the vehicle (Motion control and/or Functional Safety ASIL A through D classification)? *=(Has_Motion_Control) **OR** (ASIL A, B, C or D)*	Y	ASIL A rating - Communication with break light
C.2	Have E/E Technology that is goverend by Regulation?	N	no regulation governs the TLC feature
D	Have E/E Wireless Technology and connects to sensors and actuators? *=(Wireless_Technology) **AND** (Sensors **OR** Actuators)*	N	we have wireless conncetion (BT/ cellular) but we do not connect to neither sensors nor to actuators
E	Have E/E technology and collects "user" identifiable data that persists long term or passes that "user" identifiable data to the backend IT systems (Data about passengers and driver)?	N	no customer data stored at backends from FEATURE
F	Have Ethernet?	Y	yes, via TCU
G	Have E/E technology and main purpose is to provide security function? (ex secure valuables, prevent theft, protect accessories, prevent hacking, encrypt data)	N	FEATURE offers a customer experience function as such he/she has not to do the light test upfront trailering
H	Have critical sensors that are used for motion control, safety critical, or security critical purposes?	N	sereral steps to ensure vehicle is in stand-still while FEATURE operation/ activation

7.1 TARA

Trailer Light Check TARA

7.2 Cybersecurity Requirements

No requirements were needed from Tara. All threads were mitigated by existing mechanisms.

8 ARCHITECTURE

8.1 Functional Decomposition

8.1.1 Functions

8.2 Logical Architecture

9 TRACEABILITY MATRIX

Legend

DeriveReqt

Attribute Requirements		Feature Requirements														
		00001 ###R_F_Trailer Light Check_00001### Feature Start / Stop	00002 ###R_F_Trailer Light Check_00002### Feature operation descrip	00003 ###R_F_Trailer Light Check_00003### Vehicle stationary status	00004 ###R_F_Trailer Light Check_00004### Vehicle stationary status	00005 ###R_F_Trailer Light Check_00005### Feature Pre-Conditions n	00006 ###R_F_Trailer Light Check_00006### Feature feedback when t	00007 ###R_F_Trailer Light Check_00007### Feature behavior with mu	00009 ###R_F_Trailer Light Check_00009### Feature turn signal behav	00010 ###R_F_Trailer Light Check_00010### Remote device out of cell	00012 ###R_F_Trailer Light Check_00012### Remote device unpaired	00013 ###R_F_Trailer Light Check_00013### Feature User Interface (t	00014 ###R_F_Trailer Light Check_00014### Feature feedback upon pr	00015 ###R_F_Trailer Light Check_00015### Feature feedback upon St	00017 ###R_F_Trailer Light Check_00017### Test Ended due to a prec	00018 ###R_F_Trailer Light Check_00018### Trailer Lights Check Comp
		2	5	3	3	3	3	2	1	1	1	2	3	2	3	2
TLC_AR_001 Trailer Light Check HMI Request	5	↙	↙					↙				↙		↙		
TLC_AR_002 Trailer Light Check Objective	1		↙													
TLC_AR_003 Preconditions to activate Trailer Light Check	7		↙	↙	↙	↙	↙						↙		↙	
TLC_AR_004 Trailer Light Check Operation	14	↙	↙	↙	↙	↙	↙	↙	↙	↙	↙		↙	↙	↙	↙
TLC_AR_005 User Feedback for Trailer Light Check Operation	9		↙	↙	↙	↙	↙					↙	↙		↙	↙

10 OPEN CONCERNS

ID	Concern Description	e-Tracker / Reference	Responsible	Status	Solution
1					

Table 13: Open Concerns *(Not supported by MagicDraw report generation)*

11 REVISION HISTORY

Rev. (revision)	Vers.	Date	Description	Responsible
001	*2.0*	*9/20/2022*	*TLC model revised and updated in MBSE. AFS v1.9 frozen. New TLC feature documentation released. FD v2.0, FS v2.0 and FIS v2.0.*	*EVIEIRA1*
		9/20/2022	*Added manually the Regions and Market table – not supported by MagicDraw*	*EVIEIRA1*
		9/20/2022	*Added manually the information about CyberSecurity Relevancy assessment – not supported by MagicDraw.*	*EVIEIRA1*

12 APPENDIX

12.1 Definitions

Definition	Description
Parked State	On automatic transmissions, the vehicle PRNDL is in “PARK” and for manual transmissions, the vehicle has the parking brake applied.
Parking / position lamps	Notionally the parking/position lights. Legal issues prevent us saying parking position lights without saying side lights and license plate lights as FMVSS108 requires all these to be turned on together.
Rear Fog Lamps	Rear Fog lamps when illuminated improve visibility of the vehicle to drivers approaching from the rear and are only to be used in conditions of severely reduced visibility.
Reverse Lamps	The backup/reverse lamps are located at the rear of the vehicle and when illuminated provide an indication that the vehicle is in the reverse gear and may be moving backwards.
Stop Lamps	The stop lamps (also named as brake lamps) are located at the rear of the vehicle and when illuminated indicate the brakes are being applied and provide an indication that the vehicle is reducing speed and shall stop completely.
Turn Indicator Light	The Turn Indicator lamps when illuminated provide the indication that the driver of the vehicle intends to turn or change the lane and can only be illuminated on one side of the vehicle at a time.
Vehicle Stationary	Vehicle is defined as stationary if vehicle speed is less than 4 Kph and vehicle in in the “Parked State”.

Table 14: Definitions used in this document

12.2 Abbreviations

Abbr.	Stands for	Stands for
APIM	Application Protocol Interface Module	User interface to vehicle and APIM_CDC (Phoenix Domain Controller)
BCM	Body Control Module	Feature arbitrator
BCMc	Body control Module "C" (PDB)	Power Distribution Box
CAN	Controller Area Network	Vehicle communication architecture / protocol
ECG	Enhanced Central Gateway	Module that performs any processing or special functions other than gatewaying CAN signals
FDRS	Ford Diagnostics and Repair Systems	Based on Dealer diagnostic tool usage (Near real time to FDSP SQL Server)
HARA	Hazard Analysis and Risk Assessment	Risk assessment document
IDS	Integrated Diagnostic System	Diagnostic Service Tool
ITRM	Integrated Trailer Module	Module that delivers power to the trailer battery, turn lights and brake lights
LED	Light Emitting Diode	Diode that emits light when voltage is applied to it
PDB	Power Distribution box	Box that delivers power to the trailer tail and reverse lights
SOC	State of Charge	12v Battery State of Charge
TTLM	Trailer Tow Light Module	Module that delivers power to the trailer battery, turn lights and brake lights
UI	User Interface	HMI interface to user

Table 15: Abbreviations used in this document

Document ends here.