SCADE Formal Model Documentation

openETCS UNISIG Subset-026: SCADE model derived from SysML Model

Formal model generated from MoRC_System SysML model with “Management of Radio Communication” implementation

Summary:
Formal SCADE model generated from the accompanied MoRC_System SysML model.
Implements the “Management of Radio Communication” function by reuse of the existing MoRC model.

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Authors: Uwe Steinke
Reference: UNISIG Subset-026-3 3.0.0, Chapter 3.5 “Management of Radio Communication”
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Distribution List:
https://github.com/openETCS/model-evaluation/tree/master/model/SCADE_Siemens

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1. General Project Description

This SCADE model was generated from the MoRC_System SysML model automatically via import and synchronizing functions of SCADE Suite.
It implements the “Management of Radio Communication” function by simply incorporating the existing MoRC model that was designed from the written Subset-026 specification directly.

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openETCS / UNISIG Subset-026 SysML Model: From top level “Train” down to “Management of Radio Communication”

- Name: MoRC_System_impl.etp
- Description: SUBSET-026-3, ISSUE : 3.3.0, SCADE model derived from SysML model with “3.5 Management of Radio Communication”
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- Gist URL: ---
- Cryptography: No
- Author(s): Uwe Steinke

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2. Software Architecture

2.1. Project Architecture

This section displays the package hierarchy of projects.

Project MoRC_System_impl
- MoRC_System
  - Architecture
  - FunctionalComposition
  - FunctionAllocation
  - InterfacesAllocation

2.2. Call Graph

This Call Graph displays the dependency tree of model operators.

1. MoRC_System::Architecture::RadioManagement
   1.1. MoRC_withSimplified_IF (dManagementOfRadioCommunication)

3. MoRC_System_impl Project

3.1. MoRC_System Package

3.2. MoRC_System::Architecture Package

3.2.1. Types

Table 1: Public Types of Architecture

Name	Definition	Comments and Information
tM_Level	enum {tM_Level__ETCSLevel_0, tM_Level__ETCSLevel_NTC, tM_Level__ETCSLevel_1, tM_Level__ETCSLevel_2, tM_Level__ETCSLevel_3}	
tM_Mode	enum {tM_Mode__ETCSMode_FullSupervision, tM_Mode__ETCSMode_OnSight, tM_Mode__ETCSMode_StaffResponsible, tM_Mode__ETCSMode_Shunting, tM_Mode__ETCSMode_Unfitted, tM_Mode__ETCSMode_Sleeping, tM_Mode__ETCSMode_Standby, tM_Mode__ETCSMode_Trip, tM_Mode__ETCSMode_PostTrip, tM_Mode__ETCSMode_SystemFailure, tM_Mode__ETCSMode_Isolation, tM_Mode__ETCSMode_NonLeading, tM_Mode__ETCSMode_LimitedSupervision, tM_Mode__ETCSMode_NationalSystem, tM_Mode__ETCSMode_Reversing, tM_Mode__ETCSMode_PassiveShunting, tM_Mode__ETCSMode_EndOfMission}	
tMobileHWAction	enum {tMobileHWAction__mhwa_nop, tMobileHWAction__mhwa_register, tMobileHWAction__mhwa_connect, tMobileHWAction__mhwa_disconnect, tMobileHWAction__mhwa_unregister}	
tMobileHWConnectionStatus	enum {tMobileHWConnectionStatus__mhwc_notRegistered, tMobileHWConnectionStatus__mhwc_registered, tMobileHWConnectionStatus__mhwc_connectionSetupInProgress, tMobileHWConnectionStatus__mhwc_connected}	

Name	Definition	Comments and Information
tMobileSWConnectionStatus	enum {tMobileSWConnectionStatus__mswc_unregistered, tMobileSWConnectionStatus__mswc_registering, tMobileSWConnectionStatus__mswc_registered, tMobileSWConnectionStatus__mswc_connecting, tMobileSWConnectionStatus__mswc_connected, tMobileSWConnectionStatus__mswc_establishingSession, tMobileSWConnectionStatus__mswc_sessionEstablished}	
tNIC_RBC_ID	int	
tNID_Message	int	
tOB_Status	{powerAvailable : bool, M_Mode : MoRC_System::Architecture::tM_Mode, M_Level : MoRC_System::Architecture::tM_Level, systemVersionIsCompatible : bool, radioHoleStatus : MoRC_System::Architecture::tRadioHoleStatus, actualTime : MoRC_System::Architecture::tTime}	
tOrderToRBC	{messageToRBC : MoRC_System::Architecture::tNID_Message}	
tOrderToRM	{orderFromOnboard : MoRC_System::Architecture::tRMOrder, messageFromRBC : MoRC_System::Architecture::tNID_Message, NID_RBC_ID : MoRC_System::Architecture::tNIC_RBC_ID}	
tRadioHoleStatus	enum {tRadioHoleStatus__RHS_none, tRadioHoleStatus__RHS_end, tRadioHoleStatus__RHS_begin, tRadioHoleStatus__RHS_inside}	
tRadioNetworkID	int	
tRadioNetworkIDs_toRM	{radioNetworkID_memorized : MoRC_System::Architecture::tRadioNetworkID, radioNetworkID_fromDriver : MoRC_System::Architecture::tRadioNetworkID, radioNetworkID_fromTrackside : MoRC_System::Architecture::tRadioNetworkID}	
tRM_Status	{radioComSessionEstablished : bool, mobileSWStatus : MoRC_System::Architecture::tMobileSWConnectionStatus}	
tRMOrder	enum {tRMOrder__trm_noOrder, tRMOrder__trm_initiateSession, tRMOrder__trm_terminateSession, tRMOrder__trm_registerToNetwork}	

Name	Definition	Comments and Information
tSafeRadioCommCmd	{requestSetup : bool, releaseSetup : bool, mobileHWCmd : MoRC_System::Architecture::tMobileHWAction, actualRadioNetworkID : MoRC_System::Architecture::tRadioNetworkID, memorizeTheLastRadioNetworkID : bool}	
tSafeRadioCommStatus	{setupEstablished : bool, mobileHWConnectionStatus : MoRC_System::Architecture::tMobileHWConnectionStatus}	
tTime	int	

3.2.2. Constants

Table 2: Public Constants of Architecture

Name	Type	Value	Comments and Information
cActualTime	time_Type	0	

3.2.3. RadioManagement Operator

Declared as **`public node`**

3.2.3.1. Comments and Information

RadioManagement Comments:

- Top level operator for the “Management of Radio Commiunication”.
- The operator was generated from the accompanied “MoRC_System” SysML model and incorporates the existing MoRC SCADE model.
- By this way it serves as an encapsulation of “MoRC_withSimplified_IF” in that model.

Table 3: RadioManagement Annotations

Note Name	Attribute	Value
GdC_1	Author	Uwe Steinke
	DateC	Created : 2013-09-12
	DateM	Modified : 2013-09-12
	Version	00.00.01
	to_c	True

Note Name	Attribute	Value
Remark_1	Description	- Name: RadioManagement - Description: Implements 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.
	to_c	True

3.2.3.2. Interface

Table 4: Inputs of RadioManagement

Name	Type	Comments and Information
OB_Status	MoRC_System::Architecture::tOB_Status	
OrderToRM	MoRC_System::Architecture::tOrderToRM	
RadioNetworkIDs	MoRC_System::Architecture::tRadioNetworkIDs_toRM	
SafeRadioComStatus	MoRC_System::Architecture::tSafeRadioComStatus	

Table 5: Outputs of RadioManagement

Name	Type	Comments and Information
RM_Status	MoRC_System::Architecture::tRM_Status	
OrderToRBC	MoRC_System::Architecture::tOrderToRBC	
SafeRadioComCmd	MoRC_System::Architecture::tSafeRadioComCmd	

3.2.3.3. Locals

Table 6: Locals of RadioManagement

Name	Type	Comments and Information
M_Level	M_LEVEL_Type	

Name	Type	Comments and Information
M_Mode	M_MODE_Type	
mobileHWConnectionStatus	mobileHWConnectionStatus_Type	
orderFromOnboard	onBoardOrder_Type	
radioHoleStatus	radioHoleStatus_Type	

3.2.3.4. Operator Hierarchy

diagram : dManagementOfRadioCommunication
diagram : dOB_Status
diagram : dOrderToRM_SafeRadioComStatus

3.2.3.5. Graphical and Textual Diagrams

3.2.3.5.1. View of dManagementOfRadioCommunication (RadioManagement)

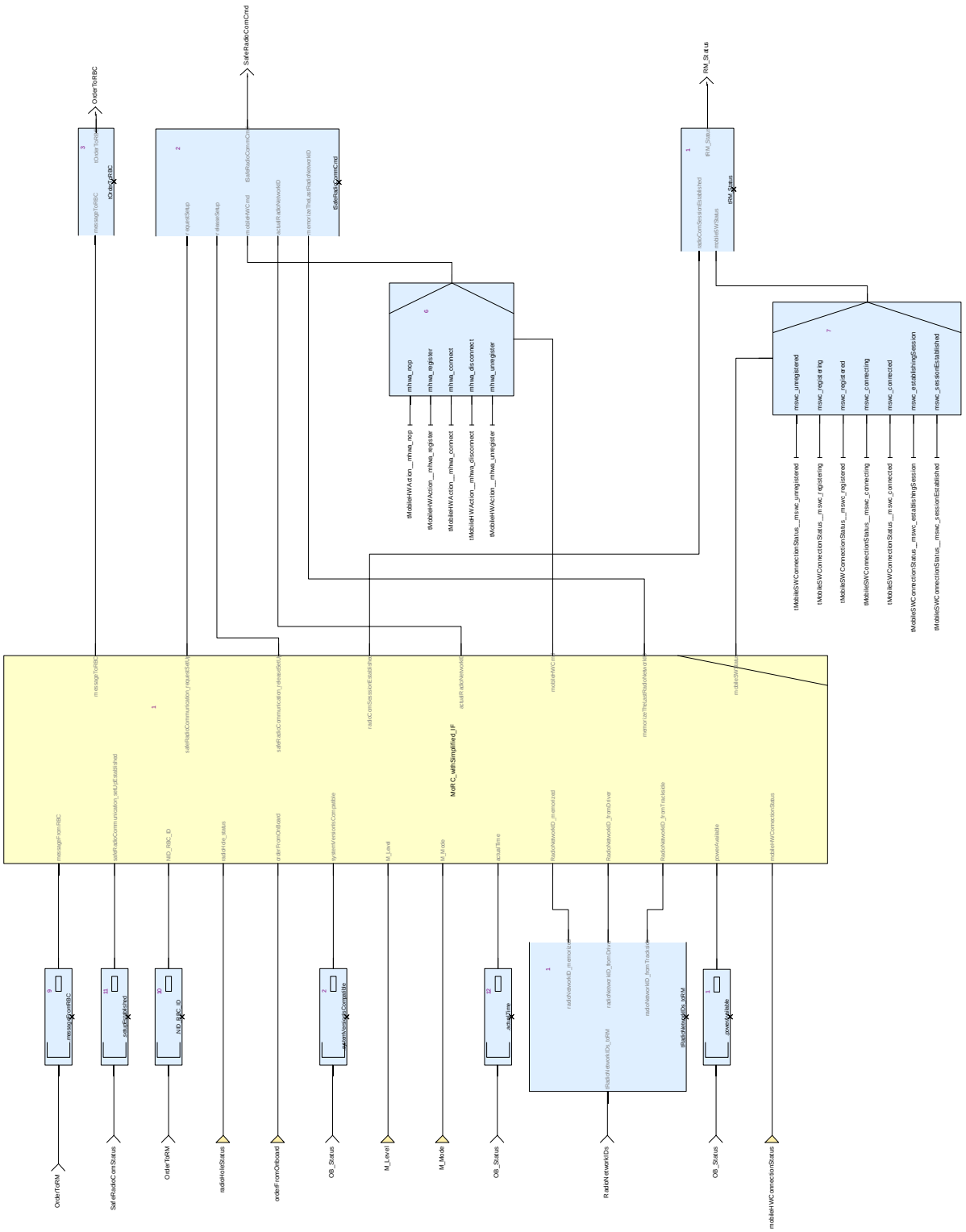

Figure 1: View of dManagementOfRadioCommunication (RadioManagement)

3.2.3.5.2. View of dOB_Status (RadioManagement)

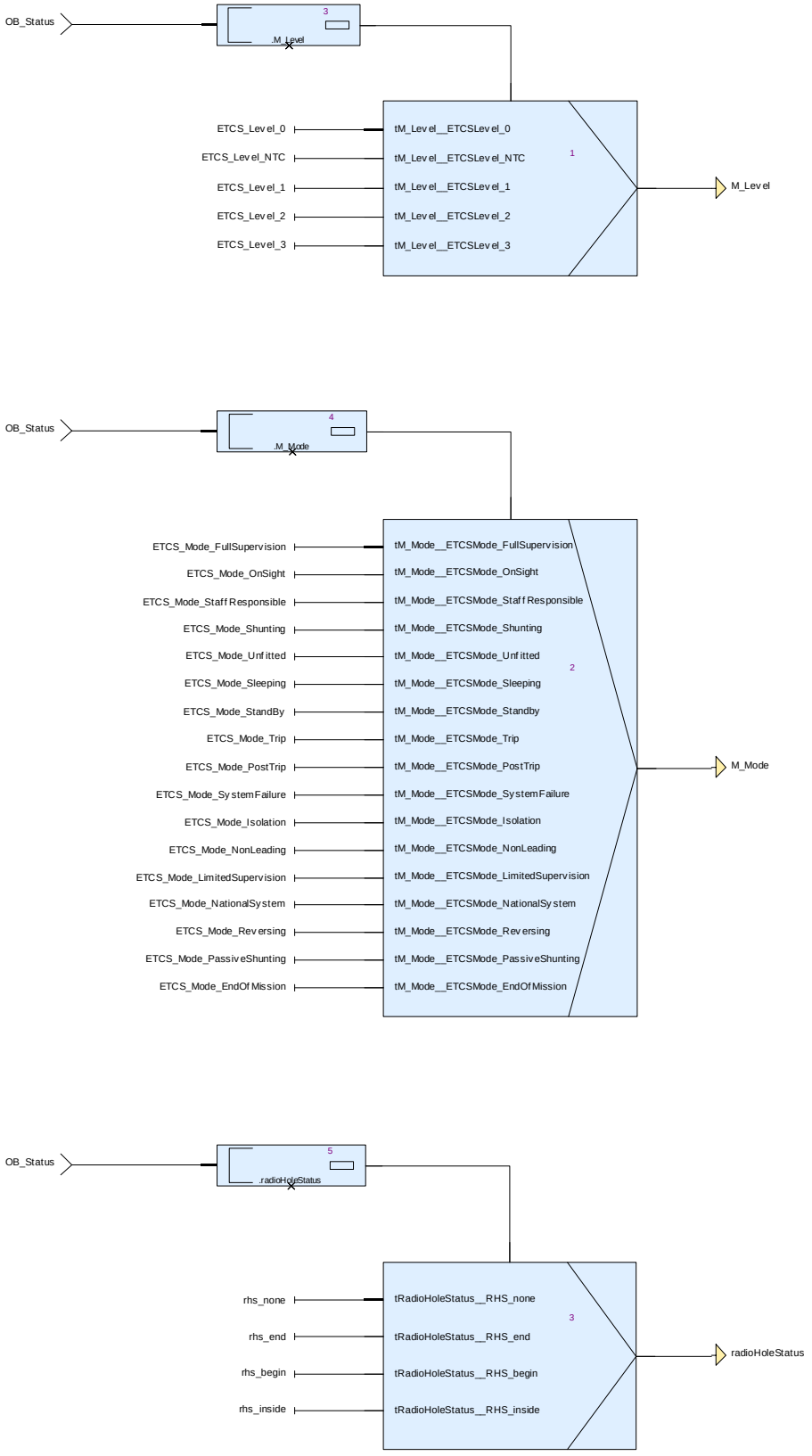

Figure 2: View of dOB_Status (RadioManagement)

3.2.3.5.3. View of dOrderToRM_SafeRadioComStatus (RadioManagement)

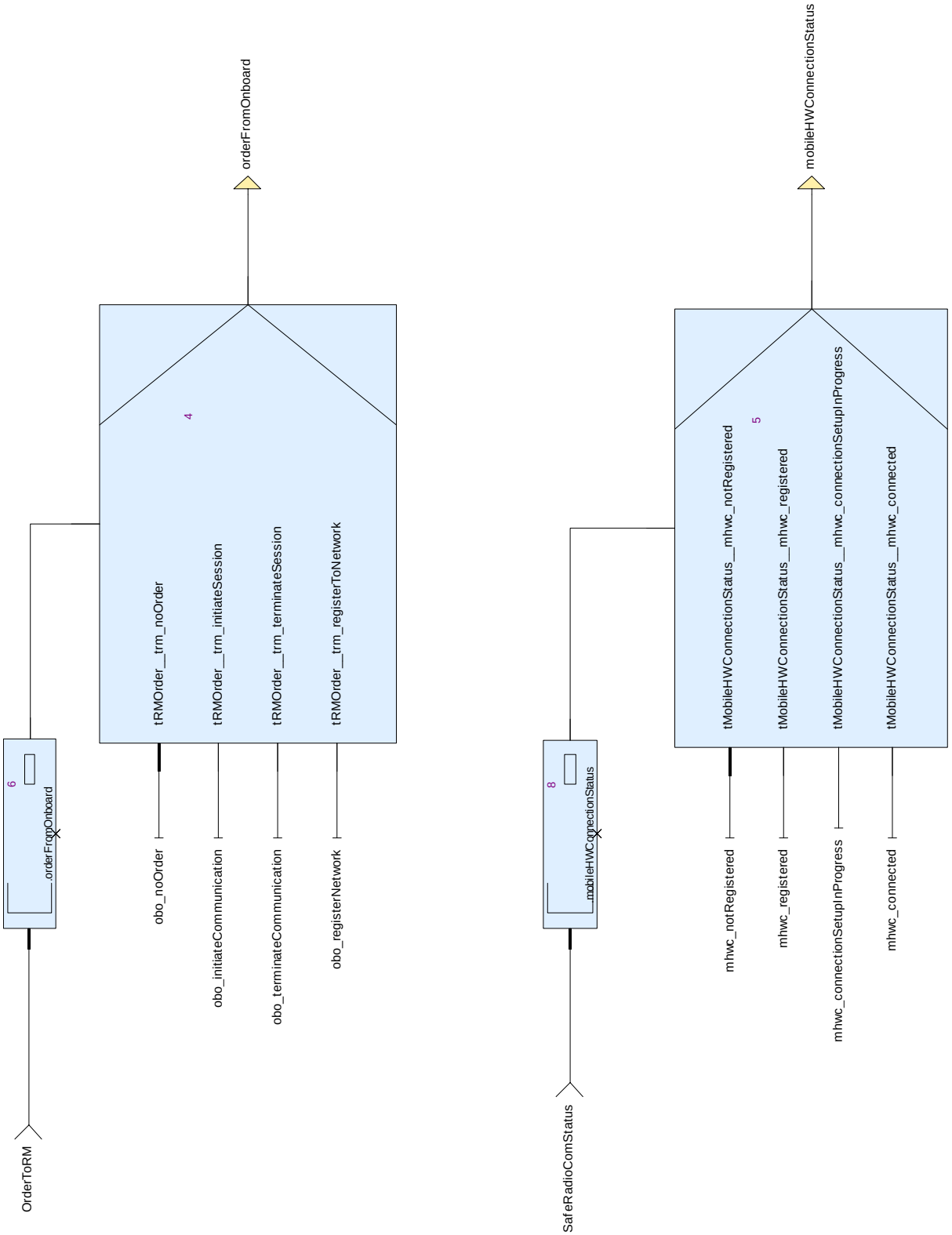

Figure 3: View of dOrderToRM_SafeRadioComStatus (RadioManagement)

3.3. MoRC_System::FunctionalComposition Package

3.3.1. Types

Table 7: Public Types of FunctionalComposition

Name	Definition	Comments and Information
ActivationMode	enum {ActivationMode__inactive, ActivationMode__establishing, ActivationMode__maintaining, ActivationMode__terminating}	

3.4. MoRC_System::FunctionAllocation Package

3.5. MoRC_System::InterfacesAllocation Package

End of document.