Inbound Location Sensor System

✉ • Transport Preparation Task Information

✉ • Transport Assignment Information

Supply Chain Management System

✉ • Transport Preparation Task Closure Request

✉ • Sensor Module Shelf Inventory Information

✉ • Sensor Module Position Request
• Sensor Module Removal Signal

Sensor Module Smart Shelf

Outbound Location Sensor System

✉ • Container Drop-Off Signal

✉ • Transport Container Shelf Inventory Information

Transport Container Smart Shelf

✉ • Sensor Module Position Information

Autonomous Transport System

✉ • Container Position Information

✉ • Container Position Request
• Container Removal Signal

SBD: Inbound Location Sensor System

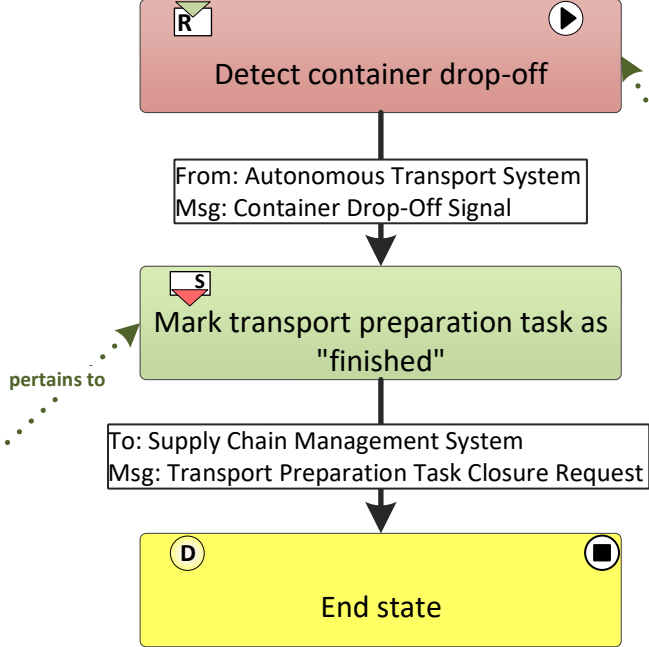**Requirement ID:** R3
Requirement Type: MA Requirement
Requirement Description: The ILSS should provide a notification feature to inform a HA about issues concerning the communication with the ATS and the SCMS and possible solutions.
Requirement Priority: High
Possible Adaptations: The ILSS behavior is adapted to send a notification message after a timeout. The process supervisor receives the notification message on their smartphone and then resolves the issue.
Comment/Underlying Reasoning: See attached concern annotation.

is sub-requirement of

Requirement ID: R3-1
Requirement Type: MA Requirement
Requirement Description: The content of the notifications in R3 should be automatically generated and adapted based on available problem-related information, such as network errors.
Requirement Priority: High
Possible Adaptations: Before a notification is sent, its content is generated based on a predefined list of matching problem and solution characteristics.
Comment/Underlying Reasoning: See attached concern annotation.

Concern Annotation Creators: CPS Designers
Covered Concern: HMT (Process Problem - Action - What if this action does not complete or does not complete on time?)
Potentially Affected Stakeholders: Logistics Center Workers
HMT-Dimension Analysis:
- *Transparency (Observability)*
The Inbound Location Sensor System (ILSS) detects a problem (related to communication) based on a defined timeout.
na
- *Transparency (Predictability)*
The ILSS sends a notification message to the HA.
- *Augmented Cognition (Directing Attention)*
- *Augmented Cognition (Solution Exploration)*
The notification message specifies the suspected problem (including any error messages that may have occured) and provides respective suggestions to help resolve the issue.
- *Augmented Cognition (Adaptability)*
The problem description and resolution suggestions provided by the ILSS are tailored based on the avilable problem-related information.
- *Coordination (Directability)*
na
- *Coordination (Calibrated Trust)*
na
- *Coordination (Common Ground)*
- The HA is referred to manuals for the ILSS and the ATS or SCMS, as well as an internal document listing common network errors.
- The HA is referred to a network technician in order to help resolve the problem.

pertains to

D ▸ **Read good and transport assignment information**

done

▢ **Create new transport preparation task marked as "in progress"**

To: Supply Chain Management System
Msg: Transport Preparation Task Information

▢ **Send good and transport assignment information**

To: Autonomous Transport System
Msg: Transport Assignment Information

D ■ **End state**

pertains to

Concern Annotation Creators: CPS Designers
Covered Concern: HMT (Process Problem - Action - What if this action does not complete or does not complete on time?)
Potentially Affected Stakeholders: Logistics Center Workers
HMT-Dimension Analysis:
- *Transparency (Observability)*
The Inbound Location Sensor System (ILSS) detects the problem based on a defined timeout.
- *Transparency (Predictability)*
- *Augmented Cognition (Directing Attention)*
The ILSS informs the HA via an acustic signal.
- *Augmented Cognition (Solution Exploration)*
The ILSS sends a notification message to the HA suggesting to reposition the item.
- *Augmented Cognition (Adaptability)*
na
- *Coordination (Directability)*
na
- *Coordination (Calibrated Trust)*
na
- *Coordination (Common Ground)*
- The HA uses color markers as a guideline to reposition the item.
- The HA is referred to the user manual of the ILSS.

pertains to
is based on

Requirement ID: R1
Requirement Type: MA Requirement
Requirement Description: The ILSS should provide a notification feature to inform a HA about issues concerning the automated reading of good and transport assignment information and possible solutions.
Requirement Priority: High
Possible Adaptations: Adaptation 1: The ILSS behavior is adapted to trigger an acustic signal after a timeout. The process supervisor receives this signal and then resolves the issue. Adaptation 2: The ILSS behavior is adapted to send a notification message after a timeout. The process supervisor receives the notification message on their smartphone and then resolves the issue.
Comment/Underlying Reasoning: See attached concern annotation.

is based on

Requirement ID: R2
Requirement Type: Environment Requirement
Requirement Description: The inbound location should use color markers to show the correct positioning of a good.
Requirement Priority: Medium
Possible Adaptations: These color markers are used during the adaptations of R1 to help a process supervisor resolve possible positioning problems.
Comment/Underlying Reasoning: See attached concern annotation.

Process transport assignment information

From: Inbound Location Sensor System
Msg: Transport Assignment Information

Move to inbound location

done

Transport package to preparation area

done

Move to transport container smart shelf

done

Request position of required transport container

To: Transport Container Smart Shelf
Msg: Container Position Request

Receive container position information

From: Transport Container Smart Shelf
Msg: Container Position Information

Pick up correct container

To: Transport Container Smart Shelf
Msg: Container Removal Signal

Transport container to preparation area

done

Move to sensor module smart shelf

done

Request position of required sensor modules

To: Sensor Module Smart Shelf
Msg: Sensor Module Position Request

Receive sensor module position information

From: Sensor Module Smart Shelf
Msg: Sensor Module Position Information

Pick up correct sensor modules

To: Sensor Module Smart Shelf
Msg: Sensor Module Removal Signal

Transport sensor modules to preparation area

done

Install sensor modules

done

Place package in container

done

Close container

done

Transport container to outbound location

To: Outbound Location Sensor System
Msg: Container Drop-Off Signal

End state

Concern Annotation Creators: CPS Designers
Covered Concern: HMT (Process Problem - Action - What if this action does not complete or does not complete on time?)
Potentially Affected Stakeholders: Logistics Center Workers
HMT-Dimension Analysis:
- *Transparency (Observability)*
The Autonomous Transport System (ATS) detects a problem (related to communication) based on a defined timeout.
- *Transparency (Predictability)*
na
- *Augmented Cognition (Directing Attention)*
The ATS sends a notification message to the HA.
- *Augmented Cognition (Solution Exploration)*
The notification message specifies the suspected problem (including any error messages that may have occured) and provides respective suggestions to help resolve the issue.
- *Augmented Cognition (Adaptability)*
The problem description and resolution suggestions provided by the ATS are tailored based on the avilable problem-related information.
- *Coordination (Directability)*
na
- *Coordination (Calibrated Trust)*
na
- *Coordination (Common Ground)*
- The HA is referred to manuals for the ATS and the SMSS or TCSS, as well as an internal document listing common network errors.
- The HA is referred to a network technician in order to help resolve the problem.

Requirement ID: R4-1
Requirement Type: MA Requirement
Requirement Description: The content of the notifications in R4 should be automatically generated and adapted based on available problem-related information, such as network errors.
Requirement Priority: High
Possible Adaptations: Before a notification is sent, its content is generated based on a predefined list of matching problem and solution characteristics.
Comment/Underlying Reasoning: See attached concern annotation.

is sub-requirement of

Requirement ID: R4
Requirement Type: MA Requirement
Requirement Description: The ATS should provide a notification feature to inform a HA about issues concerning the communication with the TCSS and the SMSS and possible solutions.
Requirement Priority: High
Possible Adaptations: The ATS behavior is adapted to send a notification message after a timeout. The process supervisor receives the notification message on their smartphone and then resolves the issue.
Comment/Underlying Reasoning: See attached concern annotation.

is based on

Concern Annotation Creators: CPS Designers
Covered Concern: HMT (Process Problem - Action - What if this action does not complete or does not complete on time?)
Potentially Affected Stakeholders: Logistics Center Workers
HMT-Dimension Analysis:
- *Transparency (Observability)*
The Autonomous Transport System (ATS) detects a problem (related to item handling) based on a defined timeout, its own sensor information indicating a mispositioned item, or the occurance of an internal error message pertaining to the attached arm unit.
- *Transparency (Predictability)*
na
- *Augmented Cognition (Directing Attention)*
The ATS sends a notification message to the HA.
- *Augmented Cognition (Solution Exploration)*
The notification message specifies the suspected problem and includes respective suggestions to help resolve the issue.
- *Augmented Cognition (Adaptability)*
The problem description and resolution suggestions provided by the ATS are tailored based on the avilable problem-related information.
- *Coordination (Directability)*
The HA should be able to manually control the ATS in case that automatic control is no longer possible.
- *Coordination (Calibrated Trust)*
The ATS moves to a safe position and powers down automatically (if possible) to allow for safe interactions during problem resolution.
- *Coordination (Common Ground)*
- The HA is referred to the user manual of the ATS and the attached arm unit.
- The HA is referred to a technician in order to help resolve the problem.

Requirement ID: R5-1
Requirement Type: MA Requirement
Requirement Description: The content of the notifications in R5 should be automatically generated and adapted based on available problem-related information, such as error message details.
Requirement Priority: High
Possible Adaptations: Before a notification is sent, its content is generated based on a predefined list of matching problem and solution characteristics.
Comment/Underlying Reasoning: See attached concern annotation.

is sub-requirement of

Requirement ID: R5
Requirement Type: MA Requirement
Requirement Description: The ATS should provide a notification feature to inform a HA about issues concerning the handling of an item via its arm unit and possible solutions.
Requirement Priority: High
Possible Adaptations: The ATS behavior is adapted to send a notification message after a timeout, when detecting a mispositioned item, or when a machine error occurs. The process supervisor receives the notification message on their smartphone and then resolves the issue.
Comment/Underlying Reasoning: See attached concern annotation.

is sub-requirement of

Requirement ID: R5-2
Requirement Type: MA Requirement
Requirement Description: After the provision of the information in R5, the ATS should move to a safe position and power down, if possible.
Requirement Priority: High
Possible Adaptations: After a notification is sent, the ATS attempts to navigate to the nearest known pre-defined safe spot and powers down. If this is not possible, it remains in place.
Comment/Underlying Reasoning: See attached concern annotation.

is based on

Concern Annotation Creators: CPS Designers
Covered Concern: HMT (Process Problem - Action - What if this action does not complete or does not complete on time?)
Potentially Affected Stakeholders: Logistics Center Workers
HMT-Dimension Analysis:
- *Transparency (Observability)*
The Autonomous Transport System (ATS) detects a problem (related to movement and path finding) based on a defined timeout, its own sensor information indicating its spatial positioning and obstacles, or the occurance of an internal error message pertaining to movement/pathfinding (e.g.: malfunctioning sensors, actuators, algorithms).
- *Transparency (Predictability)*
na
- *Augmented Cognition (Directing Attention)*
The ATS sends a notification message to the HA.
- *Augmented Cognition (Solution Exploration)*
The notification message specifies the suspected problem and includes respective suggestions to help resolve the issue.
- *Augmented Cognition (Adaptability)*
The problem description and resolution suggestions provided by the ATS are tailored based on the avilable problem-related information.
- *Coordination (Directability)*
- The HA should be able to manually control the ATS in case that automatic control is no longer possible.
- *Coordination (Calibrated Trust)*
The ATS moves to a safe position and powers down automatically (if possible) to allow for safe interactions during problem resolution.
- *Coordination (Common Ground)*
- The HA is referred to the user manual of the ATS and the attached arm unit.
- The HA is referred to a technician in order to help resolve the problem.

Requirement ID: R6-1
Requirement Type: MA Requirement
Requirement Description: The content of the notifications in R6 should be automatically generated and adapted based on available problem-related information, such as error message details.
Requirement Priority: High
Possible Adaptations: Before a notification is sent, its content is generated based on a predefined list of matching problem and solution characteristics.
Comment/Underlying Reasoning: See attached concern annotation.

is sub-requirement of

Requirement ID: R6
Requirement Type: MA Requirement
Requirement Description: The ATS should provide a notification feature to inform a HA about issues concerning movement/pathfinding and possible solutions.
Requirement Priority: High
Possible Adaptations: The ATS behavior is adapted to send a notification message after a timeout, when detecting obstacles, or when other movement/pathfinding errors occur. The process supervisor receives the notification message on their smartphone and then resolves the issue.
Comment/Underlying Reasoning: See attached concern annotation.

is sub-requirement of

Requirement ID: R6-2
Requirement Type: MA Requirement
Requirement Description: After the provision of the information in R6, the ATS should move to a safe position and power down, if possible.
Requirement Priority: High
Possible Adaptations: After a notification is sent, the ATS attemps to navigate to the nearest known pre-defined safe spot and powers down. If this is not possible, it remains in place.
Comment/Underlying Reasoning: See attached concern annotation.

is based on

pertains to

SBD: Supply Chain Management System

```
┌─[R]──────────────────[▶]─┐
│  Receive transport preparation │
│       task information         │
└────────────────────────────────┘
              │
   ┌──────────┴─────────────────────┐
   │ From: Inbound Location Sensor System │
   │ Msg: Transport Preparation Task Information │
   └──────────────────────────────────┘
              │
┌─[D]────────────────────────┐
│  Save new transport preparation │
│            task                 │
└─────────────────────────────────┘
              │
            [done]
              │
┌─[R]────────────────────────┐
│  Receive transport container shelf │
│      inventory information         │
└─────────────────────────────────────┘
              │
   ┌──────────┴───────────────────────────┐
   │ From: Transport Container Smart Shelf  │
   │ Msg: Transport Container Shelf Inventory Information │
   └────────────────────────────────────────┘
              │
┌─[D]──────────────────────────┐
│  Update transport container shelf │
│      inventory information        │
└───────────────────────────────────┘
              │
            [done]
              │
┌─[R]──────────────────────┐
│  Receive sensor module shelf │
│      inventory information   │
└──────────────────────────────┘
              │
   ┌──────────┴──────────────────────┐
   │ From: Sensor Module Smart Shelf   │
   │ Msg: Sensor Module Shelf Inventory Information │
   └───────────────────────────────────┘
              │
┌─[D]───────────────────────┐
│  Update sensor module shelf  │
│      inventory information   │
└──────────────────────────────┘
              │
            [done]
              │
┌─[R]───────────────────────┐
│  Receive transport preparation │
│      task closure request      │
└─────────────────────────────────┘
              │
   ┌──────────┴───────────────────────────┐
   │ From: Outbound Location Sensor System  │
   │ Msg: Transport Preparation Task Closure Request │
   └────────────────────────────────────────┘
              │
┌─[D]────────────────────[■]─┐
│  Close transport preparation task │
└────────────────────────────────────┘
```

Receive container position request

From: Autonomous Transport System
Msg: Container Position Request

Determine required transport container position

done

Provide requested container position information

To: Autonomous Transport System
Msg: Container Position Information

Detect container removal

From: Autonomous Transport System
Msg: Container Removal Signal

Update shelf inventory information

done

Relay updated information

To: Supply Chain Management System
Msg: Transport Container Shelf Inventory Information

End state

---

pertains to
is based on
is sub-requirement of

Concern Annotation Creators: CPS Designers
Covered Concern: HMT (Process Problem - Action - What if this action does not complete or does not complete on time?)
Potentially Affected Stakeholders: Logistics Center Workers
HMT-Dimension Analysis:
- *Transparency (Observability)*
The Transport Container Smart Shelf (TCSS) preemptively detects future problems (related to available stock) when determining the position of the required container.
- *Transparency (Predictability)*
na
- *Augmented Cognition (Directing Attention)*
The TCSS sends a notification message to the HA.
- *Augmented Cognition (Solution Exploration)*
The notification message asks a HA to re-stock the shelf.
- *Augmented Cognition (Adaptability)*
na
- *Coordination (Directability)*
na
- *Coordination (Calibrated Trust)*
na
- *Coordination (Common Ground)*
na

Requirement ID: R7
Requirement Type: MA Requirement
Requirement Description: The TCSS should provide a notification feature to inform a HA about issues concerning the available stock.
Requirement Priority: High
Possible Adaptations: The TCSS behavior is adapted to check available stock during position determination and send a notification message in case of reaching a defined threshold. The process supervisor receives the notification message on their smartphone and then re-stocks the shelf.
Comment/Underlying Reasoning: See attached concern annotation.

Requirement ID: R9
Requirement Type: MA Requirement
Requirement Description: The TCSS should provide a notification feature to inform a HA about potential issues concerning transport container removal (detection) and possible solutions.
Requirement Priority: High
Possible Adaptations: The TCSS behavior is adapted to send a notification message after a timeout. The process supervisor receives the notification message on their smartphone and then resolves the issue.
Comment/Underlying Reasoning: See attached concern annotation.

Concern Annotation Creators: CPS Designers
Covered Concern: HMT (Process Problem - Action - What if this action does not complete or does not complete on time?)
Potentially Affected Stakeholders: Logistics Center Workers
HMT-Dimension Analysis:
- *Transparency (Observability)*
The Transport Container Smart Shelf (TCSS) detects a problem based on a defined timeout.
- *Transparency (Predictability)*
na
- *Augmented Cognition (Directing Attention)*
The TCSS sends a notification message to the HA.
- *Augmented Cognition (Solution Exploration)*
The notification message asks a HA to check, whether the transport box was actually removed and if that was the case, to investigate the functionality of the smart shelf sensors.
- *Augmented Cognition (Adaptability)*
na
- *Coordination (Directability)*
na
- *Coordination (Calibrated Trust)*
na
- *Coordination (Common Ground)*
na
- The HA is referred to manuals for the ATS and the TCSS.
- The HA is referred to a technician in order to help resolve the problem.

Concern Annotation Creators: CPS Designers
Covered Concern: HMT (Process Problem - Action - What if this action does not complete or does not complete on time?)
Potentially Affected Stakeholders: Logistics Center Workers
HMT-Dimension Analysis:
- *Transparency (Observability)*
The Transport Container Smart Shelf (TCSS) detects a problem (related to communication) based on a defined timeout.
- *Transparency (Predictability)*
na
- *Augmented Cognition (Directing Attention)*
The TCSS sends a notification message to the HA.
- *Augmented Cognition (Solution Exploration)*
The notification message specifies the suspected problem (including any error messages that may have occured) and provides respective suggestions to help resolve the issue.
- *Augmented Cognition (Adaptability)*
The problem description and resolution suggestions provided by the TCSS are tailored based on the avilable problem-related information.
- *Coordination (Directability)*
na
- *Coordination (Calibrated Trust)*
na
- *Coordination (Common Ground)*
na
- The HA is referred to manuals for the TCSS and the ATS or SCMS, as well as an internal document listing common network errors.
- The HA is referred to a network technician in order to help resolve the problem.

Requirement ID: R8
Requirement Type: MA Requirement
Requirement Description: The TCSS should provide a notification feature to inform a HA about issues concerning the communication with the ATS and the SCMS and possible solutions.
Requirement Priority: High
Possible Adaptations: The TCSS behavior is adapted to send a notification message after a timeout. The process supervisor receives the notification message on their smartphone and then resolves the issue.
Comment/Underlying Reasoning: See attached concern annotation.

Requirement ID: R8-1
Requirement Type: MA Requirement
Requirement Description: The content of the notifications in R8 should be automatically generated and adapted based on available problem-related information, such as network errors.
Requirement Priority: High
Possible Adaptations: Before a notification is sent, its content is generated based on a predefined list of matching problem and solution characteristics.
Comment/Underlying Reasoning: See attached concern annotation.

SBD: Sensor Module Smart Shelf

Flowchart (center)

Receive sensor module position request (R, ▶)

From: Autonomous Transport System
Msg: Sensor Module Position Request

↓

Determine required sensor module positions (D)

done

↓

Provide requested sensor module position information (S)

To: Autonomous Transport System
Msg: Sensor Module Position Information

↓

Detect sensor module removal (R)

From: Autonomous Transport System
Msg: Sensor Module Removal Signal

↓

Update shelf inventory information (D)

done

↓

Relay updated information (S)

To: Supply Chain Management System
Msg: Sensor Module Shelf Inventory Information

↓

End state (D, ■)

Concern Annotation (top)

Concern Annotation Creators: CPS Designers
Covered Concern: HMT (Process Problem - Action - What if this action does not complete or does not complete on time?)
Potentially Affected Stakeholders: Logistics Center Workers
HMT-Dimension Analysis:
- *Transparency (Observability)*
The Sensor Module Smart Shelf (SMSS) preemptively detects future problems (related to available stock) when determining the position of the required container.
- *Transparency (Predictability)*
na
- *Augmented Cognition (Directing Attention)*
The SMSS sends a notification message to the HA.
- *Augmented Cognition (Solution Exploration)*
The notification message asks a HA to re-stock the shelf.
- *Augmented Cognition (Adaptability)*
na
- *Coordination (Directability)*
na
- *Coordination (Calibrated Trust)*
na
- *Coordination (Common Ground)*
na

Requirement R10 (top right)

Requirement ID: R10
Requirement Type: MA Requirement
Requirement Description: The SMSS should provide a notification feature to inform a HA about issues concerning the available stock.
Requirement Priority: High
Possible Adaptations: The SMSS behavior is adapted to check available stock during position determination and send a notification message in case of reaching a defined threshold. The process supervisor receives the notification message on their smartphone and then re-stocks the shelf.
Comment/Underlying Reasoning: See attached concern annotation.

is based on

Requirement R12 (left)

Requirement ID: R12
Requirement Type: MA Requirement
Requirement Description: The SMSS should provide a notification feature to inform a HA about potential issues concerning sensor module removal (detection) and possible solutions.
Requirement Priority: High
Possible Adaptations: The SMSS behavior is adapted to send a notification message after a timeout. The process supervisor receives the notification message on their smartphone and then resolves the issue.
Comment/Underlying Reasoning: See attached concern annotation.

is based on

Concern Annotation (left-center)

Concern Annotation Creators: CPS Designers
Covered Concern: HMT (Process Problem - Action - What if this action does not complete or does not complete on time?)
Potentially Affected Stakeholders: Logistics Center Workers
HMT-Dimension Analysis:
- *Transparency (Observability)*
The Sensor Module Smart Shelf (SMSS) detects a problem based on a defined timeout.
- *Transparency (Predictability)*
na
- *Augmented Cognition (Directing Attention)*
The SMSS sends a notification message to the HA.
- *Augmented Cognition (Solution Exploration)*
The notification message asks a HA to check, whether the sensor modules were actually removed and if that was the case, to investigate the functionality of the smart shelf sensors.
- *Augmented Cognition (Adaptability)*
na
- *Coordination (Directability)*
na
- *Coordination (Calibrated Trust)*
na
- *Coordination (Common Ground)*
na
- The HA is referred to manuals for the ATS and the SMSS.
- The HA is referred to a technician in order to help resolve the problem.

pertains to

Concern Annotation (right-center)

Concern Annotation Creators: CPS Designers
Covered Concern: HMT (Process Problem - Action - What if this action does not complete or does not complete on time?)
Potentially Affected Stakeholders: Logistics Center Workers
HMT-Dimension Analysis:
- *Transparency (Observability)*
The Sensor Module Smart Shelf (SMSS) detects a problem (related to communication) based on a defined timeout.
- *Transparency (Predictability)*
na
- *Augmented Cognition (Directing Attention)*
The SMSS sends a notification message to the HA.
- *Augmented Cognition (Solution Exploration)*
The notification message specifies the suspected problem (including any error messages that may have occured) and provides respective suggestions to help resolve the issue.
- *Augmented Cognition (Adaptability)*
The problem description and resolution suggestions provided by the SMSS are tailored based on the avilable problem-related information.
- *Coordination (Directability)*
na
- *Coordination (Calibrated Trust)*
na
- *Coordination (Common Ground)*
- The HA is referred to manuals for the SMSS and the ATS or SCMS, as well as an internal document listing common network errors.
- The HA is referred to a network technician in order to help resolve the problem.

pertains to

Requirement R11 (right)

Requirement ID: R11
Requirement Type: MA Requirement
Requirement Description: The SMSS should provide a notification feature to inform a HA about issues concerning the communication with the ATS and the SCMS and possible solutions.
Requirement Priority: High
Possible Adaptations: The SMSS behavior is adapted to send a notification message after a timeout. The process supervisor receives the notification message on their smartphone and then resolves the issue.
Comment/Underlying Reasoning: See attached concern annotation.

is based on

is sub-requirement of

Requirement R11-1 (bottom right)

Requirement ID: R11-1
Requirement Type: MA Requirement
Requirement Description: The content of the notifications in R11 should be automatically generated and adapted based on available problem-related information, such as network errors.
Requirement Priority: High
Possible Adaptations: Before a notification is sent, its content is generated based on a predefined list of matching problem and solution characteristics.
Comment/Underlying Reasoning: See attached concern annotation.

SBD: Outbound Location Sensor System

Requirement ID: R14
Requirement Type: MA Requirement
Requirement Description: The OLSS should provide a notification feature to inform a HA about issues concerning the communication with the SCMS and possible solutions.
Requirement Priority: High
Possible Adaptations: The OLSS behavior is adapted to send a notification message after a timeout. The process supervisor receives the notification message on their smartphone and then resolves the issue.
Comment/Underlying Reasoning: See attached concern annotation.

is based on

is sub-requirement of

Requirement ID: R14-1
Requirement Type: MA Requirement
Requirement Description: The content of the notifications in R13 should be automatically generated and adapted based on available problem-related information, such as network errors.
Requirement Priority: High
Possible Adaptations: Before a notification is sent, its content is generated based on a predefined list of matching problem and solution characteristics.
Comment/Underlying Reasoning: See attached concern annotation.

is based on

Concern Annotation Creators: CPS Designers
Covered Concern: HMT (Process Problem - Action - What if this action does not complete or does not complete on time?)
Potentially Affected Stakeholders: Logistics Center Workers
HMT-Dimension Analysis:
- *Transparency (Observability)*
The Outbound Location Sensor System (OLSS) detects a problem (related to communication) based on a defined timeout.
- *Transparency (Predictability)*
na
- *Augmented Cognition (Directing Attention)*
The OLSS sends a notification message to the HA.
- *Augmented Cognition (Solution Exploration)*
The notification message specifies the suspected problem (including any error messages that may have occured) and provides respective suggestions to help resolve the issue.
- *Augmented Cognition (Adaptability)*
The problem description and resolution suggestions provided by the OLSS are tailored based on the avilable problem-related information.
- *Coordination (Directability)*
na
- *Coordination (Calibrated Trust)*
na
- *Coordination (Common Ground)*
- The HA is referred to manuals for the OLSS and SCMS, as well as an internal document listing common network errors.
- The HA is referred to a network technician in order to help resolve the problem.

pertains to

Detect container drop-off

From: Autonomous Transport System
Msg: Container Drop-Off Signal

Mark transport preparation task as "finished"

To: Supply Chain Management System
Msg: Transport Preparation Task Closure Request

End state

pertains to

pertains to

Concern Annotation Creators: CPS Designers
Covered Concern: HMT (Process Problem - Action - What if this action does not complete or does not complete on time?)
Potentially Affected Stakeholders: Logistics Center Workers
HMT-Dimension Analysis:
- *Transparency (Observability)*
The HA checks the outbound location and open transport preparation task information periodically in order to identify detection malfunctions.
- *Transparency (Predictability)*
na
- *Augmented Cognition (Directing Attention)*
na
- *Augmented Cognition (Solution Exploration)*
na
- *Augmented Cognition (Adaptability)*
na
- *Coordination (Directability)*
na
- *Coordination (Calibrated Trust)*
na
- *Coordination (Common Ground)*
na

is based on

Requirement ID: R13
Requirement Type: HA Requirement
Requirement Description: A HA needs to periodically check the outbound location and open transport preparation task information in order to identify and resolve malfunctions.
Requirement Priority: Medium
Possible Adaptations: A separate process needs to be established, which lies outside the scope of the current models.
Comment/Underlying Reasoning: See attached concern annotation.