Feature Document (FD)

Position Light

<<Item>>

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1 INTRODUCTION

1.1 Document Purpose

A Feature Document (FD) document 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.

To get more information about the concept of feature, function and component level abstraction refer to the Ford RE Wiki. For details on the Ford Functional Safety (ISO26262) process refer to the Ford Functional Safety Sharepoint.

1.2 Document Scope

This Feature Document (FD) specifies the following features:

Feature ID	Feature Name	Owner	Reference
	Position Light (Program(s): Core)	Lukas Löhmann (lloehman)	

Table 1: Features described in this FD

1.3 Document Audience

The FD is written by the feature owner of Lukas Löhmann (lloehman). 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.

*#**Hint:** The FD template has the IP Classification "Proprietary" by default. IP Classification "Confidential" might be required in some cases, e.g. by Ford Functional Safety.*

1.3.1 Stakeholder List

For the latest list of stakeholder of the feature and their influence refer to <Put VSEM Link here>.

*#**Hint:** Refer to Ford RE Wiki – Stakeholder List on how to create a stakeholder list. The stakeholder list should be stored in VSEM in the pseudo folder "General Data Artifacts" of the corresponding feature.*

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:

Section 1 – Introduction 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.

Section 2 – Feature Description. States briefly the background and the purpose of the feature, feature variants and corresponding regions and markets. Also includes input requirements, assumptions and constraints.

Section 3 – Feature Context describes all external entities, which have an influence on the feature.

Section 4 – Feature Modeling. Contains Use Case, Driving Scenarios, State Charts to describe the functional behavior of the feature.

Section 5 – Safety. Lists System Behaviors and Safety Goals of the feature.

Section 6 – Feature Requirements. Lists functional and non-functional requirements of the feature.

Section 7 – 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.

Section 8 – List of Open Concerns

Section 9 – 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.

Section 10 – Appendix

*#**Hint:** All sections are mandatory, unless explicitly marked by the tag "#Classification" as "optional" or as applicable e.g. to certain domains like "Functional Safety".*

1.5 Document Conventions

1.5.1 Requirements Templates

Each requirement, use case or scenario in this specification shall follow the corresponding template given in the document template *Specification_Macros.dotm* at RE Wiki - Specification Templates.

1.5.1.1 Identification of requirements

1.5.1.2 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.

2 FEATURE OVERVIEW

2.1 Purpose and Description of Feature

*#**Hint:** Some descriptive text to explain the purpose and functionality of the feature.*

The primary purpose of the Position Light feature is to increase conspicuity of the vehicle during dark light condition (e.g. nighttime) by providing light at the front and rear (position light / tail light) and to both sides (side marker lights) of the vehicle.

The feature's photometric properties, such as brightness and intensity, are governed by regulations. Different market require the implementation of different regulations.

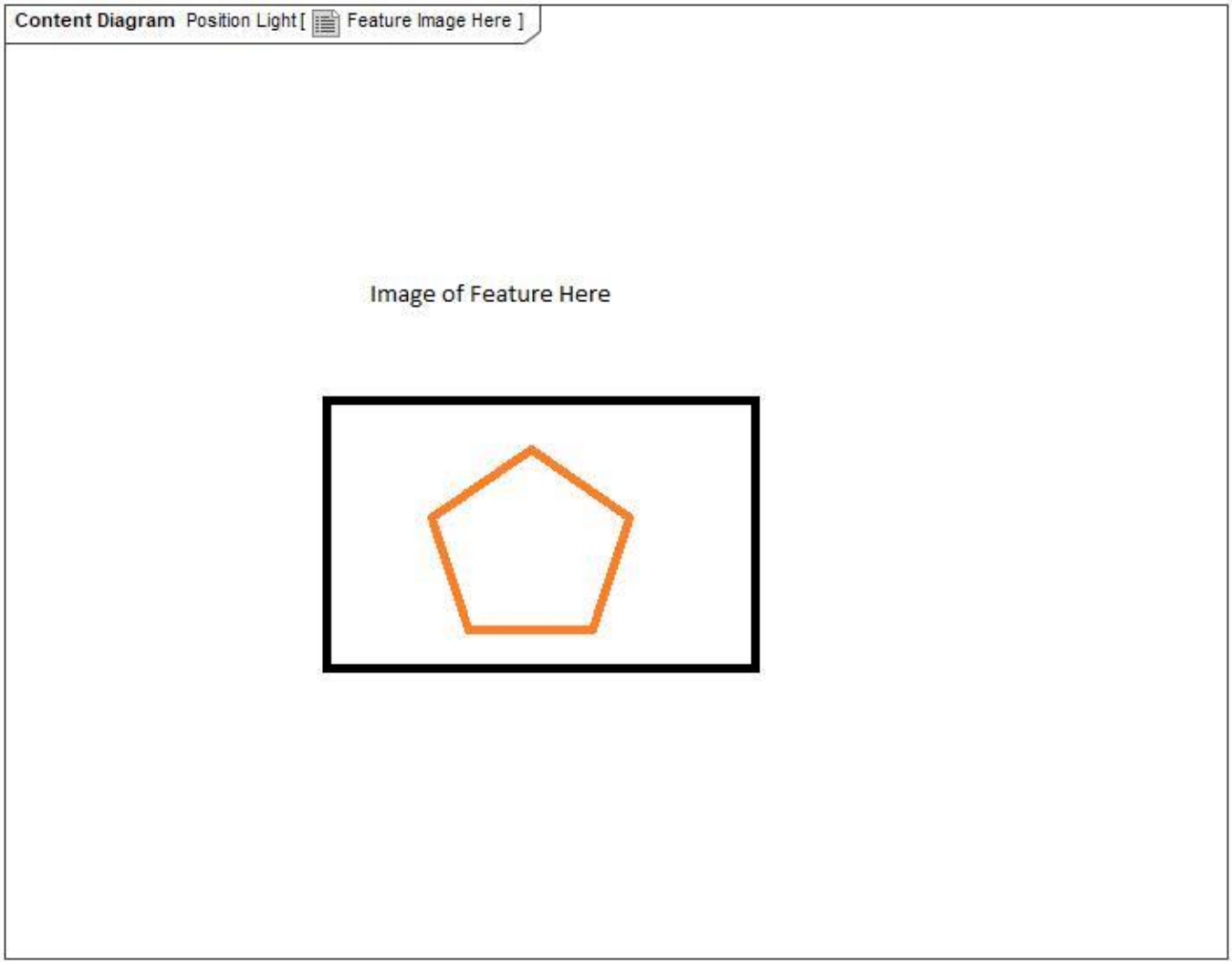


Figure 1: Feature Image Here

2.2 Feature Variants

*#**Hint:** Definitions for different variants of the feature (if applicable). Give each variant a descriptive name by which it can be referenced further on in the document. If no variant exists, state "No Feature Variants".*
The Variant Description should give a short informative text which describes the variants of the feature.

Variant Name	Variant Description	Remarks

Position Lights and side marker lights		
Position Lights only		

Table 2: Feature Variants

2.2.1 Regions & Markets

*#**Hint:** Description of purpose and functionality of the feature. If there is no variant, give feature name in first column.*

Market / Region / Variant Name	North America	South America	Europe	Middle East/Africa	Asia / Pacific	China
Position Lights and side marker lights	Mandatory	Optional	Optional	Optional	Optional	Optional
Position Lights only	No	Optional	Optional	Optional	Optional	Optional

Table 3: Regions & Markets

2.3 Input Requirements

*#**Hint:** List all input requirements, which are relevant for the feature. Typically, attribute requirements, legal requirements as well as national and international standards have to be considered.*

2.3.1 Legal Requirements

- : Compliance with ECE
  - The Featre shall comply with ECE R48 and R87.
- : Compliance with FMVSS101
  - The Feature shall comply with FMVSS101.
- : Compliane with FMVSS 108
  - Te Feature shall comply with FMVSS/CMVSS 108.

2.3.2 Industry Standards

- : ISO 26262
  - The system should be developed according to Ford's implementation of Functional Safety.

2.3.3 Attribute Requirements

- 14 : Example AR
- : Indicate Activation by Telltale
  - The activated feature Position Light shall be indicated by a telltale.
- Proj-AR:14 : Provide Visibility
  - The primary purpose of the Position Light feature is to increase conspicuity of the vehicle during dark light condition (e.g. nighttime) by providing light at the front and rear (position light / tail light) and to both sides (side marker lights) of the vehicle.

2.4 References

2.4.1 External Documents and Publications

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

*#**Hint:** You may refer to IEEE Citation Reference on how to format a reference.*

Reference	Document / Publication	Document Location
ISO/IEC 19500-2:2003	Information technology -- Open Distributed Processing -- Part 2	

Table 4: External documents and publications

2.5 Glossary

*#**Hint**: Terms, concepts and abbreviations used in the document shall be defined and illustrated here. Note that changes to terms and/or concepts described in this section tend to cause major updates to this document.*
The tables below have feature specific definitions and abbreviations. For additional, non-feature specific terms please refer to the RE Glossary

See Appendix for Definitions and Abbreviations.

3 FEATURE CONTEXT

3.1 Feature Context Diagram

*#**Hint:** High level diagram of feature interactions with the environment, people or other feature or other external entities.*
*#**Link:** RE Wiki - Context Diagram*

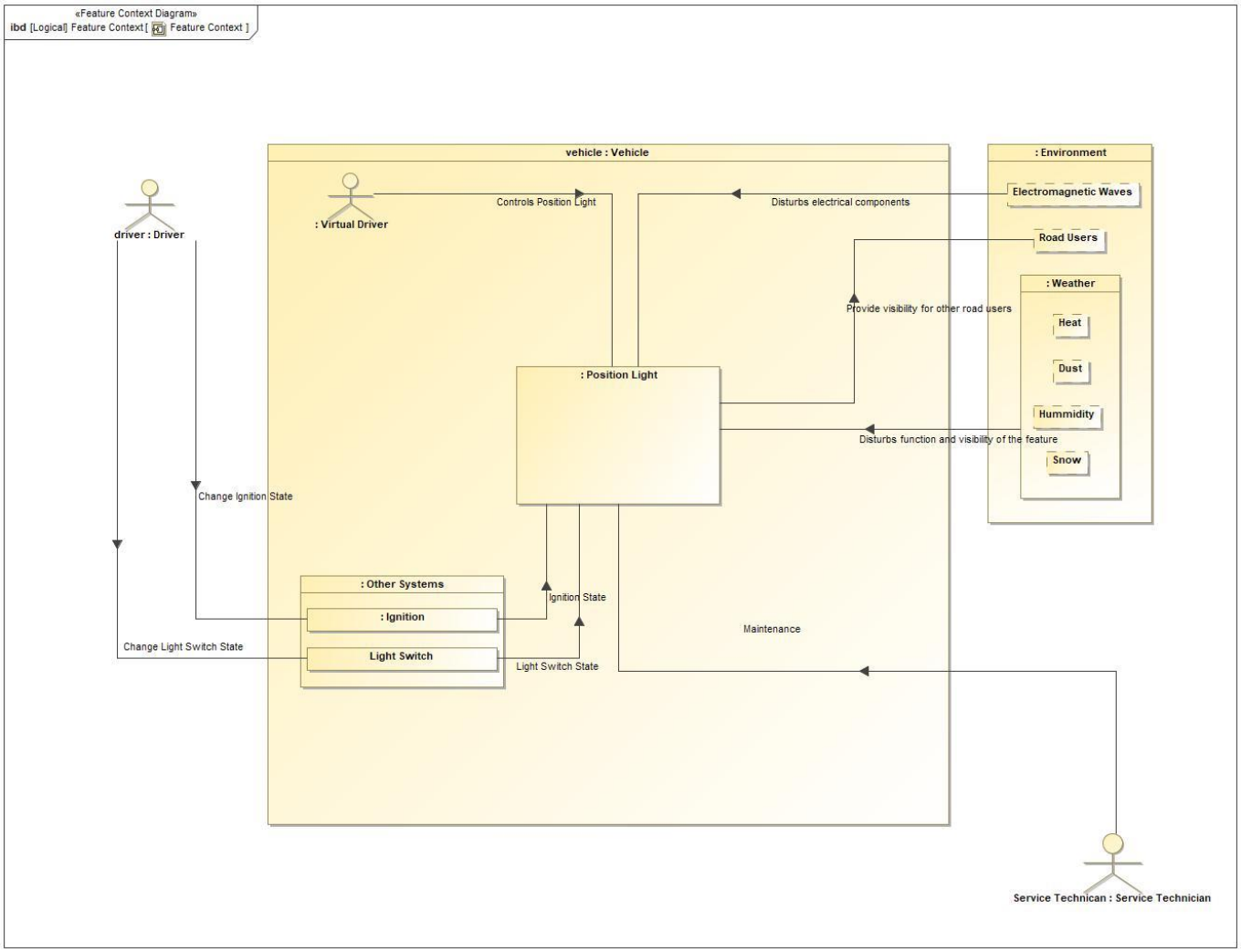


Figure 2: Feature Context

3.2 List of Influences

ID	External Entity	Influence Description
Change Ignition State	Feature Context To Ignition	
	Feature Context To Position Light	
	Position Light To Feature Context	
Change Light Switch State	Feature Context To Light Switch	
	Feature Context To Position Light	
Controls Position Light	Vehicle To Position Light	

Disturbs electrical components	Environment To Position Light	
Disturbs function and visibility of the feature	Weather To Position Light	
Ignition State	Ignition To Position Light	
Light Switch State	Light Switch To Position Light	
Maintenance	Feature Context To Position Light	
Provide visibility for other road users	Environment To Position Light	
	Position Light To Environment	

Table 5: List of Influences

4 FEATURE MODELING

4.1 Operation Modes and States

*#**Classification:** Optional (Mandatory for Functional Safety)*
*#**Link:** RE Wiki – State Charts*
*#**Hint:** State Charts are a popular means to express feature behavior in terms of states and modes. An advantage of this state machine like approach is that consistency can be easily verified.*

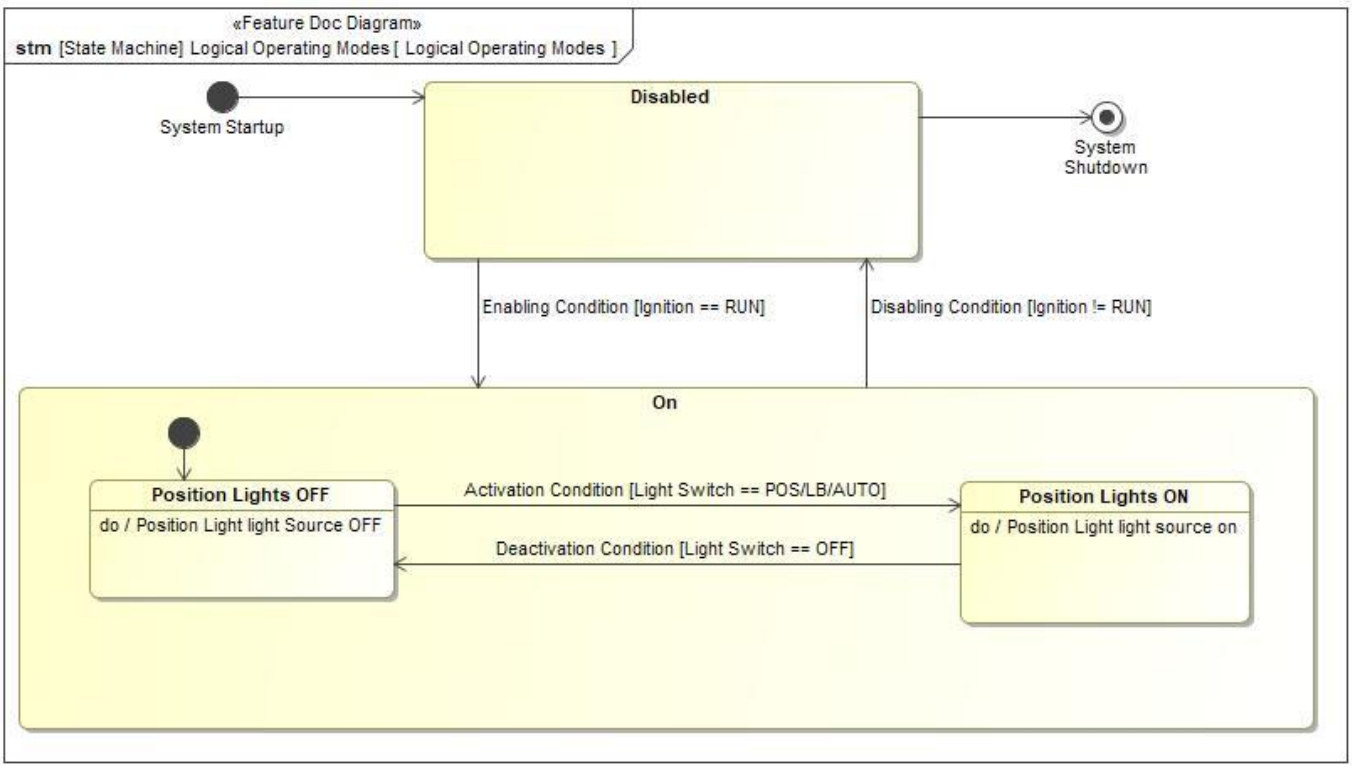


Figure 3: Logical Operating Modes

State	Description	Requirements Reference (optional)
Disabled		
On		
Position Lights OFF	Vehicle Secured is provided to allow the driver to secure the vehicle from movement once operating the vehicle is no longer desired. The primary method to secure the vehicle is to shift the vehicle to Park, but also the Electronic Park Brake can be applied as a secondary means. Usually the vehicle is turned off in this mode, but the vehicle may be secured from movement with the powertrain still active. Do behavior: Position Light light Source OFF	
Position Lights ON	Driving Mode is the primary state provided to allow the driver to operate the vehicle. This includes accelerating, decelerating, cruising, sailing, and stopping. Do behavior: Position Light light source on	

Table 6: Operation Modes and States on Logical Operating Modes

Transition ID	Description	Requirements Reference (optional)

T1	Guard: = Trigger signal: Deactivation Condition [Light Switch == OFF]	
T2		
T3		
T4	Name: Enabling Condition [Ignition State == RUN] Trigger signal: Enabling Condition [Ignition == RUN]	
T5	Trigger signal: Activation Condition [Light Switch == POS/LB/AUTO]	
T6		
T7	Name: Disabling Condition [Ignition != RUN] Trigger signal: Disabling Condition [Ignition != RUN]	

Table 7: Transitions between Operation Modes and States on Logical Operating Modes

4.2 Use Cases

*#**Classification:** Optional*
*#**Link:** RE Wiki – Use Cases*

4.2.1 Use Case Diagram

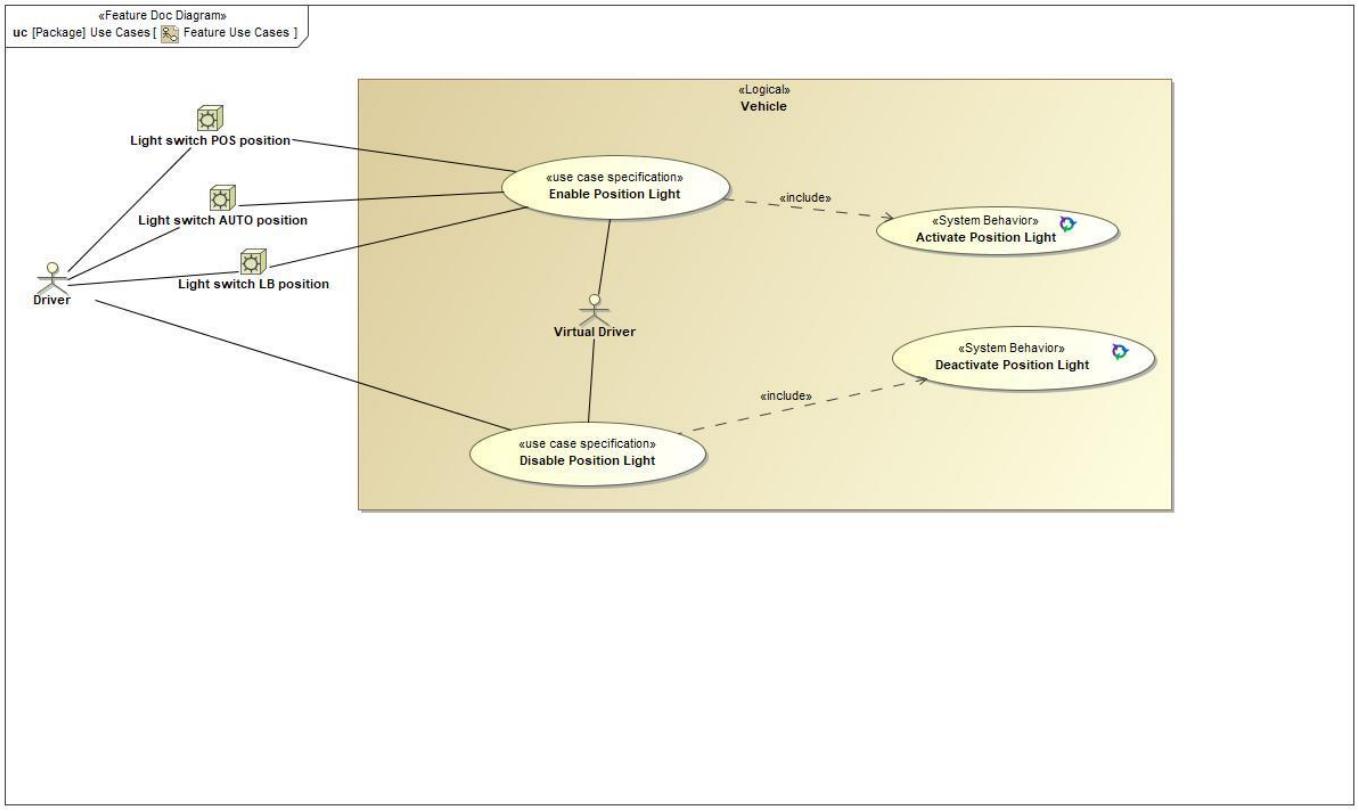


Figure 4: Feature Use Cases

4.2.2 Actors

Actor	Description
Driver	Actor description on Documentation field.
Light switch AUTO position	
Light switch LB position	
Light switch POS position	
Virtual Driver	Actor description on Documentation field.

Table 8: List of Actors

4.2.3 Use Case Descriptions

*#**Classification:** Optional*

Activate Position Light

Actors		
Subject		Vehicle
Description		
Preconditions		

Deactivate Position Light

Actors		
Subject		Vehicle
Description		
Preconditions		

Disable Position Light

Actors		Driver
		Virtual Driver
Subject		Vehicle
Subject		Vehicle
Description		
Preconditions	PreC1	Light Switch is in POS position or LB position or AUTO position
Main Flow Description		Driver turns light switch to OFF position
Alternative Flow Description		A1.1: Driver turns light switch to AUTO position A1.2: Ambient brightness exceeds threshold, so daytime light conditions can be inferred. A1.3: Disable Position Light. A2.1: Virtual driver disables Position Light.
Postconditions	PostC1	n/a

Enable Position Light

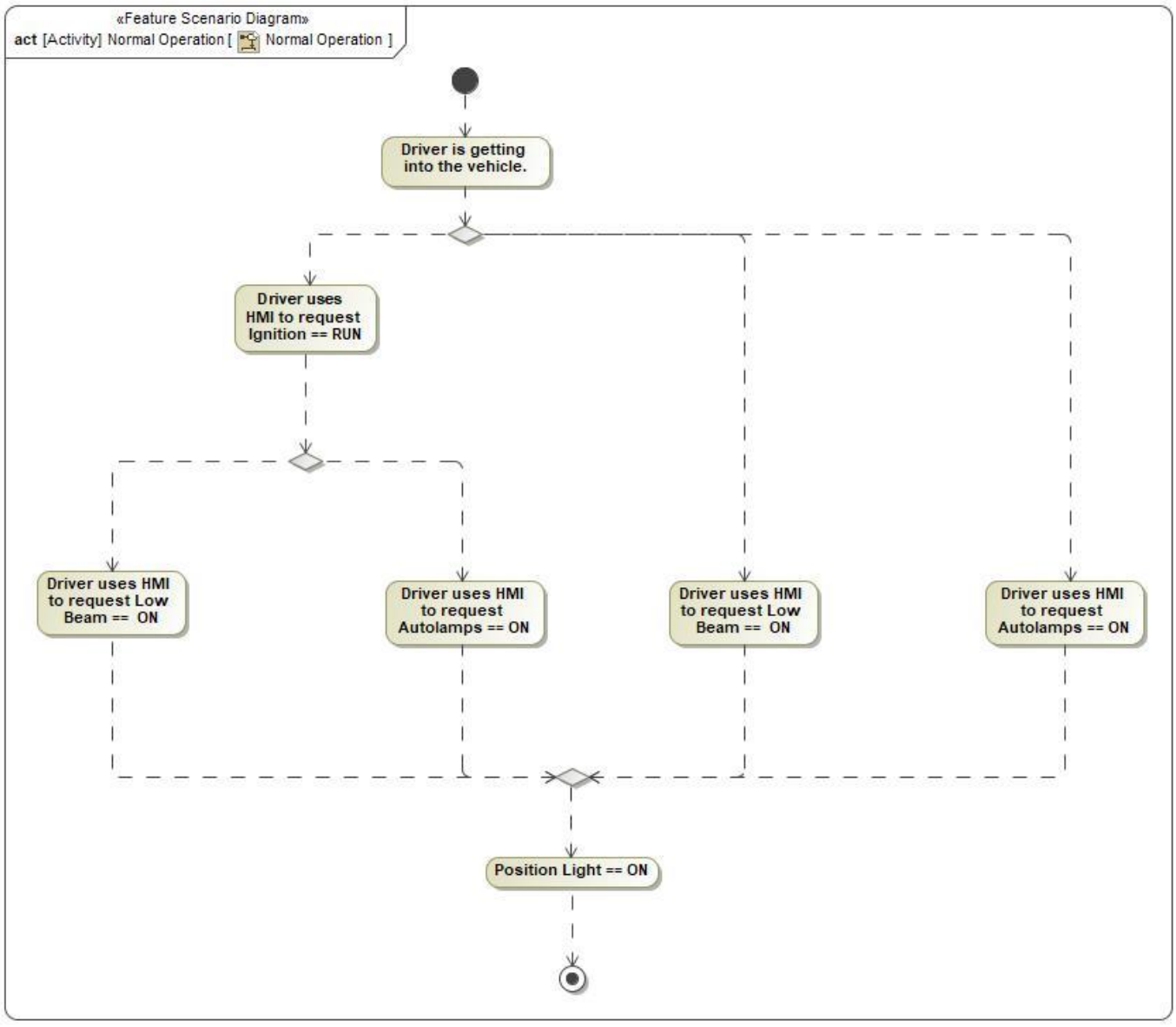
Actors		Light switch AUTO position
		Light switch LB position
		Light switch POS position
		Virtual Driver
Subject		Vehicle
Description		
Preconditions	PreC1	n/1
Main Flow Description		M1: Driver turns the light switch to POS
Main Flow	M1	Success scenario step 1
	M2	Success scenario step 2
Alternative Flow Description		A1: Driver turns the light switch to LB A2.1: Driver turns the light switch to AUTO A2.2: Depending on insufficient ambient brightness the Position Light feature is enabled A3: Virtual driver turns on Position Light directly
Postconditions	PostC1	n/a

4.3 Driving and Operation Scenarios

*#**Classification:** Optional (Mandatory for Functional Safety)*
*#**Functional Safety:** Driving and operating scenarios which impact the functionality of the feature can be used to check, if the situation analysis in the HARA is complete*
*#**Link:** RE Wiki – Driving Scenarios*

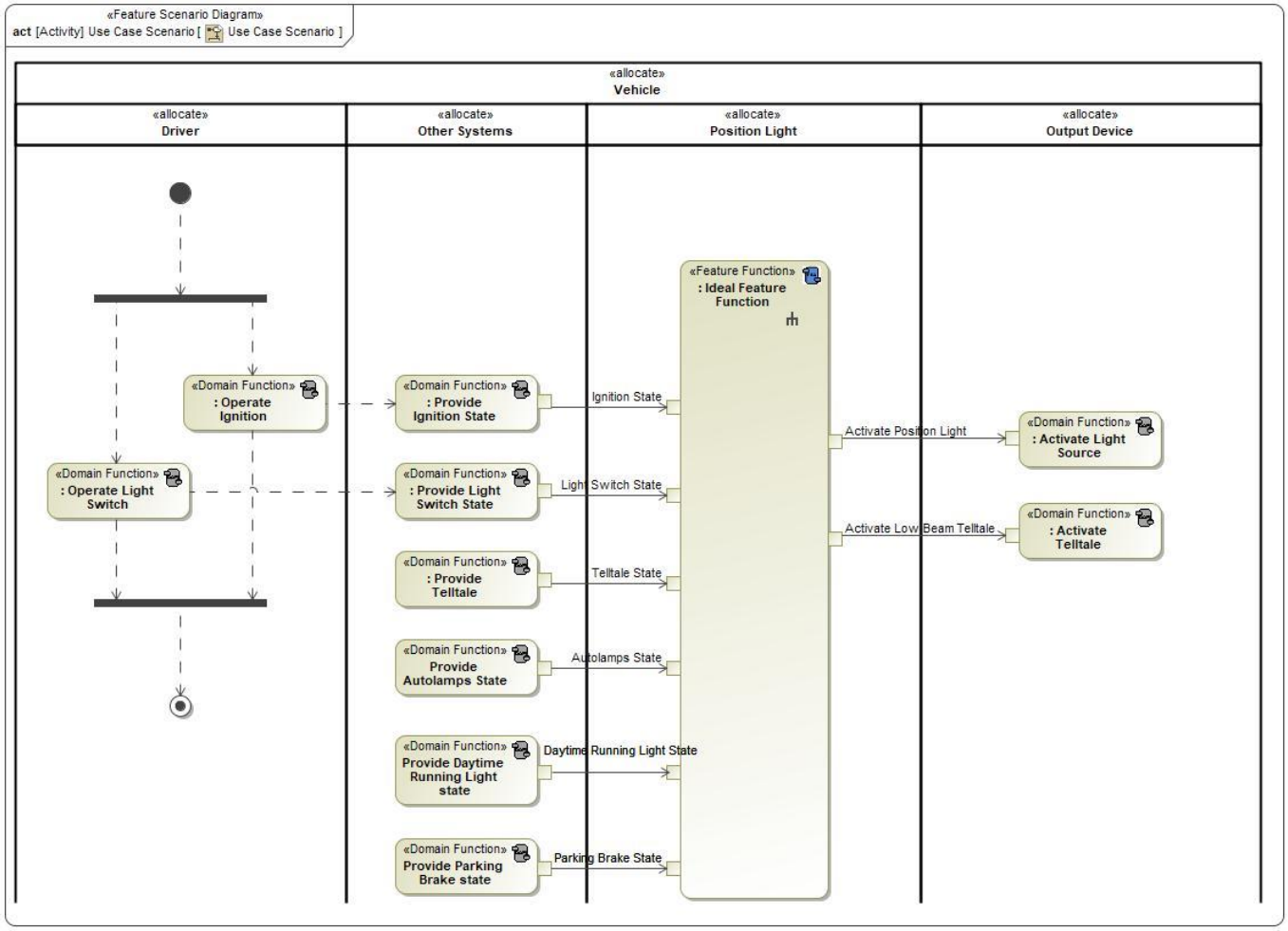
Normal Operation

Description of the scenario in the Documentation field on the Feature Scenario Diagram.



Flow of Actions	
1	Driver is getting into the vehicle.

Use Case Scenario



Flow of Actions	
1	
2	
3	
4	

4.4 Decision Tables

*#**Classification:** Optional*
*#**Link:** RE Wiki – Decision Tables.*
*#**Hint:** Use decision table, if behavior is not state based (in that case prefer state chart from ch. 4.1) and based purely on current inputs.*

Not supported by MagicDraw report generation.

5 FEATURE REQUIREMENTS

*#**Functional Safety:** In general, safety requirements are not listed here. However, it is possible that later in the development process, a non-safety requirement becomes a safety requirement. In such a case it may remain on this list.*
*#**Link:** RE Wiki – How to write good requirements.*

5.1 Functional Requirements

FMVSS/CMVSS: PL photometric compliance

The Position Light feature shall meet all legal photometric requirements for FMVSS 7.2.13 (Tail), 7.4.13 (Side marker), 7.8.13 (Position/ Park)

Requirement ID:					
Rationale					
Acceptance Criteria					
Notes					
Source				**Owner**	
Source Req.				**V&V Method**	
Type		**Priority**		**Status**	

Req. Template Version 6.0 End of Requirement

Auto light hysteresis enable

IF
the light switch is in AUTO position
AND
the ambience brightness is lower than the enabling threshold value
THEN
the Position shall be enabled.

Requirement ID:					
Rationale					
Acceptance Criteria					
Notes					
Source				**Owner**	
Source Req.				**V&V Method**	
Type		**Priority**		**Status**	

Req. Template Version 6.0 End of Requirement

PositionLight Mean time to failure

The PL feature shall have a mean time to failure of 10 years or 150,000 miles (240,000 km)

Requirement ID:					
Rationale					
Acceptance Criteria					
Notes					
Source				**Owner**	
Source Req.				**V&V Method**	
Type		**Priority**		**Status**	

Req. Template Version 6.0 End of Requirement

ECE: PL legal compliance for position, size and marking

The Position Light feature shall be compliant with legal requirement for ECE R48 contend under points 6.9 and 6.10 for position and size and marking.

Requirement ID:					
Rationale					
Acceptance Criteria					
Notes					
Source				**Owner**	
Source Req.				**V&V Method**	
Type		**Priority**		**Status**	

Req. Template Version 6.0 End of Requirement

Auto Light hysteresis disable

IF
the light switch is in AUTO position
AND
ambience brightness is higher than the disabling threshold value
THEN
the Position Light shall be disabled.

Requirement ID:					
Rationale					
Acceptance Criteria					
Notes					
Source				**Owner**	
Source Req.				**V&V Method**	
Type		**Priority**		**Status**	

Req. Template Version 6.0 End of Requirement

ECE: PL photometric compliance

The Position Light feature shall meet all legal photometric requirements ECE R7 contend under point 6.0 for ECE market.

Requirement ID:					
Rationale					
Acceptance Criteria					
Notes					
Source				**Owner**	
Source Req.				**V&V Method**	
Type		**Priority**		**Status**	

Req. Template Version 6.0 End of Requirement

5.2 Non-Functional Requirements

*#**Hint:** Non-functional requirements specify some performance criteria in addition to the functional behavior given defined by the functional requirements. Timing (if not already included in the functional requirements), security details (e.g. how secure does an algorithm have to be) reliability (e.g. mean time between failure) or maintainability could be specified in this section.*

5.2.1 Reliability

List of related reliability

RQT-170000-011038 FORWARD LIGHTING LIGHT SOURCE CHART
RQT-170000-011049 SIGNAL LIGHTING LIGHT SOURCE SELECTION CHART

Requirement ID:	
Rationale	
Acceptance Criteria	
Notes	

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

Req. Template Version 6.0 End of Requirement

5.3 Other Requirements

5.3.1 Service Requirements

*#**Hint:** Requirements in this section could specify, e.g. what needs to be considered, if individual ECUs are replaced or new SW is flashed to ECUs (parameter set in non-volatile memory might get inconsistent and needs also to be updated).*

List of related Service

RQT-170000-010994 BULB REPLACEMENT TIME
RQT-170000-011032 HEADLAMP AND FOGLAMP ADJUSTER ACCESS
RQT-170000-011050 SERVICE RELEASE

Requirement ID:

Rationale					
Acceptance Criteria					
Notes					
Source				**Owner**	
Source Req.				**V&V Method**	
Type		**Priority**		**Status**	

Req. Template Version 6.0 End of Requirement

5.3.2 Process Requirements

*#**Hint**: Requirements in this section are relevant for the development process of the feature, e.g. ISO26262 compliance.*

FMVSS/CMVSS: PL legal compliance for position, size and marking

The Position Light feature shall be compliant with the legal requirement from FMVSS 108 / CMVSS 108 table IV for position, size and marking.

Requirement ID:

Rationale					
Acceptance Criteria					
Notes					
Source				**Owner**	
Source Req.				**V&V Method**	
Type		**Priority**		**Status**	

Req. Template Version 6.0 End of Requirement

6 FUNCTIONAL ARCHITECTURE

*#**Classification:** Optional (mandatory for Functional Safety)*
*#**Hint**: This section depicts the coarse Functional Architecture. This architectural step is needed to find the right functional partitioning for the function level. The function shown here are those, which are specified on function level. Either SysML activity diagrams or Data Flow Diagrams could be used to depict such a Functional Architecture. For bigger features, which are decomposed in a hierarchical manner down to atomic functions (and which do not follow the Functional Safety process), a function tree could be given here.*
*#**Links:***
- *Functional Decomposition: RE Wiki – Functional Decomposition*
- *SysML - Activity Diagrams or RE Wiki - Data Flow Diagrams*
- *Data Flow Diagram: RE Wiki – Data Flow Diagram*

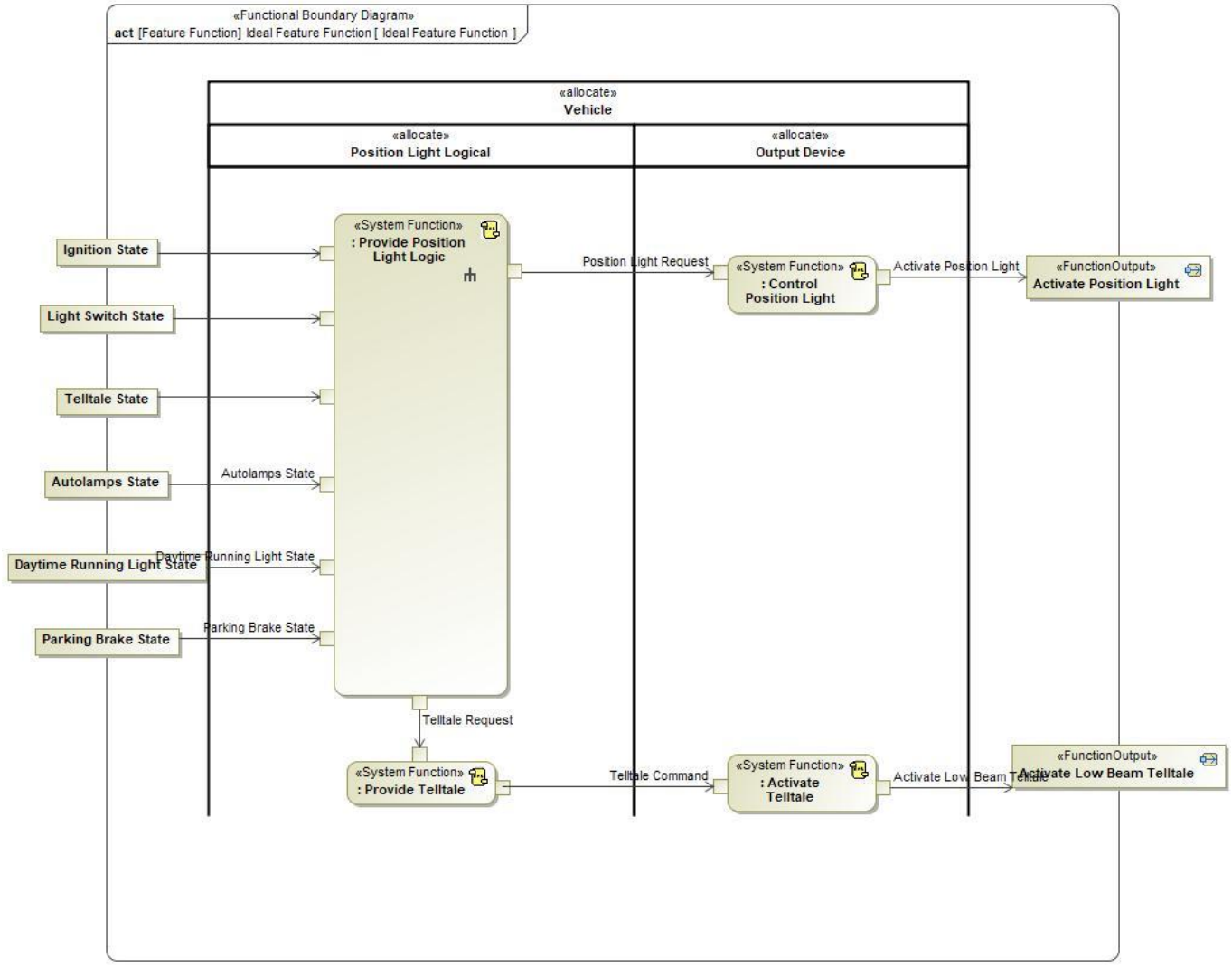


Figure 5: Ideal Feature Function

6.1 List of Functions

*#**Hint:** The functions shown in the Functional Architecture should be listed and described in the table below*

Function Name	Description	Comments
(activity) Provide Telltale	*(activity)*	

Function Name	Description	Comments
(activity) Provide Position Light Logic	*(activity)*	
(activity) Activate Telltale	*(activity)*	
(activity) Control Position Light	*(activity)*	

Table 9: List of Functions

7 OPEN CONCERNS

*#**Hint:** The following list presents open concerns, which have to be discussed or clarified over the course of the on-going requirements engineering.*

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

Table 10: Open Concerns *(Not supported by MagicDraw report generation)*

8 REVISION HISTORY

*#**Hint:** A new version number is assigned to a document with a given revision each time it is checked in to Team Center (TCSE). After release of a revision, the document cannot be edited and no new versions can be created on that revision. When updating the document after that, a new revision has to be created and new versions on that revision will be created upon checking in.*

No Revision History found.

9 APPENDIX

9.1 Definitions

No terms specified.

9.2 Abbreviations

No acronyms specified.

Document ends here.