

SCADE Formal Model Documentation

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# openETCS / UNISIG Subset-026-3

## *3.5 Management of Radio Communication (MoRC)*

### Summary:

#### 3.5 Management of Radio Communication (MoRC)

This document describes the formal SCADE model implementation of the behaviour of the ETCS OBU user application interacting with Euroradio protocols.

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Distribution List: <https://github.com/openETCS/model-evaluation>

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# 1. General Project Description

This SCADE model implements the behaviour of the ETCS OBU user application interacting with Euroradio protocols.

The top level of this model is represented by the node "managementOfRadioCommunication".

A simplified interface intended to be used in conjunction with the SYS/ML model and RT-Tester residing at

<https://github.com/openETCS/model-evaluation/tree/master/model/EA-SysML/> to achieve automatic test case generation is provided by the node "MoRC\_withSimplified\_IF".

This node serves as a wrapper to the top level operator managementOfRadioCommunication.

It simplifies the MoRC external interface so that it suits to the SYS/ML model and RT-Tester approach residing on

<https://github.com/openETCS/model-evaluation/tree/master/model/EA-SysML/>.

This enables the SCADE model to be used as the "System under test" and the SYS/ML model as a test model for automatic test sequence generation with RT-Tester.

Due to the interface simplification the functionality of the underlying "Management Of Radio Communication" is limited by the simplification.

If the complete functionality is required without restrictions, the operator "managementOfRadioCommunication" should be used directly.

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## D3.5 Management of Radio Communication

- Name: MoRC.etp
- Description: SUBSET-026-3, ISSUE : 3.3.0, 3.5 Management of Radio Communication)
- Copyright Siemens AG, 2013
- Licensed under the EUPL V.1.1 (<http://joinup.ec.europa.eu/software/page/eupl/licence-eupl> )
- Gist URL: ---
- Cryptography: No
- Author(s): Uwe Steinke

The use of this software is limited to non-vital applications.

It has not been developed for vital operation purposes and must not be used for applications which may cause harm to people, physical accidents or financial loss.

THEREFORE, NO LIABILITY WILL BE GIVEN FOR SUCH AND ANY OTHER KIND OF USE.

## 2. Software Architecture

### 2.1. Project Architecture

This section displays the package hierarchy of projects.

Project MoRC

### 2.2. Call Graph

This Call Graph displays the dependency tree of model operators.

#### 1. MoRC\_withSimplified\_IF

- 1.1. digital::FallingEdge (dMainSheet)
- 1.2. managementOfRadioCommunication (dMainSheet)
  - 1.2.1. digital::FallingEdge (diagram\_safeRadioConnectionIndication)
  - 1.2.2. digital::FallingEdge (diagram\_TerminationInitiation)
  - 1.2.3. digital::RisingEdge (diagram\_safeRadioConnectionIndication) [2]
  - 1.2.4. establish\_a\_CommunicationSession (diagram\_Establishing\_1  
(CommunicationSession\_SM: Establishing))
  - 1.2.5. evaluateOrderToContactAnRBD (diagram\_Establishing\_1  
(CommunicationSession\_SM: Establishing))
    - 1.2.5.1. digital::FallingEdge  
(diagram\_evaluateOrderToContactAnRBD\_1)
    - 1.2.5.2. linear::MemoryBasic  
(diagram\_evaluateOrderToContactAnRBD\_1)
  - 1.2.6. Initiate\_a\_Session (diagram\_NoSession\_1  
(CommunicationSession\_SM: NoSession))
  - 1.2.7. initiateTerminatingASession (diagram\_TerminationInitiation)
    - 1.2.7.1. waitAndRepeatTimer  
(diagram\_WaitForOrderToTerminateTheSession\_1  
(TrainExitedFromRBCArea\_SM: WaitForOrderToTerminateTheSession))
      - 1.2.7.1.1. countdownTimer  
(diagram\_waitAndRepeatTimer\_1)
        - 1.2.7.1.1.1. linear::MemoryBasic (diagram\_Counting\_1  
(TimerStatus\_SM: Counting))
  - 1.2.8. isOrderToEstablishConnection (diagram\_NoSession\_1  
(CommunicationSession\_SM: NoSession)) [3]
  - 1.2.9. maintaining\_a\_CommunicationSession (diagram\_Maintaining\_1  
(CommunicationSession\_SM: Maintaining))
    - 1.2.9.1. countdownTimer  
(diagram\_CommunicationSessionEstablished\_1  
(Maintaining\_SM: CommunicationSessionEstablished))
      - 1.2.9.1.1. linear::MemoryBasic (diagram\_Counting\_1  
(TimerStatus\_SM: Counting))
  - 1.2.10. registeringToTheRadioNetwork (diagram\_NetworkRegistration)
    - 1.2.10.1. digital::FlipFlopReset  
(diagram\_registeringToTheRadioNetwork\_2)
    - 1.2.10.2. digital::RisingEdge  
(diagram\_registeringToTheRadioNetwork\_1) [3]
    - 1.2.10.3. digital::RisingEdge

(diagram\_registeringToTheRadioNetwork\_2)  
1.2.10.4. linear::MemoryBasic  
(diagram\_registeringToTheRadioNetwork\_1)  
1.2.10.5. radioNetworkMobile  
(diagram\_registeringToTheRadioNetwork\_2)  
1.2.10.5.1. linear::MemoryBasic  
(diagram\_radioNetworkMobile\_1)  
1.2.10.5.2. linear::MemoryBasic  
(diagram\_radioNetworkMobile\_2) [2]  
1.2.11. safeRadioConnectionIndication  
(diagram\_safeRadioConnectionIndication)  
1.2.11.1. countDownTimer  
(diagram\_safeRadioConnectionIndication\_3)  
1.2.11.1.1. linear::MemoryBasic (diagram\_Counting\_1  
(TimerStatus\_SM: Counting))  
1.2.12. terminateAndEstablishSession (diagram\_TerminationInitiation)  
1.2.12.1. linear::MemoryBasic  
(diagram\_terminateAndEstablishSession\_1)  
1.2.13. terminating\_a\_CommunicationSession (diagram\_Terminating\_1  
(CommunicationSession\_SM: Terminating))  
1.2.13.1. waitAndRepeatTimer  
(diagram\_WaitForAcknowledgementMessage\_1  
(TerminateTheCommunicationSession\_SM: WaitForAcknowledgementMessage))  
1.2.13.1.1. countDownTimer  
(diagram\_waitAndRepeatTimer\_1)  
1.2.13.1.1.1. linear::MemoryBasic (diagram\_Counting\_1  
(TimerStatus\_SM: Counting))  
2. RBCTransition\_forSafeRadioConnectionIndication

## 3. MoRC Project

### 3.1. Root Elements

#### 3.1.1. Types

Table 1: Public Types of MoRC

Name	Definition	Comments and Information
D_RBCTR_Type	int	Comments: Distance to RBC transition. In 10 cm, 1m or 10 m, depends on Q_SCALE.
m154_NoCompatibleVersionSupported_Type	{ valid : bool, NID_MESSAGE : NID_MESSAGE_Type, T_TRAIN : T_TRAIN_Type, NID_ENGINE : NID_ENGINE_Type }	NID_MESSAGE Comments: Must be cNID_MESSAGE_NoCompatibleVersionSupported == 154. T_TRAIN Comments: Time in 10 ms NID_ENGINE Comments: Onboard ETCS identity
m155_initiationOfACommunicationSession_Type	{ valid : bool, NID_MESSAGE : NID_MESSAGE_Type, T_TRAIN : T_TRAIN_Type, NID_ENGINE : NID_ENGINE_Type }	NID_MESSAGE Comments: Must be cNID_MESSAGE_initiationOfACommunicationSession == 155. T_TRAIN Comments: Time in 10 ms NID_ENGINE Comments: Onboard ETCS identity
m156_terminationOfACommunicationSession_Type	{ valid : bool, NID_MESSAGE : NID_MESSAGE_Type, T_TRAIN : T_TRAIN_Type, NID_ENGINE : NID_ENGINE_Type }	NID_MESSAGE Comments: Must be cNID_MESSAGE_terminationOfACommunicationSession == 156. T_TRAIN Comments: Time in 10 ms NID_ENGINE Comments: Onboard ETCS identity
m159_SessionEstablished_Type	{ valid : bool, NID_MESSAGE : NID_MESSAGE_Type, T_TRAIN : T_TRAIN_Type, NID_ENGINE : NID_ENGINE_Type, NID_RADIO : NID_RADIO_Type }	NID_MESSAGE Comments: Must be cNID_MESSAGE_SessionEstablished == 159. T_TRAIN Comments: Time in 10 ms NID_ENGINE Comments: Onboard ETCS identity NID_RADIO Comments: Extracted and abstracted from Packet 3: Onboard telephone numbers



Name	Definition	Comments and Information
m24_generalMessage_Type	{valid : bool, NID_MESSAGE : NID_MESSAGE_Type, T_TRAIN : T_TRAIN_Type, M_ACK : M_ACK_Type, NID_LRBG : NID_LRBG_Type}	NID_MESSAGE Comments: Must be cNID_MESSAGE_GeneralMessage == 24. T_TRAIN Comments: Time in 10 ms M_ACK Comments: Indicates whether the telegram must be acknowledged or not NID_LRBG Comments: Identity of last relevant balise group
m32_RBC_RIU_systemVersion_Type	{valid : bool, NID_MESSAGE : NID_MESSAGE_Type, T_TRAIN : T_TRAIN_Type, M_ACK : M_ACK_Type, NID_LRBG : NID_LRBG_Type, M_VERSION : M_VERSION_Type}	NID_MESSAGE Comments: Must be cNID_MESSAGE_RBC_RIU_SystemVersion == 32. T_TRAIN Comments: Time in 10 ms M_ACK Comments: Indicates whether the telegram must be acknowledged or not NID_LRBG Comments: Identity of last relevant balise group M_VERSION Comments: Version of ETCS system
m38_initiationOfACommunicationSession_Type	{valid : bool, NID_MESSAGE : NID_MESSAGE_Type, T_TRAIN : T_TRAIN_Type, M_ACK : M_ACK_Type, NID_LRBG : NID_LRBG_Type}	NID_MESSAGE Comments: Must be cNID_MESSAGE_InitiationOfACommunicationSession_Track == 38. T_TRAIN Comments: Time in 10 ms: always set to unknown M_ACK Comments: Indicates whether the telegram must be acknowledged or not NID_LRBG Comments: Identity of last relevant balise group: always set to unknown
m39_acknowledgementOfTerminationOfACommunicationSession_Type	{valid : bool, NID_MESSAGE : NID_MESSAGE_Type, T_TRAIN : T_TRAIN_Type, M_ACK : M_ACK_Type, NID_LRBG : NID_LRBG_Type}	NID_MESSAGE Comments: Must be cNID_MESSAGE_AckOfTerminationOfACommunicationSession == 39. T_TRAIN Comments: Time in 10 ms: always set to unknown M_ACK Comments: Indicates whether the telegram must be acknowledged or not: always set to 0 == not NID_LRBG Comments: Identity of last relevant balise group: always set to unknown

Name	Definition	Comments and Information
M_ACK_Type	enum {M_ACK_NoAckRequired, M_ACK_AckRequired}	Comments: Qualifier for acknowledgement request. Indicates whether the telegram must be acknowledged or not
M_LEVEL_Type	enum {ETCS_Level_0, ETCS_Level_NTC, ETCS_Level_1, ETCS_Level_2, ETCS_Level_3}	Comments: The ETCS Level of Operation : M_LEVEL: 7.5.1.65 ETCS_Level_0 Comments: Level 0 ETCS_Level_NTC Comments: Level NTC specified by NID_NTC ETCS_Level_1 Comments: Level 1 ETCS_Level_2 Comments: Level 2 ETCS_Level_3 Comments: Level 3

Name	Definition	Comments and Information
M_MODE_Type	enum { ETCS_Mode_FullSupervision, ETCS_Mode_OnSight, ETCS_Mode_StaffResponsible, ETCS_Mode_Shunting, ETCS_Mode_Unfitted, ETCS_Mode_Sleeping, ETCS_Mode_StandBy, ETCS_Mode_Trip, ETCS_Mode_PostTrip, ETCS_Mode_SystemFailure, ETCS_Mode_Isolation, ETCS_Mode_NonLeading, ETCS_Mode_LimitedSupervision, ETCS_Mode_NationalSystem, ETCS_Mode_Reversing, ETCS_Mode_PassiveShunting, ETCS_Mode_EndOfMission}	Comments: ETCS Mode: M_MODE: 7.5.1.72 ETCS_Mode_FullSupervision Comments: 0 ETCS_Mode_OnSight Comments: 1 ETCS_Mode_StaffResponsible Comments: 2 ETCS_Mode_Shunting Comments: 3 ETCS_Mode_Unfitted Comments: 4 ETCS_Mode_Sleeping Comments: 5 ETCS_Mode_StandBy Comments: 6 ETCS_Mode_Trip Comments: 7 ETCS_Mode_PostTrip Comments: 8 ETCS_Mode_SystemFailure Comments: 9 ETCS_Mode_Isolation Comments: 10 ETCS_Mode_NonLeading Comments: 11 ETCS_Mode_LimitedSupervisi on Comments: 12 ETCS_Mode_NationalSystem Comments: 13 ETCS_Mode_Reversing Comments: 14 ETCS_Mode_PassiveShunting Comments: 15 ETCS_Mode_EndOfMission Comments: 3.5.3.4 c)

Name	Definition	Comments and Information
M_VERSION_Type	{firstNumber : int, secondNumber : int}	Comments: Version of ETCS system firstNumber Comments: The first number distinguishes not compatible versions. (The three MSB's) secondNumber Comments: The second number indicates compatibility within a version X. (The four LSB's)
mobileHWAAction_Type	enum {mhwa_nop, mhwa_register, mhwa_connect, mhwa_disconnect, mhwa_unregister}	Comments: 3.5.6, 3.5.6.3.2, 3.5.6.5, 3.5.6.5: Commands to the mobile hardware Traceability: 3.5.6.5 3.5.6.3.2 mhwa_nop Comments: noAction
mobileHWCmd_Type	{valid : bool, action : mobileHWAAction_Type, radioNetworkID : radioNetworkID_Type}	Comments: 3.5.6, 3.5.6.3.2, 3.5.6.5, 3.5.6.5: Commands to the mobile hardware Traceability: 3.5.6.3 3.5.6.3.2 3.5.6.5
mobileHWConnectionStatus_Type	enum {mhw_notRegistered, mhw_registered, mhw_connectionSetupInProgress, mhw_connected}	Comments: 3.5.6.5 Traceability: 3.5.6.5
mobileHWStatus_Type	{valid : bool, connectionStatus : mobileHWConnectionStatus_Type, settingUpConnectionHasFailed : bool}	Comments: 3.5.6.5 Traceability: 3.5.6.5
mobileSWAction_Type	enum {mswa_nop, mswa_register, mswa_connect, mswa_establishRadioConnection, mswa_terminateRadioConnection, mswa_disconnect, mswa_unregister}	
mobileSWCmd_Type	{valid : bool, action : mobileSWAction_Type, radioNetworkID : radioNetworkID_Type}	
mobileSWConnectionStatus_Type	enum {mswc_unregistered, mswc_registering, mswc_registered, mswc_connecting, mswc_connected, mswc_establishingSession, mswc_sessionEstablished}	
mobileSWStatus_Type	{valid : bool, mobileHW_available : bool, connectionStatus : mobileSWConnectionStatus_Type, registeredRadioNetworkID : radioNetworkID_Type, settingUpConnectionHasFailed : bool}	

Name	Definition	Comments and Information
morc_RBC_action_Type	enum {morc_rbca_noAction, morc_rbca_establishSession, morc_rbca_terminateSession}	Comments: 3.5.3.5 a) Traceability: 3.5.3.5
NID_C_Type	int	Comments: Identity number of the country or region: 7.5.1.86: 0..1023
NID_ENGINE_Type	int	Comments: Onboard ETCS identity. The ETCS identity number is uniquely defined for ERTMS/ETCS purposes.
NID_LRBG_Type	int	Comments: Identity of last relevant balise group. Country/region identity (NID_C) + balise identity number of last relevant balise group (NID_BG).
NID_MESSAGE_Type	int	Comments: Message identifier. Regards defined values of NID_MESSAGE, refer to chapters 8.5.2 and 8.5.3
NID_PACKET_Type	int	Comments: Packet identifier: 7.5.1.93: 0..255
NID_RADIO_Type	int	Comments: Radio subscriber number: 7.5.1.95: FFFF FFFF FFFF FFFF = Use the short number stored onboard
NID_RBC_Type	int	Comments: RBC ETCS identity number: 7.5.1.96: 0..16 382; 16 383 = Contact the last known RBC
onBoardOrder_Type	enum {obo_noOrder, obo_initiateCommunication, obo_terminateCommunication, obo_registerNetwork}	Comments: orders from OBU to MoRC
orderToContactAnAcceptingRBC_Type	{valid : bool, rbc_id : rbc_id_Type, telephoneNoOfTheRBC : rbc_phoneNo_Type, appliesAlsoToSleepingUnits : bool}	Comments: 3.5.3.5.3 Traceability: 3.5.3.5.3
orderToContactAnRBC_Type	{valid : bool, rbc_id : rbc_id_Type, telephoneNoOfTheRBC : rbc_phoneNo_Type, actionToBePerformed : morc_RBC_action_Type, appliesAlsoToSleepingUnits : bool}	Comments: 3.5.3.5 Traceability: 3.5.3.5
orderToContactARadioInfillUnit_Type	{valid : bool, radioInfillUnit_id : rbc_id_Type, telephoneNoOfTheRadioInfillUnit : rbc_phoneNo_Type, actionToBePerformed : morc_RBC_action_Type}	Comments: 3.5.3.6 Traceability: 3.5.3.6

Name	Definition	Comments and Information
p131_RBC_TransitionOrderType	{valid : bool, NID_PACKET : NID_PACKET_Type, Q_DIR : Q_DIR_Type, L_PACKET : int, D_RBCTR : D_RBCTR_Type, NID_C : NID_C_Type, NID_RBC : NID_RBC_Type, NID_RADIO : NID_RADIO_Type, Q_SLEEPSESSION : Q_SLEEPSESSION_Type}	Comments: Packet Number 131: RBC transition order NID_PACKET Comments: Must be = cNID_PACKET_131 L_PACKET Comments: L_PACKET indicates the length of the packet in bits, including all bits of the packet header: 7.5.1.49 D_RBCTR Comments: Distance to RBC transition NID_C Comments: Accepting RBC identity. Identity number of the country or region: 7.5.1.86: 0..1023. Not relevant, if NID_RBC == Contact last known RBC NID_RBC Comments: Accepting RBC identity. RBC ETCS identity number: 7.5.1.96: 0..16 382; 16 383 = Contact the last known RBC NID_RADIO Comments: Accepting RBC radio subscriber number: 7.5.1.95: FFFF FFFF FFFF FFFF = Use the short number stored onboard Q_SLEEPSESSION Comments: Session management for sleeping equipment

Name	Definition	Comments and Information
p42_SessionManagement_Type	{valid : bool, NID_PACKET : NID_PACKET_Type, Q_DIR : Q_DIR_Type, L_PACKET : int, Q_RBC : Q_RBC_Type, NID_C : NID_C_Type, NID_RBC : NID_RBC_Type, NID_RADIO : NID_RADIO_Type, Q_SLEEPSESSION : Q_SLEEPSESSION_Type}	Comments: Packet 42: Session Management: 7.4.2.10 NID_PACKET Comments: Must be = cNID_PACKET_42 L_PACKET Comments: L_PACKET indicates the length of the packet in bits, including all bits of the packet header: 7.5.1.49 Q_RBC Comments: Terminate or establish communication session NID_C Comments: Identity number of the country or region: 7.5.1.86: 0..1023. Not relevant, if NID_RBC == Contact last known RBC NID_RBC Comments: RBC ETCS identity number: 7.5.1.96: 0..16 382; 16 383 = Contact the last known RBC NID_RADIO Comments: Radio subscriber number: 7.5.1.95: FFFF FFFF FFFF FFFF = Use the short number stored onboard Q_SLEEPSESSION Comments: Session management for sleeping equipment
Q_DIR_Type	enum {q_dir_reverse, q_dir_nominal, q_dir_bothDirections, q_dir_spare}	Comments: Validity direction of transmitted data: 7.5.1.103
Q_RBC_Type	enum {q_rbc_terminateCommunicationSession, q_rbc_establishCommunicationSession}	Comments: Qualifier for communication session order: 7.5.1.127
Q_SLEEPSESSION_Type	enum {q_sleepsession_ignoreSessionEstablishmentOrder, q_sleepsession_executeSessionEstablishmentOrder}	Comments: 7.5.1.131: Qualifier for a Sleeping onboard equipment to execute or not the "session establishment" order
radioHoleStatus_Type	enum {rhs_none, rhs_end, rhs_begin, rhs_inside}	Comments: Designates, if the EVC is inside a radio hole
radioNetworkID_Type	int	Comments: 3.5.6.2 Traceability: 3.5.6.2
RadioNetworkMobileHWSStatusType	{valid : bool, connectionStatus : mobileHWConnectionStatus_Type}	Comments: 3.5.6
rbc_id_Type	int	Comments: 3.5.3.16
rbc_phoneNo_Type	int	Comments: 3.5.3.16

Name	Definition	Comments and Information
rbc_TransitionOrder_Type	{valid : bool, orderToContactAnAcceptingRBC : orderToContactAnAcceptingRBC_Type }	Traceability: 3.5.3.5.3 orderToContactAnAcceptingRBC Comments: 3.5.3.5.3
safeRadioConnectionStatus_Type	enum {srcs_NoConnection, srcs_ConnectionLost_SetupFailed, srcs_ConnectionUp}	Comments: 3.5.7.1 Traceability: 3.5.7.1
safeRadioConnectionStatusValid_Type	{valid : bool, status : safeRadioConnectionStatus_Type}	
sessionStatus_Type	enum {morc_st_inactive, morc_st_establishing, morc_st_maintaining, morc_st_terminating}	Comments: Designates the MoRC session status
T_TRAIN_Type	int	Comments: Time, according to trainborne clock, at which message is sent, in 10 ms
time_Type	int	Comments: time in ms
track_2_train_Type	{m24_generalMessage : m24_generalMessage_Type, m32_RBC_RIU_systemVersion : m32_RBC_RIU_systemVersion_Type, m38_initiationOfACommunicationSession : m38_initiationOfACommunicationSession_Type, m39_acknowledgementOfTerminationOfACommunicationSession : m39_acknowledgementOfTerminationOfACommunicationSession_Type, p131_RBC_TransitionOrder : p131_RBC_TransitionOrder_Type, p42_sessionManagement : p42_SessionManagement_Type}	m24_generalMessage Comments: The RBC orders the EVC to establish or terminate a communication session with packet 42 p131_RBC_TransitionOrder Comments: The RBC orders a transition to another RBC p42_sessionManagement Comments: Packet to give the identity and phone no of the RBC with which a session shall be established/terminated
train_2_track_Type	{m155_initiationOfACommunicationSession : m155_initiationOfACommunicationSession_Type, m156_terminationOfACommunicationSession : m156_terminationOfACommunicationSession_Type, m159_SessionEstablished : m159_SessionEstablished_Type, m154_NoCompatibleVersionSupported : m154_NoCompatibleVersionSupported_Type}	m155_initiationOfACommunicationSession Comments: The EVC initiates a communication m156_terminationOfACommunicationSession Comments: The EVC terminates a communication m159_SessionEstablished Comments: The EVC acknowledges the establishment m154_NoCompatibleVersionSupported Comments: The EVC acknowledges the establishment with an error
validRadioNetworkID_Type	{valid : bool, radioNetworkID : radioNetworkID_Type}	Comments: 3.5.6.2 Traceability: 3.5.6.2



### 3.1.2. Constants

Table 2: Public Constants of MoRC

Name	Type	Value	Comments and Information
cConnectionStatusTime rInterval	time_Type	15000	Comments: Estimated Value
cEstablishOrderFromTr ackside	orderToContactAnR BC_Type	{ valid : true, rbc_id : 0, telephoneNoOfTheR BC : 0, actionToBePerforme d : morc_rbca_establis hSession, appliesAlsoToSleepi ngUnits : false}	
cEstablishSafeRadioCo nnectionCmd	mobileSWCmd_Typ e	{ valid : true, action : mswa_establishRadi oConnection, radioNetworkID : 0}	
cInvalidmobileHWCmd	mobileHWCmd_Typ e	{ valid : false, action : mhwa_nop, radioNetworkID : 0}	
cInvalidMobileHWStatu s	mobileHWStatus_Ty pe	{ valid : false, connectionStatus : mhwc_notRegistere d, settingUpConnectio nHasFailed : false}	
cInvalidMobileSWCmd	mobileSWCmd_Typ e	{ valid : false, action : mswa_nop, radioNetworkID : 0}	
cInvalidMobileSWStatu s	mobileSWStatus_Ty pe	{ valid : false, mobileHW_available : false, connectionStatus : mswc_unregistered, registeredRadioNet workID : 0, settingUpConnectio nHasFailed : false}	
cInvalidOrderToContac tAnRBC	orderToContactAnR BC_Type	{ valid : false, rbc_id : 0, telephoneNoOfTheR BC : 0, actionToBePerforme d : morc_rbca_noActio n, appliesAlsoToSleepi ngUnits : false}	
cInvalidRadioNetworkI D	validRadioNetworkI D_Type	{ valid : false, radioNetworkID : 0}	
cInvalidRadioNetworkI D_value	radioNetworkID_Ty pe	-1	

Name	Type	Value	Comments and Information
cMaxNoOfConnectionRetries	int	3	Comments: 3.5.3.7 a) Traceability: 3.5.3.7
cMobileHWStatus_Connected	mobileHWStatus_Type	{ valid : true, connectionStatus : mhwc_connected, settingUpConnectionHasFailed : false}	
cMobileHWStatus_Disconnected	mobileHWStatus_Type	{ valid : true, connectionStatus : mhwc_notRegistered, settingUpConnectionHasFailed : false}	
cMobileHWStatus_notRegistered	mobileHWStatus_Type	{ valid : true, connectionStatus : mhwc_notRegistered, settingUpConnectionHasFailed : false}	
cMobileHWStatus_Registered	mobileHWStatus_Type	{ valid : true, connectionStatus : mhwc_registered, settingUpConnectionHasFailed : false}	
cMobileSWStatus_noHW	mobileSWStatus_Type	{ valid : true, mobileHW_available : false, connectionStatus : mswc_unregistered, registeredRadioNetworkID : cInvalidRadioNetworkID_value, settingUpConnectionHasFailed : false}	
cMobileSWStatus_unregistered	mobileSWStatus_Type	{ valid : true, mobileHW_available : true, connectionStatus : mswc_unregistered, registeredRadioNetworkID : 0, settingUpConnectionHasFailed : false}	
cNID_LRBG_Unknown	NID_LRBG_Type	16777215	Comments: Unknown identity of last relevant balise group
cNID_MESSAGE_AckOfTerminationOfACommunicationSession	NID_MESSAGE_Type	39	Comments: TERM_ACK
cNID_MESSAGE_GeneralMessage	NID_MESSAGE_Type	24	Comments: TERM_SESSION_TRACK
cNID_MESSAGE_GeneralMessage_init	NID_MESSAGE_Type	25	Comments: INIT_SESSION_ORDER

Name	Type	Value	Comments and Information
cNID_MESSAGE_InitiationOfACommunicationSession	NID_MESSAGE_Type	155	Comments: INIT_SESSION
cNID_MESSAGE_InitiationOfACommunicationSession_track	NID_MESSAGE_Type	38	Comments: INIT_SESSION_TRACK
cNID_MESSAGE_NoCompatibleVersionSupported	NID_MESSAGE_Type	154	Comments: SYS_NO_COMP
cNID_MESSAGE_noMessage	NID_MESSAGE_Type	255	Comments: NO_MESSAGE
cNID_MESSAGE_RBC_RIU_SystemVersion	NID_MESSAGE_Type	32	Comments: SYS_VERSION
cNID_MESSAGE_registerNetwork	NID_MESSAGE_Type	45	Comments: Cecile: MessageFromRBC : Messages == 45 that corresponds to register order
cNID_MESSAGE_SessionEstablished	NID_MESSAGE_Type	159	Comments: SESSION_ESTABLISHED
cNID_MESSAGE_terminationOfACommunicationSession	NID_MESSAGE_Type	156	Comments: TERM_SESSION
cNID_PACKET_131	int	131	Comments: Packet Number 131: RBC transition order
cNID_PACKET_42	int	42	Comments: Session Management: 7.5.1.93
cNID_RADIO_useTheShortNumberStoredOnboard	NID_RADIO_Type	4294967295	Comments: 7.5.1.95 NID_RADIO: 0xFFFF FFFF
cNID_RBC_ContactLastKnownRBC	NID_RBC_Type	16383	Comments: 7.5.1.96
cPositionReport_MaxNumberOfRepetitions	int	5	Comments: 3.5.5.1e) Traceability: 3.5.5.1
cPositionReportRepetitionInterval	time_Type	10000	Comments: 3.5.5.1e) Traceability: 3.5.5.1
cRadioConnectionReestablishingTimeout	time_Type	10000	Comments: 3.5.4.1, 3.5.4.2.1 Traceability: 3.5.4.1 3.5.4.2 3.5.4.2.1
cRBC_id_contactLastKnownRBC	rbc_id_Type	-1	Comments: 3.5.3.13: Order to contact the last known RBC 3.5.3.16, Option 1: Contact the last known RBC Traceability: 3.5.3.13

Name	Type	Value	Comments and Information
cRBC_phoneNo_UseOn boardStoredShortNo	rbc_phoneNo_Type	-1	Comments: 3.5.3.16, Option 2: Use on-board stored short number
cRegisterSafeRadioConnectionCmd	mobileSWCmd_Type	{ valid : true, action : mswa_register, radioNetworkID : 0}	
cSampleRadioNetworkID	validRadioNetworkID_Type	{ valid : true, radioNetworkID : 12345}	Comments: Example value for a valid radio network ID
cTerminateOrderFromTrackside	orderToContactAnRBC_Type	{ valid : true, rbc_id : 0, telephoneNoOfTheRBC : 0, actionToBePerformed : morc_rbca_terminateSession, appliesAlsoToSleepingUnits : false}	
cTerminateSafeRadioConnectionCmd	mobileSWCmd_Type	{ valid : true, action : mswa_terminateRadioConnection, radioNetworkID : 0}	
cTerminationOfCommunicationSession_MaxNumberOfRepetitions	int	5	Comments: 3.5.5.3.1 Traceability: 3.5.5.3.1
cTerminationOfCommunicationSessionRepetitionInterval	time_Type	1000	Comments: 3.5.5.3.1 Traceability: 3.5.5.3.1
cTime_0	time_Type	0	

### 3.1.3. countDownTimer Operator

Declared as **private node**

#### 3.1.3.1. Comments and Information

countDownTimer Comments:

- The countDownTimer implements a generic timer function.

Table 3: countDownTimer Annotations

Note Name	Attribute	Value
GdC_1	Author	Author : Uwe Steinke
	DateC	Created : 2012-10-15
	DateM	Modified : 2012-12-20
	Version	Version : 00.00.00.001
	to_c	True

Note Name	Attribute	Value
Remark_1	Description	<ul style="list-style-type: none"> <li>- Name: countdownTimer</li> <li>- Description: Implements a generic Count Down Timer</li> <li>- Copyright Siemens AG, 2013</li> <li>- Licensed under the EUPL V.1.1 ( <a href="http://joinup.ec.europa.eu/software/page/eupl/licence-eupl">http://joinup.ec.europa.eu/software/page/eupl/licence-eupl</a> )</li> <li>- Gist URL: ---</li> <li>- Cryptography: No</li> <li>- Author(s): Uwe Steinke</li> </ul> <p>The use of this software is limited to non-vital applications.                      It has not been developed for vital operation purposes and must not be used for applications which may cause harm to people, physical accidents or financial loss.                      THEREFORE, NO LIABILITY WILL BE GIVEN FOR SUCH AND ANY OTHER KIND OF USE.</p>
	to_c	True

### 3.1.3.2. Interface

Table 4: Inputs of countdownTimer

Name	Type	Properties	Comments and Information
re_start	bool		
stop	bool		
actualTime	time_Type		
autoretrigger	bool		
interval	time_Type	hidden	

Table 5: Outputs of countdownTimer

Name	Type	Properties	Comments and Information
expired	bool	default false	
started	bool		

### 3.1.3.3. Locals

Table 6: Locals of countdownTimer

Name	Type	Properties	Comments and Information
expired_loc	bool	default false	

Table 7: Signals of countdownTimer

Name	Comments and Information
sStart	

#### 3.1.3.4. Operator Hierarchy

diagram : diagram\_countDownTimer\_1

*state-machine* : TimerStatus\_SM

state : Counting

diagram : diagram\_Counting\_1

state : Expired

state : Stopped

### 3.1.3.5. Graphical and Textual Diagrams

#### 3.1.3.5.1. View of diagram\_countDownTimer\_1 (countDownTimer)

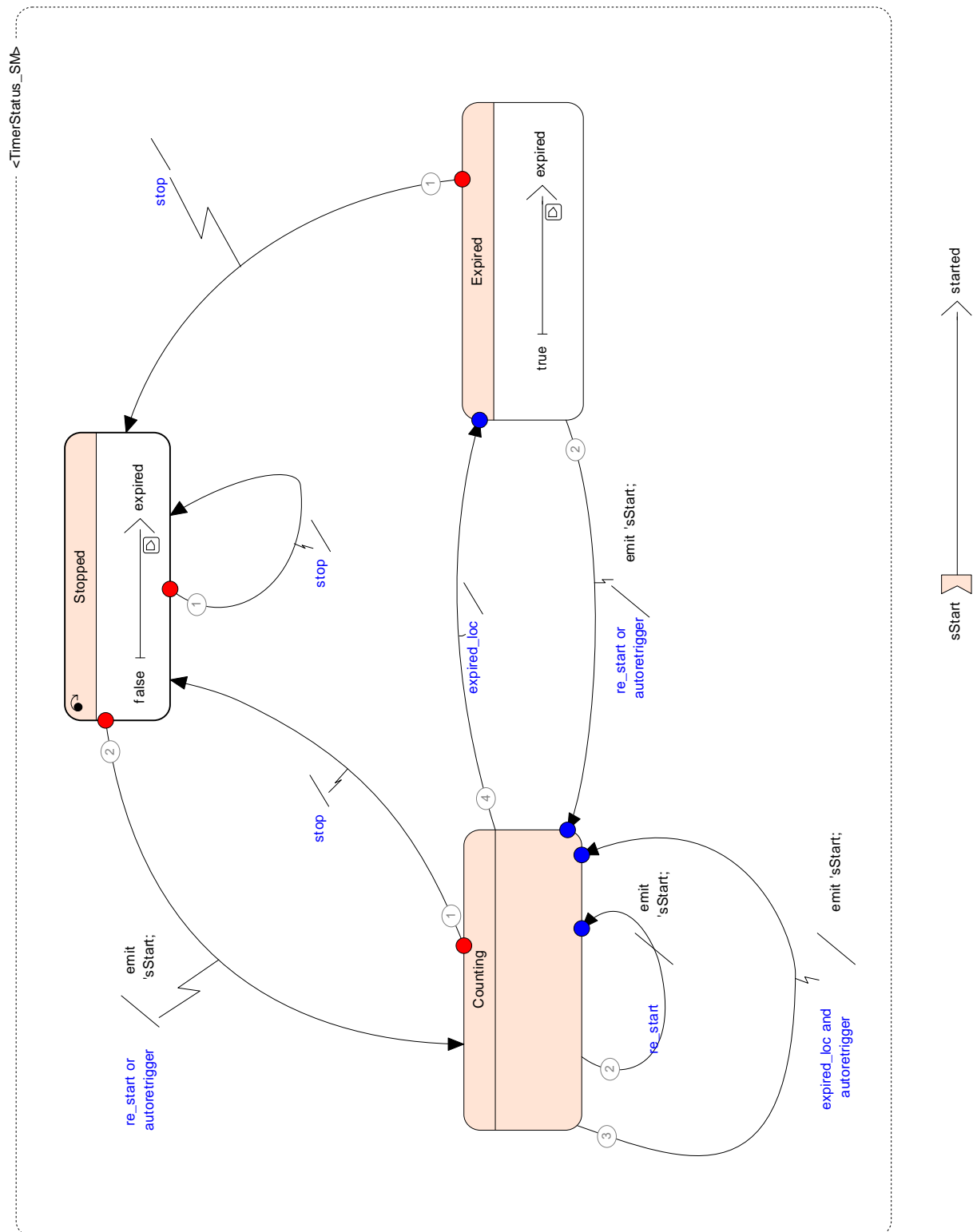


Figure 1: View of diagram\_countDownTimer\_1 (countDownTimer)

Table 8: State Machines of diagram\_countDownTimer\_1

State Machine	Comments and Information
TimerStatus_SM	

Table 9: States of diagram\_countDownTimer\_1

State	Comments and Information
TimerStatus_SM: Counting	
TimerStatus_SM: Expired	
TimerStatus_SM: Stopped	

Table 10: Transitions of diagram\_countDownTimer\_1

Source/Target	#	Conditions/Actions	Comments and Information
Source: TimerStatus_SM: Counting Target: TimerStatus_SM: Stopped	1	Condition: stop	
Source: TimerStatus_SM: Counting Target: TimerStatus_SM: Counting	2	Condition: re_start Actions: emit 'sStart;	
Source: TimerStatus_SM: Counting Target: TimerStatus_SM: Counting	3	Condition: expired_loc and autoretrigger Actions: emit 'sStart;	
Source: TimerStatus_SM: Counting Target: TimerStatus_SM: Expired	4	Condition: expired_loc Actions:	
Source: TimerStatus_SM: Expired Target: TimerStatus_SM: Stopped	1	Condition: stop	
Source: TimerStatus_SM: Expired Target: TimerStatus_SM: Counting	2	Condition: re_start or autoretrigger Actions: emit 'sStart;	
Source: TimerStatus_SM: Stopped Target: TimerStatus_SM: Stopped	1	Condition: stop	
Source: TimerStatus_SM: Stopped Target: TimerStatus_SM: Counting	2	Condition: re_start or autoretrigger Actions: emit 'sStart;	



### 3.1.3.5.2. View of diagram\_Counting\_1 (countDownTimer/TimerStatus\_SM: Counting:)

Owner diagram: diagram\_countDownTimer\_1

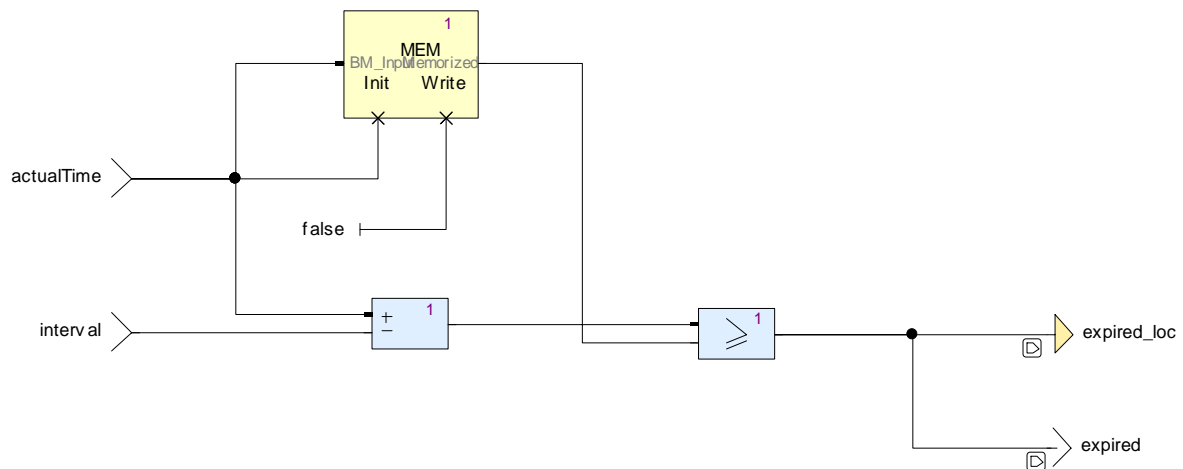


Figure 2: View of diagram\_Counting\_1 (countDownTimer/TimerStatus\_SM:Counting:)

### 3.1.4. establish\_a\_CommunicationSession Operator

Declared as **private node**

#### 3.1.4.1. Comments and Information

establish\_a\_CommunicationSession Comments:

- Subset 096, REQ 3.5.3
- Implements the establishing process of a communication session

Table 11: establish\_a\_CommunicationSession Annotations

Note Name	Attribute	Value
Remark_1	Description	<p>- Name: establish_a_CommunicationSession</p> <p>- Description: Implements the establishing process of a communication session</p> <p>- Copyright Siemens AG, 2013</p> <p>- Licensed under the EUPL V.1.1 ( <a href="http://joinup.ec.europa.eu/software/page/eupl/licence-eupl">http://joinup.ec.europa.eu/software/page/eupl/licence-eupl</a> )</p> <p>- Gist URL: ---</p> <p>- Cryptography: No</p> <p>- Author(s): Uwe Steinke</p> <p>The use of this software is limited to non-vital applications.  It has not been developed for vital operation purposes and must not be used for applications which may cause harm to people, physical accidents or financial loss.  THEREFORE, NO LIABILITY WILL BE GIVEN FOR SUCH AND ANY OTHER KIND OF USE.</p>
	to_c	True

### 3.1.4.2. Interface

Table 12: Inputs of establish\_a\_CommunicationSession

Name	Type	Comments and Information
isPartOfAnOngoingStartOfMissionProcedure	bool	Comments: 3.5.3.7 Traceability: 3.5.3.7
connectionSuccessfullyEstablished	bool	Comments: 3.5.3.7 a) Safe Radio Connection successfully established Traceability: 3.5.3.7
settingUpSafeConnectionHasFailed	bool	Comments: 3.5.3.7 a) Traceability: 3.5.3.7
endOfMissionIsPerformed	bool	Comments: 3.5.3.7 a) Traceability: 3.5.3.7
trainPassesALevelTransitionBorder	bool	Comments: 3.5.3.7 a) trainPassesALevelTransitionBorder with it's front end Traceability: 3.5.3.7
orderToEstablishACommunicationSession_fromTrackside	orderToContactAnRBC_Type	Comments: 3.5.3.7 a) Traceability: 3.5.3.7
orderToEstablishACommunicationSession_fromOBU	orderToContactAnRBC_Type	Comments: 3.5.3.7 a) Traceability: 3.5.3.7
orderDoesNotRequestToContactAnAcceptingRBC	bool	Comments: 3.5.3.7 a) Traceability: 3.5.3.7
trainPassesA_RBC_RBC_border_WithItsFrontEnd	bool	Comments: 3.5.3.7 a) Traceability: 3.5.3.7
systemVersionFromTracksideSupported	bool	Comments: 3.5.3.8 a) Traceability: 3.5.3.8
systemVersionReceived	bool	Comments: 3.5.3.8 a) Traceability: 3.5.3.8
initiationOfACommunicationSession_receivedFromTrackside	bool	Comments: 3.5.3.10 b) Traceability: 3.5.3.10
communicationSessionInitiatedByOBU_	bool	

Name	Type	Comments and Information
communicationSession InitiatedFromTrackside —	bool	

Table 13: Outputs of establish\_a\_CommunicationSession

Name	Type	Properties		Comments and Information
InformTheDriverThatNoConnectionWasSetup	bool			
requestTheSetupOfASafeRadioConnection	bool			
sendTheMessageInitiationOfCommunicationSessionToTrackside	bool			Comments: 3.5.3.7 b) Traceability: 3.5.3.7
sendMessage_NoCompatibleVersionSupported	bool			Comments: 3.5.3.8 b) Traceability: 3.5.3.8
terminateTheCommunicationSession	bool			Comments: 3.5.3.8 b) Traceability: 3.5.3.8
sendASessionEstablishedReportToTrackside	bool			Comments: 3.5.3.10 c) 3.5.3.8 a) sSendMessageEstablishedReport to trackside Traceability: 3.5.3.8 3.5.3.10
firstRequestToSetupASafeRadioConnection	bool			Comments: 3.5.7.3a) Traceability: 3.5.7.3
finalAttemptToSetupTheSafeRadioConnectionFailed	bool			Comments: 3.5.7.5[1] Traceability: 3.5.7.5
requestsToSetupTheSafeRadioConnectionStopped	bool			Comments: 3.5.7.4 Traceability: 3.5.7.4
sessionSuccessfullyEstablished	bool	default	false	
establishingACommunicationSessionAborted	bool			

### 3.1.4.3. Locals

Table 14: Signals of establish\_a\_CommunicationSession

Name	Comments and Information
sfinalAttemptToSetupTheSafeRadioConnectionFailed	Comments: 3.5.7.5[1] Traceability: 3.5.7.5
sFirstRequestToSetupASafeRadioConnection	Comments: 3.5.7.3a) Traceability: 3.5.7.3
sInformTheDriverThatNoConnectionWasSetup	
sRequestTheSetupOfASafeRadioConnection	
sSendASessionEstablishedReportToTrackside	Comments: 3.5.3.10 c) Traceability: 3.5.3.10
sSendMessage_NoCompatibleVersionSupported	Comments: 3.5.3.8 b) Traceability: 3.5.3.8
sSendMessageEstablishedReport	Comments: 3.5.3.8 a) sSendMessageEstablishedReport to trackside Traceability: 3.5.3.8
sSendTheMessageInitiationOfCommunicationSessionToTrackside	Comments: 3.5.3.7 b) Traceability: 3.5.3.7
sTerminateTheCommunicationSession	Comments: 3.5.3.8 b) Traceability: 3.5.3.8
sTryToEstablishConnectionFailed	

#### 3.1.4.4. Operator Hierarchy

diagram : diagram\_establish\_a\_CommunicationSession

*state-machine* : EstablishmentOfACommunicationSession\_SM

state : CompatibleSystemVersionSupported

state : ConsiderTheCommunicationSessionEstablished

state : Idle

state : NoCompatibleSystemVersionSupported

state : RequestSetupOfASafeRadioConnection\_initiatedByOBU

diagram :

diagram\_RequestSetupOfASafeRadioConnection\_initiatedByOBU\_1

*state-machine* : RequestConnectionWithTrackSide\_SM

state : NoSuccess

state : Start

state : Success

state :

TryToEstablishConnection\_isNotPartOfStartOfMission

diagram :  
diagram\_TryToEstablishConnection\_isNotPartOfStartOfMission\_1  
*state-machine* :

RepeatSetupConnection\_SM

state : Retry

state : Start

state :

TryToEstablishConnection\_isPartOfStartOfMission

diagram :

diagram\_TryToEstablishConnection\_isPartOfStartOfMission\_1

*state-machine* :

RepeatSetupConnection\_SM

state : Retry

state : Start

state : RequestSetupOfASafeRadioConnection\_initiatedByTrackside

state :

WaitForMessage\_InitiationOfCommunicationSession\_FromTrackside

state : WaitForSystemVersionFromTrackSide

state : WaitTil\_CommunicationSessionTerminated

### 3.1.4.5. Graphical and Textual Diagrams

#### 3.1.4.5.1. View of diagram\_establish\_a\_CommunicationSession (establish\_a\_CommunicationSession)

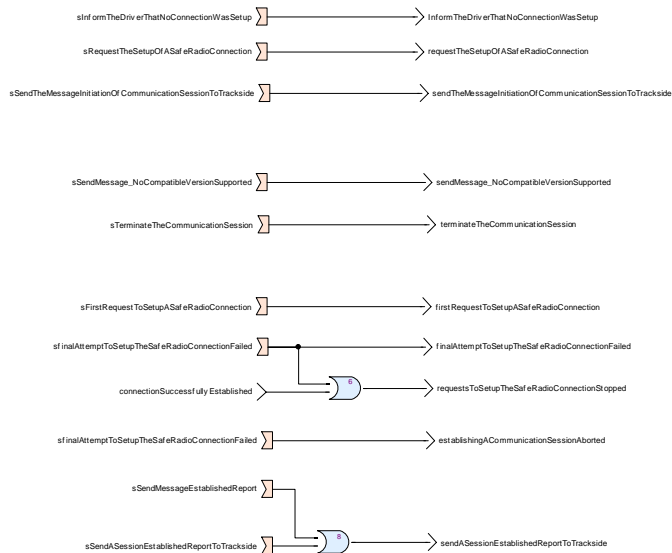
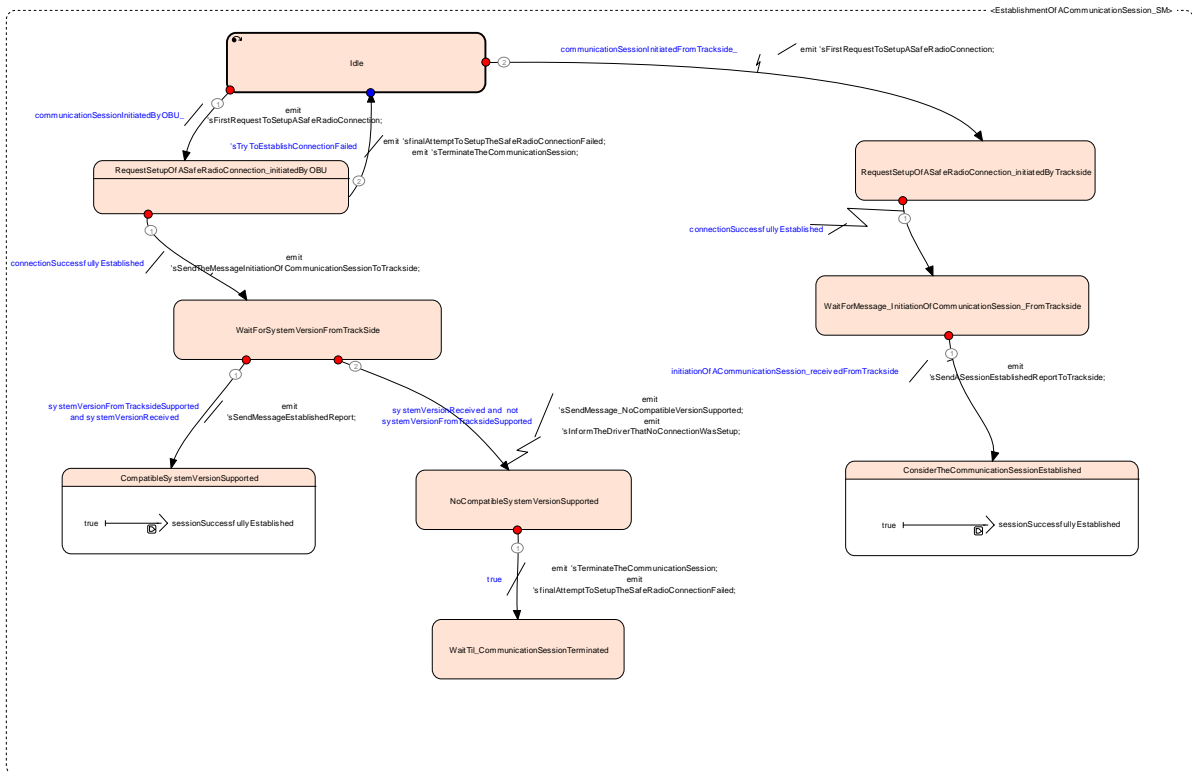


Figure 3: View of diagram\_establish\_a\_CommunicationSession (establish\_a\_CommunicationSession)

Table 15: Locals of diagram\_establish\_a\_CommunicationSession

Name	Type	Properties		Comments and Information
EstablishmentOfACommunicationSession_SM : RequestSetupOfASafeRadioConnection_initiatedByOBU: noOfConnectionRetriesExceeded	bool	default	false	Comments: 3.5.3.7 a) Traceability: 3.5.3.7
EstablishmentOfACommunicationSession_SM : RequestSetupOfASafeRadioConnection_initiatedByOBU: repeatRetryConditionFailed	bool	default	false	

Table 16: State Machines of diagram\_establish\_a\_CommunicationSession

State Machine	Comments and Information
EstablishmentOfACommunicationSession_SM	Comments: 3.5.3.7 Traceability: 3.5.3.7

Table 17: States of diagram\_establish\_a\_CommunicationSession

State	Comments and Information
EstablishmentOfACommunicationSession_SM: CompatibleSystemVersionSupported	Comments: 3.5.3.8 a) Communication Session established and SystemVersionFromTrackside supported by the OBU Traceability: 3.5.3.8
EstablishmentOfACommunicationSession_SM: ConsiderTheCommunicationSessionEstablished	Comments: 3.5.3.10 c) Traceability: 3.5.3.10
EstablishmentOfACommunicationSession_SM: Idle	Traceability: 3.5.3.10
EstablishmentOfACommunicationSession_SM: NoCompatibleSystemVersionSupported	Comments: 3.5.3.8 b) Communication Session established and SystemVersionFromTrackside not supported by the OBU Traceability: 3.5.3.8
EstablishmentOfACommunicationSession_SM: RequestSetupOfASafeRadioConnection_initiatedByOBU	Comments: 3.5.3.7 a)
EstablishmentOfACommunicationSession_SM: RequestSetupOfASafeRadioConnection_initiatedByTrackside	Comments: 3.5.3.10 a) Traceability: 3.5.3.10

State	Comments and Information
EstablishmentOfACommunicationSession_ SM:WaitForMessage_InitiationOfCommuni cationSession_FromTrackside	Comments: 3.5.3.10 b) Wait for message InitiationOfCommunicationSession from trackside. Traceability: 3.5.3.10
EstablishmentOfACommunicationSession_ SM:WaitForSystemVersionFromTrackSide	Comments: 3.5.3.7 c), 3.5.3.8 Traceability: 3.5.3.7 3.5.3.8
EstablishmentOfACommunicationSession_ SM:WaitTil_CommunicationSessionTermin ated	Comments: 3.5.3.8 b) Communication Session established and waiting til communication session terminates Traceability: 3.5.3.8

Table 18: Transitions of diagram\_establish\_a\_CommunicationSession

Source/Target	#	Conditions/Actions	Comments and Information
Source: EstablishmentOfACommunicationSe ssion_SM: Idle Target: EstablishmentOfACommunicationSe ssion_SM: RequestSetupOfASafeRad ioConnection_initiatedByOBU	1	Condition: communicationSession InitiatedByOBU_ Actions: emit 'sFirstRequestToSetup ASafeRadioConnection;	
Source: EstablishmentOfACommunicationSe ssion_SM: Idle Target: EstablishmentOfACommunicationSe ssion_SM: RequestSetupOfASafeRad ioConnection_initiatedByTrackside	2	Condition: communicationSession InitiatedFromTrackside _ Actions: emit 'sFirstRequestToSetup ASafeRadioConnection;	Comments: 3.5.3.10 a)
Source: EstablishmentOfACommunicationSe ssion_SM: NoCompatibleSystemVer sionSupported Target: EstablishmentOfACommunicationSe ssion_SM: WaitTil_CommunicationS essionTerminated	1	Condition: true Actions: let emit 'sTerminateTheCommuni cationSession; emit 'sfinalAttemptToSetupT heSafeRadioConnection Failed; tel	Comments: 3.5.3.8 b)



Source/Target	#	Conditions/Actions	Comments and Information
Source: EstablishmentOfACommunicationSession_SM: RequestSetupOfASafeRadioConnection_initiatedByOBU Target: EstablishmentOfACommunicationSession_SM: WaitForSystemVersionFromTrackSide	1	Condition: connectionSuccessfullyEstablished Actions: emit 'sSendMessageInitiationOfCommunicationSessionToTrackside;	
Source: EstablishmentOfACommunicationSession_SM: RequestSetupOfASafeRadioConnection_initiatedByOBU Target: EstablishmentOfACommunicationSession_SM: Idle	2	Condition:  'sTryToEstablishConnectionFailed Actions: let emit 'sfinalAttemptToSetupTheSafeRadioConnectionFailed; emit 'sTerminateTheCommunicationSession; tel	
Source: EstablishmentOfACommunicationSession_SM: RequestSetupOfASafeRadioConnection_initiatedByTrackside Target: EstablishmentOfACommunicationSession_SM: WaitForMessage_InitiationOfCommunicationSession_FromTrackside	1	Condition: connectionSuccessfullyEstablished	
Source: EstablishmentOfACommunicationSession_SM: WaitForMessage_InitiationOfCommunicationSession_FromTrackside Target: EstablishmentOfACommunicationSession_SM: ConsiderTheCommunicationSessionEstablished	1	Condition: initiationOfACommunicationSession_receivedFromTrackside Actions: emit 'sSendASessionEstablishedReportToTrackside;	Comments: 3.5.3.10 c)
Source: EstablishmentOfACommunicationSession_SM: WaitForSystemVersionFromTrackSide Target: EstablishmentOfACommunicationSession_SM: CompatibleSystemVersionSupported	1	Condition: systemVersionFromTracksideSupported and systemVersionReceived Actions: emit 'sSendMessageEstablishedReport;	

Source/Target	#	Conditions/Actions	Comments and Information
Source: EstablishmentOfACommunicationSession_SM: WaitForSystemVersionFromTrackSide Target: EstablishmentOfACommunicationSession_SM: NoCompatibleSystemVersionSupported	2	Condition: systemVersionReceived and not systemVersionFromTracksideSupported Actions: let emit 'sSendMessage_NoCompatibleVersionSupported; emit 'sInformTheDriverThatNoConnectionWasSetup; tel	

3.1.4.5.2. View of diagram\_RequestSetupOfASafeRadioConnection\_initiatedByOBU\_1 (establish\_a\_CommunicationSession/EstablishmentOfACommunicationSession\_SM: RequestSetupOfASafeRadioConnection\_initiatedByOBU:)

*Owner diagram:* diagram\_establish\_a\_CommunicationSession

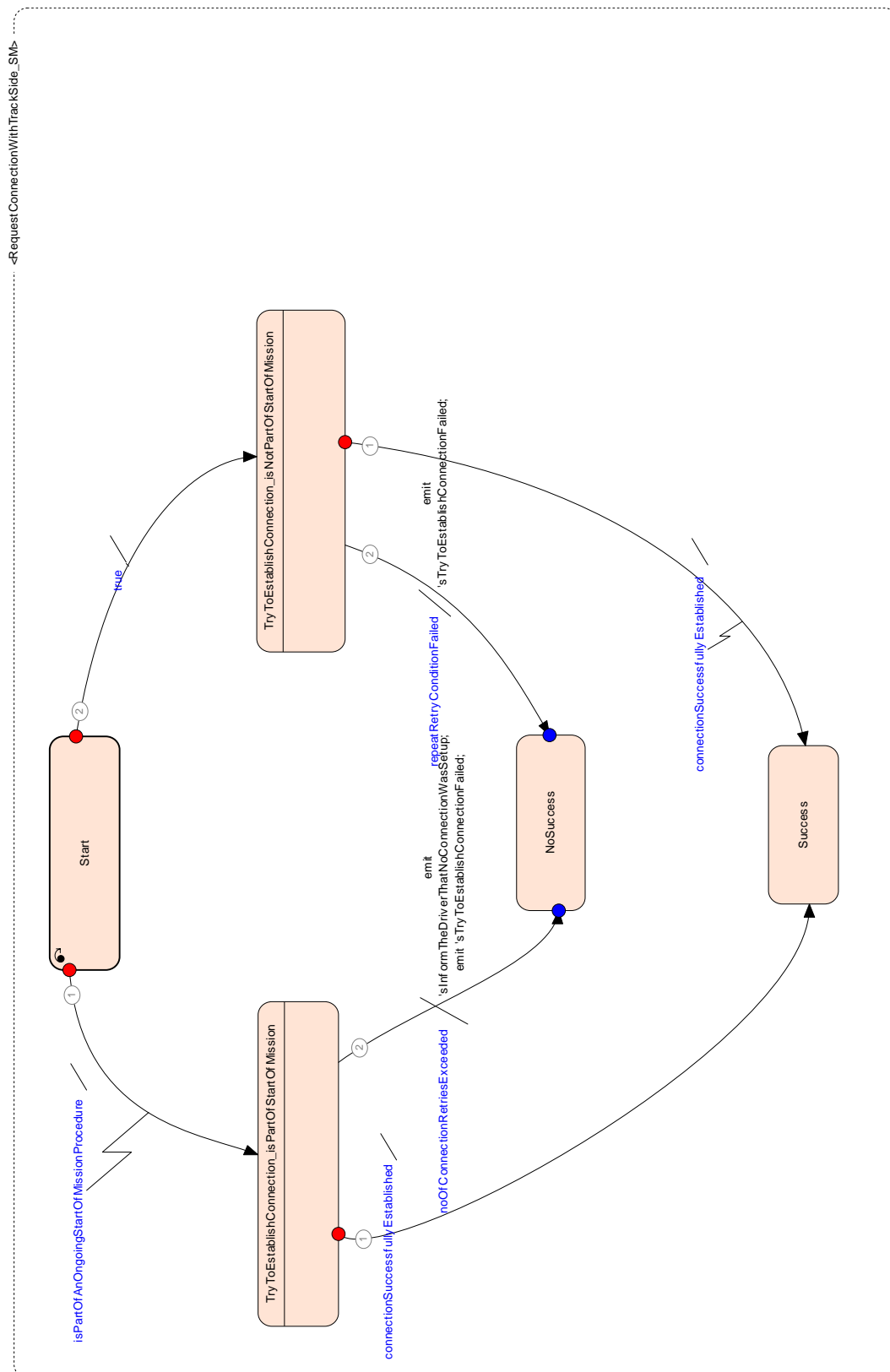


Figure 4: View of diagram\_RequestSetupOfASafeRadioConnection\_initiatedByOBU\_1 (establish\_a\_CommunicationSession/EstablishmentOfACommunicationSession\_SM:RequestSetupOfASafeRadioConnection\_initiatedByOBU:)

Table 19: State Machines of diagram\_RequestSetupOfASafeRadioConnection\_initiatedByOBU\_1

State Machine	Comments and Information
RequestConnectionWithTrackSide_SM	Comments: 3.5.3.7 Traceability: 3.5.3.7

Table 20: States of diagram\_RequestSetupOfASafeRadioConnection\_initiatedByOBU\_1

State	Comments and Information
RequestConnectionWithTrackSide_SM: No Success	
RequestConnectionWithTrackSide_SM: Start	
RequestConnectionWithTrackSide_SM: Success	
RequestConnectionWithTrackSide_SM: TryToEstablishConnection_isNotPartOfStartOfMission	
RequestConnectionWithTrackSide_SM: TryToEstablishConnection_isPartOfStartOfMission	Comments: 3.5.3.7 a) Traceability: 3.5.3.7

Table 21: Transitions of diagram\_RequestSetupOfASafeRadioConnection\_initiatedByOBU\_1

Source/Target	#	Conditions/Actions	Comments and Information
Source: RequestConnectionWithTrackSide_SM: Start Target: RequestConnectionWithTrackSide_SM: TryToEstablishConnection_isPartOfStartOfMission	1	Condition: isPartOfAnOngoingStartOfMissionProcedure	
Source: RequestConnectionWithTrackSide_SM: Start Target: RequestConnectionWithTrackSide_SM: TryToEstablishConnection_isNotPartOfStartOfMission	2	Condition: true	
Source: RequestConnectionWithTrackSide_SM: TryToEstablishConnection_isNotPartOfStartOfMission Target: RequestConnectionWithTrackSide_SM: Success	1	Condition: connectionSuccessfullyEstablished	
Source: RequestConnectionWithTrackSide_SM: TryToEstablishConnection_isNotPartOfStartOfMission Target: RequestConnectionWithTrackSide_SM: NoSuccess	2	Condition: repeatRetryConditionFailed Actions: emit 'sTryToEstablishConnectionFailed;	

Source/Target	#	Conditions/Actions	Comments and Information
Source: RequestConnectionWithTrackSide_ SM: TryToEstablishConnection_isPar tOfStartOfMission Target: RequestConnectionWithTrackSide_ SM: Success	1	Condition: connectionSuccessfully Established	
Source: RequestConnectionWithTrackSide_ SM: TryToEstablishConnection_isPar tOfStartOfMission Target: RequestConnectionWithTrackSide_ SM: NoSuccess	2	Condition: noOfConnectionRetries Exceeded Actions: let emit 'sInformTheDriverThat NoConnectionWasSetu p; emit 'sTryToEstablishConnec tionFailed; tel	

3.1.4.5.3. View of diagram\_TryToEstablishConnection\_isNotPartOfStartOfMission\_1  
(establish\_a\_CommunicationSession/EstablishmentOfACommunicationSession\_SM: Reque  
stSetupOfASafeRadioConnection\_initiatedByOBU: RequestConnectionWithTrackSide\_SM: T  
ryToEstablishConnection\_isNotPartOfStartOfMission:)

Owner diagram: diagram\_RequestSetupOfASafeRadioConnection\_initiatedByOBU\_1

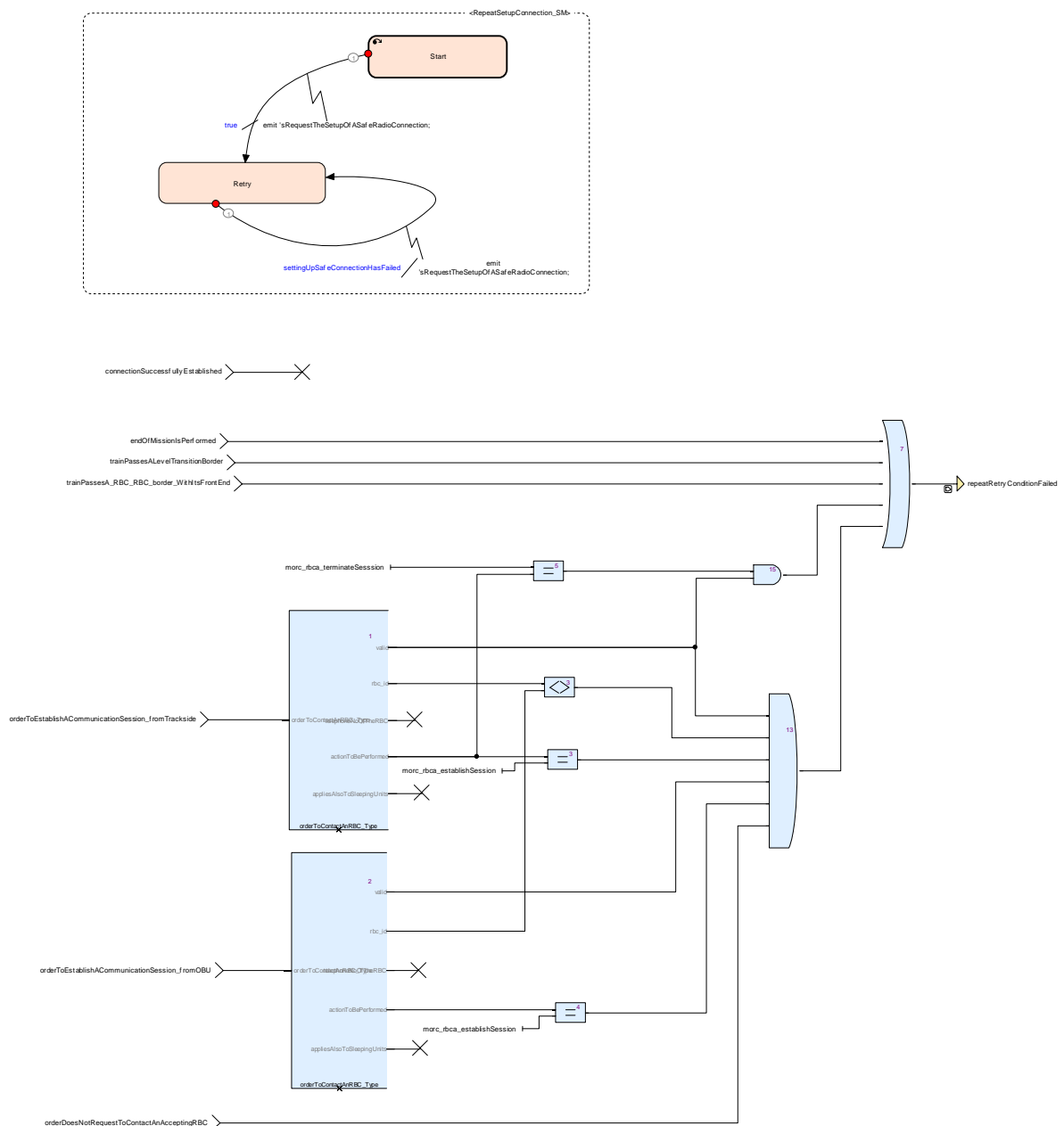


Figure 5: View of diagram\_TryToEstablishConnection\_isNotPartOfStartOfMission\_1 (establish\_a\_CommunicationSession/EstablishmentOfACommunicationSession\_SM:RequestSetupOfASafeRadioConnection\_initiatedByOBU:RequestConnectionWithTrackSide\_SM:TryToEstablishConnection\_isNotPartOfStartOfMission:)

Table 22: State Machines of diagram\_TryToEstablishConnection\_isNotPartOfStartOfMission\_1

State Machine	Comments and Information
RepeatSetupConnection_SM	

Table 23: States of diagram\_TryToEstablishConnection\_isNotPartOfStartOfMission\_1

State	Comments and Information
RepeatSetupConnection_SM: Retry	
RepeatSetupConnection_SM: Start	

Table 24: Transitions of diagram\_TryToEstablishConnection\_isNotPartOfStartOfMission\_1

Source/Target	#	Conditions/Actions	Comments and Information
Source: RepeatSetupConnection_SM: Retry Target: RepeatSetupConnection_SM: Retry	1	Condition: settingUpSafeConnecti onHasFailed Actions: emit 'sRequestTheSetupOfA SafeRadioConnection;	
Source: RepeatSetupConnection_SM: Start Target: RepeatSetupConnection_SM: Retry	1	Condition: true Actions: emit 'sRequestTheSetupOfA SafeRadioConnection;	

3.1.4.5.4. View of diagram\_TryToEstablishConnection\_isPartOfStartOfMission\_1  
(establish\_a\_CommunicationSession/EstablishmentOfACommunicationSession\_SM: Reque  
stSetupOfASafeRadioConnection\_initiatedByOBU: RequestConnectionWithTrackSide\_SM: T  
ryToEstablishConnection\_isPartOfStartOfMission:)

*Owner diagram:* diagram\_RequestSetupOfASafeRadioConnection\_initiatedByOBU\_1

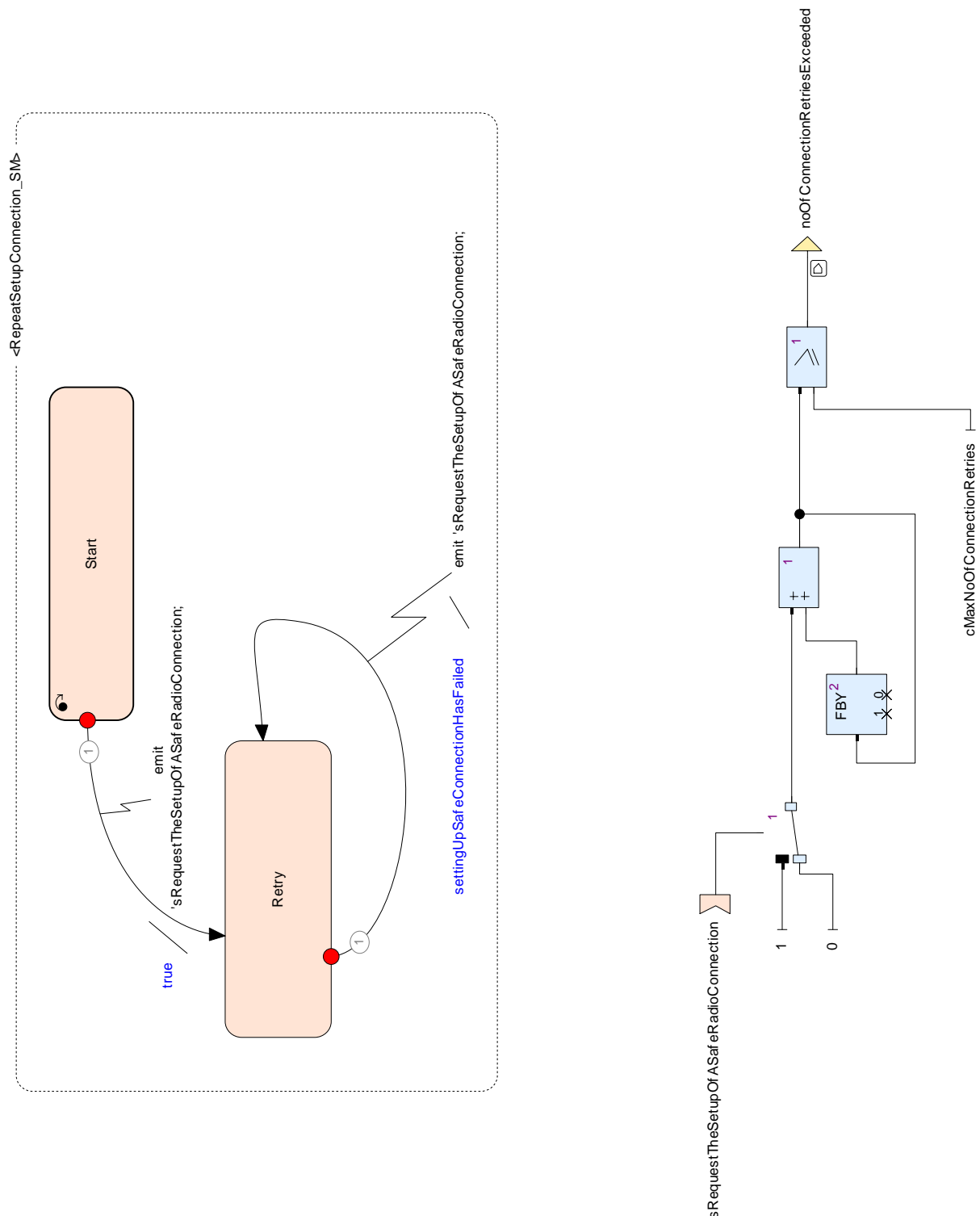


Figure 6: View of diagram\_TryToEstablishConnection\_isPartOfStartOfMission\_1 (establish\_a\_CommunicationSession/EstablishmentOfACommunicationSession\_SM:RequestSetupOfASafeRadioConnection\_initiatedByOBU:RequestConnectionWithTrackSide\_SM:TryToEstablishConnection\_isPartOfStartOfMission:)

Table 25: State Machines of diagram\_TryToEstablishConnection\_isPartOfStartOfMission\_1

State Machine	Comments and Information
RepeatSetupConnection_SM	



Table 26: States of diagram\_TryToEstablishConnection\_isPartOfStartOfMission\_1

State	Comments and Information
RepeatSetupConnection_SM: Retry	
RepeatSetupConnection_SM: Start	

Table 27: Transitions of diagram\_TryToEstablishConnection\_isPartOfStartOfMission\_1

Source/Target	#	Conditions/Actions	Comments and Information
Source: RepeatSetupConnection_SM: Retry Target: RepeatSetupConnection_SM: Retry	1	Condition: settingUpSafeConnecti onHasFailed Actions: emit 'sRequestTheSetupOfA SafeRadioConnection;	
Source: RepeatSetupConnection_SM: Start Target: RepeatSetupConnection_SM: Retry	1	Condition: true Actions: emit 'sRequestTheSetupOfA SafeRadioConnection;	

### 3.1.5. evaluateOrderToContactAnRBD Operator

Declared as **private node**

#### 3.1.5.1. Comments and Information

evaluateOrderToContactAnRBD Comments:

- Subset 096, REQ 3.5.3.13, 3.5.3.16, 3.5.3.13.1, 3.5.3.14, 3.5.3.15:
- Evaluates the order to contact a RBC, i. e. establish, maintain or terminate a communication session.

Table 28: evaluateOrderToContactAnRBD Annotations

Note Name	Attribute	Value
Remark_1	Description	<p>- Name: evaluateOrderToContactAnRBD  - Description: Evaluates the orders to establish, maintain or terminate a communication session  - Copyright Siemens AG, 2013  - Licensed under the EUPL V.1.1 ( <a href="http://joinup.ec.europa.eu/software/page/eupl/licence-eupl">http://joinup.ec.europa.eu/software/page/eupl/licence-eupl</a> )  - Gist URL: ---  - Cryptography: No  - Author(s): Uwe Steinke</p> <p>The use of this software is limited to non-vital applications.  It has not been developed for vital operation purposes and must not be used for applications which may cause harm to people, physical accidents or financial loss.  THEREFORE, NO LIABILITY WILL BE GIVEN FOR SUCH AND ANY OHER KIND OF USE.</p>

Note Name	Attribute	Value
	to_c	True

evaluateOrderToContactAnRBD Traceability:

- 3.5.3.13
- 3.5.3.14
- 3.5.3.15
- 3.5.3.13.1
- 3.5.3.16

### 3.1.5.2. Interface

Table 29: Inputs of evaluateOrderToContactAnRBD

Name	Type	Comments and Information
order_in	orderToContactAnRBC_Type	
onBoardStoredShortPhoneNo	rbc_phoneNo_Type	

Table 30: Outputs of evaluateOrderToContactAnRBD

Name	Type	Comments and Information
order_out	orderToContactAnRBC_Type	

### 3.1.5.3. Operator Hierarchy

diagram : diagram\_evaluateOrderToContactAnRBD\_1

### 3.1.5.4. Graphical and Textual Diagrams

#### 3.1.5.4.1. View of diagram\_evaluateOrderToContactAnRBD\_1 (evaluateOrderToContactAnRBD)

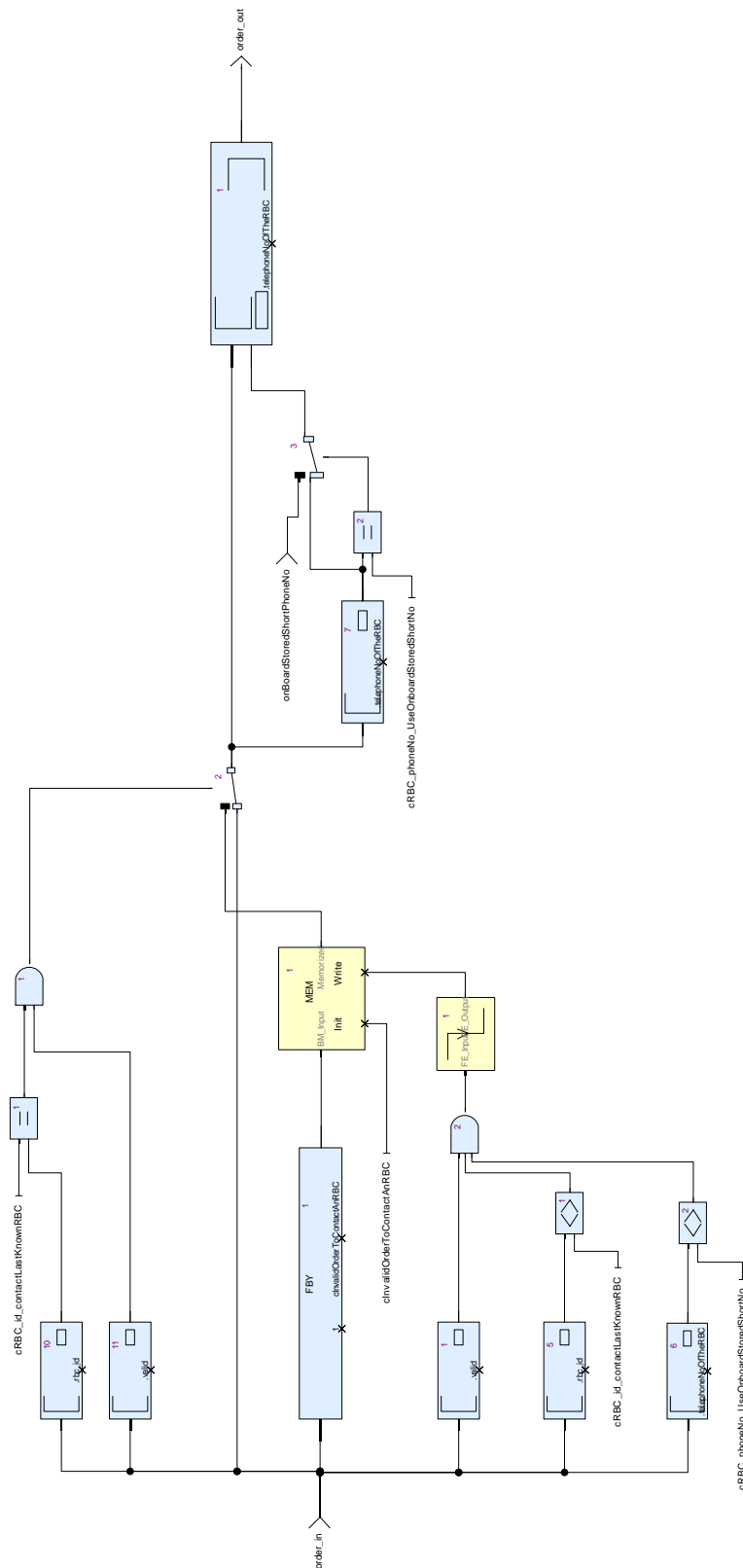


Figure 7: View of diagram\_evaluateOrderToContactAnRBD\_1 (evaluateOrderToContactAnRBD)

diagram\_evaluateOrderToContactAnRBD\_1 Traceability:

- 3.5.3.13.1

### 3.1.6. Initiate\_a\_Session Operator

Declared as **private node**

#### 3.1.6.1. Comments and Information

Initiate\_a\_Session Comments:

- Subset 096, REQ 3.5.3:
- Determines, if a communication session has to be initiated.

Table 31: Initiate\_a\_Session Annotations

Note Name	Attribute	Value
Remark_1	Description	<ul style="list-style-type: none"> <li>- Name: Initiate_a_Session</li> <li>- Description: Determines, if a communication session has to be initiated.</li> <li>- Copyright Siemens AG, 2013</li> <li>- Licensed under the EUPL V.1.1 ( <a href="http://joinup.ec.europa.eu/software/page/eupl/licence-eupl">http://joinup.ec.europa.eu/software/page/eupl/licence-eupl</a> )</li> <li>- Gist URL: ---</li> <li>- Cryptography: No</li> <li>- Author(s): Uwe Steinke</li> </ul> <p>The use of this software is limited to non-vital applications.  It has not been developed for vital operation purposes and must not be used for applications which may cause harm to people, physical accidents or financial loss.  THEREFORE, NO LIABILITY WILL BE GIVEN FOR SUCH AND ANY OTHER KIND OF USE.</p>
	to_c	True

#### 3.1.6.2. Interface

Table 32: Inputs of Initiate\_a\_Session

Name	Type	Comments and Information
initiateRequest_fromOnboardEquipment	bool	Comments: 3.5.3.1: Initiate Request from ERTMS/ETCS on-board equipment Traceability: 3.5.3.1
initiateRequest_fromRBC	bool	
initiateRequest_fromRadio_InfillUnit	bool	
etcs_level	M_LEVEL_Type	
atStartOfMission	bool	Comments: Start of Mission 3.5.3.4. a) Traceability: 3.5.3.4

Name	Type	Comments and Information
establishSessionOrderedFromTrackside	bool	Comments: 3.5.3.4 b) Is this the same as the initiateRequest_fromRBC input ?
etcs_mode	M_MODE_Type	
modeChangeHasToBeReportedToRBC	bool	Comments: 3.5.3.4 c) Traceability: 3.5.3.4
driverHasManuallyChangedLevel	bool	Comments: 3.5.3.4 d)
trainFrontReachesEndOfAnnouncedRadioHole	bool	Comments: 3.5.3.4e)
prevSessionTerminatedDueToLossOfSafeRadioConnection	bool	Comments: 3.5.3.4 f)
startOfMissionProcedureCompleted	bool	Comments: 3.5.3.4 e)
NoCommunicationSessionEstablished	bool	Comments: 3.5.3.4 g)
initiateEstablishingNewSessionRequest	bool	Comments: 3.5.3.5.2 Traceability: 3.5.3.5.2

Table 33: Outputs of Initiate\_a\_Session

Name	Type	Comments and Information
initiate_a_communicationSession_Request	bool	
communicationSessionInitiatedByOBU_	bool	Traceability: 3.5.3.7
communicationSessionInitiatedFromTrackside_	bool	

### 3.1.6.3. Locals

Table 34: Locals of Initiate\_a\_Session

Name	Type	Comments and Information
establishACommunicationSession_1	bool	Comments: 3.5.3.4
initiateACommunicationSession_loc	bool	

### 3.1.6.4. Operator Hierarchy

diagram : diagram\_Initiate\_a\_Session\_1

diagram : diagram\_Initiate\_a\_Session\_2

### 3.1.6.5. Graphical and Textual Diagrams

#### 3.1.6.5.1. View of diagram\_Initiate\_a\_Session\_1 (Initiate\_a\_Session)

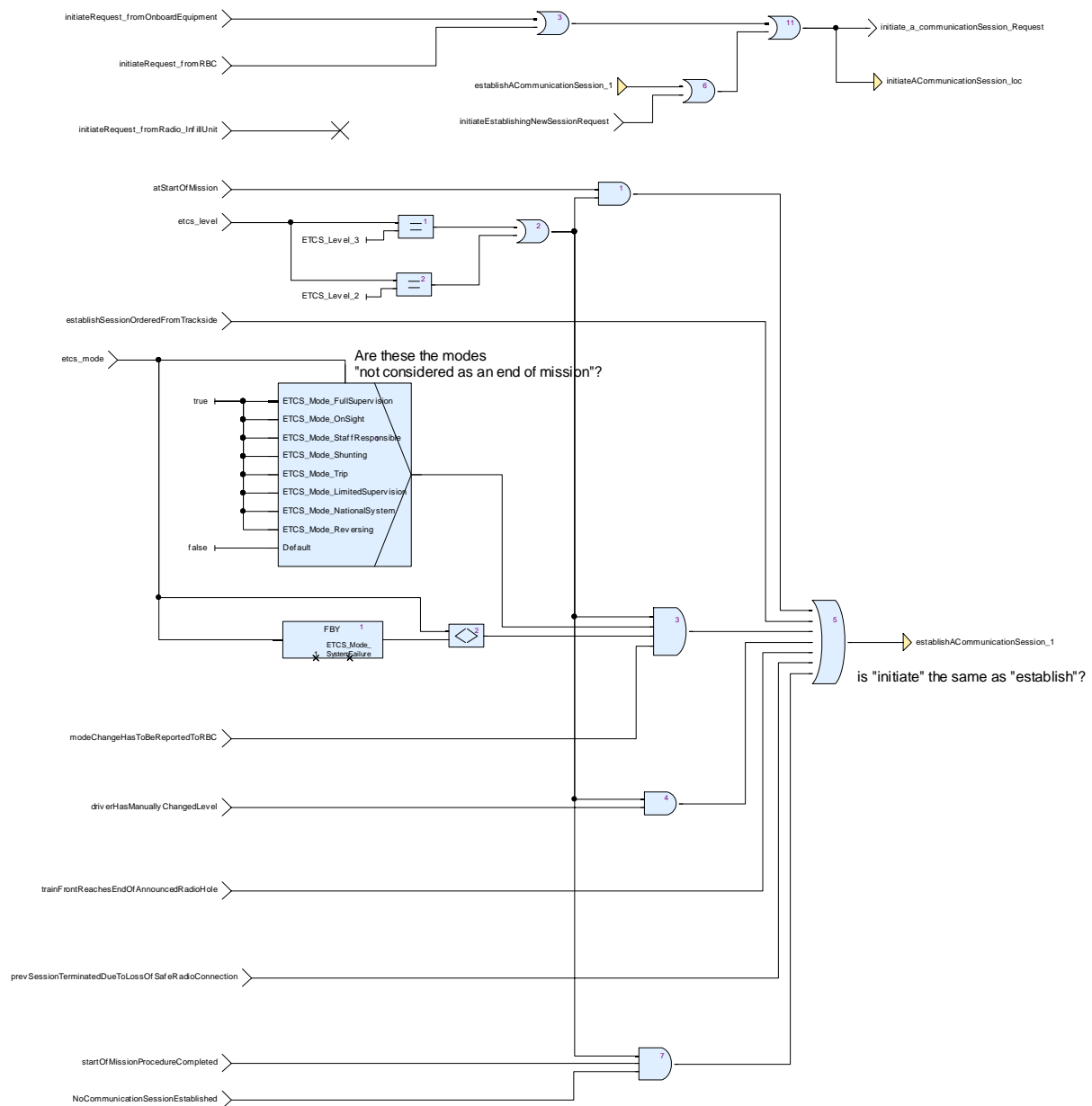


Figure 8: View of diagram\_Initiate\_a\_Session\_1 (Initiate\_a\_Session)

diagram\_Initiate\_a\_Session\_1 Traceability:

- 3.5.3.4

### 3.1.6.5.2. View of diagram\_Initiate\_a\_Session\_2 (Initiate\_a\_Session)

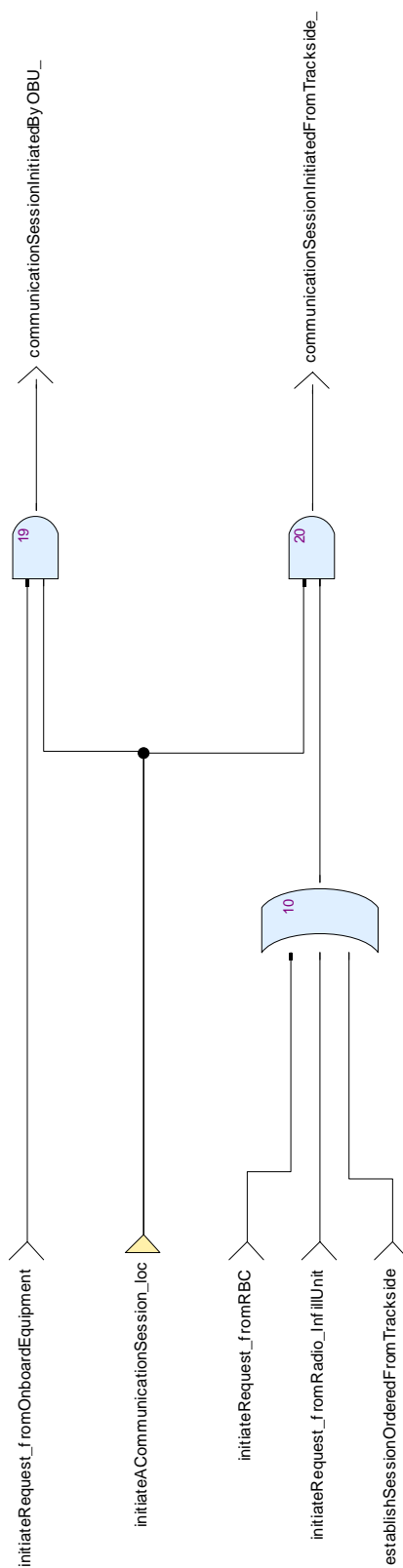


Figure 9: View of diagram\_Initiate\_a\_Session\_2 (Initiate\_a\_Session)

### 3.1.7. initiateTerminatingASession Operator

Declared as **private node**

#### 3.1.7.1. Comments and Information

initiateTerminatingASession Comments:

- Subset 096, REQ 3.5.5.1
- Initiates and processes the termination of a communication session.

Table 35: initiateTerminatingASession Annotations

Note Name	Attribute	Value
Remark_1	Description	- Name: initiateTerminatingASession - Description: Initiates and processes the termination of a communication session. - Copyright Siemens AG, 2013 - Licensed under the EUPL V.1.1 ( <a href="http://joinup.ec.europa.eu/software/page/eupl/licence-eupl">http://joinup.ec.europa.eu/software/page/eupl/licence-eupl</a> ) - Gist URL: --- - Cryptography: No - Author(s): Uwe Steinke  The use of this software is limited to non-vital applications. It has not been developed for vital operation purposes and must not be used for applications which may cause harm to people, physical accidents or financial loss. THEREFORE, NO LIABILITY WILL BE GIVEN FOR SUCH AND ANY OTHER KIND OF USE.
	to_c	True

initiateTerminatingASession Traceability:

- 3.5.5.1

#### 3.1.7.2. Interface

Table 36: Inputs of initiateTerminatingASession

Name	Type	Comments and Information
orderReceivedFromTrasckside	orderToContactAnRBC_Type	Comments: 3.5.5.1a) Traceability: 3.5.5.1
errorConditionRequiringTerminationDetected	bool	Comments: 3.5.5.1b) Traceability: 3.5.5.1
trainIsRejectedByRBC_duringStartOfMission	bool	Comments: 3.5.5.1c) Traceability: 3.5.5.1



Name	Type	Comments and Information
driverClosesTheDeskdu ringStartOfMission	bool	Comments: 3.5.5.1d) Traceability: 3.5.5.1
trainExitedFromAnRBC Area	bool	Comments: 3.5.5.1e) Traceability: 3.5.5.1
receivedOrderToTermin ateTheSession	orderToContactAnRBC_ Type	Comments: 3.5.5.1e) Traceability: 3.5.5.1
actualTime	time_Type	
isInCommunicationSes sionWithAnRIU	bool	Comments: 3.5.5.1f) Traceability: 3.5.5.1
level_1_isLeft	bool	Comments: 3.5.5.1f) Traceability: 3.5.5.1
endOfMissionIsExecute d	bool	Comments: 3.5.5.1f) Traceability: 3.5.5.1

Table 37: Outputs of initiateTerminatingASession

Name	Type	Comments and Information
initiateTermination	bool	
sendAPositionReport	bool	Comments: 3.5.5.1e) Traceability: 3.5.5.1

### 3.1.7.3. Locals

Table 38: Locals of initiateTerminatingASession

Name	Type	Properties		Comments and Information
definedNumberOfRepet itionsHasBeenReached	bool	default	false	Comments: 3.5.5.1e) Traceability: 3.5.5.1
noReplyReceivedAfterL astRepetition	bool			Comments: 3.5.5.1e) Traceability: 3.5.5.1
orderToTerminateTheS essionIsReceived	bool			Comments: 3.5.5.1e) Traceability: 3.5.5.1

Table 39: Signals of initiateTerminatingASession

Name	Comments and Information
sSendAPositionReport	Comments: 3.5.5.1e) Traceability: 3.5.5.1
sTerminateTheCommunicationSession	Comments: 3.5.5.1e) Traceability: 3.5.5.1

#### 3.1.7.4. Operator Hierarchy

diagram : diagram\_initiateTerminatingASession\_1

diagram : diagram\_initiateTerminatingASession\_2

*state-machine* : TrainExitedFromRBCArea\_SM

state : Idle

state : WaitForOrderToTerminateTheSession

diagram : diagram\_WaitForOrderToTerminateTheSession\_1

### 3.1.7.5. Graphical and Textual Diagrams

#### 3.1.7.5.1. View of diagram\_initiateTerminatingASession\_1 (initiateTerminatingASession)

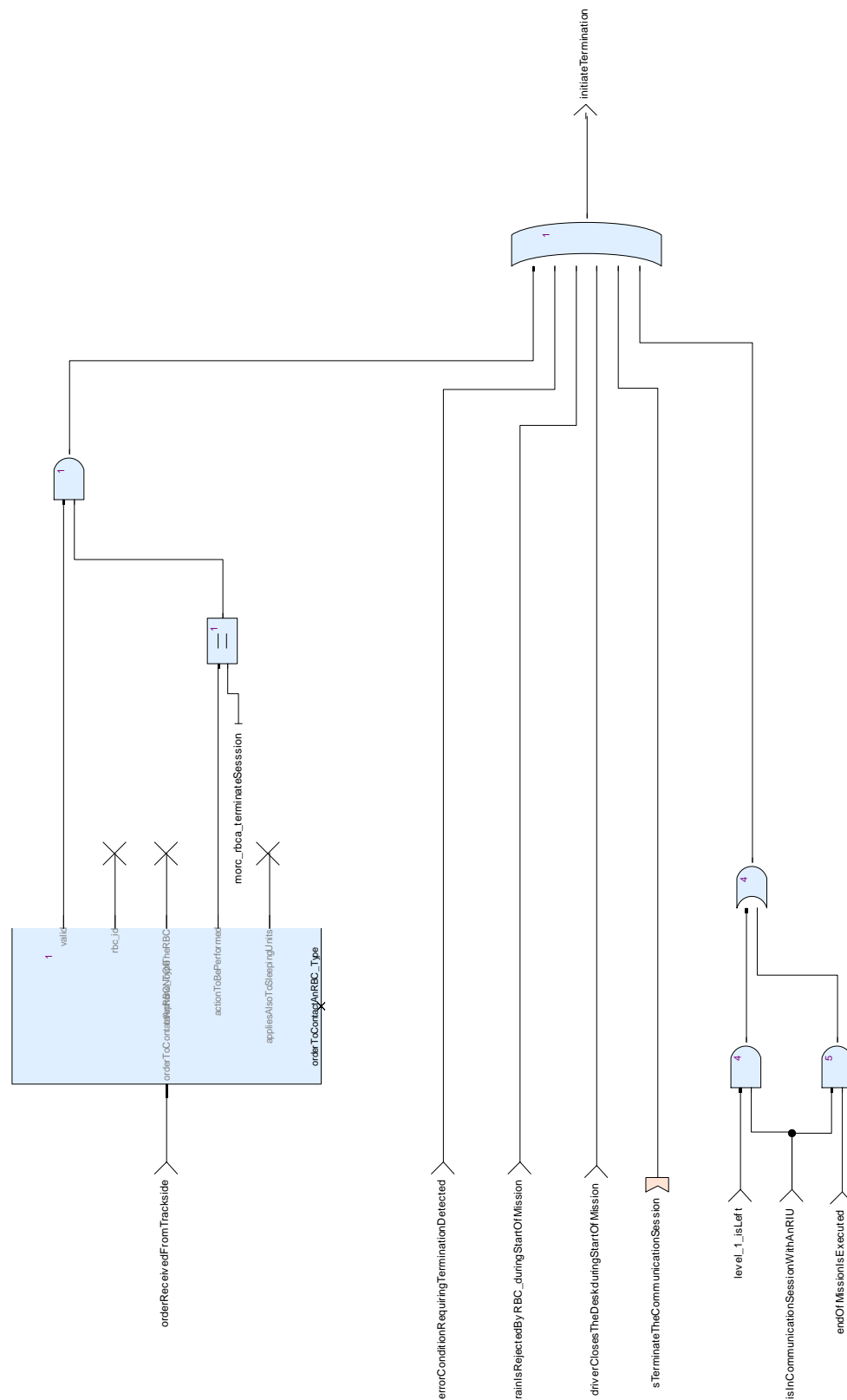


Figure 10: View of diagram\_initiateTerminatingASession\_1 (InitiateTerminatingASession)

### 3.1.7.5.2. View of diagram\_initiateTerminatingASession\_2 (initiateTerminatingASession)

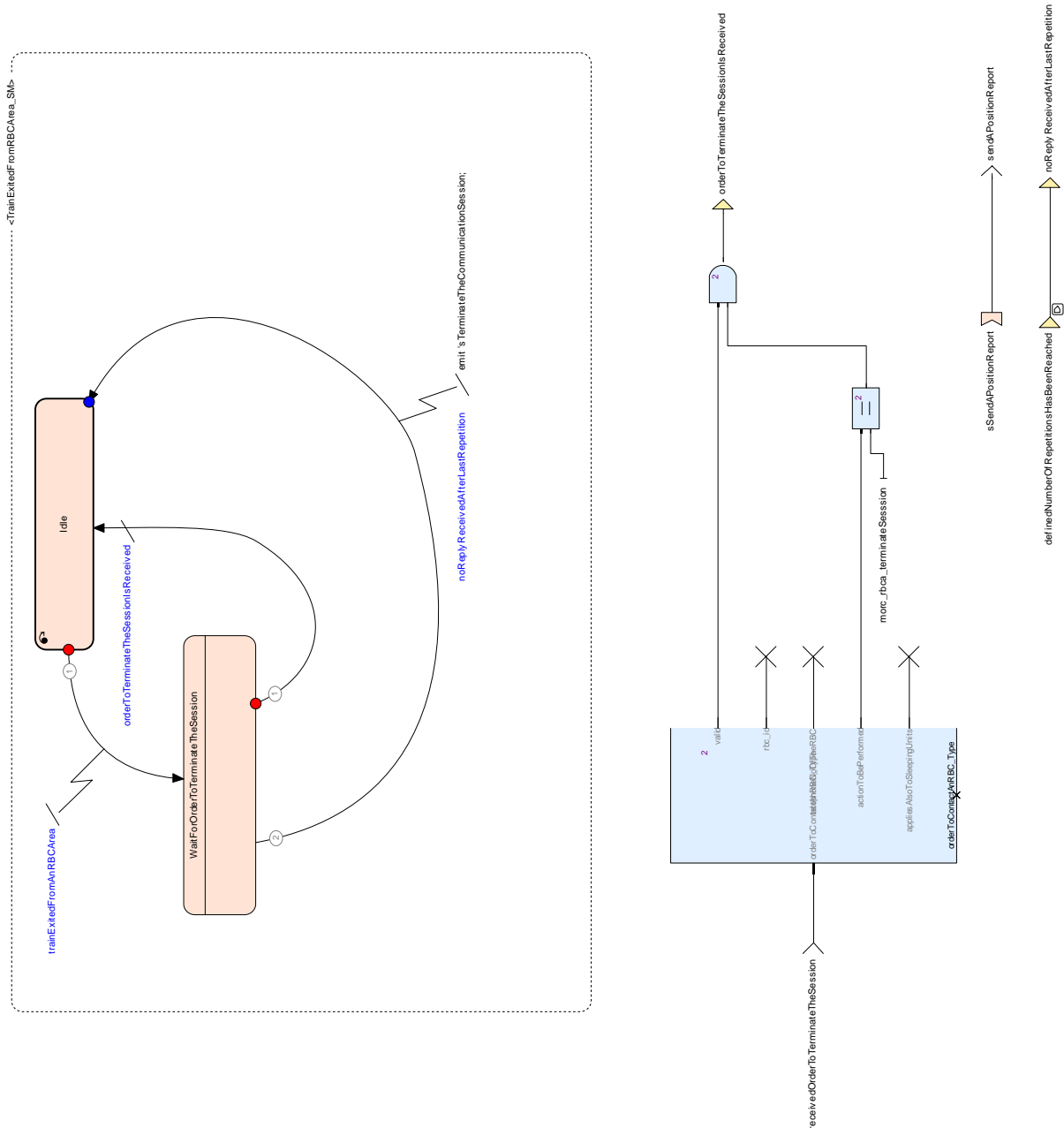


Figure 11: View of diagram\_initiateTerminatingASession\_2 (initiateTerminatingASession)

Table 40: State Machines of diagram\_initiateTerminatingASession\_2

State Machine	Comments and Information
TrainExitedFromRBCArea_SM	Comments: 3.5.5.1e Traceability: 3.5.5.1

Table 41: States of diagram\_initiateTerminatingASession\_2

State	Comments and Information
TrainExitedFromRBCArea_SM: Idle	
TrainExitedFromRBCArea_SM: WaitForOrderToTerminateTheSession	Traceability: 3.5.5.1

Table 42: Transitions of diagram\_initiateTerminatingASession\_2

Source/Target	#	Conditions/Actions	Comments and Information
Source: TrainExitedFromRBCArea_SM: Idle Target: TrainExitedFromRBCArea_SM: WaitForOrderToTerminateTheSession	1	Condition: trainExitedFromAnRBCArea Actions:	
Source: TrainExitedFromRBCArea_SM: WaitForOrderToTerminateTheSession Target: TrainExitedFromRBCArea_SM: Idle	1	Condition: orderToTerminateTheSessionIsReceived	
Source: TrainExitedFromRBCArea_SM: WaitForOrderToTerminateTheSession Target: TrainExitedFromRBCArea_SM: Idle	2	Condition: noReplyReceivedAfterLastRepetition Actions: emit 'sTerminateTheCommunicationSession;	

3.1.7.5.3. View of diagram\_WaitForOrderToTerminateTheSession\_1  
(initiateTerminatingASession/TrainExitedFromRBCArea\_SM: WaitForOrderToTerminateTheSession:)

Owner diagram: diagram\_initiateTerminatingASession\_2

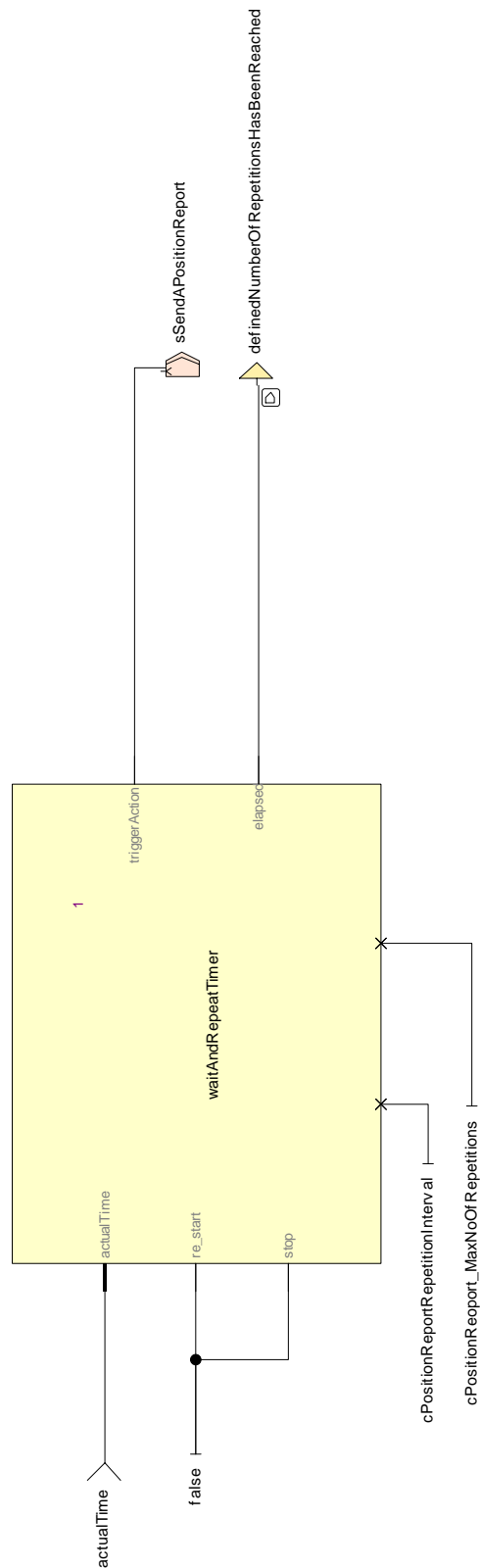


Figure 12: View of diagram\_WaitForOrderToTerminateTheSession\_1  
 (initiateTerminatingASession/TrainExitedFromRBCArea\_SM:WaitForOrderToTerminateTheSession:)

diagram\_WaitForOrderToTerminateTheSession\_1 Traceability:

- 3.5.5.1

### 3.1.8. isOrderToEstablishConnection Operator

Declared as **private function**

#### 3.1.8.1. Comments and Information

isOrderToEstablishConnection Comments:

- Checks, if the order carries a valid "Establish Session" command

Table 43: isOrderToEstablishConnection Annotations

Note Name	Attribute	Value
Remark_1	Description	- Name: isOrderToEstablishConnection - Description: Checks, if the order carries a valid "Establish Session" command - Copyright Siemens AG, 2013 - Licensed under the EUPL V.1.1 ( <a href="http://joinup.ec.europa.eu/software/page/eupl/licence-eupl">http://joinup.ec.europa.eu/software/page/eupl/licence-eupl</a> ) - Gist URL: --- - Cryptography: No - Author(s): Uwe Steinke  The use of this software is limited to non-vital applications. It has not been developed for vital operation purposes and must not be used for applications which may cause harm to people, physical accidents or financial loss. THEREFORE, NO LIABILITY WILL BE GIVEN FOR SUCH AND ANY OTHER KIND OF USE.
	to_c	True

#### 3.1.8.2. Interface

Table 44: Inputs of isOrderToEstablishConnection

Name	Type	Comments and Information
order	orderToContactAnRBC_Type	

Table 45: Outputs of isOrderToEstablishConnection

Name	Type	Comments and Information
isEstablishCmd	bool	

#### 3.1.8.3. Operator Hierarchy

diagram : diagram\_isOrder

### 3.1.8.4. Graphical and Textual Diagrams

#### 3.1.8.4.1. View of diagram\_isOrder (isOrderToEstablishConnection)

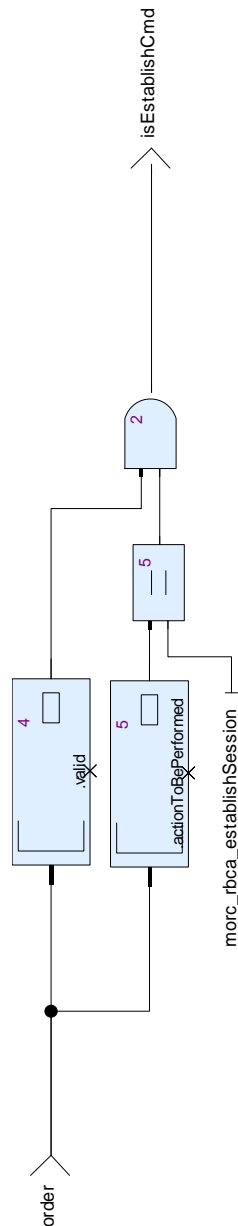


Figure 13: View of diagram\_isOrder (isOrderToEstablishConnection)

### 3.1.9. maintaining\_a\_CommunicationSession Operator

Declared as **private node**

#### 3.1.9.1. Comments and Information

maintaining\_a\_CommunicationSession Comments:

- Subset 096, REQ 3.5.4
- Maintains an established communication session.



Table 46: maintaining\_a\_CommunicationSession Annotations

Note Name	Attribute	Value
Remark_1	Description	<ul style="list-style-type: none"> <li>- Name: maintaining_a_CommunicationSession</li> <li>- Description: Maintains an established communication session.</li> <li>- Copyright Siemens AG, 2013</li> <li>- Licensed under the EUPL V.1.1 ( <a href="http://joinup.ec.europa.eu/software/page/eupl/licence-eupl">http://joinup.ec.europa.eu/software/page/eupl/licence-eupl</a> )</li> <li>- Gist URL: ---</li> <li>- Cryptography: No</li> <li>- Author(s): Uwe Steinke</li> </ul> <p>The use of this software is limited to non-vital applications.  It has not been developed for vital operation purposes and must not be used for applications which may cause harm to people, physical accidents or financial loss.  THEREFORE, NO LIABILITY WILL BE GIVEN FOR SUCH AND ANY OTHER KIND OF USE.</p>
	to_c	True

### 3.1.9.2. Interface

Table 47: Inputs of maintaining\_a\_CommunicationSession

Name	Type	Comments and Information
communicationSessionEstablished	bool	Comments: 3.5.4.1 Traceability: 3.5.4.1
safeRadioConnectionReestablished	bool	Comments: 3.5.4.1 Traceability: 3.5.4.1
lossOfTheSafeRadioConnection	bool	Comments: 3.5.4.1 Traceability: 3.5.4.1
disconnectionHasNotBeenOrdered	bool	Comments: 3.5.4.1 Traceability: 3.5.4.1
trainFrontInsideInAnAnnouncedRadioHole	bool	Comments: 3.5.4.4 Traceability: 3.5.4.4
actualTime	time_Type	

Table 48: Outputs of maintaining\_a\_CommunicationSession

Name	Type	Properties		Comments and Information
tryToSetupANewSafeRadioConnection	bool	default	false	
informTheDriverThatNoConnectionWasSetup	bool			

Name	Type	Properties	Comments and Information
firstRequestToSetupASafeRadioConnection	bool		Comments: 3.5.7.3b) Traceability: 3.5.7.3
finalAttemptToSetupTheSafeRadioConnectionFailed	bool		Comments: 3.5.7.5[6] Traceability: 3.5.7.5
requestsToSetupTheSafeRadioConnectionStopped	bool		Comments: 3.5.7.4 Traceability: 3.5.7.4

### 3.1.9.3. Locals

Table 49: Signals of maintaining\_a\_CommunicationSession

Name	Comments and Information
sConneccionLostInAnnouncedRadioHole	
sFinalAttemptToSetupTheSafeRadioConnectionFailed	
sInformTheDriverThatNoConnectionWasSetup	
sStartToTryToSetupASafeRadioConnection	Comments: 3.5.7.3b) Traceability: 3.5.7.3

### 3.1.9.4. Operator Hierarchy

diagram : diagram\_maintaining\_a\_CommunicationSession\_1

*state-machine* : Maintaining\_SM

state : CommunicationSessionEstablished

diagram : diagram\_CommunicationSessionEstablished\_1

*state-machine* : RadioConnection\_SM

state : ConneccionLostInAnnouncedRadioHole

state : ConnectionLost

state : RadioConnectionLostTimerExpired

state : SafeRadio\_connected

state : CommunicationSessionNotEstablished

### 3.1.9.5. Graphical and Textual Diagrams

#### 3.1.9.5.1. View of diagram\_maintaining\_a\_CommunicationSession\_1 (maintaining\_a\_CommunicationSession)

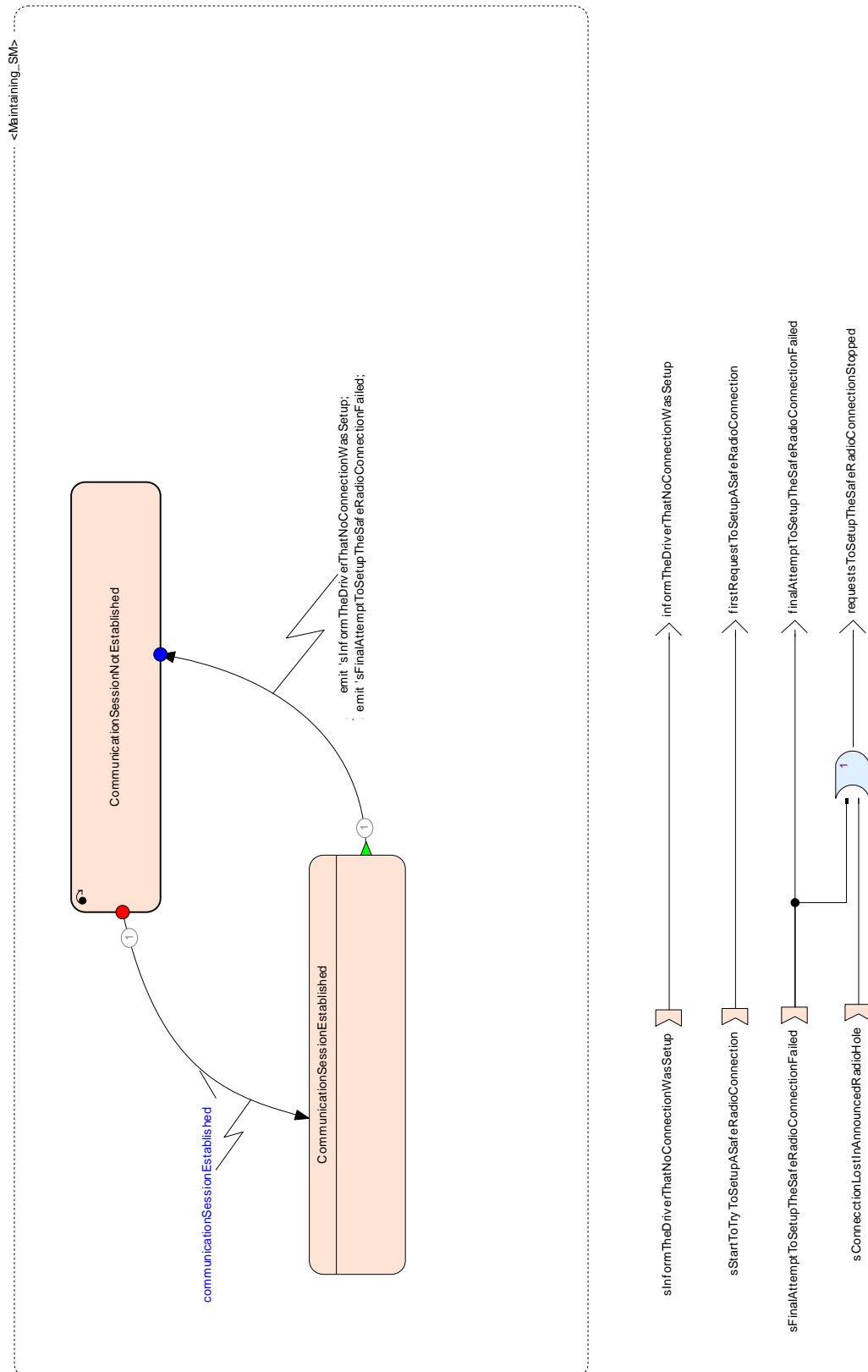


Figure 14: View of diagram\_maintaining\_a\_CommunicationSession\_1  
(maintaining\_a\_CommunicationSession)

Table 50: Locals of diagram\_maintaining\_a\_CommunicationSession\_1

Name	Type	Comments and Information
Maintaining_SM: CommunicationSessionEstablished: radioConnectionLostTimer_expired	bool	

Table 51: Signals of diagram\_maintaining\_a\_CommunicationSession\_1

Name	Comments and Information
Maintaining_SM: CommunicationSessionEstablished: sStart_RadioConnectionLostTimer	

Table 52: State Machines of diagram\_maintaining\_a\_CommunicationSession\_1

State Machine	Comments and Information
Maintaining_SM	

Table 53: States of diagram\_maintaining\_a\_CommunicationSession\_1

State	Comments and Information
Maintaining_SM: CommunicationSessionEstablished	Comments: 3.5.4.1 Traceability: 3.5.4.1 3.5.4.2.1
Maintaining_SM: CommunicationSessionNotEstablished	

Table 54: Transitions of diagram\_maintaining\_a\_CommunicationSession\_1

Source/Target	#	Conditions/Actions	Comments and Information
Source: Maintaining_SM: CommunicationSessionEstablished Target: Maintaining_SM: CommunicationSessionNotEstablished	1	Actions: let emit 'sInformTheDriverThatNoConnectionWasSetup; emit 'sFinalAttemptToSetupTheSafeRadioConnectionFailed; tel	Comments: 3.5.4.3 Traceability: 3.5.4.3
Source: Maintaining_SM: CommunicationSessionNotEstablished Target: Maintaining_SM: CommunicationSessionEstablished	1	Condition: communicationSessionEstablished	Comments: 3.5.4.1 Traceability: 3.5.4.1

### 3.1.9.5.2. View of diagram\_CommunicationSessionEstablished\_1 (maintaining\_a\_CommunicationSession/Maintaining\_SM: CommunicationSessionEstablished:)

Owner diagram: diagram\_maintaining\_a\_CommunicationSession\_1

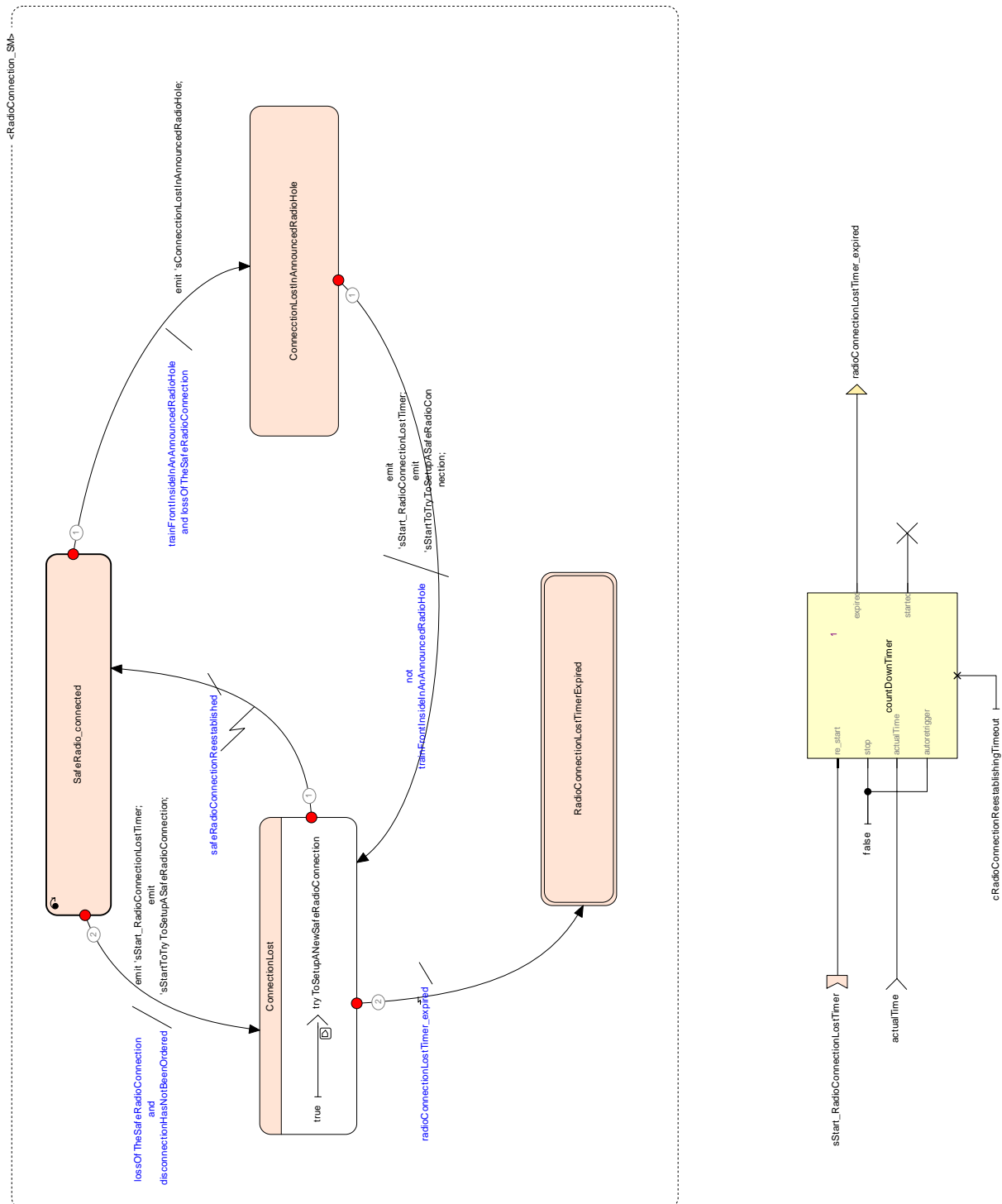


Figure 15: View of diagram\_CommunicationSessionEstablished\_1  
 (maintaining\_a\_CommunicationSession/Maintaining\_SM: CommunicationSessionEstablished:)

Table 55: State Machines of diagram\_CommunicationSessionEstablished\_1

State Machine	Comments and Information
RadioConnection_SM	

Table 56: States of diagram\_CommunicationSessionEstablished\_1

State	Comments and Information
RadioConnection_SM: ConnectionLostInAnnouncedRadioHole	Comments: 3.5.4.4 Traceability: 3.5.4.4
RadioConnection_SM: ConnectionLost	
RadioConnection_SM: RadioConnectionLostTimerExpired	
RadioConnection_SM: SafeRadio_connected	

Table 57: Transitions of diagram\_CommunicationSessionEstablished\_1

Source/Target	#	Conditions/Actions	Comments and Information
Source: RadioConnection_SM: ConnectionLostInAnnouncedRadioHole Target: RadioConnection_SM: ConnectionLost	1	Condition: not trainFrontInsideInAnnouncedRadioHole Actions: let emit 'sStart_RadioConnectionLostTimer; emit 'sStartToTryToSetupASafeRadioConnection; tel	Comments: 3.5.4.4 Traceability: 3.5.4.4
Source: RadioConnection_SM: ConnectionLost Target: RadioConnection_SM: SafeRadio_connected	1	Condition: safeRadioConnectionReestablished	Comments: 3.5.4.3 Traceability: 3.5.4.3
Source: RadioConnection_SM: ConnectionLost Target: RadioConnection_SM: RadioConnectionLostTimerExpired	2	Condition: radioConnectionLostTimer_expired	Comments: 3.5.4.2.1, 3.5.4.3 Traceability: 3.5.4.2.1 3.5.4.3
Source: RadioConnection_SM: SafeRadio_connected Target: RadioConnection_SM: ConnectionLostInAnnouncedRadioHole	1	Condition: trainFrontInsideInAnnouncedRadioHole and lossOfTheSafeRadioConnection Actions: emit 'sConnectionLostInAnnouncedRadioHole;	

Source/Target	#	Conditions/Actions	Comments and Information
Source: RadioConnection_SM: SafeRadio_co nnected Target: RadioConnection_SM: ConnectionLo st	2	Condition: lossOfTheSafeRadioCo nnection and disconnectionHasNotBe enOrdered Actions: let emit 'sStart_RadioConnectio nLostTimer; emit 'sStartToTryToSetupAS afeRadioConnection; tel	Comments: 3.5.4.1 Traceability: 3.5.4.1

### 3.1.10. managementOfRadioCommunication Operator

Declared as **public node**

#### 3.1.10.1. Comments and Information

managementOfRadioCommunication Comments:

- Subset 096, REQ 3.5
- This is the top level node of the "Management of Radio Communication" function.

Table 58: managementOfRadioCommunication Annotations

Note Name	Attribute	Value
Remark_1	Description	- Name: managementOfRadioCommunication - Description: This is the top level node of the "Management of Radio Communication" function - Copyright Siemens AG, 2013 - Licensed under the EUPL V.1.1 ( <a href="http://joinup.ec.europa.eu/software/page/eupl/licence-eupl">http://joinup.ec.europa.eu/software/page/eupl/licence-eupl</a> ) - Gist URL: --- - Cryptography: No - Author(s): Uwe Steinke  The use of this software is limited to non-vital applications. It has not been developed for vital operation purposes and must not be used for applications which may cause harm to people, physical accidents or financial loss. THEREFORE, NO LIABILITY WILL BE GIVEN FOR SUCH AND ANY OHER KIND OF USE.
	to_c	True

### 3.1.10.2. Interface

Table 59: Inputs of managementOfRadioCommunication

Name	Type	Properties	Comments and Information
actualTime	time_Type		
acknowledgementOfTerminationOfCommunicationSessionReceived	bool		Comments: 3.5.5.2c) Traceability: 3.5.5.2
orderReceivedFromTruckside	orderToContactAnRBC_Type		Comments: 3.5.5.1a) Traceability: 3.5.5.1
orderReceivedFromRBC	orderToContactAnRBC_Type		Comments: 3.5.3.1 Traceability: 3.5.3.1
orderReceivedFromRadio_InfillUnit	orderToContactAnRBC_Type		Comments: 3.5.3.2 Traceability: 3.5.3.2
errorConditionRequiringTerminationDetected	bool		Comments: 3.5.5.1b) Traceability: 3.5.5.1
trainIsRejectedByRBC_duringStartOfMission	bool		Comments: 3.5.5.1c) Traceability: 3.5.5.1
driverClosesTheDeskdu ringStartOfMission	bool		Comments: 3.5.5.1d) Traceability: 3.5.5.1
trainExitedFromAnRBC Area	bool		Comments: 3.5.5.1e) Traceability: 3.5.5.1
endOfMissionIsExecuted	bool		Comments: 3.5.5.1f) Traceability: 3.5.5.1
isInCommunicationSessionWithAnRIU	bool		Comments: 3.5.5.1f) Traceability: 3.5.5.1
atPowerUp	bool		Comments: 3.5.6.1a) Traceability: 3.5.6.1
atPowerOff	bool		Comments: 3.5.6.2
M_LEVEL	M_LEVEL_Type		Comments: 3.5.6.1b) 7.5.1.65 M_LEVEL Traceability: 3.5.6.1



Name	Type	Properties	Comments and Information
RadioNetworkID memorized	validRadioNetworkID_Type		Comments: 3.5.6.2
RadioNetworkID_from Driver	validRadioNetworkID_Type		Comments: 3.5.6.2
RadioNetworkID_from Trackside	validRadioNetworkID_Type		Comments: 3.5.6.1c), 3.5.6.2 Traceability: 3.5.6.1 3.5.6.2
afterDriverEntryOfANewRadioNetworkID	bool		Comments: 3.5.6.1b), 3.5.6.2 Strobe input, activated when the driver sets the Radio Network ID Traceability: 3.5.6.2 3.5.6.1
triggerDecisionThatNoRadioNetworkIDAvailable	bool		Comments: 3.5.6.3 Traceability: 3.5.6.3
mobileHWStatus	mobileHWStatus_Type		Comments: Communication status received from the mobile hardware. If valid, designates that this operator is connected to an existing mobile hardware
isPartOfAnOngoingStartOfMissionProcedure	bool		Comments: 3.5.3.7 Traceability: 3.5.3.7
trainPassesALevelTransitionBorder	bool		Comments: 3.5.3.7 a) trainPassesALevelTransitionBorder with its front end Traceability: 3.5.3.7
orderToEstablishACommunicationSession_from OBU	orderToContactAnRBC_Type		Comments: 3.5.3.7 a) Traceability: 3.5.3.7
orderDoesNotRequestToContactAnAcceptingRBC	bool		Comments: 3.5.3.7 a) Traceability: 3.5.3.7
trainPassesA_RBC_RBC_border_WithItsFrontEnd	bool		Comments: 3.5.3.7 a) Traceability: 3.5.3.7
systemVersionFromTracksideSupported	bool		Comments: 3.5.3.8 a) Traceability: 3.5.3.8

Name	Type	Properties	Comments and Information
systemVersionReceived	bool		Comments: 3.5.3.8 a) Traceability: 3.5.3.8
M_MODE	M_MODE_Type		Comments: 7.5.1.72 M_MODE: Onboard operating mode
atStartOfMission	bool		Comments: Start of Mission 3.5.3.4. a) Traceability: 3.5.3.4
modeChangeHasToBeReportedToRBC	bool		Comments: 3.5.3.4 c) Traceability: 3.5.3.4
driverHasManuallyChangedLevel	bool		Comments: 3.5.3.4 d) Traceability: 3.5.3.4
trainFrontReachesEndOfAnnouncedRadioHole	bool		Comments: 3.5.3.4e) Traceability: 3.5.3.4
startOfMissionProcedureCompleted	bool		Comments: 3.5.3.4 e) Traceability: 3.5.3.4
trainFrontInsideInAnAnnouncedRadioHole	bool		Comments: 3.5.4.4 Traceability: 3.5.4.4
OBU_hasToEstablishANewSession	bool		Comments: 3.5.3.5.2 Traceability: 3.5.3.5.2
startOfMissionProceduresGoingOn	bool		Comments: 3.5.7.5 [1] Traceability: 3.5.7.5
RadioNetworkID_Default	validRadioNetworkID_Type	hidden	Comments: 3.5.6.3 Traceability: 3.5.6.3
connectionStatusTimerInterval	time_Type	hidden	Comments: 3.5.7.2 Traceability: 3.5.7.2

Table 60: Outputs of managementOfRadioCommunication

Name	Type	Properties	Comments and Information
sendAPositionReport	bool		Comments: 3.5.5.1e) Traceability: 3.5.5.1

Name	Type	Properties		Comments and Information
mobileHWCmd	mobileHWCmd_Type			Comments: 3.5.6, 3.5.6.3.2, 3.5.6.5, 3.5.6.5: Commands to the mobile hardware Traceability: 3.5.6.3.2 3.5.6.5
memorizeTheLastRadio NetworkID	bool			Comments: 3.5.6.2
actualRadioNetworkID	validRadioNetworkID_Type			Comments: 3.5.6.2
orderTheRegistrationOf ItsConnectedMobiles	bool			Comments: 3.5.6.1 Traceability: 3.5.6.1
rejectOrderToContactR BC_or_RIU	bool			Comments: 3.5.6.7
InformTheDriverThatN oConnectionWasSetup	bool	default	false	
sendTheMessageInitiati onOfCommunicationSe ssionToTrackside	bool	default	false	Comments: 3.5.3.7 b) Traceability: 3.5.3.7
sendMessage_NoComp atibleVersionSupported	bool	default	false	Comments: 3.5.3.8 b) Traceability: 3.5.3.8
sendASessionEstablish edReportToTrackside	bool	default	false	Comments: 3.5.3.10 c) 3.5.3.8 a) ssSendMessageEstablish edReport to trackside Traceability: 3.5.3.8 3.5.3.10
sendATerminationOfCo mmunicationMessage	bool	default	false	Comments: 3.5.5.2a), 3.5.5.3.1 Traceability: 3.5.5.2
ignoreMessagesFromR BC_exceptAckOfTermin ationOfCommunication Session	bool	default	false	Comments: 3.5.5.3.6
safeRadioConnectionSt atus_toDriver	safeRadioConnectionSt atusValid_Type			Comments: 3.5.7.1 Traceability: 3.5.7.1
sessionSuccessfullyEst ablished	bool	last	false	
mobileSWStatus	mobileSWStatus_Type			
requestTheSetupOfASa feRadioConnection	bool	default	false	
requestReleaseOfSafeR adioConnectionWithTra ckside	bool	default	false	Comments: 3.5.5.2c)

### 3.1.10.3. Locals

Table 61: Locals of managementOfRadioCommunication

Name	Type	Properties		Comments and Information
communicationSessionInitiatedByOBU	bool	last	false	
communicationSessionInitiatedFromTrackside	bool	last	false	
establishingACommunicationSessionAborted	bool	last	false	
finalAttemptToSetupTheSafeRadioConnectionFailed	bool	last	false	
firstRequestToSetupASafeRadioConnection	bool	default	false	Comments: 3.5.7.3a), 3.5.7.3b) Traceability: 3.5.7.3
initiateEstablishingNewSession	bool			Comments: 3.5.3.5.2
initiateTermination	bool			
mobileSWCmd	mobileSWCmd_Type	default	cInvalidMobileSWCmd	
mobileSWStatus_loc	mobileSWStatus_Type	last	cInvalidMobileSWStatus	
orderReceivedFromTrackside_loc	orderToContactAnRBC_Type			
prevSessionTerminatedDueToLossOfSafeRadioConnection	bool			
requestsToSetupTheSafeRadioConnectionStopped	bool	default	false	
requestTheSetupOfASafeRadioConnection_loc	bool	default	false	
sessionEstablished	bool	last	false	
sessionStatus	sessionStatus_Type	last	morc_st_inactive	
sessionTerminated	bool	default	false	
startEstablishingSession	bool			
startTerminatingSession	bool	default	false	

### 3.1.10.4. Operator Hierarchy

diagram : diagram\_NetworkRegistration

diagram : diagram\_safeRadioConnectionIndication

diagram : diagram\_SessionManagement

state-machine : CommunicationSession\_SM

state : Establishing

diagram : diagram\_Establishing\_1

state : Maintaining

diagram : diagram\_Maintaining\_1  
state : NoSession  
diagram : diagram\_NoSession\_1  
state : Terminating  
diagram : diagram\_Terminating\_1  
diagram : diagram\_TerminationInitiation

### 3.1.10.5. Graphical and Textual Diagrams

#### 3.1.10.5.1. View of diagram\_NetworkRegistration (managementOfRadioCommunication)

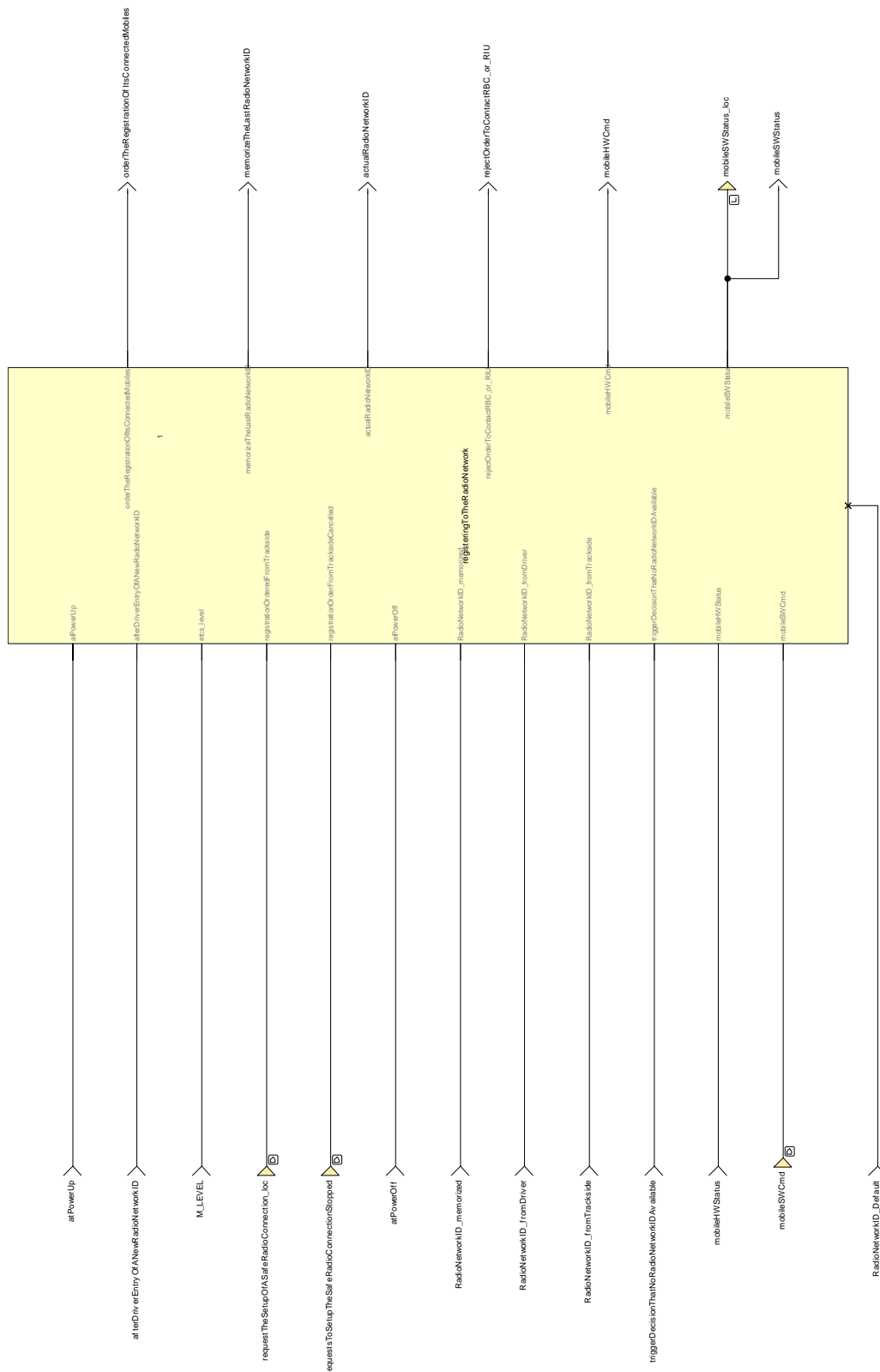


Figure 16: View of diagram\_NetworkRegistration (managementOfRadioCommunication)

### 3.1.10.5.2. View of diagram\_safeRadioConnectionIndication (managementOfRadioCommunication)

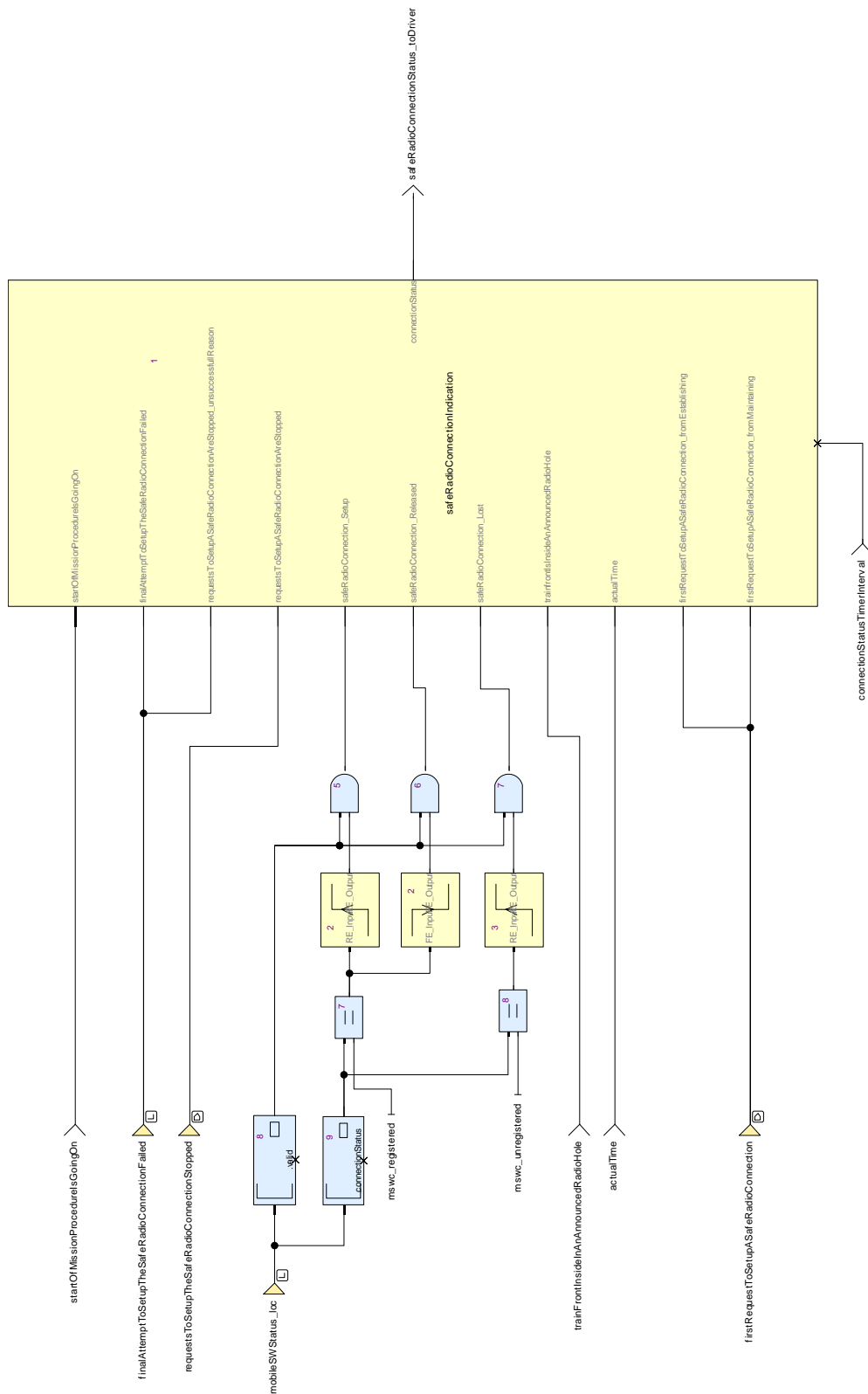


Figure 17: View of diagram\_safeRadioConnectionIndication (managementOfRadioCommunication)

### 3.1.10.5.3. View of diagram\_SessionManagement (managementOfRadioCommunication)

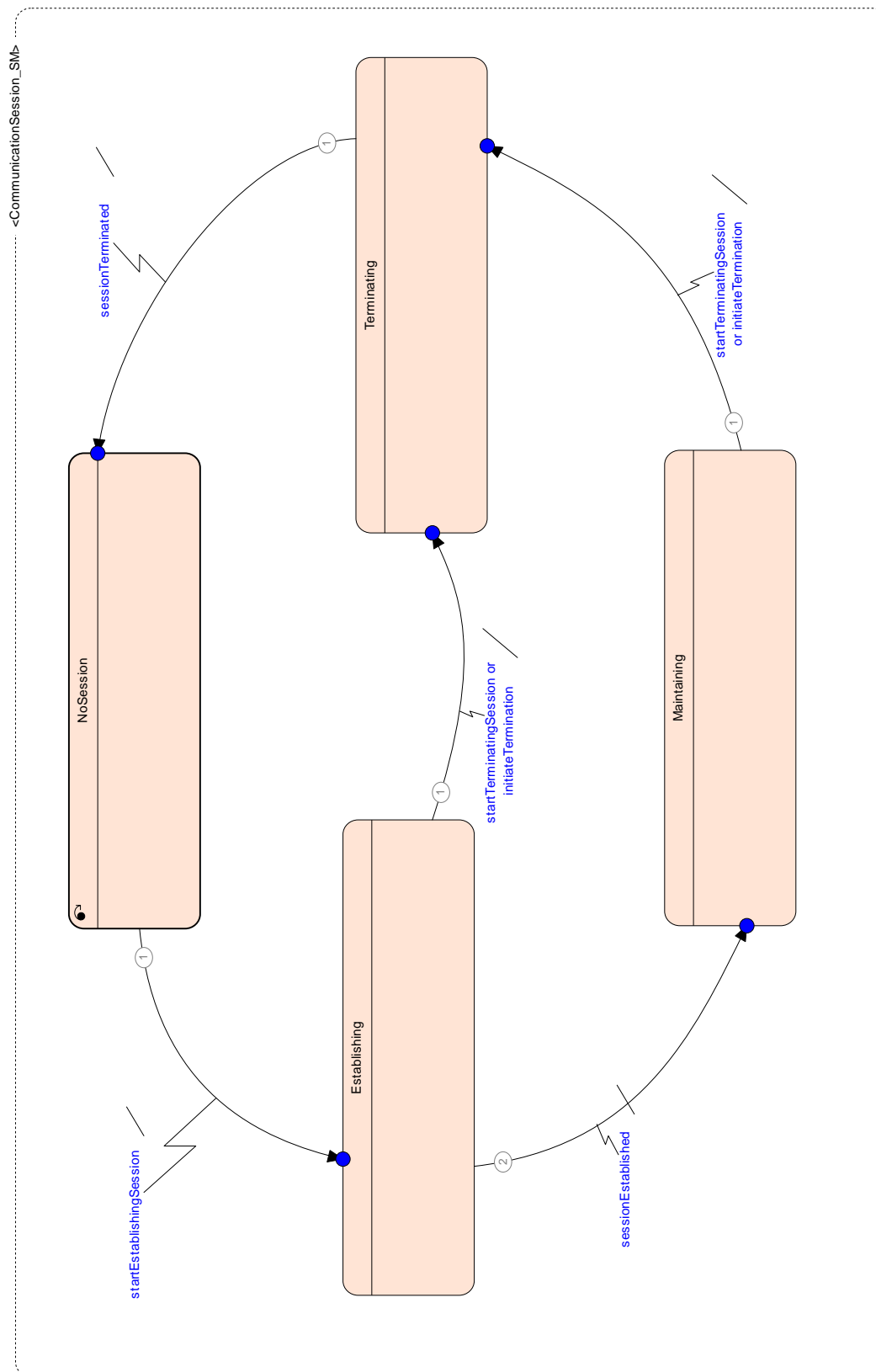


Figure 18: View of diagram\_SessionManagement (managementOfRadioCommunication)



Table 62: State Machines of diagram\_SessionManagement

State Machine	Comments and Information
CommunicationSession_SM	

Table 63: States of diagram\_SessionManagement

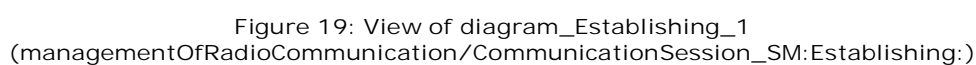
State	Comments and Information
CommunicationSession_SM: Establishing	
CommunicationSession_SM: Maintaining	
CommunicationSession_SM: NoSession	
CommunicationSession_SM: Terminating	

Table 64: Transitions of diagram\_SessionManagement

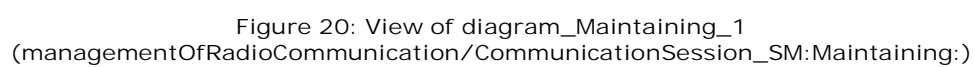
Source/Target	#	Conditions/Actions	Comments and Information
Source: CommunicationSession_SM: Establishing Target: CommunicationSession_SM: Terminating	1	Condition: startTerminatingSession or initiateTermination Actions:	
Source: CommunicationSession_SM: Establishing Target: CommunicationSession_SM: Maintaining	2	Condition: sessionEstablished Actions:	
Source: CommunicationSession_SM: Maintaining Target: CommunicationSession_SM: Terminating	1	Condition: startTerminatingSession or initiateTermination Actions:	
Source: CommunicationSession_SM: NoSession Target: CommunicationSession_SM: Establishing	1	Condition: startEstablishingSession Actions:	
Source: CommunicationSession_SM: Terminating Target: CommunicationSession_SM: NoSession	1	Condition: sessionTerminated Actions:	

3.1.10.5.4. View of diagram\_Establishing\_1  
(managementOfRadioCommunication/CommunicationSession\_SM: Establishing:)

Owner diagram: diagram\_SessionManagement



3.1.10.5.5. View of diagram\_Maintaining\_1  
(managementOfRadioCommunication/CommunicationSession\_SM: Maintaining:)  
*Owner diagram:* diagram\_SessionManagement



### 3.1.10.5.6. View of diagram\_NoSession\_1 (managementOfRadioCommunication/CommunicationSession\_SM: NoSession:)

Owner diagram: diagram\_SessionManagement

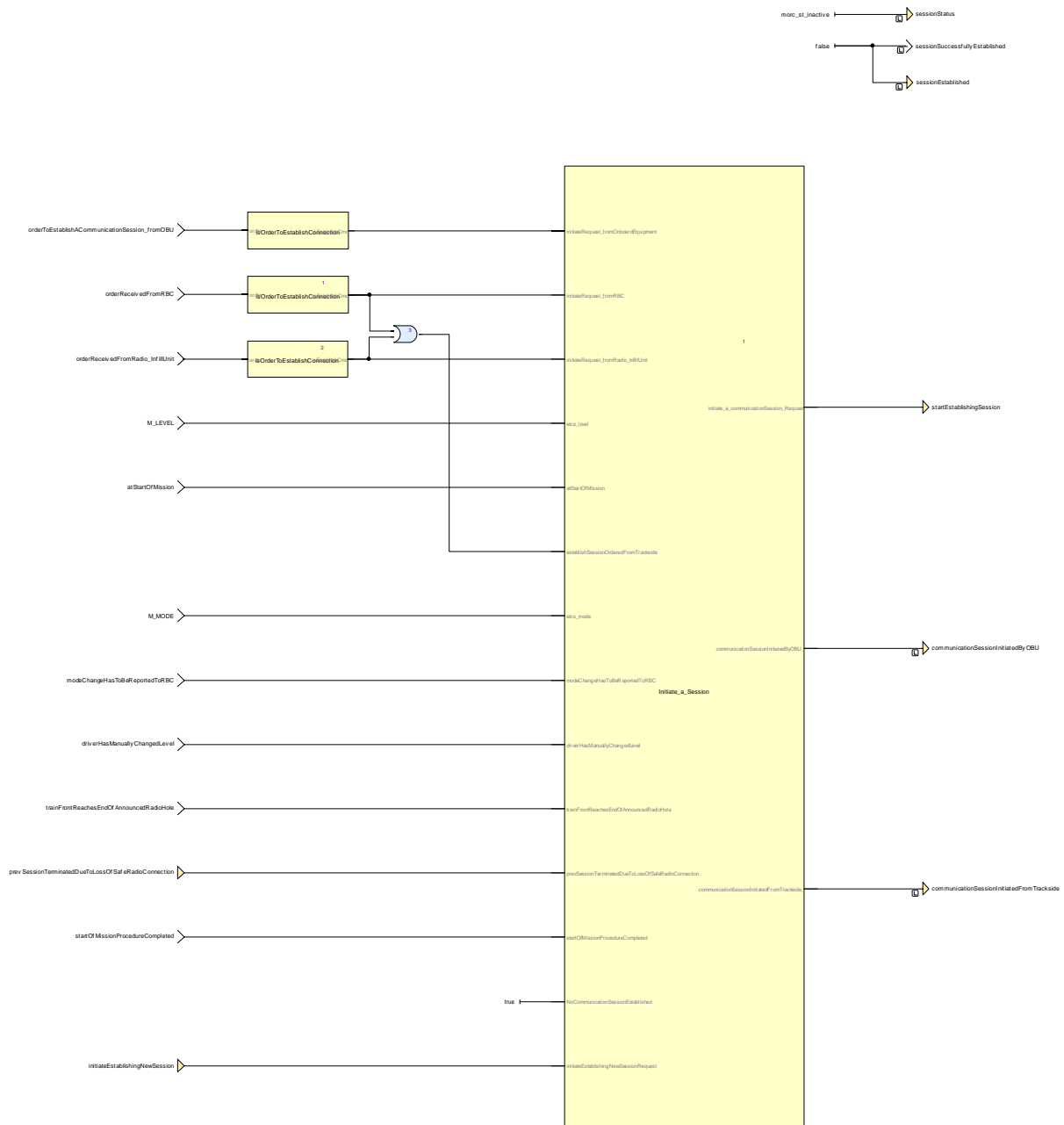
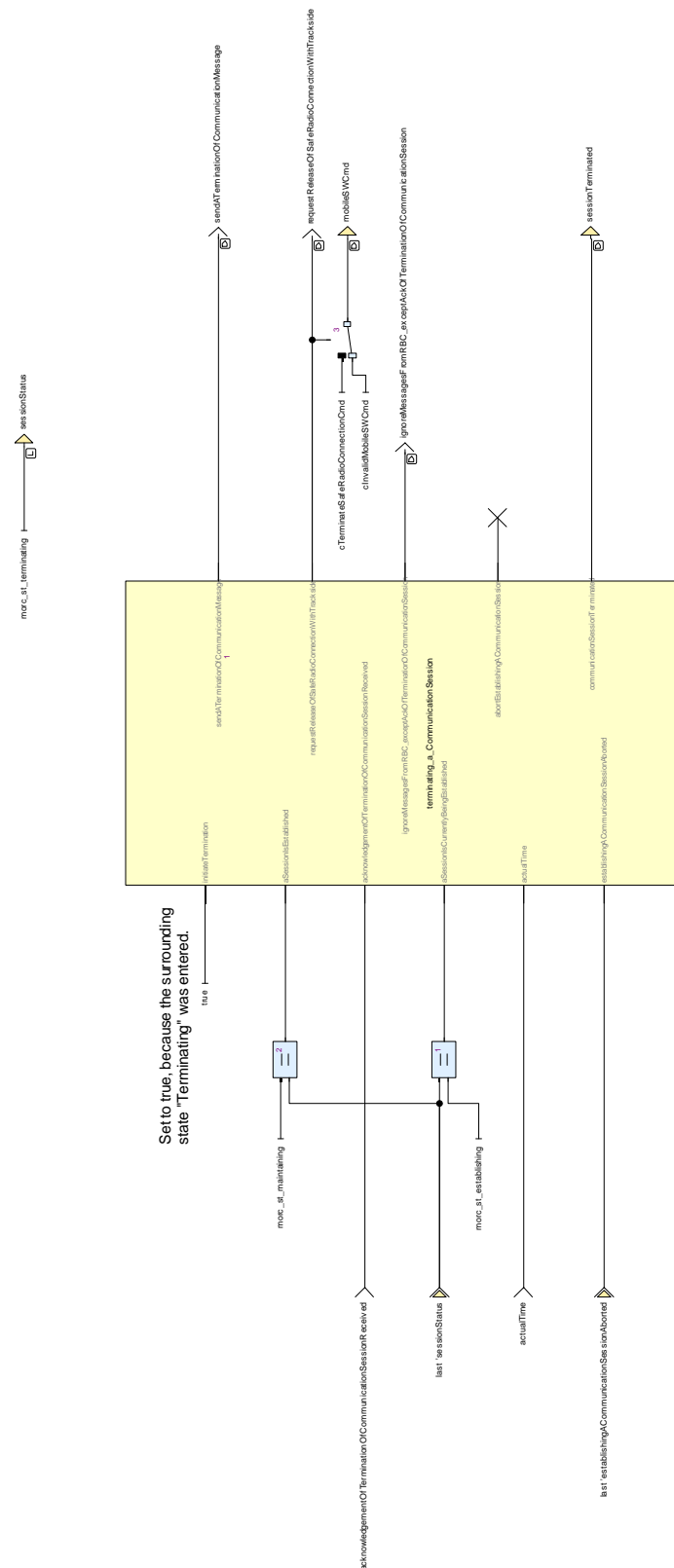


Figure 21: View of diagram\_NoSession\_1  
 (managementOfRadioCommunication/CommunicationSession\_SM: NoSession:)

### 3.1.10.5.7. View of diagram\_Terminating\_1 (managementOfRadioCommunication/CommunicationSession\_SM: Terminating:)

Owner diagram: diagram\_SessionManagement



### 3.1.10.5.8. View of diagram\_TerminationInitiation (managementOfRadioCommunication)

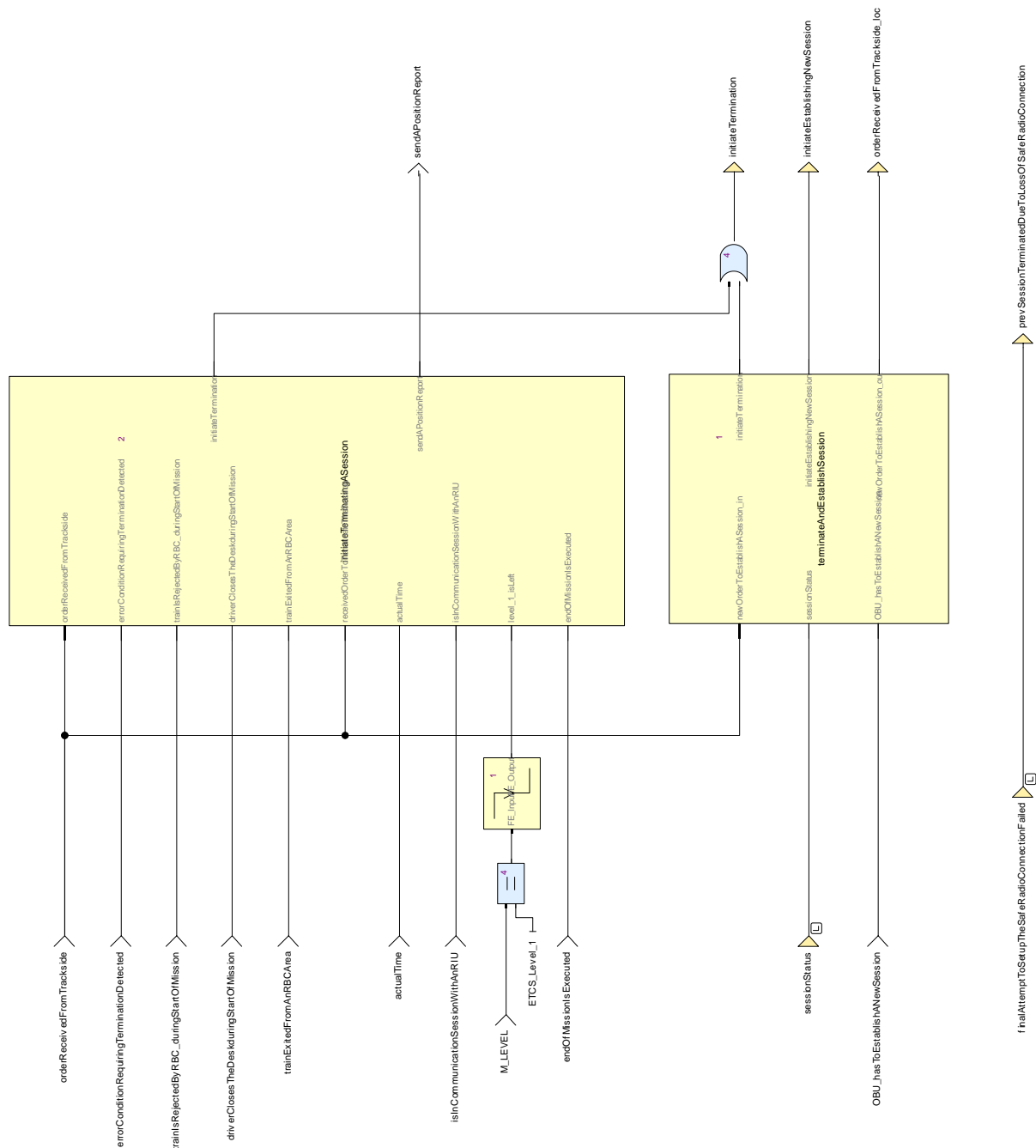


Figure 23: View of diagram\_TerminationInitiation (managementOfRadioCommunication)

### 3.1.11. MoRC\_withSimplified\_IF Operator

Declared as **public node**

#### 3.1.11.1. Comments and Information

MoRC\_withSimplified\_IF Comments:

- This node serves as a wrapper to the top level operator managementOfRadioCommunication.

- It simplifies the MoRC external interface so that it suits to the SYS/ML model and RT-Tester approach residing on <https://github.com/openETCS/model-evaluation/tree/master/model/EA-SySML/>.
- This enables the SCADE model to be used as the "System under test" and the SYS/ML model as a test model for automatic test sequence generation with RT-Tester.
- 
- Due to the interface simplification the functionality of the underlying "Management Of Radio Communication" is limited by the simplification.
- If the complete functionality is required without restrictions, the operator "managementOfRadioCommunication" should be used directly.

Table 65: MoRC\_withSimplified\_IF Annotations

Note Name	Attribute	Value
Remark_1	Description	<ul style="list-style-type: none"> <li>- Name: managementOfRadioCommunication</li> <li>- Description: This a interface adapter at the top level of the "Management of Radio Communication" function</li> <li>- Copyright Siemens AG, 2013</li> <li>- Licensed under the EUPL V.1.1 ( <a href="http://joinup.ec.europa.eu/software/page/eupl/licence-eupl">http://joinup.ec.europa.eu/software/page/eupl/licence-eupl</a> )</li> <li>- Gist URL: ---</li> <li>- Cryptography: No</li> <li>- Author(s): Uwe Steinke</li> </ul> <p>The use of this software is limited to non-vital applications.  It has not been developed for vital operation purposes and must not be used for applications which may cause harm to people, physical accidents or financial loss.  THEREFORE, NO LIABILITY WILL BE GIVEN FOR SUCH AND ANY OTHER KIND OF USE.</p>
	to_c	True

### 3.1.11.2. Interface

Table 66: Inputs of MoRC\_withSimplified\_IF

Name	Type	Comments and Information
messageFromRBC	NID_MESSAGE_Type	Comments: Commands and Messages received from RBC.
safeRadioCommunication_setUpEstablished	bool	Comments: Designates that safe radio connection has been established
NID_RBC_ID	NID_RBC_Type	Comments: RBC identifier
radioHole_status	radioHoleStatus_Type	Comments: Designates when the train passes an announced radio hole.
orderFromOnBoard	onBoardOrder_Type	Comments: Commands from the onboard unit to the MoRC function.



Name	Type	Comments and Information
systemVersionIsCompatible	bool	Comments: Designates that the system versions of train and track are compatible.
M_Level	M_LEVEL_Type	Comments: ETCS Level
M_Mode	M_MODE_Type	Comments: ETCS Mode
actualTime	time_Type	Comments: The actual time.
RadioNetworkID_memorized	radioNetworkID_Type	Comments: 3.5.6.2
RadioNetworkID_fromDriver	radioNetworkID_Type	Comments: 3.5.6.2
RadioNetworkID_fromTrackside	radioNetworkID_Type	Comments: 3.5.6.1c), 3.5.6.2
powerAvailable	bool	Comments: True, as long as power is available.
mobileHWConnectionStatus	mobileHWConnectionStatus_Type	

Table 67: Outputs of MoRC\_withSimplified\_IF

Name	Type	Comments and Information
messageToRBC	NID_MESSAGE_Type	Comments: Commands and message to be sent to the RBC.
safeRadioCommunication_requestSetUp	bool	Comments: Requests a safe radio to be established.
safeRadioCommunication_releaseSetUp	bool	Comments: Requests a safe radio to be released.
radioComSessionEstablished	bool	Comments: Designates that a communication session has been established.
actualRadioNetworkID	radioNetworkID_Type	Comments: 3.5.6.2
mobileHWCmd	mobileHWAction_Type	Comments: 3.5.6, 3.5.6.3.2, 3.5.6.5, 3.5.6.5: Commands to the mobile hardware
memorizeTheLastRadioNetworkID	bool	Comments: 3.5.6.2
mobileSWStatus	mobileSWConnectionStatus_Type	

### 3.1.11.3. Locals

Table 68: Locals of MoRC\_withSimplified\_IF

Name	Type	Properties		Comments and Information
atPowerUp	bool	default	false	
establishOrderFromRBC	orderToContactAnRBC_Type			
establishOrderFromTrackside	orderToContactAnRBC_Type			
initiateCmd_fromOBU	bool	default	false	

Name	Type	Properties		Comments and Information
mobileHWStatus_loc	mobileHWStatus_Type			
orderReceivedFromOBU	orderToContactAnRBC_Type	default	cInvalidOrderToContactAnRBC	
orderReceivedFromRBC	orderToContactAnRBC_Type	default	cInvalidOrderToContactAnRBC	
RBCAcknowledgesInitializationWithSystemVersion	bool	default	false	
RBCAcknowledgesTermination	bool	default	false	
RBCOrdersATransitionOverAnotherRBC	bool	default	false	
terminateOrderFromRBC	orderToContactAnRBC_Type			
terminateOrderFromTrackside	orderToContactAnRBC_Type			
transmitCommunicationInitMsgToRBC	bool			
transmitCommunicationTerminateMsgToRBC	bool			
transmitNoCompatibleVersionSupportedMsgToRBC	bool			
transmitSessionEstablishedMsgToRBC	bool			

#### 3.1.11.4. Operator Hierarchy

diagram : dDecodeOBUOrders

*activate if* : orderFromOnboardDec

branch : then

branch : else

branch : then

branch : else

branch : then

branch : else

diagram : dDecodeRBCOrders

*activate if* : MessageFromTrackDec

branch : then

branch : else

branch : then

branch : else

branch : then

branch : else

branch : then

branch : else

branch : then

branch : else

branch : then

branch : else

branch : then  
branch : else

diagram : dGenerateMessageToRBC  
    *activate if* : GenerateMessageToRBC\_If  
        branch : then  
        branch : else  
            branch : then  
            branch : else  
                branch : then  
                branch : else  
                    branch : then  
                    branch : else

diagram : dMainSheet

diagram : dPowerUp

*state-machine* : PowerUpSequencer  
        state : AfterPowerUp  
        state : AtPowerUpState  
        state : TheVeryFirstCycle

#### 3.1.11.5.1. View of dDecodeOBUOrders (MoRC\_withSimplified\_IF)

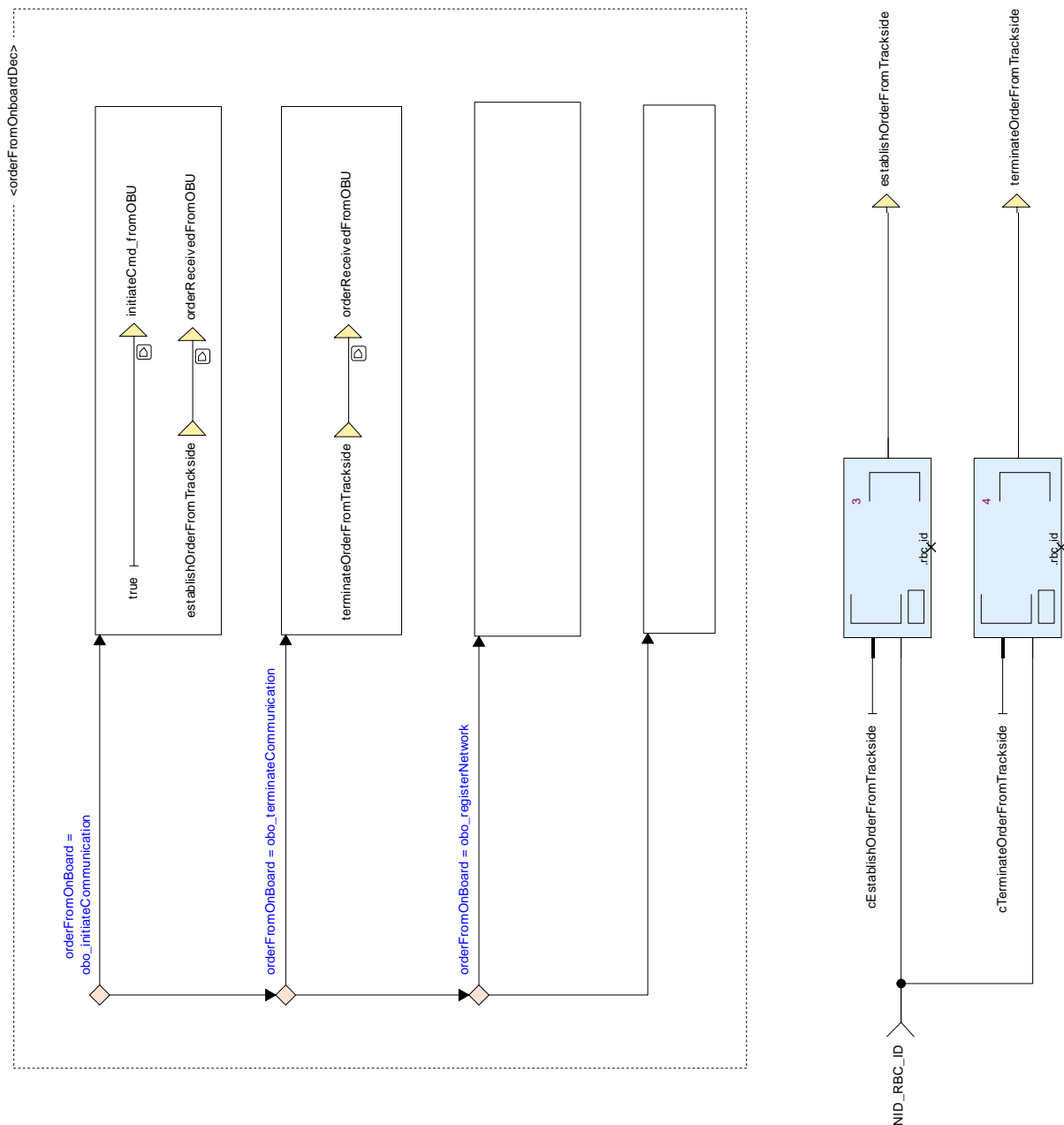


Figure 24: View of dDecodeOBUOrders (MoRC\_withSimplified\_IF)

Table 69: Conditional Blocks of dDecodeOBUOrders

Conditional Block	Comments and Information
orderFromOnboardDec	

Table 70: Actions of dDecodeOBUOrders

Conditional Block Action	Comments and Information
orderFromOnboardDec: then	
orderFromOnboardDec: else: then	

Conditional Block Action	Comments and Information
orderFromOnboardDec:else:else: then	
orderFromOnboardDec:else:else: else	

### 3.1.11.5.2. View of dDecoderRBCOrders (MoRC\_withSimplified\_IF)

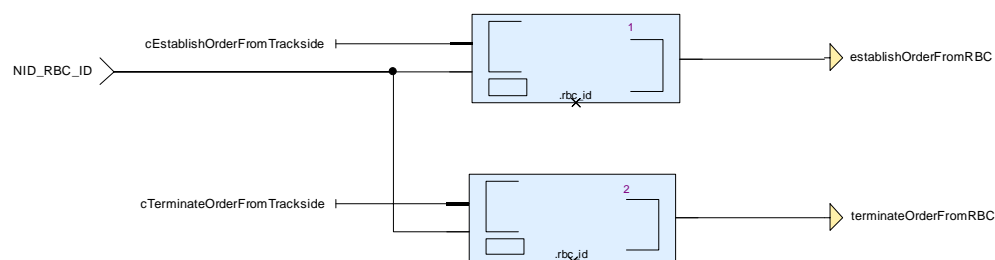


Figure 25: View of dDecoderRBCOrders (MoRC\_withSimplified\_IF)

Table 71: Conditional Blocks of dDecodeRBCOrders

Conditional Block	Comments and Information
MessageFromTrackDec	

Table 72: Actions of dDecodeRBCOrders

Conditional Block Action	Comments and Information
MessageFromTrackDec: then	Comments: TERM_SESSION_TRACK
MessageFromTrackDec: else: then	Comments: INIT_SESSION_ORDER
MessageFromTrackDec: else: else: then	Comments: SYS_VERSION
MessageFromTrackDec: else: else: else: the n	Comments: INIT_SESSION_TRACK
MessageFromTrackDec: else: else: else: else : then	Comments: TERM_ACK
MessageFromTrackDec: else: else: else: else : else: then	Comments: TRANS_OVER_ORDER
MessageFromTrackDec: else: else: else: else : else: else: then	
MessageFromTrackDec: else: else: else: else : else: else: else	

### 3.1.11.5.3. View of dGenerateMessageToRBC (MoRC\_withSimplified\_IF)

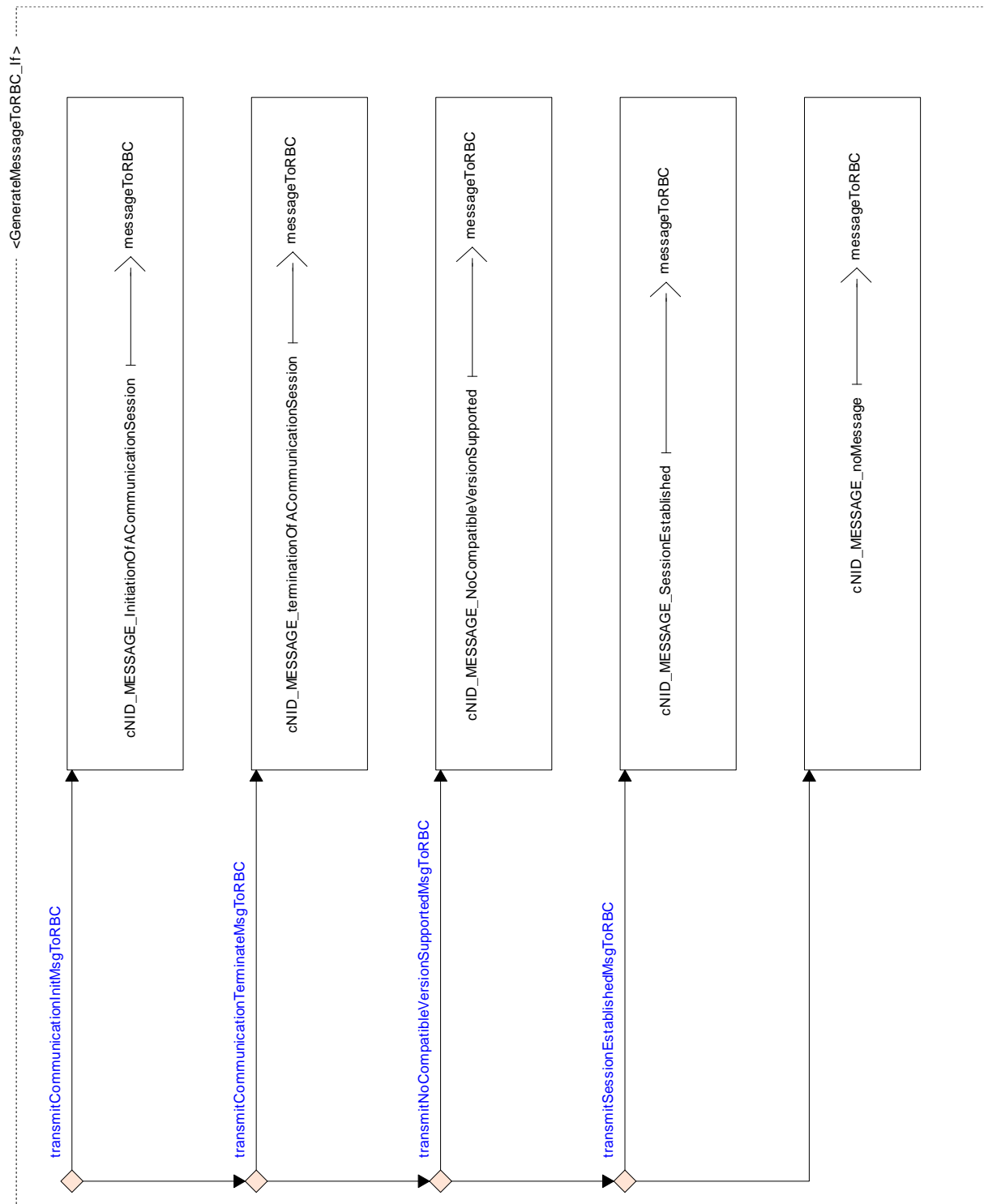


Figure 26: View of dGenerateMessageToRBC (MoRC\_withSimplified\_IF)

Table 73: Conditional Blocks of dGenerateMessageToRBC

Conditional Block	Comments and Information
GenerateMessageToRBC_If	

Table 74: Actions of dGenerateMessageToRBC

Conditional Block Action	Comments and Information
GenerateMessageToRBC_If: then	Comments: INIT_SESSION
GenerateMessageToRBC_If: else: then	Comments: TERM_SESSION
GenerateMessageToRBC_If: else: else: then	Comments: SYS_NO_COMP
GenerateMessageToRBC_If: else: else: else : then	Comments: SESSION_ESTABLISHED
GenerateMessageToRBC_If: else: else: else : else	Comments: NO_MESSAGE



[illegible]

Figure 27: View of dMainSheet (MoRC\_withSimplified\_IF)

### 3.1.11.5.5. View of dPowerUp (MoRC\_withSimplified\_IF)

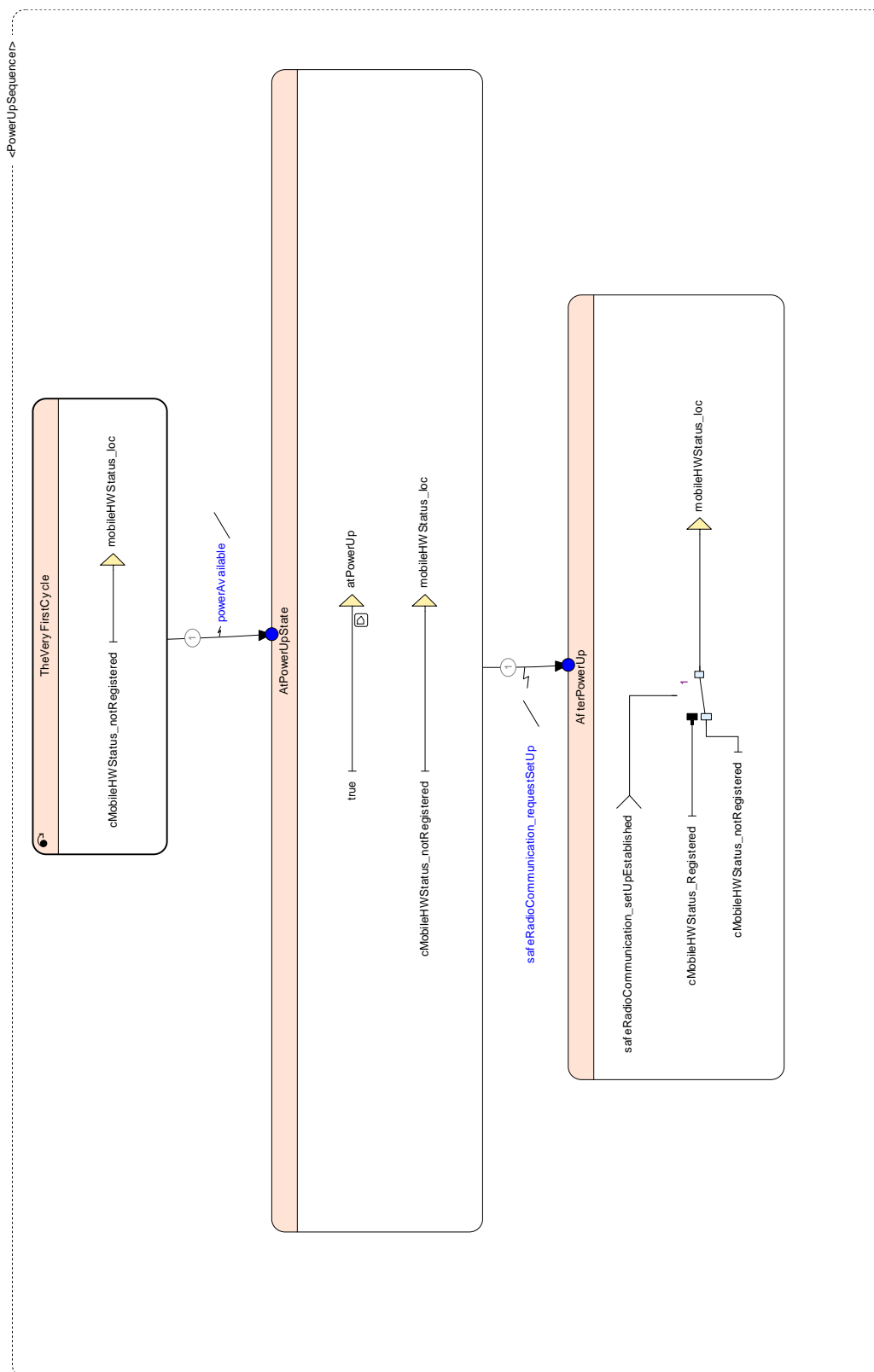


Figure 28: View of dPowerUp (MoRC\_withSimplified\_IF)

Table 75: State Machines of dPowerUp

State Machine	Comments and Information
PowerUpSequencer	Comments: This state machine generates the power-up sequence at system start and provides the HW-Status of the mobile.

Table 76: States of dPowerUp

State	Comments and Information
PowerUpSequencer: AfterPowerUp	
PowerUpSequencer: AtPowerUpState	
PowerUpSequencer: TheVeryFirstCycle	

Table 77: Transitions of dPowerUp

Source/Target	#	Conditions/Actions	Comments and Information
Source: PowerUpSequencer: AtPowerUpState Target: PowerUpSequencer: AfterPowerUp	1	Condition: safeRadioCommunication_requestSetUp	
Source: PowerUpSequencer: TheVeryFirstCycle Target: PowerUpSequencer: AtPowerUpState	1	Condition: powerAvailable	

### 3.1.12. radioNetworkMobile Operator

Declared as **private node**

#### 3.1.12.1. Comments and Information

radioNetworkMobile Comments:

- Subset 096, REQ 3.5.6.3.2, 3.5.6.5
- Controls the registration to the radio network for a single mobile terminal.

Table 78: radioNetworkMobile Annotations

Note Name	Attribute	Value
Remark_1	Description	- Name: radioNetworkMobile - Description: Controls the registration to the radio network for a single mobile terminal. - Copyright Siemens AG, 2013 - Licensed under the EUPL V.1.1 ( <a href="http://joinup.ec.europa.eu/software/page/eupl/licence-eupl">http://joinup.ec.europa.eu/software/page/eupl/licence-eupl</a> ) - Gist URL: --- - Cryptography: No - Author(s): Uwe Steinke  The use of this software is limited to non-vital applications. It has not been developed for vital operation purposes and must not be used for applications which may cause harm to people, physical accidents or financial loss. THEREFORE, NO LIABILITY WILL BE GIVEN FOR SUCH AND ANY OTHER KIND OF USE.
	to_c	True

radioNetworkMobile Traceability:

- 3.5.6.3.2
- 3.5.6.5

### 3.1.12.2. Interface

Table 79: Inputs of radioNetworkMobile

Name	Type	Comments and Information
mobileHWStatus	mobileHWStatus_Type	Comments: Communication status received from the mobile hardware. If valid, designates that this operator is connected to an existing mobile hardware
mobileSWCmd	mobileSWCmd_Type	Comments: Cmd inputs to this operator 3.5.6.5: includes the order to use and occupy this mobile for a (established) communication session Traceability: 3.5.6.5

Table 80: Outputs of radioNetworkMobile

Name	Type	Properties		Comments and Information
mobileHWCmd	mobileHWCmd_Type	default	cInvalidmobileHWCmd	Comments: 3.5.6, 3.5.6.3.2, 3.5.6.5, 3.5.6.5: Commands to the mobile hardware Traceability: 3.5.6.3.2 3.5.6.5

Name	Type	Properties	Comments and Information
mobileSWStatus	mobileSWStatus_Type		Comments: SW-Status of the mobile: 3.5.6.5 Indicates, that this mobile is in use for an Established Communication Session Traceability: 3.5.6.5

### 3.1.12.3. Locals

Table 81: Locals of radioNetworkMobile

Name	Type	Properties	Comments and Information
hw_available	bool		
hw_cmd	mobileHWAction_Type	default mhwa_nop	
hw_connectionStatus	mobileHWConnectionStatus_Type		
radioNetworkID	radioNetworkID_Type		
registeredRadioNetworkID	radioNetworkID_Type		
sw_cmd	mobileSWAction_Type		
sw_connectionStatus	mobileSWConnectionStatus_Type	default mswc_unregistered	

Table 82: Signals of radioNetworkMobile

Name	Comments and Information
sHWConnect	
sHWDisconnect	
sHwRegister	
sHWUnregister	

### 3.1.12.4. Operator Hierarchy

diagram : diagram\_radioNetworkMobile\_1

diagram : diagram\_radioNetworkMobile\_2

*state-machine* : MobileHW\_available\_SM

state : InitialState

state : MobileHwAvailable

diagram : diagram\_MobileHwAvailable\_1

*state-machine* : MobileSWConnection\_SM

state : ConnectedToTheRadioNetwork

state : ConnectingToTheRadioNetwork

state : EstablishingASession

state : RegisteredToTheRadioNetwork

state : RegisteringToTheRadioNetwork

state : SessionEstablished

```
state : UnregisteredToTheRadioNetwork
diagram : diagram_MobileHWAvalable_2
  activate if : IfBlock1
    branch : then
    branch : else
      branch : then
      branch : else
        branch : then
        branch : else
          branch : then
          branch : else
state : MobileHWNNotAvailable
```

#### 3.1.12.5.1. View of diagram\_radioNetworkMobile\_1 (radioNetworkMobile)

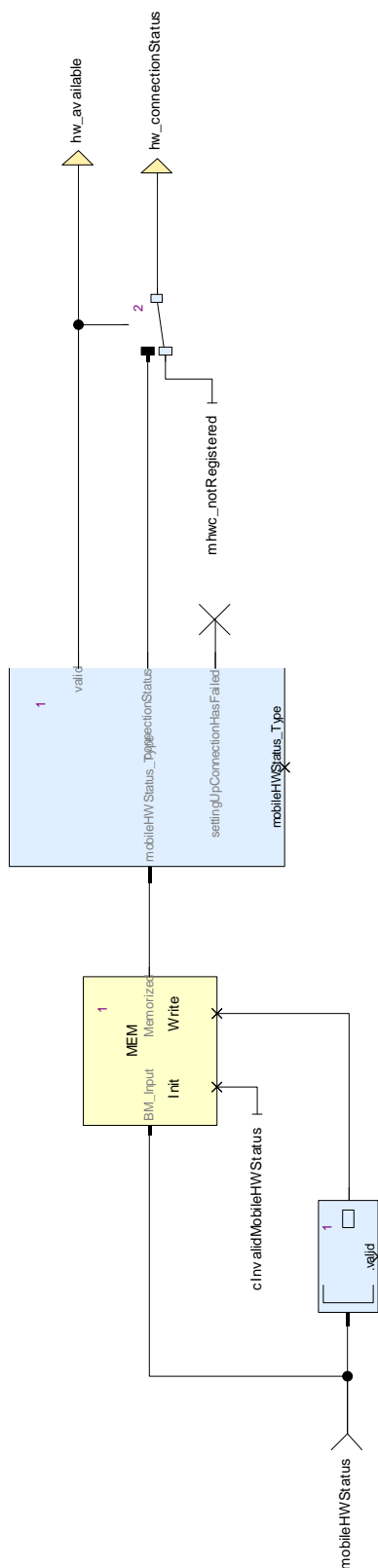


Figure 29: View of diagram\_radioNetworkMobile\_1 (radioNetworkMobile)

### 3.1.12.5.2. View of diagram\_radioNetworkMobile\_2 (radioNetworkMobile)

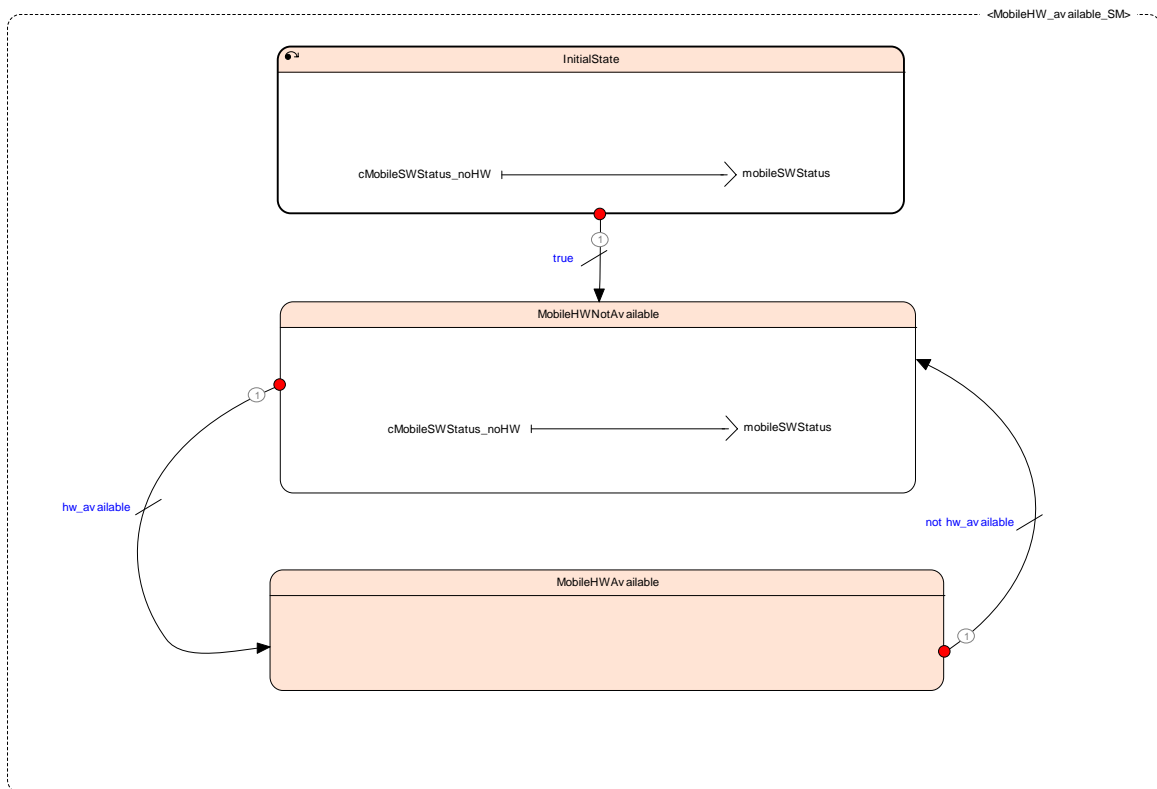
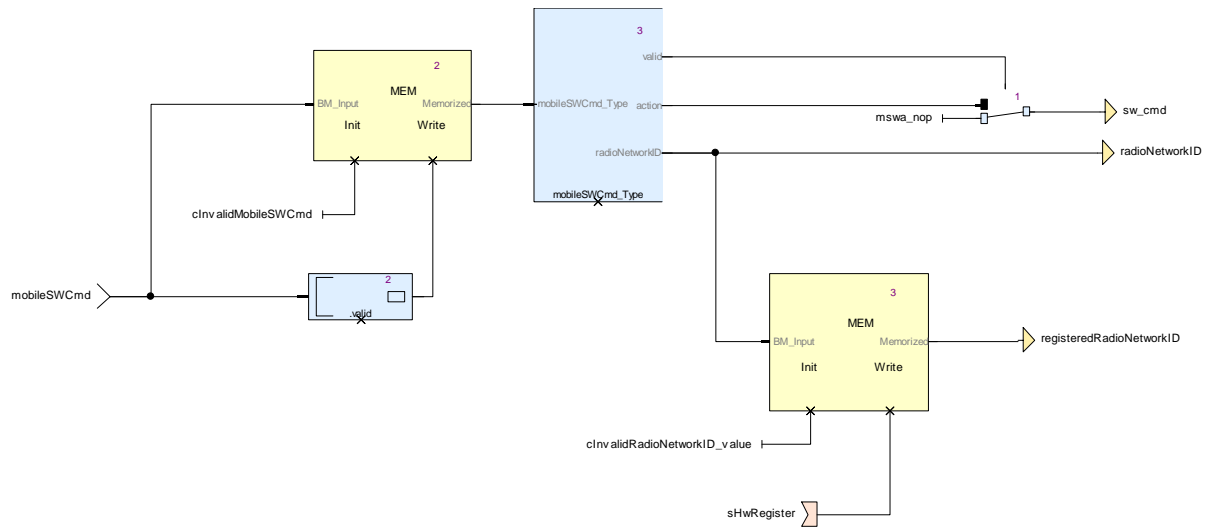


Figure 30: View of diagram\_radioNetworkMobile\_2 (radioNetworkMobile)

Table 83: State Machines of diagram\_radioNetworkMobile\_2

State Machine	Comments and Information
MobileHW_available_SM	



Table 84: States of diagram\_radioNetworkMobile\_2

State	Comments and Information
MobileHW_available_SM: InitialState	
MobileHW_available_SM: MobileHWAvalab le	
MobileHW_available_SM: MobileHWNotAva ilable	

Table 85: Transitions of diagram\_radioNetworkMobile\_2

Source/Target	#	Conditions/Actions	Comments and Information
Source: MobileHW_available_SM: InitialStat e Target: MobileHW_available_SM: MobileHW NotAvailable	1	Condition: true Actions:	
Source: MobileHW_available_SM: MobileHW Available Target: MobileHW_available_SM: MobileHW NotAvailable	1	Condition: not hw_available Actions:	
Source: MobileHW_available_SM: MobileHW NotAvailable Target: MobileHW_available_SM: MobileHW Available	1	Condition: hw_available Actions:	

3.1.12.5.3. View of diagram\_MobileHWAvalable\_1  
(radioNetworkMobile/MobileHW\_available\_SM: MobileHWAvalable:)

*Owner diagram:* diagram\_radioNetworkMobile\_2

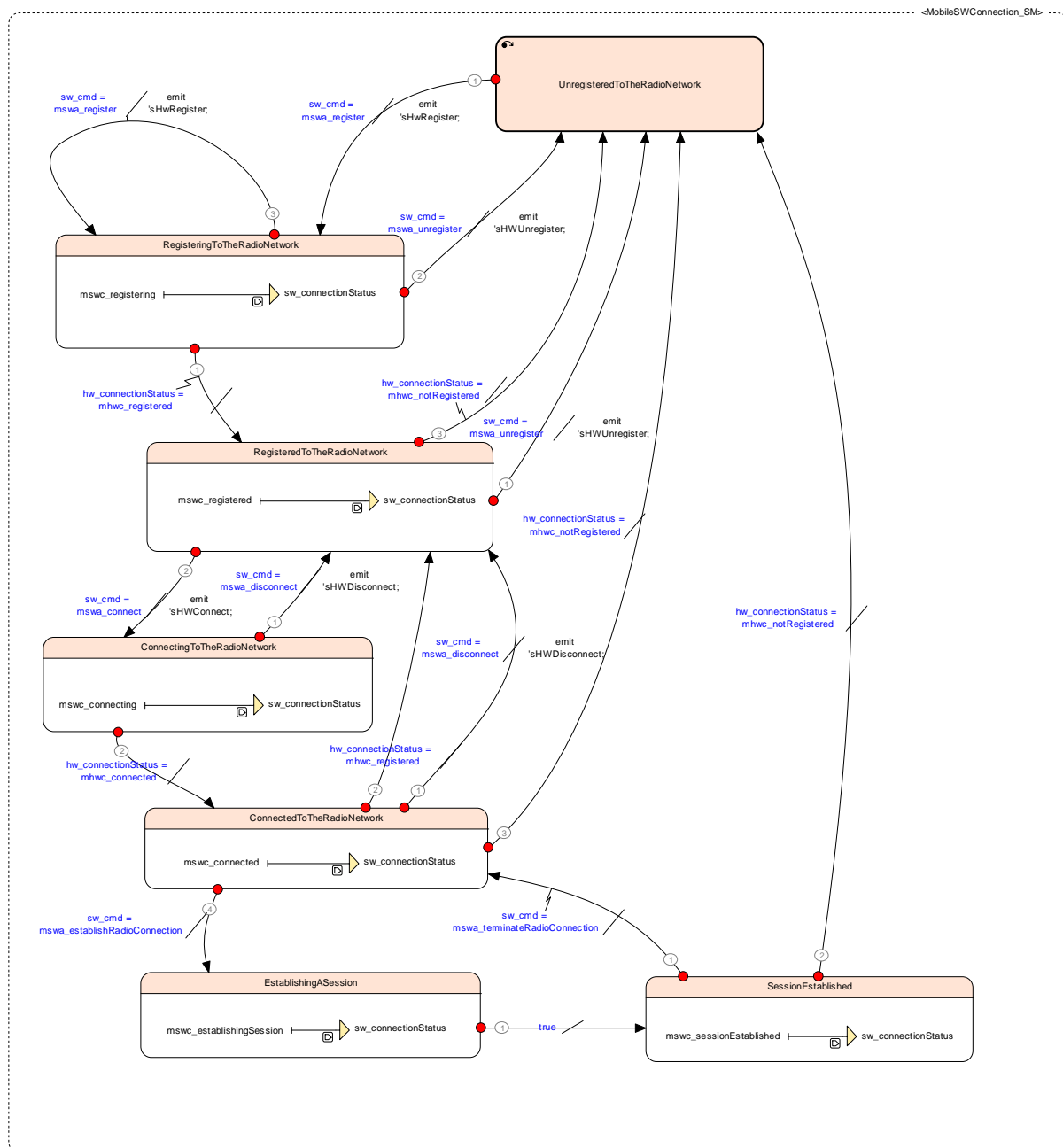


Figure 31: View of diagram\_MobileHWAavailable\_1  
(radioNetworkMobile/MobileHW\_available\_SM:MobileHWAavailable:)

Table 86: State Machines of diagram\_MobileHWAavailable\_1

State Machine	Comments and Information
MobileSWConnection_SM	

Table 87: States of diagram\_MobileHWAavailable\_1

State	Comments and Information
MobileSWConnection_SM: ConnectedToTheRadioNetwork	
MobileSWConnection_SM: ConnectingToTheRadioNetwork	

State	Comments and Information
MobileSWConnection_SM: EstablishingASession	
MobileSWConnection_SM: RegisteredToTheRadioNetwork	
MobileSWConnection_SM: RegisteringToTheRadioNetwork	Comments: 3.5.6.3.2: attempts to register to this Radio Network Traceability: 3.5.6.3.2
MobileSWConnection_SM: SessionEstablished	
MobileSWConnection_SM: UnregisteredToTheRadioNetwork	

Table 88: Transitions of diagram\_MobileHWAavailable\_1

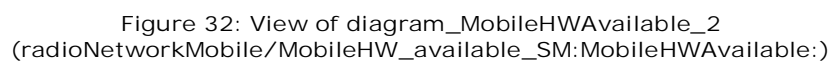
Source/Target	#	Conditions/Actions	Comments and Information
Source: MobileSWConnection_SM: ConnectedToTheRadioNetwork Target: MobileSWConnection_SM: RegisteredToTheRadioNetwork	1	Condition: sw_cmd = mswa_disconnect Actions: emit 'sHWDDisconnect;	
Source: MobileSWConnection_SM: ConnectedToTheRadioNetwork Target: MobileSWConnection_SM: RegisteredToTheRadioNetwork	2	Condition: hw_connectionStatus = mhwc_registered	
Source: MobileSWConnection_SM: ConnectedToTheRadioNetwork Target: MobileSWConnection_SM: UnregisteredToTheRadioNetwork	3	Condition: hw_connectionStatus = mhwc_notRegistered	
Source: MobileSWConnection_SM: ConnectedToTheRadioNetwork Target: MobileSWConnection_SM: EstablishingASession	4	Condition: sw_cmd = mswa_establishRadioConnection	
Source: MobileSWConnection_SM: ConnectingToTheRadioNetwork Target: MobileSWConnection_SM: RegisteredToTheRadioNetwork	1	Condition: sw_cmd = mswa_disconnect Actions: emit 'sHWDDisconnect;	
Source: MobileSWConnection_SM: ConnectingToTheRadioNetwork Target: MobileSWConnection_SM: ConnectedToTheRadioNetwork	2	Condition: hw_connectionStatus = mhwc_connected	

Source/Target	#	Conditions/Actions	Comments and Information
Source: MobileSWConnection_SM: EstablishingASession Target: MobileSWConnection_SM: SessionEstablished	1	Condition: true	
Source: MobileSWConnection_SM: RegisteredToTheRadioNetwork Target: MobileSWConnection_SM: UnregisteredToTheRadioNetwork	1	Condition: sw_cmd = mswa_unregister Actions: emit 'sHWUnregister;	
Source: MobileSWConnection_SM: RegisteredToTheRadioNetwork Target: MobileSWConnection_SM: ConnectingToTheRadioNetwork	2	Condition: sw_cmd = mswa_connect Actions: emit 'sHWConnect;	
Source: MobileSWConnection_SM: RegisteredToTheRadioNetwork Target: MobileSWConnection_SM: UnregisteredToTheRadioNetwork	3	Condition: hw_connectionStatus = mhwc_notRegistered	
Source: MobileSWConnection_SM: RegisteringToTheRadioNetwork Target: MobileSWConnection_SM: RegisteredToTheRadioNetwork	1	Condition: hw_connectionStatus = mhwc_registered	
Source: MobileSWConnection_SM: RegisteringToTheRadioNetwork Target: MobileSWConnection_SM: UnregisteredToTheRadioNetwork	2	Condition: sw_cmd = mswa_unregister Actions: emit 'sHWUnregister;	
Source: MobileSWConnection_SM: RegisteringToTheRadioNetwork Target: MobileSWConnection_SM: RegisteringToTheRadioNetwork	3	Condition: sw_cmd = mswa_register Actions: emit 'sHwRegister;	
Source: MobileSWConnection_SM: SessionEstablished Target: MobileSWConnection_SM: ConnectedToTheRadioNetwork	1	Condition: sw_cmd = mswa_terminateRadioConnection	
Source: MobileSWConnection_SM: SessionEstablished Target: MobileSWConnection_SM: UnregisteredToTheRadioNetwork	2	Condition: hw_connectionStatus = mhwc_notRegistered	

Source/Target	#	Conditions/Actions	Comments and Information
Source: MobileSWConnection_SM: UnregisterToTheRadioNetwork Target: MobileSWConnection_SM: RegisteringToTheRadioNetwork	1	Condition: sw_cmd = mswa_register Actions: emit 'sHwRegister;	Comments: 3.5.6.3.2: attempts to register to this Radio Network Traceability: 3.5.6.3.2

3.1.12.5.4. View of diagram\_MobileHwAvailable\_2  
(radioNetworkMobile/MobileHW\_available\_SM: MobileHwAvailable:)

*Owner diagram:* diagram\_radioNetworkMobile\_2



Conditional Block	Comments and Information
IfBlock1	

Conditional Block Action	Comments and Information
IfBlock1: then	
IfBlock1: else: then	

Conditional Block Action	Comments and Information
IfBlock1:else:else: then	
IfBlock1:else:else:else: then	
IfBlock1:else:else:else:else	

### 3.1.13. RBCTransition\_forSafeRadioConnectionIndication Operator

Declared as **private function**

#### 3.1.13.1. Comments and Information

RBCTransition\_forSafeRadioConnectionIndication Comments:

- Subset 096, REQ 3.5.7.6
- Manages the switch of the indication status in the case of an RBC/RBC transition

Table 91: RBCTransition\_forSafeRadioConnectionIndication Annotations

Note Name	Attribute	Value
Remark_1	Description	- Name: RBCTransition_forSafeRadioConnectionIndication - Description: Manages the switch of the indication status in the case of an RBC/RBC transition - Copyright Siemens AG, 2013 - Licensed under the EUPL V.1.1 ( <a href="http://joinup.ec.europa.eu/software/page/eupl/licence-eupl">http://joinup.ec.europa.eu/software/page/eupl/licence-eupl</a> ) - Gist URL: --- - Cryptography: No - Author(s): Uwe Steinke  The use of this software is limited to non-vital applications. It has not been developed for vital operation purposes and must not be used for applications which may cause harm to people, physical accidents or financial loss. THEREFORE, NO LIABILITY WILL BE GIVEN FOR SUCH AND ANY OTHER KIND OF USE.
	to_c	True

RBCTransition\_forSafeRadioConnectionIndication Traceability:

- 3.5.7.6

#### 3.1.13.2. Interface

Table 92: Inputs of RBCTransition\_forSafeRadioConnectionIndication

Name	Type	Comments and Information
connectionStatus_ofHandingOverRBC	safeRadioConnectionStatusValid_Type	Comments: 3.5.7.1 Traceability: 3.5.7.1

Name	Type	Comments and Information
connectionStatus_ofAcceptingRBC	safeRadioConnectionStatusValid_Type	Comments: 3.5.7.1 Traceability: 3.5.7.1
acceptingRBC_becomesTheSupervisingRBC	bool	Comments: 3.5.7.6a) Traceability: 3.5.7.6
safeRadioConnectionIsReleasedWithTheHandingoverRBC	bool	Comments: 3.5.7.6b) Traceability: 3.5.7.6
minimumSafeRearEndOfTheTrainHasCrossedTheBorder	bool	Comments: 3.5.7.6b) Traceability: 3.5.7.6

Table 93: Outputs of RBCTransition\_forSafeRadioConnectionIndication

Name	Type	Comments and Information
connectionStatus	safeRadioConnectionStatusValid_Type	Comments: 3.5.7.1 Traceability: 3.5.7.1

### 3.1.13.3. Operator Hierarchy

diagram : diagram\_RBCTransition\_forSafeRadioConnectionIndication\_1



### 3.1.13.4. Graphical and Textual Diagrams

#### 3.1.13.4.1. View of diagram\_RBCTransition\_forSafeRadioConnectionIndication\_1 (RBCTransition\_forSafeRadioConnectionIndication)

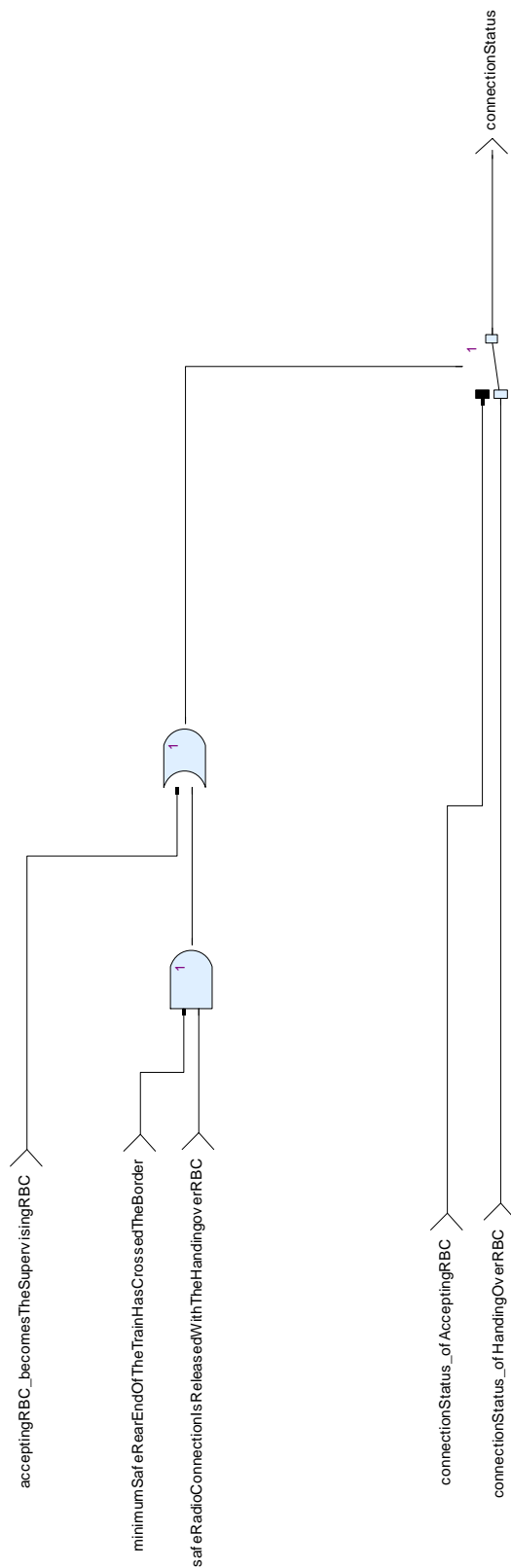


Figure 33: View of diagram\_RBCTransition\_forSafeRadioConnectionIndication\_1  
(RBCTransition\_forSafeRadioConnectionIndication)

### 3.1.14. registeringToTheRadioNetwork Operator

Declared as **private node**

#### 3.1.14.1. Comments and Information

registeringToTheRadioNetwork Comments:

- Subset 096, REQ 3.5.6
- Implements the registration to the radio network.

Table 94: registeringToTheRadioNetwork Annotations

Note Name	Attribute	Value
Remark_1	Description	<ul style="list-style-type: none"> <li>- Name: registeringToTheRadioNetwork</li> <li>- Description: Implements the registration to the radio network.</li> <li>- Copyright Siemens AG, 2013</li> <li>- Licensed under the EUPL V.1.1 ( <a href="http://joinup.ec.europa.eu/software/page/eupl/licence-eupl">http://joinup.ec.europa.eu/software/page/eupl/licence-eupl</a> )</li> <li>- Gist URL: ---</li> <li>- Cryptography: No</li> <li>- Author(s): Uwe Steinke</li> </ul> <p>The use of this software is limited to non-vital applications.  It has not been developed for vital operation purposes and must not be used for applications which may cause harm to people, physical accidents or financial loss.  THEREFORE, NO LIABILITY WILL BE GIVEN FOR SUCH AND ANY OTHER KIND OF USE.</p>
	to_c	True

registeringToTheRadioNetwork Traceability:

- 3.5.6.1
- 3.5.6.2
- 3.5.6.5
- 3.5.6.6
- 3.5.6.7

#### 3.1.14.2. Interface

Table 95: Inputs of registeringToTheRadioNetwork

Name	Type	Properties	Comments and Information
atPowerUp	bool		Comments: 3.5.6.1a) Traceability: 3.5.6.1

Name	Type	Properties	Comments and Information
afterDriverEntryOfANewRadioNetworkID	bool		Comments: 3.5.6.1b), 3.5.6.2 Strobe input, activated when the driver sets the Radio Network ID Traceability: 3.5.6.1 3.5.6.2
etcs_level	M_LEVEL_Type		Comments: 3.5.6.1b) Traceability: 3.5.6.1
registrationOrderedFromTrackside	bool		Comments: 3.5.6.1.c) Traceability: 3.5.6.1
registrationOrderFromTracksideCancelled	bool		Comments: 3.5.6.6 Traceability: 3.5.6.6
atPowerOff	bool		Comments: 3.5.6.2 Traceability: 3.5.6.2
RadioNetworkID_memory	validRadioNetworkID_Type		Comments: 3.5.6.2 Traceability: 3.5.6.2
RadioNetworkID_fromDriver	validRadioNetworkID_Type		Comments: 3.5.6.2 Traceability: 3.5.6.2
RadioNetworkID_fromTrackside	validRadioNetworkID_Type		Comments: 3.5.6.1c), 3.5.6.2 Traceability: 3.5.6.1 3.5.6.2
triggerDecisionThatNoRadioNetworkIDAvailable	bool		Comments: 3.5.6.3 Traceability: 3.5.6.3
mobileHWStatus	mobileHWStatus_Type		Comments: Communication status received from the mobile hardware. If valid, designates that this operator is connected to an existing mobile hardware

Name	Type	Properties	Comments and Information
mobileSWCmd	mobileSWCmd_Type		Comments: Cmd inputs to this operator 3.5.6.5: includes the order to use and occupy this mobile for a (established) communication session Traceability: 3.5.6.3 3.5.6.3.2 3.5.6.5
RadioNetworkID_Default	validRadioNetworkID_Type	hidden	Comments: 3.5.6.3 Traceability: 3.5.6.3

Table 96: Outputs of registeringToTheRadioNetwork

Name	Type	Properties		Comments and Information
orderTheRegistrationOfItsConnectedMobiles	bool			Comments: 3.5.6.1 Traceability: 3.5.6.1
memorizeTheLastRadioNetworkID	bool			Comments: 3.5.6.2 Traceability: 3.5.6.2
actualRadioNetworkID	validRadioNetworkID_Type			Comments: 3.5.6.2 Traceability: 3.5.6.2
rejectOrderToContactRBC_or_RIU	bool			Comments: 3.5.6.7 Traceability: 3.5.6.7
mobileHWCmd	mobileHWCmd_Type	default	cInvalidmobileHWCmd	Comments: 3.5.6, 3.5.6.3.2, 3.5.6.5, 3.5.6.5: Commands to the mobile hardware Traceability: 3.5.6.5
mobileSWStatus	mobileSWStatus_Type			Comments: SW-Status of the mobile: 3.5.6.5 Indicates, that this mobile is in use for an Established Communication Session Traceability: 3.5.6.5

### 3.1.14.3. Locals

Table 97: Locals of registeringToTheRadioNetwork

Name	Type	Properties		Comments and Information
actualRadioNetworkID_loc	validRadioNetworkID_Type			Traceability: 3.5.6.2
mobileSWStatus_loc	mobileSWStatus_Type	last	cInvalidMobileSWStatus	
newRadioNetworkIDReceivedFromTracksideOrDriver	bool			Comments: 3.5.6.3.2 Traceability: 3.5.6.3.2
noValidActualRadioNetworkID_available	bool	last	true	Comments: 3.5.6.3 Traceability: 3.5.6.3
orderTheRegistrationOfEachMobile	bool			Comments: 3.5.6.5 Traceability: 3.5.6.1 3.5.6.5 3.5.6.6
startTheRegistrationOfConnectedMobiles	bool			

### 3.1.14.4. Operator Hierarchy

diagram : diagram\_registeringToTheRadioNetwork\_1

diagram : diagram\_registeringToTheRadioNetwork\_2



### 3.1.14.5.2. View of diagram\_registeringToTheRadioNetwork\_2 (registeringToTheRadioNetwork)

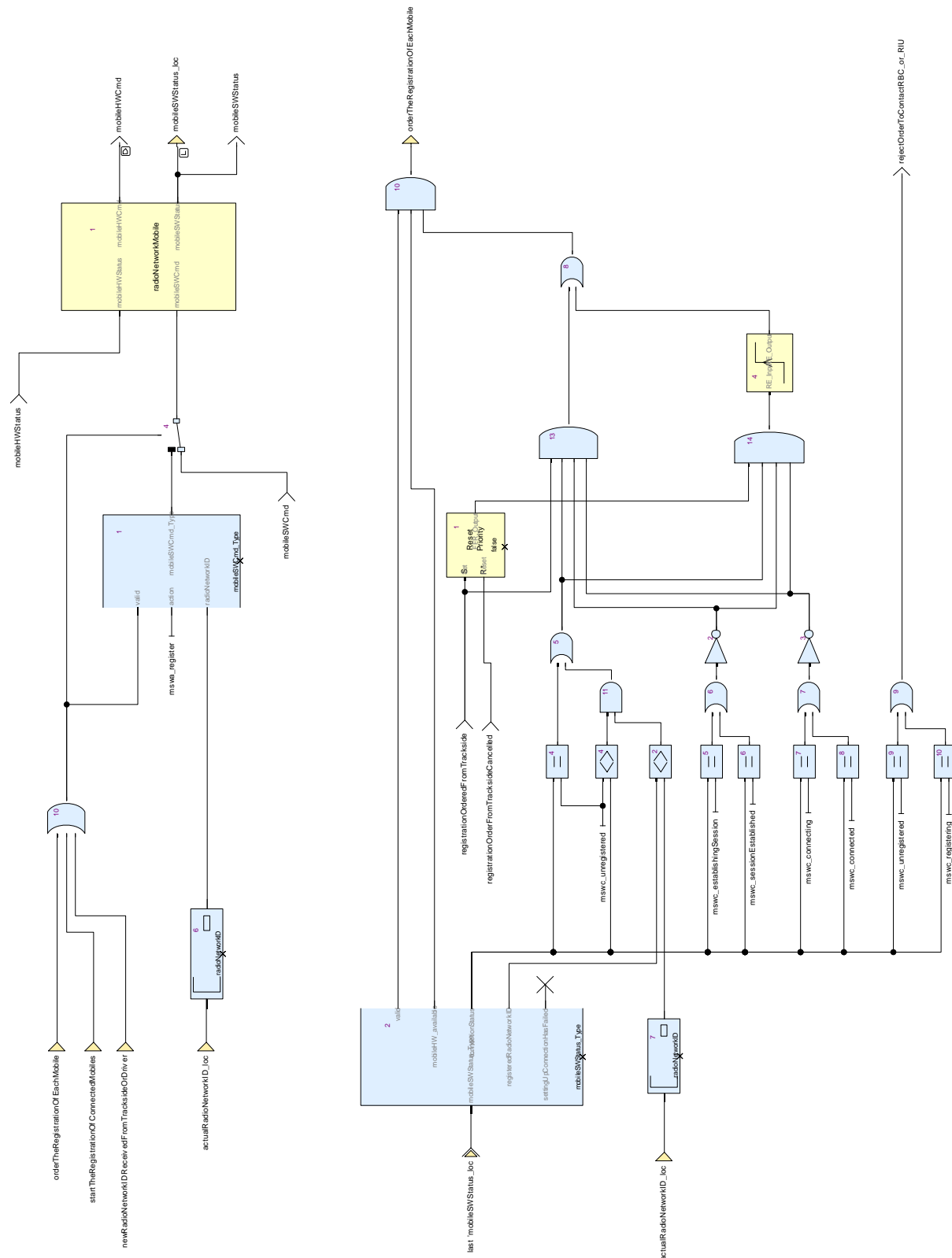


Figure 35: View of diagram\_registeringToTheRadioNetwork\_2 (registeringToTheRadioNetwork)

### 3.1.15. safeRadioConnectionIndication Operator

Declared as **private node**

#### 3.1.15.1. Comments and Information

safeRadioConnectionIndication Comments:

- Subset 096, REQ 3.5.7
- Controls the radio connection indication for the driver.

Table 98: safeRadioConnectionIndication Annotations

Note Name	Attribute	Value
Remark_1	Description	<ul style="list-style-type: none"> <li>- Name: safeRadioConnectionIndication</li> <li>- Description: Controls the radio connection indication for the driver.</li> <li>- Copyright Siemens AG, 2013</li> <li>- Licensed under the EUPL V.1.1 ( <a href="http://joinup.ec.europa.eu/software/page/eupl/licence-eupl">http://joinup.ec.europa.eu/software/page/eupl/licence-eupl</a> )</li> <li>- Gist URL: ---</li> <li>- Cryptography: No</li> <li>- Author(s): Uwe Steinke</li> </ul> <p>The use of this software is limited to non-vital applications.  It has not been developed for vital operation purposes and must not be used for applications which may cause harm to people, physical accidents or financial loss.  THEREFORE, NO LIABILITY WILL BE GIVEN FOR SUCH AND ANY OTHER KIND OF USE.</p>
	to_c	True

safeRadioConnectionIndication Traceability:

- 3.5.7.2
- 3.5.7.2.1
- 3.5.7.3
- 3.5.7.5

#### 3.1.15.2. Interface

Table 99: Inputs of safeRadioConnectionIndication

Name	Type	Properties	Comments and Information
startOfMissionProceduresGoingOn	bool		Comments: 3.5.7.5 [1] Traceability: 3.5.7.5
finalAttemptToSetupTheSafeRadioConnectionFailed	bool		Comments: 3.5.7.5[1] Traceability: 3.5.7.5



Name	Type	Properties	Comments and Information
requestsToSetupASafeRadioConnectionAreStopped_unsuccessfulReason	bool		Comments: 3.5.7.5[3], 3.5.7.5[6] Traceability: 3.5.7.5
requestsToSetupASafeRadioConnectionAreStopped	bool		Comments: 3.5.7.4 Traceability: 3.5.7.4
safeRadioConnection_Setup	bool		Comments: 3.5.7.5[4] Traceability: 3.5.7.5
safeRadioConnection_Released	bool		Comments: 3.5.7.5[5] Traceability: 3.5.7.5
safeRadioConnection_Lost	bool		Comments: 3.5.7.5[6], 3.5.7.5[7] Traceability: 3.5.7.5
trainfrontIsInsideAnAnnouncedRadioHole	bool		Comments: 3.5.7.5[7] Traceability: 3.5.7.5
actualTime	time_Type		
firstRequestToSetupASafeRadioConnection_fromEstablishing	bool		Comments: 3.5.7.3a) Traceability: 3.5.7.3
firstRequestToSetupASafeRadioConnection_fromMaintaining	bool		Comments: 3.5.7.3a) Traceability: 3.5.7.3
connectionStatusTimerInterval	time_Type	hidden	Comments: 3.5.7.2 Traceability: 3.5.7.2

Table 100: Outputs of safeRadioConnectionIndication

Name	Type	Comments and Information
connectionStatus	safeRadioConnectionStatusValid_Type	Comments: 3.5.7.1 Traceability: 3.5.7.1

### 3.1.15.3. Locals

Table 101: Locals of safeRadioConnectionIndication

Name	Type	Comments and Information
condition_ID_1	bool	Comments: 3.5.7.5[1] Traceability: 3.5.7.5

Name	Type	Comments and Information
condition_ID_2	bool	Comments: 3.5.7.5[2] Traceability: 3.5.7.5
condition_ID_3	bool	Comments: 3.5.7.5[3] Traceability: 3.5.7.5
condition_ID_4	bool	Comments: 3.5.7.5[4] Traceability: 3.5.7.5
condition_ID_5	bool	Comments: 3.5.7.5[5] Traceability: 3.5.7.5
condition_ID_6	bool	Comments: 3.5.7.5[6] Traceability: 3.5.7.5
condition_ID_7	bool	Comments: 3.5.7.5[7] Traceability: 3.5.7.5
connectionStatus_loc	safeRadioConnectionStatus_Type	
connectionStatusTimer Expired	bool	Comments: 3.5.7.5[2] Traceability: 3.5.7.5

#### 3.1.15.4. Operator Hierarchy

diagram : diagram\_safeRadioConnectionIndication\_1

*state-machine* : connectionStatus\_SM

state : ConnectionLost\_SetupFailed

state : ConnectionUp

state : NoConnection

diagram : diagram\_safeRadioConnectionIndication\_2

diagram : diagram\_safeRadioConnectionIndication\_3

### 3.1.15.5. Graphical and Textual Diagrams

#### 3.1.15.5.1. View of diagram\_safeRadioConnectionIndication\_1 (safeRadioConnectionIndication)

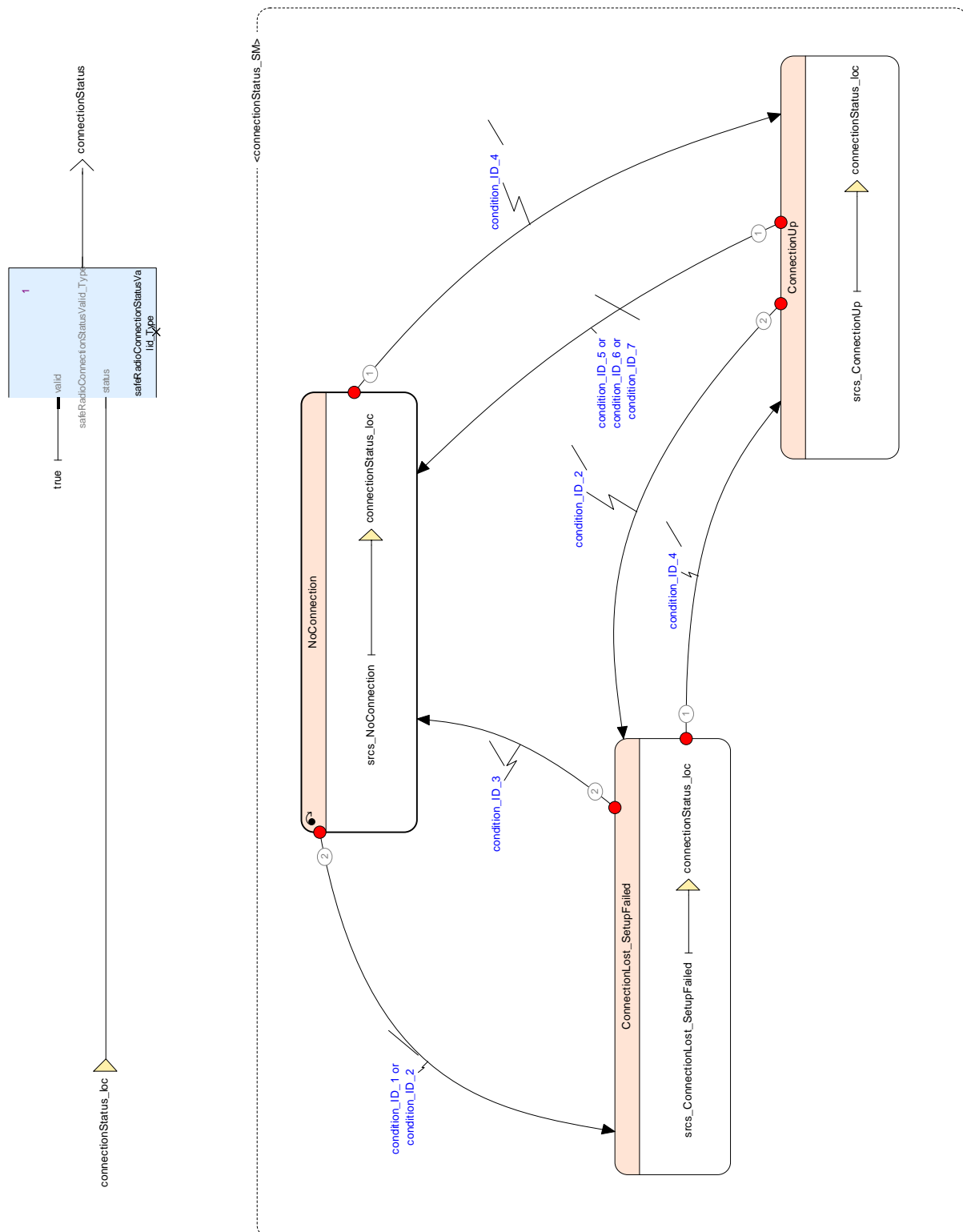


Figure 36: View of diagram\_safeRadioConnectionIndication\_1 (safeRadioConnectionIndication)

Table 102: State Machines of diagram\_safeRadioConnectionIndication\_1

State Machine	Comments and Information
connectionStatus_SM	Comments: 3.5.7.1 Traceability: 3.5.7.1

Table 103: States of diagram\_safeRadioConnectionIndication\_1

State	Comments and Information
connectionStatus_SM:ConnectionLost_SetupFailed	
connectionStatus_SM:ConnectionUp	
connectionStatus_SM:NoConnection	

Table 104: Transitions of diagram\_safeRadioConnectionIndication\_1

Source/Target	#	Conditions/Actions	Comments and Information
Source: connectionStatus_SM:ConnectionLost_SetupFailed Target: connectionStatus_SM:ConnectionUp	1	Condition: condition_ID_4	
Source: connectionStatus_SM:ConnectionLost_SetupFailed Target: connectionStatus_SM:NoConnection	2	Condition: condition_ID_3	
Source: connectionStatus_SM:ConnectionUp Target: connectionStatus_SM:NoConnection	1	Condition: condition_ID_5 or condition_ID_6 or condition_ID_7	
Source: connectionStatus_SM:ConnectionUp Target: connectionStatus_SM:ConnectionLost_SetupFailed	2	Condition: condition_ID_2	
Source: connectionStatus_SM:NoConnection Target: connectionStatus_SM:ConnectionUp	1	Condition: condition_ID_4	
Source: connectionStatus_SM:NoConnection Target: connectionStatus_SM:ConnectionLost_SetupFailed	2	Condition: condition_ID_1 or condition_ID_2	

### 3.1.15.5.2. View of diagram\_safeRadioConnectionIndication\_2 (safeRadioConnectionIndication)

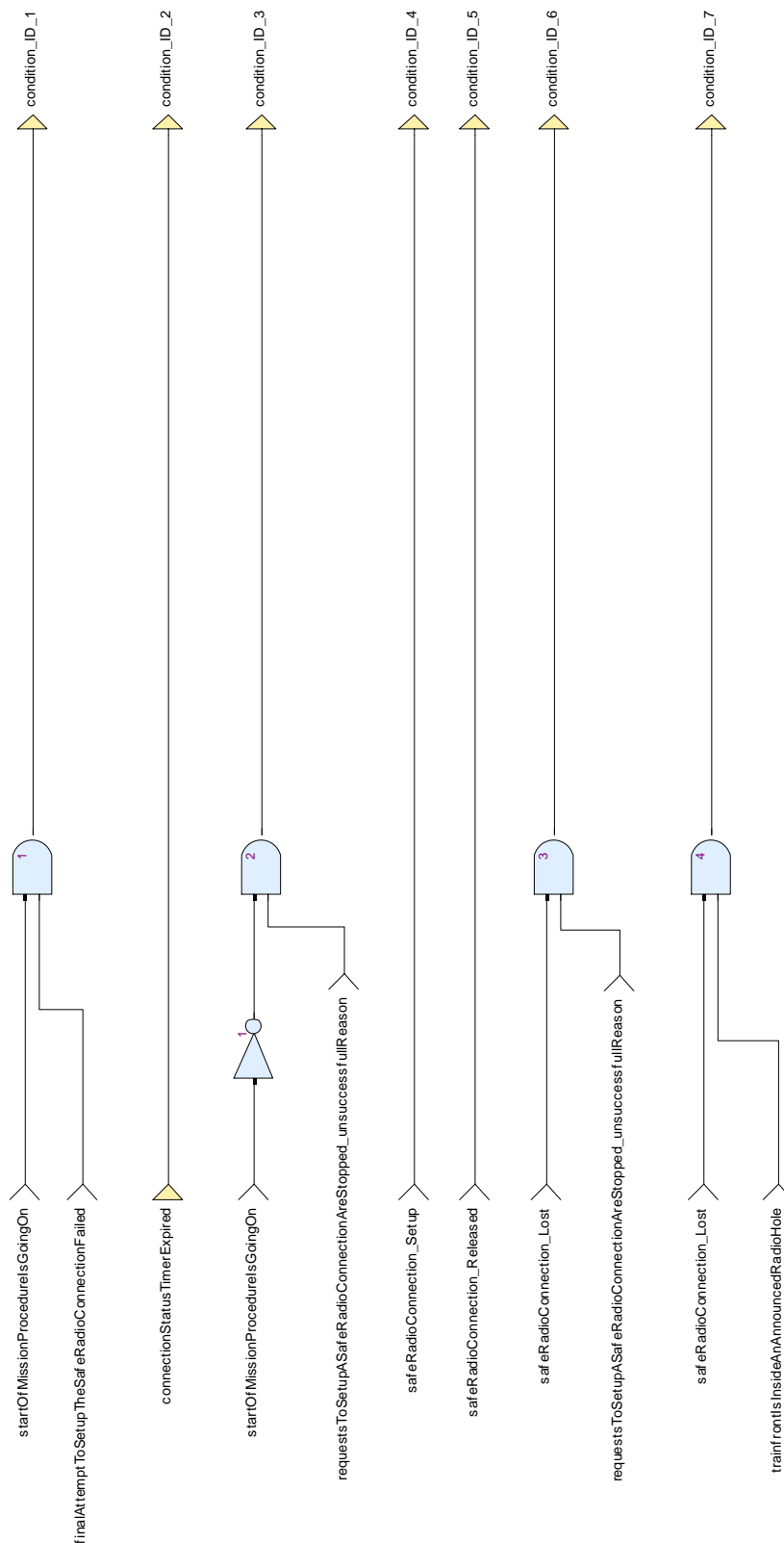


Figure 37: View of diagram\_safeRadioConnectionIndication\_2 (safeRadioConnectionIndication)

### 3.1.15.5.3. View of diagram\_safeRadioConnectionIndication\_3 (safeRadioConnectionIndication)

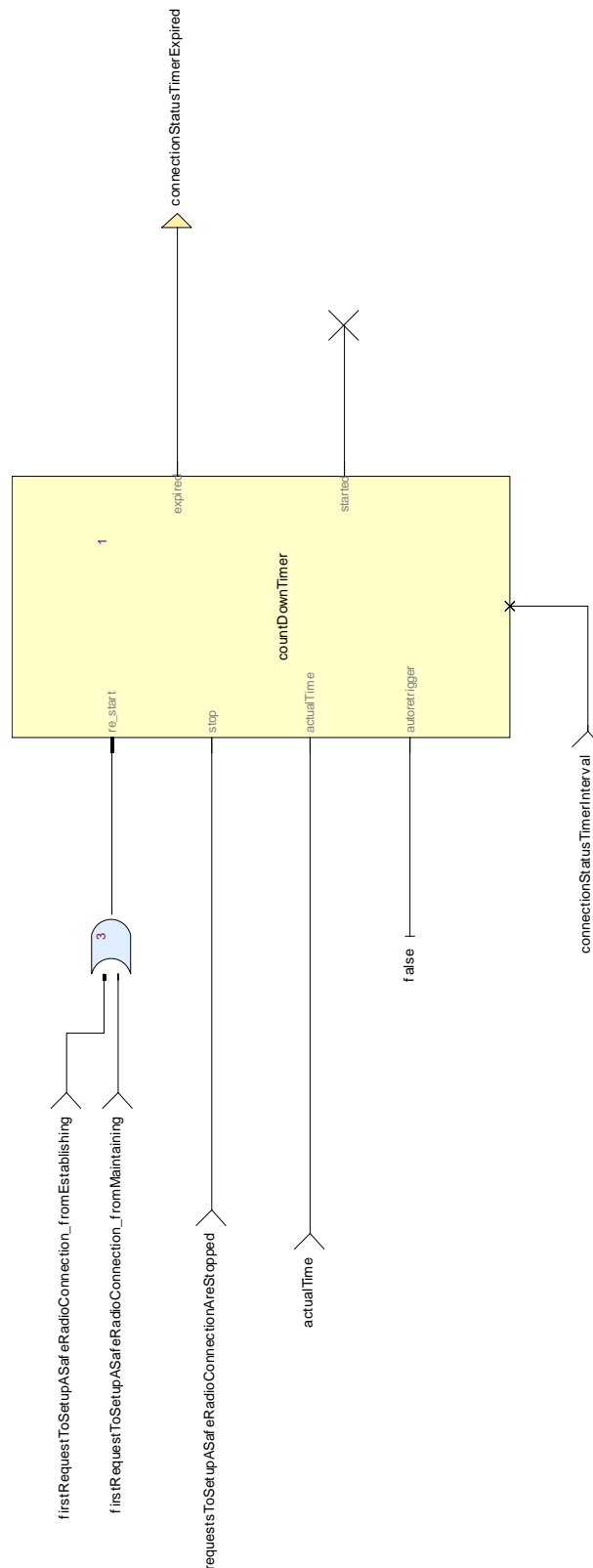


Figure 38: View of diagram\_safeRadioConnectionIndication\_3 (safeRadioConnectionIndication)

### 3.1.16. terminateAndEstablishSession Operator

Declared as **private node**

#### 3.1.16.1. Comments and Information

terminateAndEstablishSession Comments:

- Subset 096, REQ 3.5.3.5.2
- Determines, if an establishing or established session has to be terminated due to a new order that request a session with a different RBC.
- Initiates the termination, waits til the termination is achieved and initiates the new session.

Table 105: terminateAndEstablishSession Annotations

Note Name	Attribute	Value
Remark_1	Description	- Name: terminateAndEstablishSession - Description: Terminates the actual session and establishes a new one, if required. - Copyright Siemens AG, 2013 - Licensed under the EUPL V.1.1 ( <a href="http://joinup.ec.europa.eu/software/page/eupl/licence-eupl">http://joinup.ec.europa.eu/software/page/eupl/licence-eupl</a> ) - Gist URL: --- - Cryptography: No - Author(s): Uwe Steinke  The use of this software is limited to non-vital applications. It has not been developed for vital operation purposes and must not be used for applications which may cause harm to people, physical accidents or financial loss. THEREFORE, NO LIABILITY WILL BE GIVEN FOR SUCH AND ANY OHER KIND OF USE.
	to_c	True

terminateAndEstablishSession Traceability:

- 3.5.3.5.2

#### 3.1.16.2. Interface

Table 106: Inputs of terminateAndEstablishSession

Name	Type	Comments and Information
newOrderToEstablishASession_in	orderToContactAnRBC_Type	Comments: 3.5.5.1a) Traceability: 3.5.5.1
sessionStatus	sessionStatus_Type	
OBU_hasToEstablishANewSession	bool	Comments: 3.5.3.5.2 Traceability: 3.5.3.5.2

Table 107: Outputs of terminateAndEstablishSession

Name	Type	Properties		Comments and Information
initiateTermination	bool			
initiateEstablishingNewSession	bool	default	false	
newOrderToEstablishA Session_out	orderToContactAnRBC_ Type			Comments: 3.5.5.1a) Traceability: 3.5.5.1

### 3.1.16.3. Locals

Table 108: Locals of terminateAndEstablishSession

Name	Type	Comments and Information
ActualSessionIsInactive	bool	
storedOrder	orderToContactAnRBC_ Type	
terminateActualSession	bool	

### 3.1.16.4. Operator Hierarchy

diagram : diagram\_terminateAndEstablishSession\_1

*state-machine* : SM1

state : EstablishNewSession

state : NoTerminationInProgress

state : TerminationInProgress



### 3.1.16.5. Graphical and Textual Diagrams

#### 3.1.16.5.1. View of diagram\_terminateAndEstablishSession\_1 (terminateAndEstablishSession)

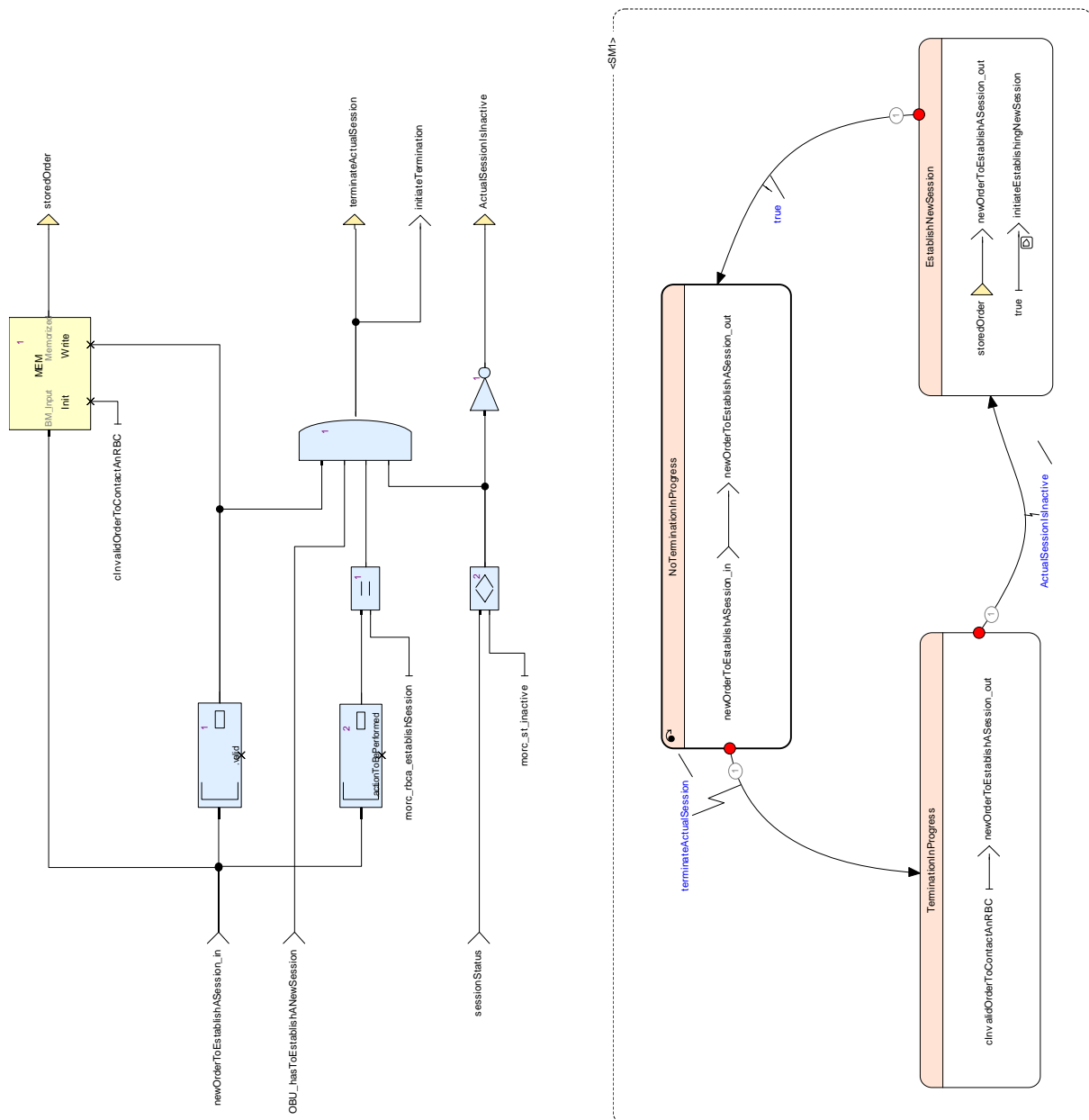


Figure 39: View of diagram\_terminateAndEstablishSession\_1 (terminateAndEstablishSession)

Table 109: State Machines of diagram\_terminateAndEstablishSession\_1

State Machine	Comments and Information
SM1	

Table 110: States of diagram\_terminateAndEstablishSession\_1

State	Comments and Information
SM1: EstablishNewSession	
SM1: NoTerminationInProgress	

State	Comments and Information
SM1:TerminationInProgress	

Table 111: Transitions of diagram\_terminateAndEstablishSession\_1

Source/Target	#	Conditions/Actions	Comments and Information
Source: SM1:EstablishNewSession Target: SM1:NoTerminationInProgress	1	Condition: true	
Source: SM1:NoTerminationInProgress Target: SM1:TerminationInProgress	1	Condition: terminateActualSession	
Source: SM1:TerminationInProgress Target: SM1:EstablishNewSession	1	Condition: ActualSessionIsInactive	

### 3.1.17. terminating\_a\_CommunicationSession Operator

Declared as **private node**

#### 3.1.17.1. Comments and Information

terminating\_a\_CommunicationSession Comments:

- Subset 096, REQ 3.5.5.2
- Implements the termination of a communication session.

Table 112: terminating\_a\_CommunicationSession Annotations

Note Name	Attribute	Value
Remark_1	Description	- Name: terminating_a_CommunicationSession - Description: Terminates the communication session. - Copyright Siemens AG, 2013 - Licensed under the EUPL V.1.1 ( <a href="http://joinup.ec.europa.eu/software/page/eupl/licence-eupl">http://joinup.ec.europa.eu/software/page/eupl/licence-eupl</a> ) - Gist URL: --- - Cryptography: No - Author(s): Uwe Steinke  The use of this software is limited to non-vital applications. It has not been developed for vital operation purposes and must not be used for applications which may cause harm to people, physical accidents or financial loss. THEREFORE, NO LIABILITY WILL BE GIVEN FOR SUCH AND ANY OTHER KIND OF USE.
	to_c	True

terminating\_a\_CommunicationSession Traceability:

- 3.5.5.2

- 3.5.5.3

### 3.1.17.2. Interface

Table 113: Inputs of terminating\_a\_CommunicationSession

Name	Type	Comments and Information
initiateTermination	bool	Comments: Intended to be fed by "initiateTerminatingASession"
aSessionIsEstablished	bool	Comments: 3.5.5.2 Traceability: 3.5.5.2
acknowledgementOfTerminationOfCommunicationSessionReceived	bool	Comments: 3.5.5.2c) Traceability: 3.5.5.2
aSessionIsCurrentlyBeingEstablished	bool	Comments: 3.5.5.7 Traceability: 3.5.5.7
actualTime	time_Type	
establishingACommunicationSessionAborted	bool	Comments: 3.5.5.7 Intended to be fed by "Establishing_a_CommunicationSession". Traceability: 3.5.5.7

Table 114: Outputs of terminating\_a\_CommunicationSession

Name	Type	Properties		Comments and Information
sendATerminationOfCommunicationMessage	bool			Comments: 3.5.5.2a), 3.5.5.3.1 Traceability: 3.5.5.2 3.5.5.3.1
requestReleaseOfSafeRadioConnectionWithTrackside	bool			Comments: 3.5.5.2c) Traceability: 3.5.5.2
ignoreMessagesFromRBC_exceptAckOfTerminationOfCommunicationSession	bool	default	false	Comments: 3.5.5.3.6 Traceability: 3.5.5.3.1
abortEstablishingACommunicationSession	bool			Comments: 3.5.5.7 Traceability: 3.5.5.7
communicationSessionTerminated	bool	default	false	

### 3.1.17.3. Locals

Table 115: Locals of terminating\_a\_CommunicationSession

Name	Type	Properties		Comments and Information
considerTheCommunicationSessionTerminated	bool	default	false	Comments: 3.5.5.3.2 Traceability: 3.5.5.3.1 3.5.5.3.2
initiateTerminationOfEstablishedSession	bool			Comments: 3.5.5.2 Traceability: 3.5.5.2 3.5.5.7
initiateTerminationOfEstablishingSession	bool			Comments: 3.5.5.7 Traceability: 3.5.5.7

Table 116: Signals of terminating\_a\_CommunicationSession

Name	Comments and Information
sAbortEstablishingACommunicationSession	
sRequestReleaseOfSafeRadioConnectionWithTrackside	Comments: 3.5.5.2c) Traceability: 3.5.5.2
sSendATerminationOfCommunicationMessage	Comments: 3.5.5.2a), 3.5.5.3.1 Traceability: 3.5.5.2 3.5.5.3.1

### 3.1.17.4. Operator Hierarchy

diagram : diagram\_terminating\_a\_CommunicationSession\_1

*state-machine* : TerminateTheCommunicationSession\_SM

state : CommunicationSession\_Terminated

state : EstablishingACommunicationSessionAborted

state : Idle

state : WaitForAcknowledgementMessage

diagram : diagram\_WaitForAcknowledgementMessage\_1

### 3.1.17.5. Graphical and Textual Diagrams

#### 3.1.17.5.1. View of diagram\_terminating\_a\_CommunicationSession\_1 (terminating\_a\_CommunicationSession)

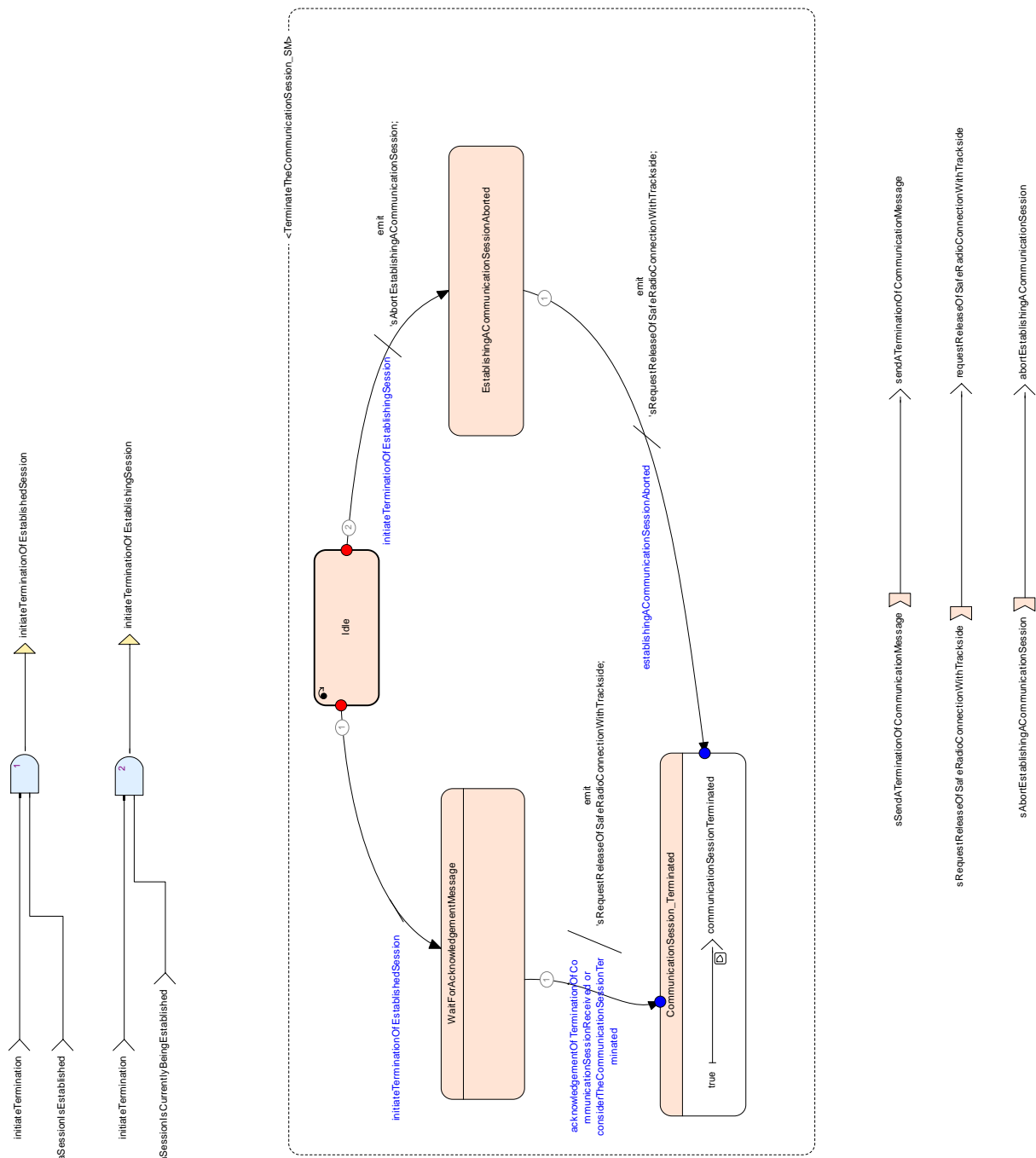


Figure 40: View of diagram\_terminating\_a\_CommunicationSession\_1  
 (terminating\_a\_CommunicationSession)

Table 117: State Machines of diagram\_terminating\_a\_CommunicationSession\_1

State Machine	Comments and Information
TerminateTheCommunicationSession_SM	Comments: 3.5.5.2 Traceability: 3.5.5.2

Table 118: States of diagram\_terminating\_a\_CommunicationSession\_1

State	Comments and Information
TerminateTheCommunicationSession_SM: CommunicationSession_Terminated	Comments: 3.5.5.3.2, Traceability: 3.5.5.3.1 3.5.5.3.2
TerminateTheCommunicationSession_SM: EstablishingACommunicationSessionAborted	Comments: 3.5.5.7 Traceability: 3.5.5.7
TerminateTheCommunicationSession_SM: Idle	
TerminateTheCommunicationSession_SM: WaitForAcknowledgementMessage	Traceability: 3.5.5.3.1 3.5.5.6

Table 119: Transitions of diagram\_terminating\_a\_CommunicationSession\_1

Source/Target	#	Conditions/Actions	Comments and Information
Source: TerminateTheCommunicationSession_SM: EstablishingACommunicationSessionAborted Target: TerminateTheCommunicationSession_SM: CommunicationSession_Terminated	1	Condition: establishingACommunicationSessionAborted Actions: emit 'sRequestReleaseOfSafeRadioConnectionWithTrackside;	Comments: 3.5.5.7 Traceability: 3.5.5.7
Source: TerminateTheCommunicationSession_SM: Idle Target: TerminateTheCommunicationSession_SM: WaitForAcknowledgementMessage	1	Condition: initiateTerminationOfEstablishedSession Actions:	Comments: 3.5.5.2a) Traceability: 3.5.5.2
Source: TerminateTheCommunicationSession_SM: Idle Target: TerminateTheCommunicationSession_SM: EstablishingACommunicationSessionAborted	2	Condition: initiateTerminationOfEstablishingSession Actions: emit 'sAbortEstablishingACommunicationSession;	Comments: 3.5.5.7 Traceability: 3.5.5.7

Source/Target	#	Conditions/Actions	Comments and Information
Source: TerminateTheCommunicationSession_SM:WaitForAcknowledgementMessage Target: TerminateTheCommunicationSession_SM:CommunicationSession_Terminated	1	Condition: acknowledgementOfTerminationOfCommunicationSessionReceived or considerTheCommunicationSessionTerminated Actions: emit 'sRequestReleaseOfSafeRadioConnectionWithTrackside;	Comments: 3.5.5.2c), 3.5.5.3.2 Traceability: 3.5.5.2 3.5.5.3.1 3.5.5.3.2

3.1.17.5.2. View of diagram\_WaitForAcknowledgementMessage\_1  
(terminating\_a\_CommunicationSession/TerminateTheCommunicationSession\_SM:WaitForAcknowledgementMessage:)

*Owner diagram:* diagram\_terminating\_a\_CommunicationSession\_1

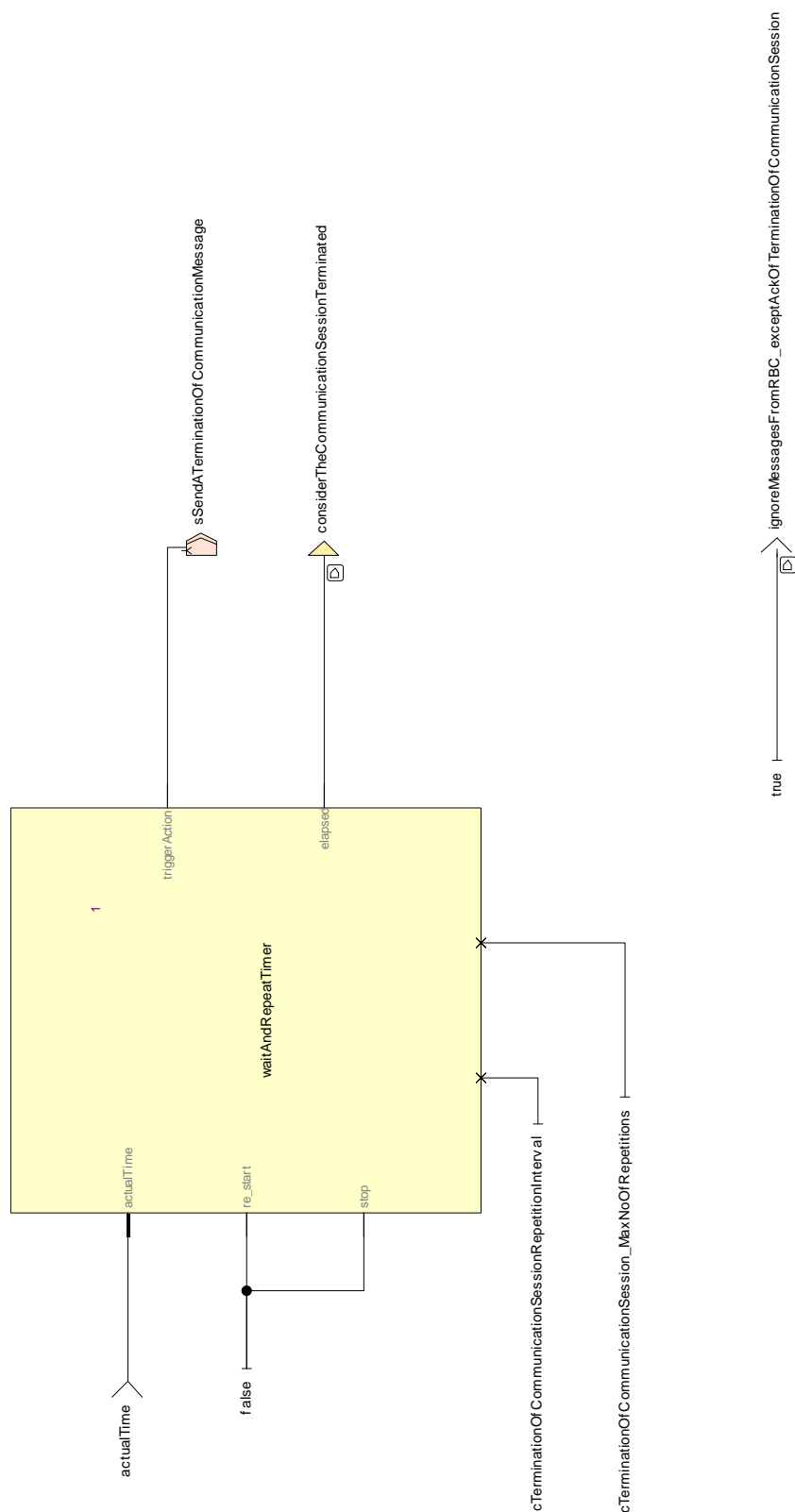


Figure 41: View of diagram\_WaitForAcknowledgementMessage\_1  
 (terminating\_a\_CommunicationSession/TerminateTheCommunicationSession\_SM:WaitForAcknowledge  
 dgementMessage:)



### 3.1.18. waitAndRepeatTimer Operator

Declared as **private node**

#### 3.1.18.1. Comments and Information

waitAndRepeatTimer Comments:

- Implements a timer for a triggering an action a limited number of times in configured intervals.
- Repeats triggerAction maxNoOfRepetition times in intervals of repeatInterval.
- triggerAction is activated at the beginning of each interval.
- elapsed is activated after the last interval.

Table 120: waitAndRepeatTimer Annotations

Note Name	Attribute	Value
Remark_1	Description	- Name: waitAndRepeatTimer - Description: Implements a timer for a triggering an action a limited number of times in configured intervals - Copyright Siemens AG, 2013 - Licensed under the EUPL V.1.1 ( <a href="http://joinup.ec.europa.eu/software/page/eupl/licence-eupl">http://joinup.ec.europa.eu/software/page/eupl/licence-eupl</a> ) - Gist URL: --- - Cryptography: No - Author(s): Uwe Steinke  The use of this software is limited to non-vital applications. It has not been developed for vital operation purposes and must not be used for applications which may cause harm to people, physical accidents or financial loss. THEREFORE, NO LIABILITY WILL BE GIVEN FOR SUCH AND ANY OHER KIND OF USE.
	to_c	True

#### 3.1.18.2. Interface

Table 121: Inputs of waitAndRepeatTimer

Name	Type	Properties	Comments and Information
actualTime	time_Type		
re_start	bool		
stop	bool		
repeatInterval	time_Type	hidden	
maxNoOfRepetitions	int	hidden	

Table 122: Outputs of waitAndRepeatTimer

Name	Type	Comments and Information
triggerAction	bool	

Name	Type	Comments and Information
elapsed	bool	

### 3.1.18.3. Operator Hierarchy

diagram : diagram\_waitAndRepeatTimer\_1

### 3.1.18.4. Graphical and Textual Diagrams

#### 3.1.18.4.1. View of diagram\_waitAndRepeatTimer\_1 (waitAndRepeatTimer)

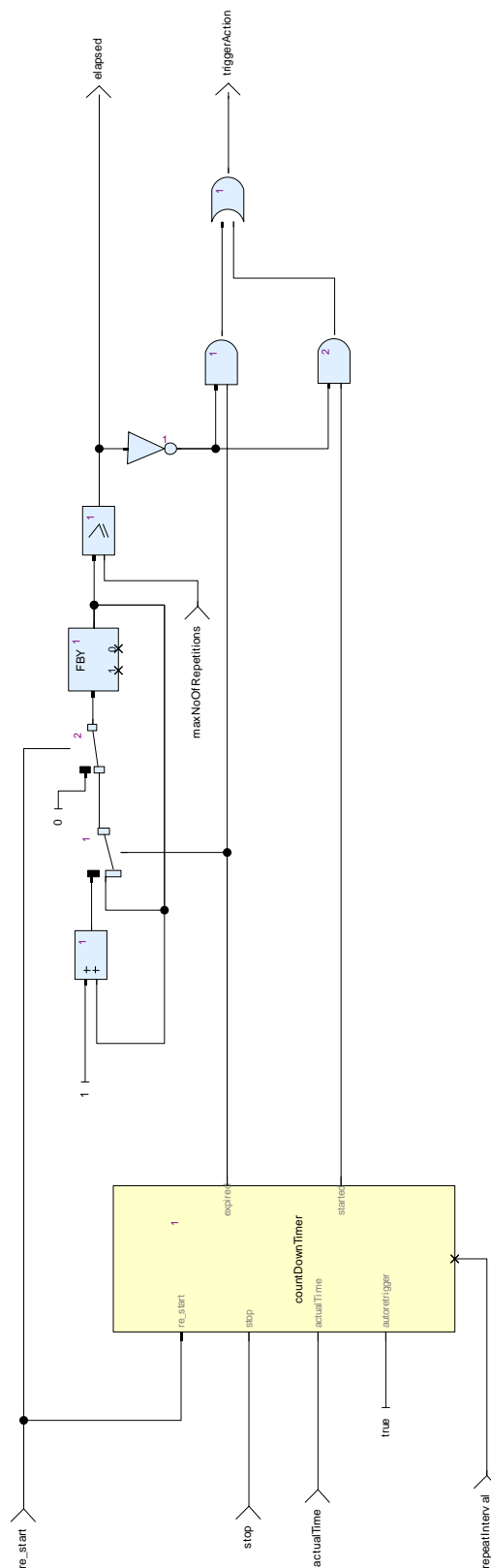


Figure 42: View of diagram\_waitAndRepeatTimer\_1 (waitAndRepeatTimer)

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