

RCA



Reference CCS Architecture

*An initiative facilitated by the ERTMS Users Group
and the EULYNX consortium*

A. Component Specification APS-SL

This is a snapshot version. Please use it with caution.
There is ongoing work. The content of this document
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REVISION HISTORY

Version	Date	Superseded documents/description/details	Change Request No
0.0.7	06-12-2019	Initial version of component specification	n/a

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1. CONCEPT (PHASE 1)

Cenelec Phase 1 is not covered in this document

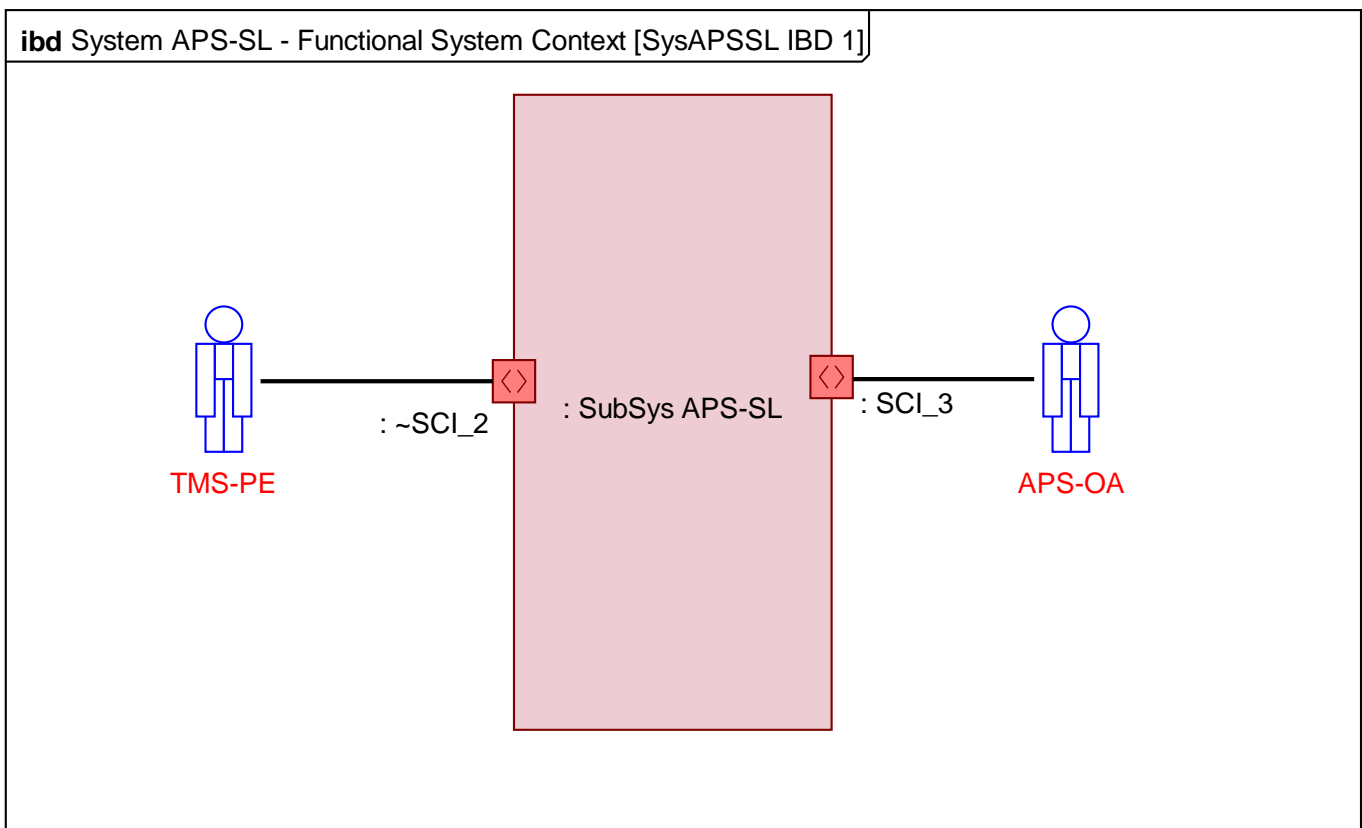
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2. SYSTEM DEFINITION (PHASE 2)

2.1. System Context

Description: [SubSys APS-SL](#) decides, if a [SubSys TMS-PE](#) request is granted or rejected depending on the evaluated risk (rule-based). The request can ask for a state change of a [TA](#), the creation / modification / removal of a [Movement Permission](#) or set / unset a [Usage Restriction Area](#). For the decision, [SubSys APS-SL](#) is maintaining of a complete and up-to-date representation of the [TA](#), the [Movement Permissions](#), the position of [Moveable Objects](#), the current [Usage Restriction Areas](#) and the [Topology](#) data.

Source: RCA Alpha.1 (Description has been modified)



Description:

2.2. Descriptions of Actors

2.2.1. APS-OA

Description: See [SubSys APS-OA](#)

2.2.2. TMS-PE

Description: See [SubSys TMS-PE](#)

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2.3. **Interface definition**

2.3.1. **SCI_2**

Description: [SCI_2](#) allows that the non-safety critical block requests state changes from the [SubSys APS-SL](#) and monitors the [SubSys APS-SL](#). It includes the following main information:

Downstream:

- Request required allocation state of the elements in a route (e.g. [TA](#))
- Request [Movement Permission](#) for a [Moveable Object](#)
- Request [Usage Restriction Area](#)
- Request Warning

Upstream:

- Provides the current allocation state (updates) of the elements (e.g. [TA](#))
- Provides the state of the [Moveable Object](#), position, and extent
- Provides [Usage Restriction Area](#)
- Updates about actions taken by [SubSys APS-SM](#)

Candidate interface definition: Adaption of [EULYNX](#) SCI-CC.

Source: RCA Beta.1

2.3.2. **SCI_3**

Description: Interface between an [SubSys APS-SL](#) and the outsideworld that it controls. It includes the following information:

Downstream:

- Requests the required allocation state of the elements in a route (e.g. [TA](#))
- Grant [Movement Permission](#) to the [Moveable Object](#).
- Warn [Moveable Object](#) (e.g. [TracksidePerson](#))

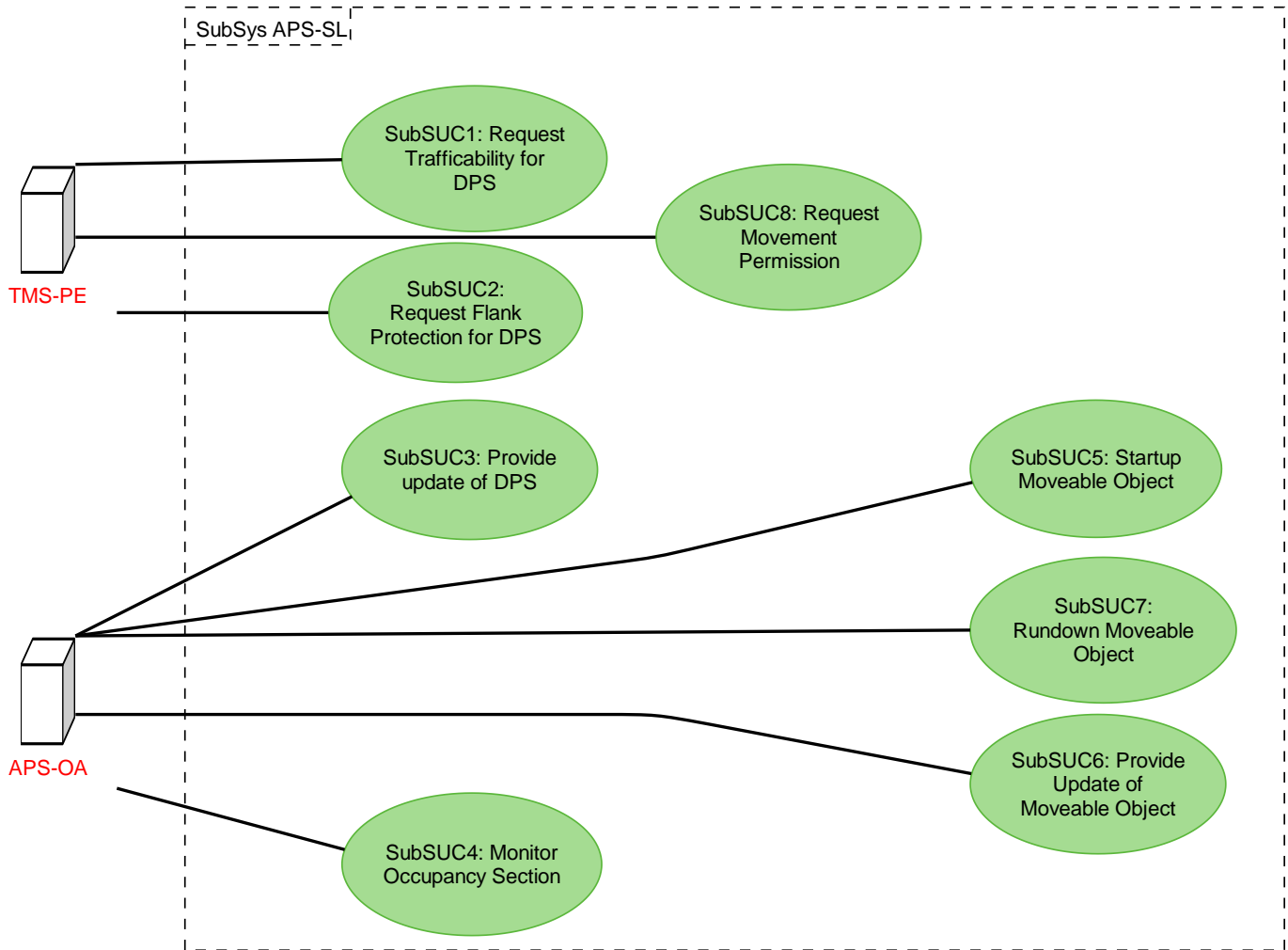
Upstream:

- Provides the current allocation state (updates) of the elements in a route (e.g. [TA](#)).
- Provides the position and the extent (length) of all the [Moveable Object](#).

Source: RCA Beta.1

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2.4. UseCases



Description: Use Cases of [SubSys APS-SL](#)

2.4.1. SubSUC1: Request Trafficability for DPS

Description: UseCase shows requesting a trafficable [Drive Protection Section](#)

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2.4.1.1. *Alternative Scenario: Request Drive Protection sucessfully [SubS APSSL SD 1.1.1]*

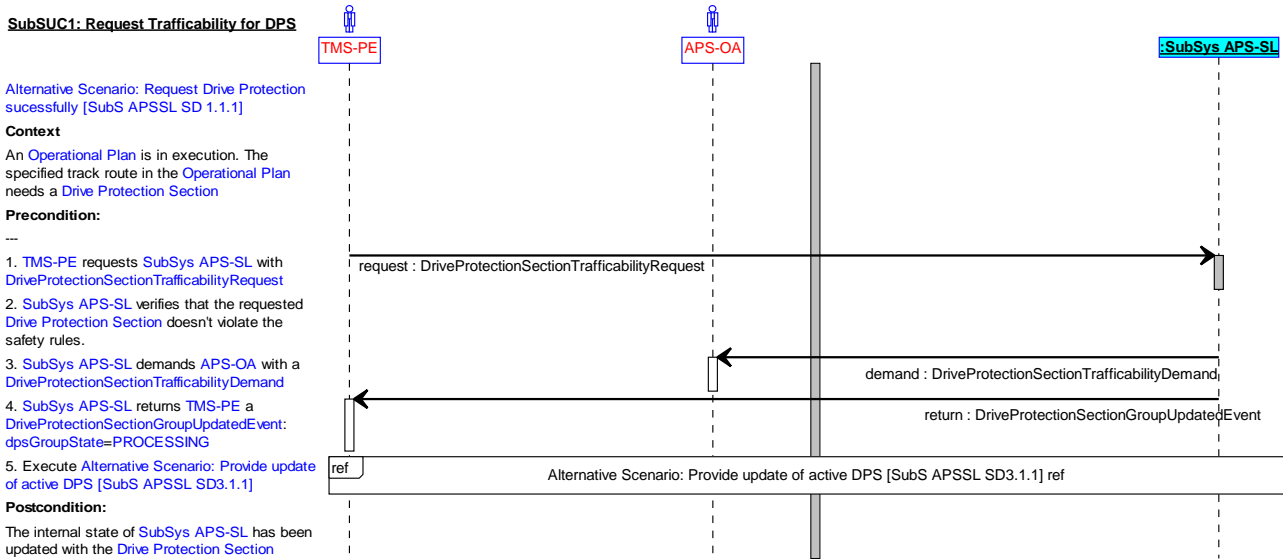


Figure 1 Alternative Scenario: Request Drive Protection sucessfully [SubS APSSL SD 1.1.1]

2.4.2. **SubSUC2: Request Flank Protection for DPS**

Description: UseCase shows requesting [Flank Protection](#)

2.4.2.1. *Alternative Scenario: Request Flank Protection sucessfully [SubS APSSL SD 2.1.1]*

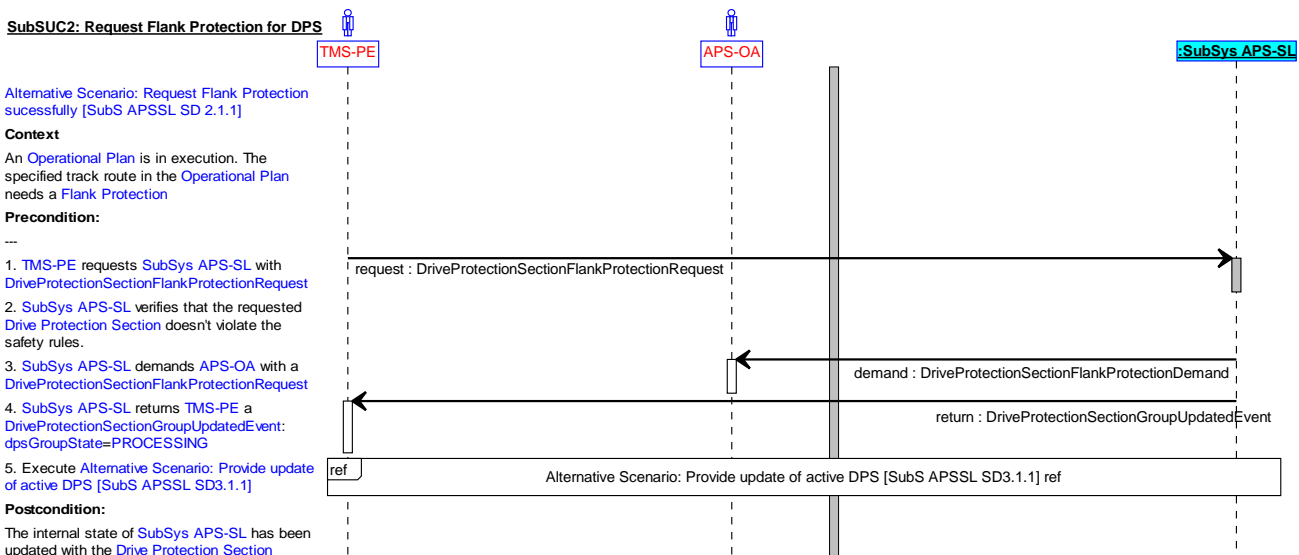


Figure 2 Alternative Scenario: Request Flank Protection sucessfully [SubS APSSL SD 2.1.1]

2.4.3. **SubSUC3: Provide update of DPS**

Description: UseCase shows the update if a [Drive Protection Section](#) state changed.

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2.4.3.1. *Alternative Scenario: Provide update of active DPS [SubS APSSL SD3.1.1]*

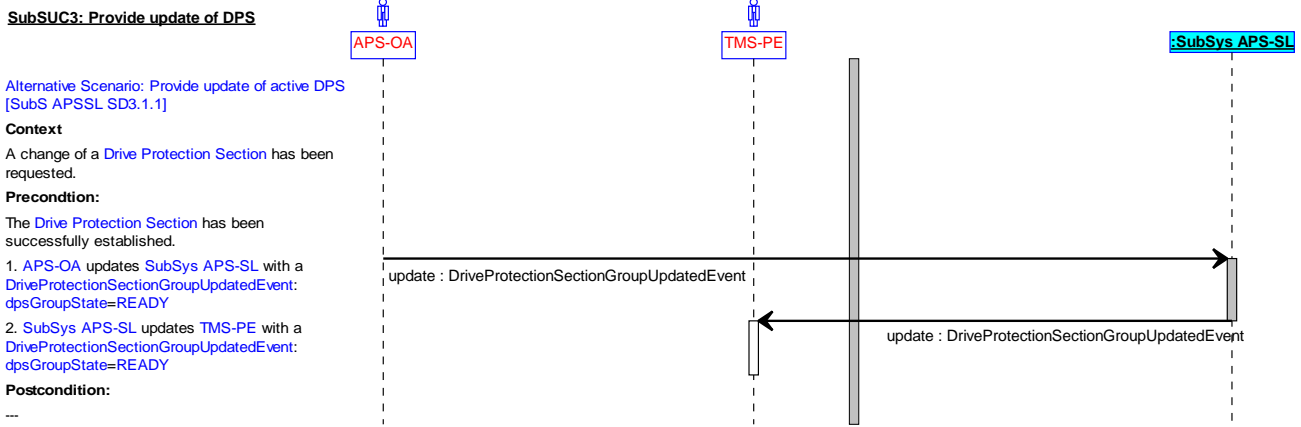


Figure 3 Alternative Scenario: Provide update of active DPS [SubS APSSL SD3.1.1]

2.4.4. **SubSUC4: Monitor Occupancy Section**

Description: Use case shows creation and clearing of [Occupancy](#)

2.4.4.1. *Alternative Scenario: Occupancy Section gets cleared [SubS APSSL SD 4.1.2]*

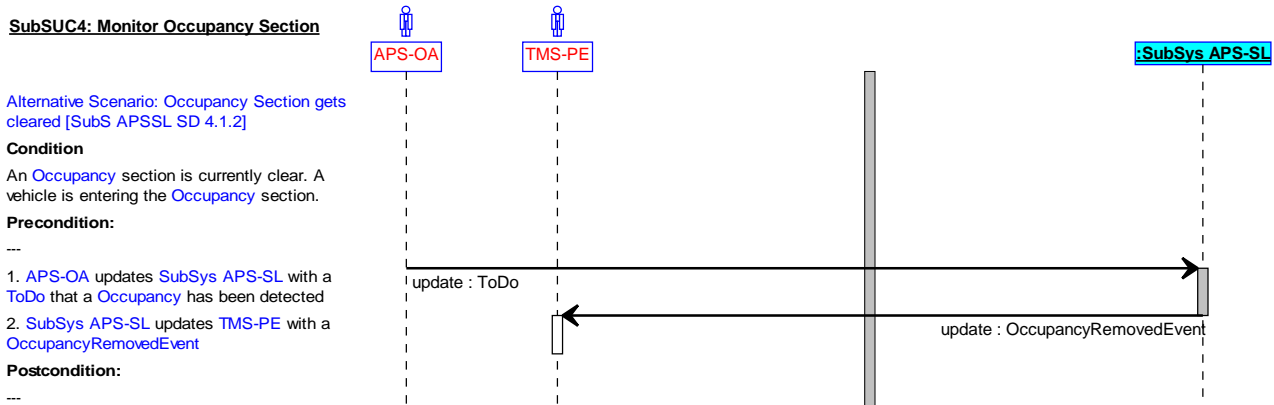


Figure 4 Alternative Scenario: Occupancy Section gets cleared [SubS APSSL SD 4.1.2]

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2.4.4.2. *Alternative Scenario: Occupancy Section gets occupied [SubS APSSL SD 4.1.1]*

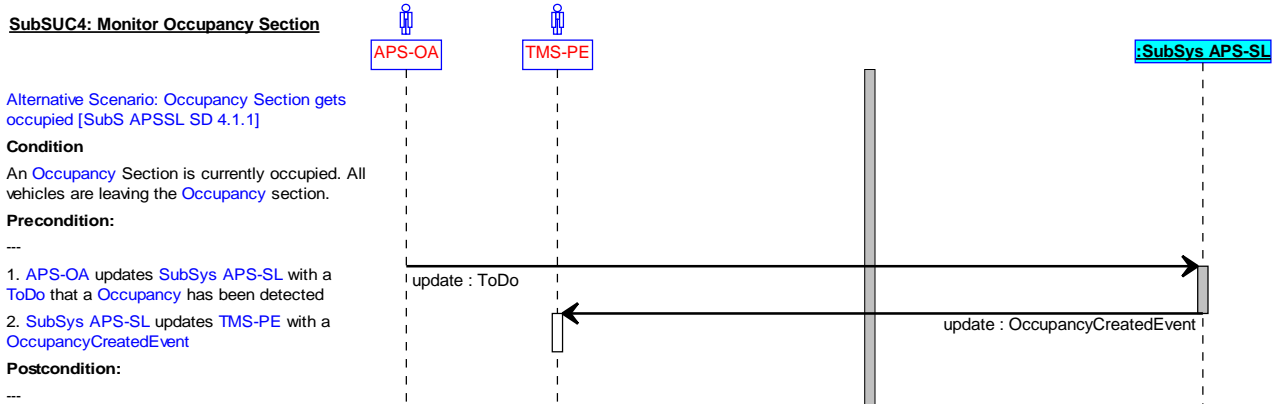


Figure 5 Alternative Scenario: Occupancy Section gets occupied [SubS APSSL SD 4.1.1]

2.4.5. **SubSUC5: Startup Moveable Object**

Description: Use Case shows startup of a [Moveable Object](#).

2.4.5.1. *Alternative Scenario: Create MOB [SubS APSSL SD 5.1.1]*

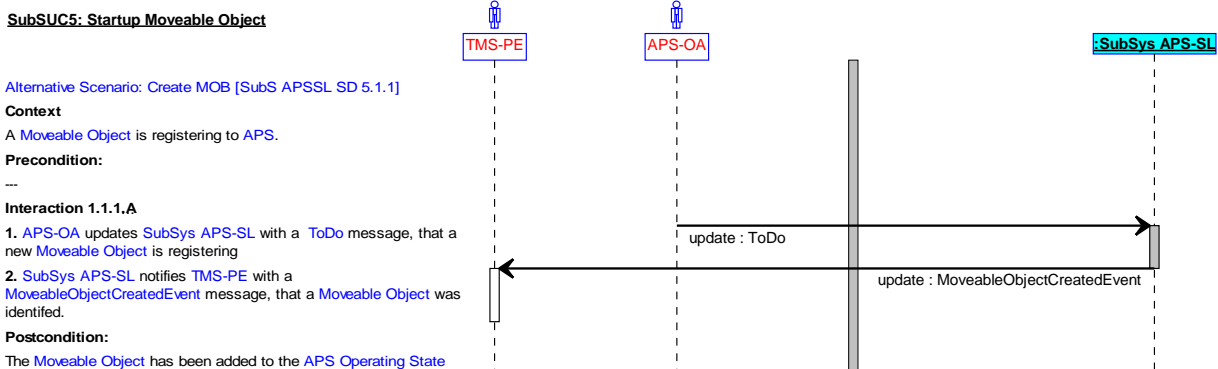


Figure 6 Alternative Scenario: Create MOB [SubS APSSL SD 5.1.1]

2.4.6. **SubSUC6: Provide Update of Moveable Object**

Description: Use Case shows the update procedure if a property of a [Moveable Object](#) changed.

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2.4.6.1. Alternative Scenario: Update MOB [SubS SD APSSL 6.1.1]

SubSUC6: Provide Update of Moveable Object

Alternative Scenario: Update MOB [SubS SD APSSL 6.1.1]

Context

A **Moveable Object** is registered in **APS**.

Precondition:

Interaction 2.1.1.A

1. - **APS-OA** updates **SubSys APS-SL** with a **ToDo** message that a property of **Moveable Object** changed.
2. **SubSys APS-SL** updates **TMS-PE** with a **MoveableObjectUpdatedEvent** that a property of a **Moveable Object** changed.

Postcondition:

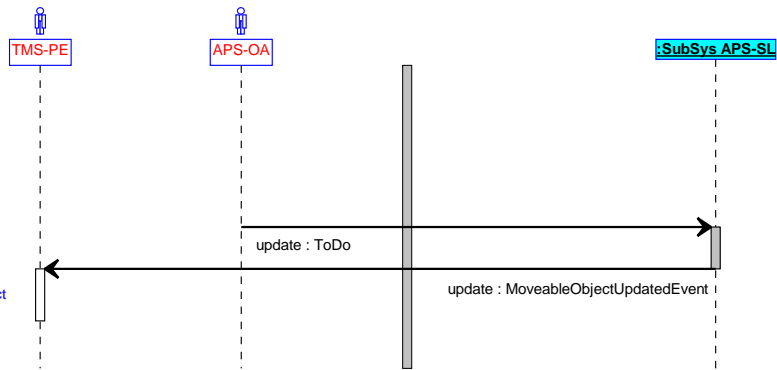


Figure 7 Alternative Scenario: Update MOB [SubS SD APSSL 6.1.1]

2.4.7. SubSUC7: Rundown Moveable Object

Description: Use Case shows rundown of a [Moveable Object](#).

2.4.7.1. Alternative Scenario: Remove MOB [SubS APSSL SD 3.1.1]

SubSUC7: Rundown Moveable Object

Alternative Scenario: Remove MOB [SubS APSSL SD 3.1.1]

Context

The **APS Operating State** contains the **Moveable Object**.

Precondition:

Interaction 3.1.1.A

1. - **APS-OA** updates **SubSys APS-SL** with a **ToDo** message that a **Moveable Object** has been unregistered.
2. **SubSys APS-SL** update **TMS-PE** with a **MoveableObjectRemovedEvent** message that a **Moveable Object** has been unregistered.

Postcondition:

The **Moveable Object** has been removed from **APS Operating State**

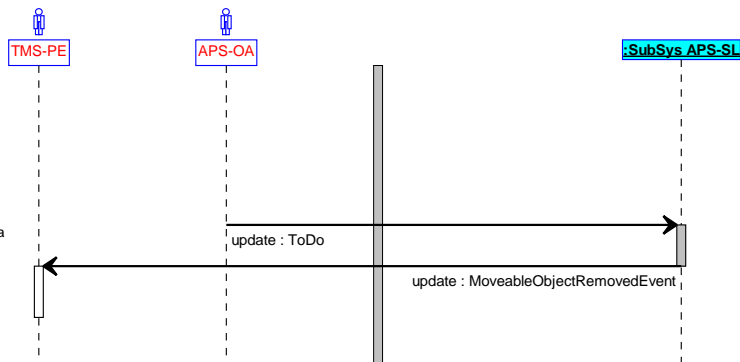


Figure 8 Alternative Scenario: Remove MOB [SubS APSSL SD 3.1.1]

2.4.8. SubSUC8: Request Movement Permission

Description:

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2.4.8.1. *Alternative Scenario: Request MovementPermission rejected [SubS APSSL SD 8.1.2]*

SubSUC8: Request Movement Permission

Alternative Scenario: Request MovementPermission rejected [SubS APSSL SD 8.1.2]

Context

The Moveable Object for which the Movement Permission will be requested is contained in the APS Operating State

Precondition:

Interaction 4.1.2.A

1. - TMS-PE requests SubSys APS-SL with a MovementPermissionRequest message for a updating a Movement Permission.
2. SubSys APS-SL check if the requested update of the Movement Permission doesn't violate the safety rules.
3. SubSys APS-SL returns TMS-PE with a MovementPermissionRejectedEvent message that the Movement Permission hasn't been changed.
4. SubSys APS-SL demands APS-OA with a ToDo message to update the Movement Permission

Postcondition:

The Movement Permission has been unchanged.

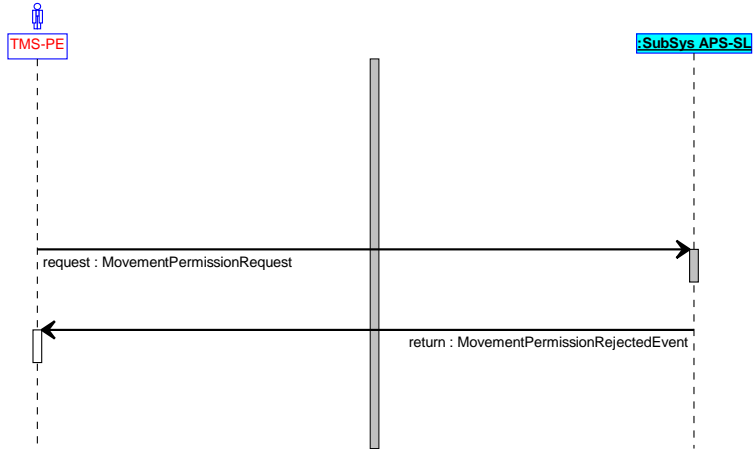


Figure 9 Alternative Scenario: Request MovementPermission rejected [SubS APSSL SD 8.1.2]

2.4.8.2. *Alternative Scenario: Request MovementPermission successfully [SubS APSSL SD 8.1.1]*

SubSUC8: Request Movement Permission

Alternative Scenario: Request MovementPermission successfully [SubS APSSL SD 8.1.1]

Context

The Moveable Object for which the Movement Permission will be requested is contained in the APS Operating State

Precondition:

Interaction 4.1.2.A

1. - TMS-PE requests SubSys APS-SL with a MovementPermissionRequest message for a updating a Movement Permission.
2. SubSys APS-SL check if the requested update of the Movement Permission doesn't violate the safety rules.
3. SubSys APS-SL return TMS-PE with a MovementPermissionUpdatedEvent message that the Movement Permission has been updated.
4. SubSys APS-SL demands APS-OA with a ToDo message to update the Movement Permission

Postcondition:

The Movement Permission has been updated.

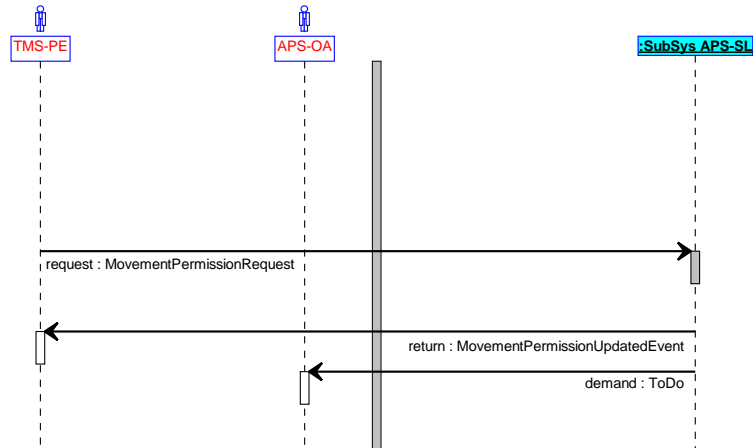


Figure 10 Alternative Scenario: Request MovementPermission successfully [SubS APSSL SD 8.1.1]

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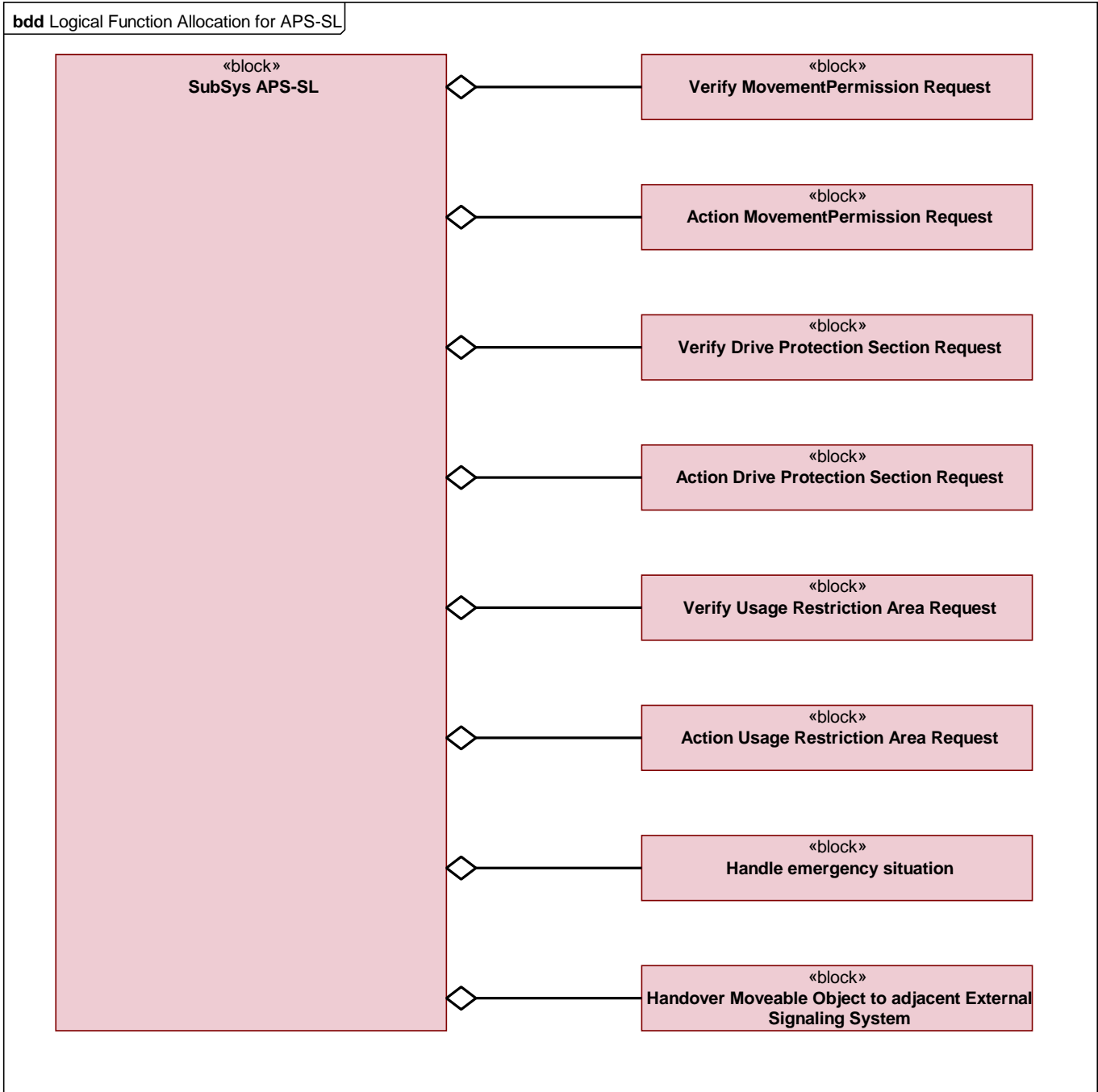
3. RISK ANALYSIS AND EVALUATION (PHASE 3)

Cenelec Phase 3 is not covered in this document

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4. SYSTEM REQUIREMENTS (PHASE 4)

4.1. Logical Function Allocation



Description: This diagram shows the allocation of logical functions to the [SubSys APS-SL](#).

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4.2. **Logical Function Description**

4.2.1. **Handle emergency situation**

Description: Provides functions to handle emergency situations.

4.2.2. **Action Usage Restriction Area Request**

Description: Implements a [Usage Restriction Area](#) according to a request received.

4.2.3. **Verify Usage Restriction Area Request**

Description: Does all verifications of safety rules before a [Usage Restriction Area](#) can be implemented

4.2.4. **Handover Moveable Object to adjacent External Signaling System**

Description: Function to hand over [Moveable Object](#) at the system border to adjacent [ExternalSignalingSystem](#).

4.2.5. **Action Drive Protection Section Request**

Description: Implements a [Drive Protection Section](#) according to a request received.

4.2.6. **Verify Drive Protection Section Request**

Description: Does all verifications of safety rules before a [Movement Permission](#) can be implemented.

4.2.7. **Action MovementPermission Request**

Description: Implements a [Movement Permission](#) according to a request received.

4.2.8. **Verify MovementPermission Request**

Description: Does all verifications of safety rules before a [Drive Protection Section](#) can be implemented