UPDM 2.0 Modeling

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Introduction

When modeling joint task operations involving different organizational groups you need to have a consistent model approach. The Unified Profile for DoDAF and MODAF (UPDM) Version 2.0 provides a framework that incorporates both DoDAF 2.0 and MODAF 1.2 frameworks. Although based on military frameworks, you can use UPDM to model any type of combined operations from domestic search and rescue through to combined force military operations.

Enterprise Architect's MDG Technology for UPDM 2.0 provides, along with the UPDM 2.0 framework, comprehensive facilities to create models and develop code from these models, as well as test and analyze these software intensive systems within a single development environment. Using Enterprise Architect you can integrate your model with each and every phase of the software development lifecycle.

The purpose of this paper is to examine the development of a UPDM model using Enterprise Architect. The example we use is the Search and Rescue (SAR) model, which is presented in the UPDM specification and reproduced in the UPDM Example Model provided with the MDG Technology for UPDM add-in. This paper discusses the core features of the add-in along with other Enterprise Architect features that are complementary to UPDM modeling.

> **Note:** The names of the views used in this paper are based on the MODAF view names, rather than DoDAF view names, as the SAR example is a MODAF model.

Overview of UPDM Process

UPDM defines an architecture that is broadly structured around a set of 'Views' or planes. These Views start with defining high level strategic concepts and each subsequent view progressively defines more concrete representations of how these strategic concepts are to be implemented. UPDM includes the following views:

- **All Views**
  Provides a general overview
- **Operational Views**
  Provides an operational view of what needs to be accomplished
- **Service Orientated Views**
  Identifies the services involved
- **Strategic Views**
  Models the capabilities required for delivering a strategy
- **System Views**
  Relates systems to operational needs
- **Acquisition Views**
  Identifies the acquisition of required resources
- **Technical Views**
  Describes the required technical standards

Views can incorporate models defined using UML, SysML or other modeling languages

For more details on UPDM see:

- UPDM Version 2.0 Specification

Structuring your UPDM Model

A common method of structuring a project is to define an outline of the views and then provide a main diagram that provides links to the core diagrams supplied in these views. This can be automatically generated using the Model Wizard supplied with the UPDM MDG.

A project structure and overview diagram can be created automatically for UPDM using Enterprise Architect's Model Wizard, as shown in Figure 1.

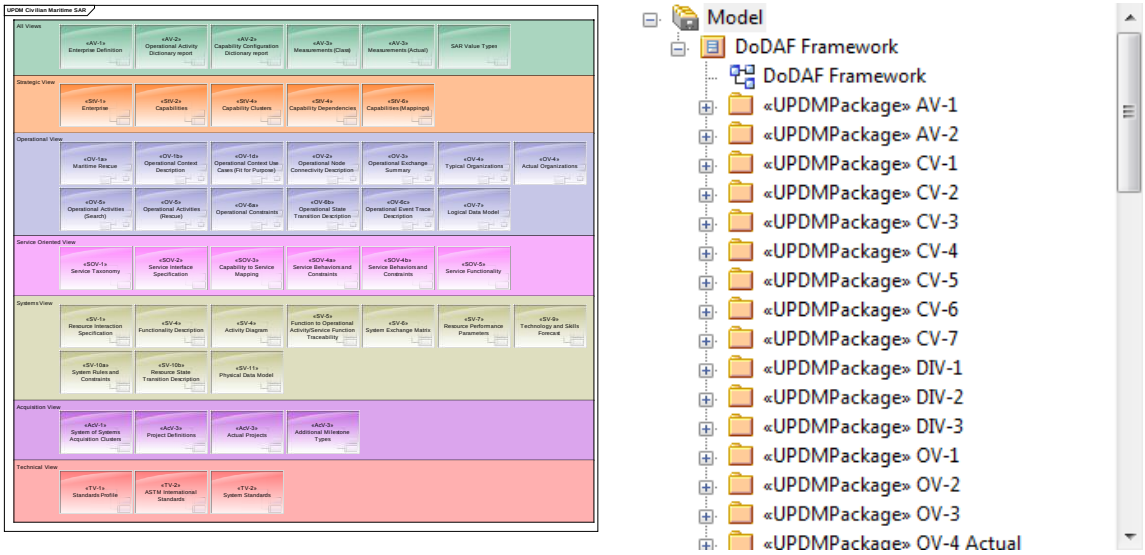


Figure 1: The overview diagram and corresponding package structure in Enterprise Architect.

Tip:
- Start by importing the images using the main menu: Extensions | UPDM 2.0 | Import Images
- Open the Model Wizard to create your template: Ctrl+Shift+M
- Select UPDM 2.0 in the Technology panel and either DoDAF or MODAF in the Name panel, then click on the OK button.

Depending on the option you selected in the Model Wizard you will now have an outline of either the DoDAF or MODAF framework that provides a starter for your modeling.

Tip: On the Default Toolbar, select UPDM 2.0 from the drop-down selection list. This will give you access within the Toolbox to the full listing of all UPDM element-types.

All Views

The All Views Viewpoint allows you to present an architectural overview of the scope of the model, the timeframe and any related metadata, including a dictionary of key terms used in the model.

The models within the All Views section can be defined in a number of ways.
We will examine the options using the UPDM MDG add-in, along with the various other Enterprise Architect features that can be used in creating, viewing and reporting these views.

For more detailed descriptions see:

- DoDAF All Viewpoint
- MODAF View Summary

AV-1 Overview and Summary Information

The **AV-1 Overview and Summary Information view** provides an overview and summary that identifies the architecture goals, viewpoint, findings and recommendations. An AV-1 view can be defined either with a simple document stored in the model or using an AV-1 diagram type. It is intended to provide an executive summary of the overall architectural model.

To define an AV-1 view using a document stored in the model, it is best to use a Document Artifact element. Figure 2 shows an example that is being edited in Enterprise Architect's document editor. This document is stored in the model under a Document Artifact. The Model Wizard creates a stub Document Artifact for you under the AV-1 view.

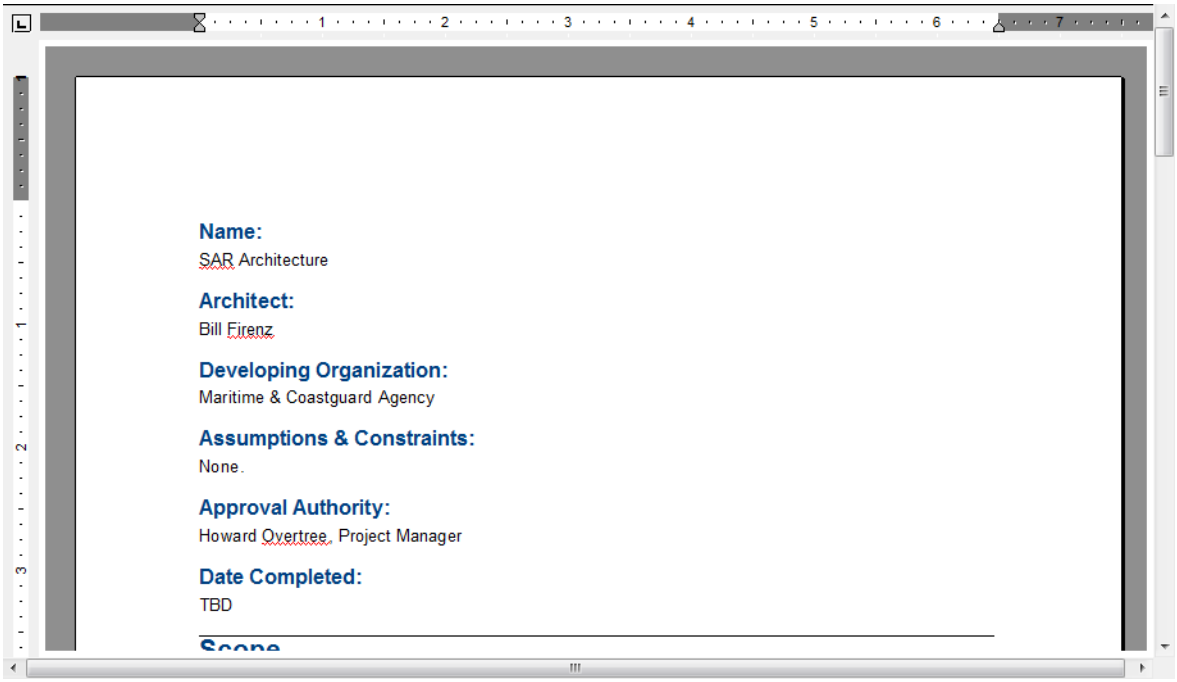


Figure 2: AV-1 Using a Document Artifact

Figure 3 is an alternate example of an AV-1 view using an AV-1 diagram type:

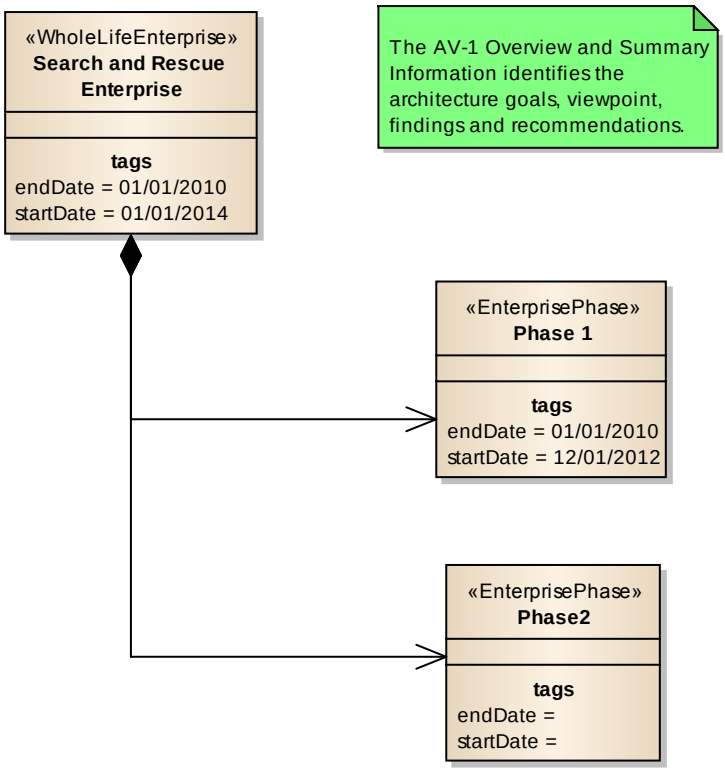


Figure 3: AV-1 Top Level context model of temporal phases for Search and Rescue

For more options on using internal documents see the related Help topics on Document Artifacts and Linked Documents.

AV-2 - Operational Activity Dictionary

The **AV-2 Operational Activity Dictionary view** provides an overall glossary or dictionary for the model. This maintains the consistency and clarity of meaning of terms used to define external items referenced within your model. There are a number of options in Enterprise Architect for defining a dictionary of key terms including:

- Using Enterprise Architect's Model Glossary. See the Help topic Project Glossary.
- Using a Linked Document with terms and definitions combined in text form. See the related Help topics on Document Artifacts and Linked Documents.
- Defining an Ontology or Taxonomy of terms using the Enterprise Architect ODM OWL/RDF MDG Technology. See the Help topic MDG Technology for ODM
- Using an element for each glossary entry, and then displaying these in list–form using the Package Browser view option. Where extra fields are required for each term you can create a profile to define Tagged Values for these fields. For more information see the related Help topics: Package Browser and UML Profiles.

For examples see the following package in the UPDM Example model:
Model.Civilian Maritime SAR.Architectural Description.SAR Architecture.Resources.Capability Configuration.Capability Configurations

AV-3 – Measurements Definition

An **AV-3 Measurements Definition view** is used to enforce consistency in the measurement definitions used in the model. It can be composed of a Measurements Definition Class diagram and an Actual Measurements view.

Figure 4 shows an example Measurements Definition view for the SAR reconnaissance model.

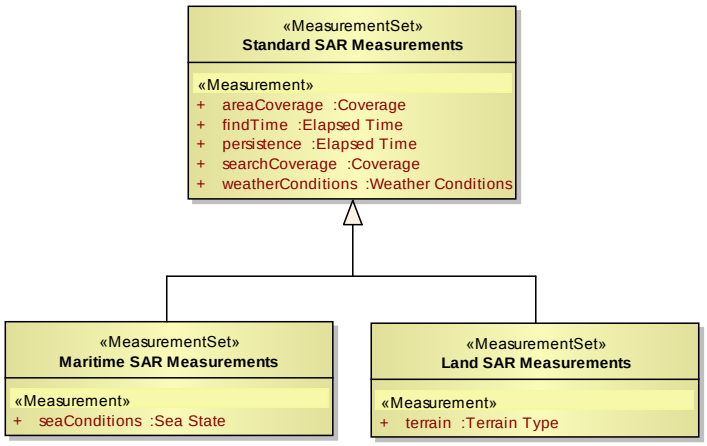


Figure 4: AV-3 Measurements Class

Figure 5 shows an example containing Actual Measurements using the structures from Figure 4 .

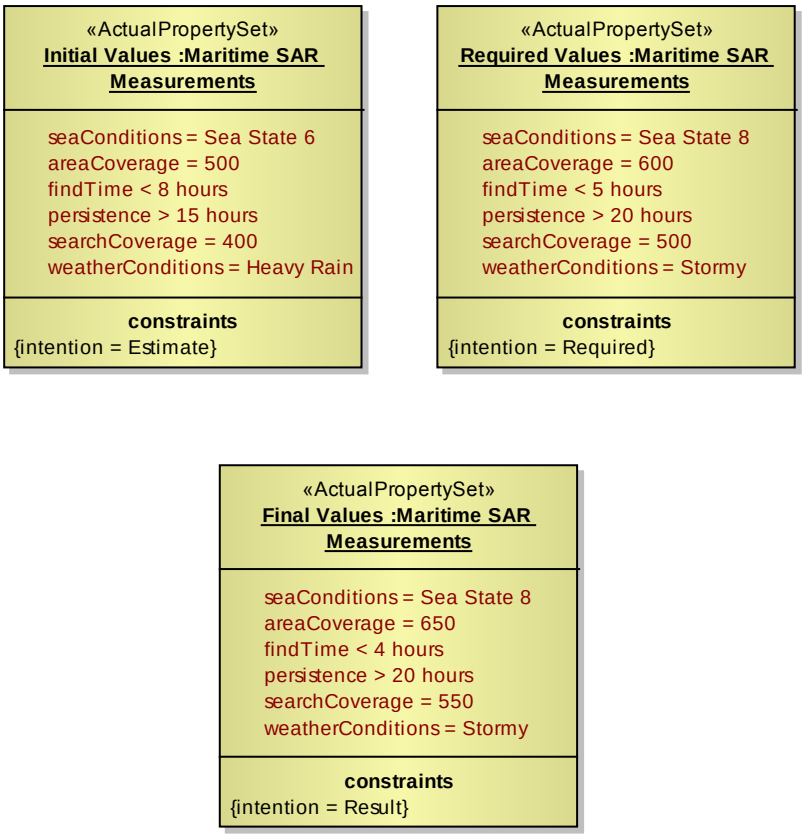


Figure 5: AV-3 Measurements (Actual)

For more information on setting these actual measurements see the Run Time State Help topic.

Related to:

- StV-1 Capability Vision View
- StV-2 Capabilities Taxonomy View
- SV-7 Resource Performance Parameters View

Strategic Views

The **Strategic views** (or **DoDAF Capability Views**) are used to model the relationships between the projects and the capabilities. These views are used to define the capabilities, and through analysis and optimization, map out the evolution of the capabilities.

For more detailed descriptions see:

- DoDAF Capability Viewpoint
- MODAF View Summary

StV-1 Capability Vision (DoDAF CV-1)

The **StV-1 Capability Vision view** is used to outline the vision for a capability area for a defined period. It is used to provide, on a high-level scope, a strategic context for the capabilities being utilized, and any intended changes to these capabilities. StV-1 is based on the DoDAF CV-1 view.

Figure 6 gives an example StV-1 view modeling the capabilities required for the SAR model.

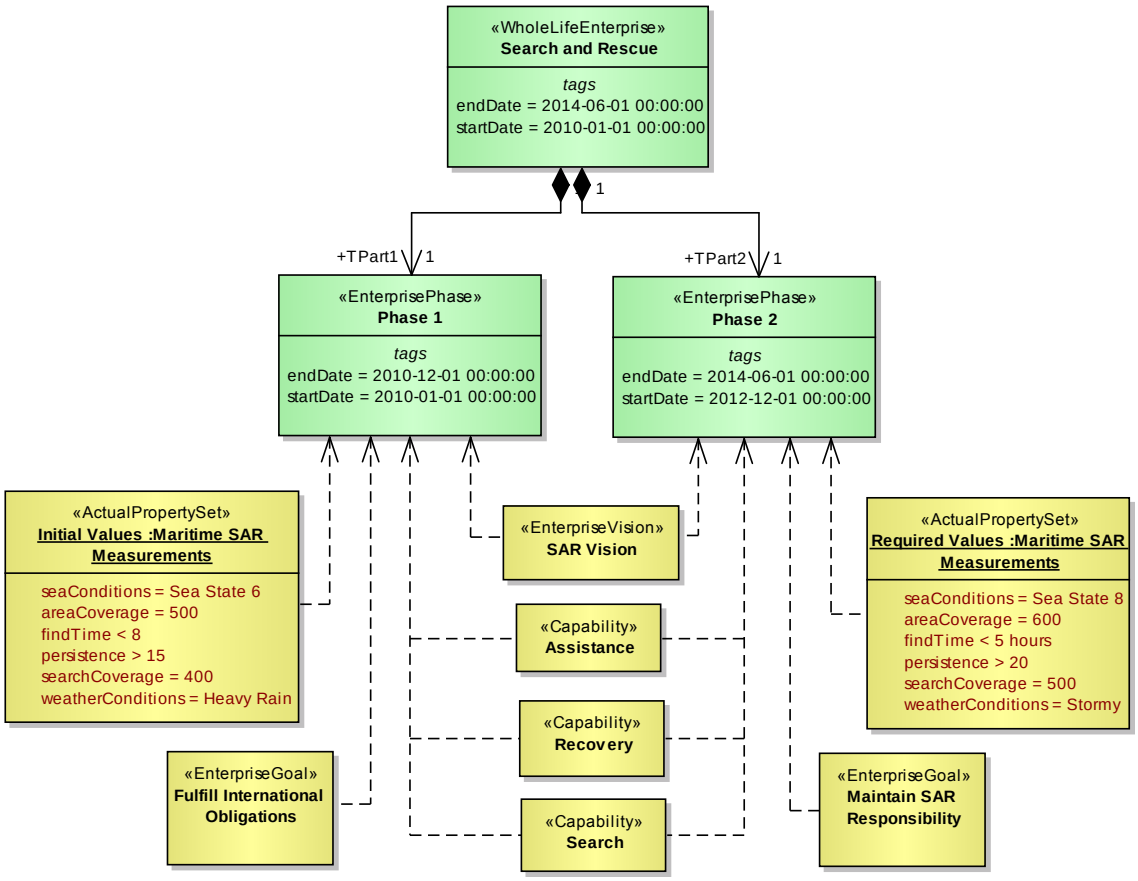


Figure 6: Stv-1 for the Search and Rescue model example

Related to:

- AV-3 Actual Measurements Definition

StV-2 Capabilities Taxonomy (DoDAF CV-2)

The **StV-2 Capabilities Taxonomy** view describes the communication between systems, showing the communication networks, pathways and resource flows, and providing details regarding their configuration. Figure 7 is an example StV-2 view depicting the core taxonomy for the SAR reconnaissance model.

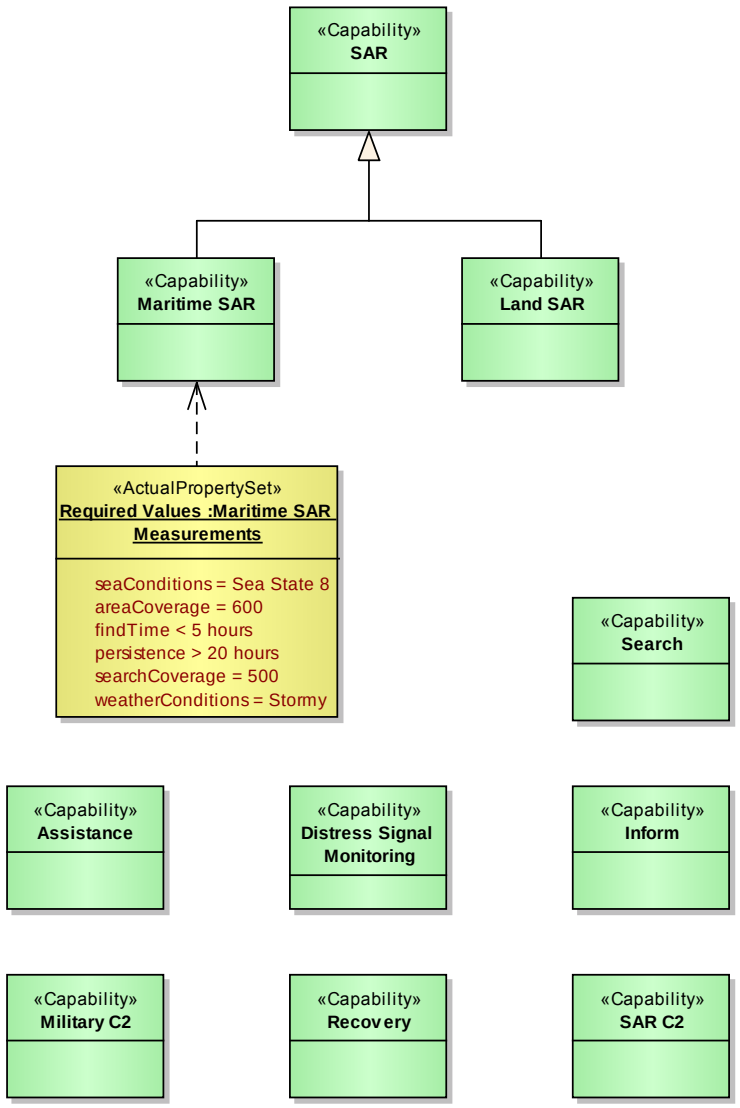


Figure 7: StV-2/CV-2 Capabilities Taxonomy from the SAR example model

Related to:

- AV-3 Measurements (actual)

StV-3 Capability Phasing (DoDAF CV-3)

StV-3 Capability Phasing view lays out the planned achievement of capability in the time-line of the overall project. The example in Figure 8 shows the SAR Capability Phasing for the Maritime and the Automated Rescue units using an Enterprise Architect 'Swimlane Matrix'.

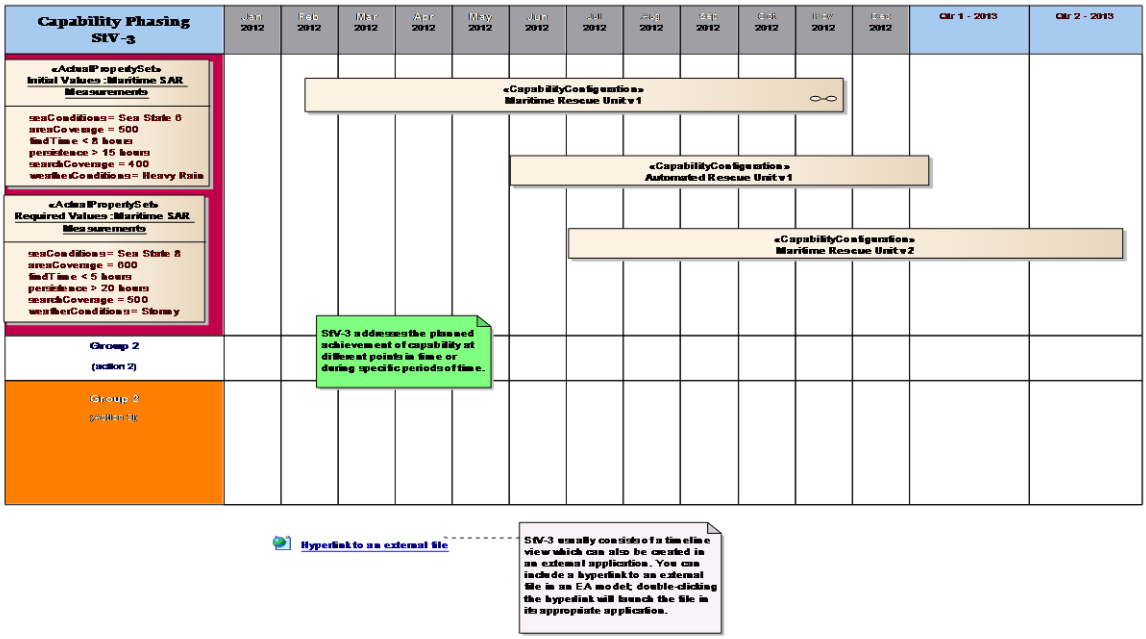


Figure 8: StV-3 example Capability Phasing

For help on constructing a Matrix see the Swimlane Matrix Help topic.

A StV-3 Capability Phasing view can also be created in an external application and then the external file can be hyperlinked into the StV-3 diagram in the model. Double-clicking the hyperlink will launch the file in its appropriate application. For more information see the Hyperlinks Help topic.

Related to:

- AcV-2 Program Timeline
- SV-8 System Capability Configuration Management

StV-4 Capability Dependencies (DoDAF CV-4)

The **StV-4 Capability Dependencies view** describes the dependencies between planned capabilities. It also defines logical groupings of capabilities.

The StV-4 view can be depicted as a Composite Structure diagram (Figure 9) or as a Class diagram (Figure 10).

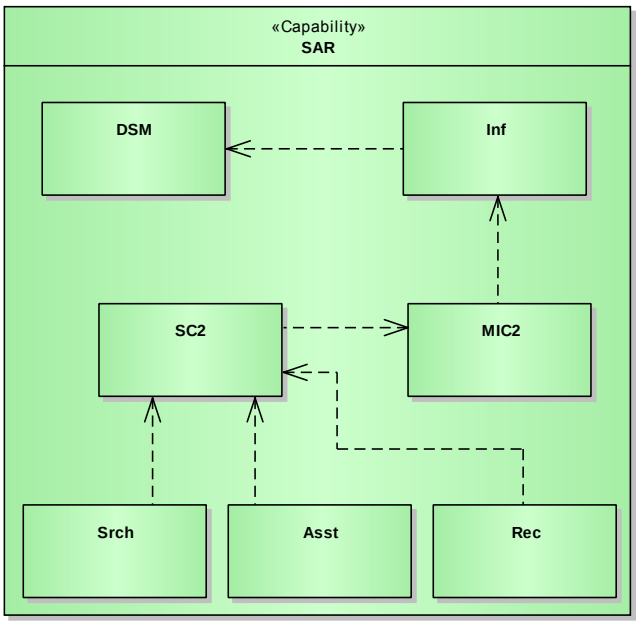


Figure 9: StV-4 Capability Dependencies (Composite Structure Diagram)

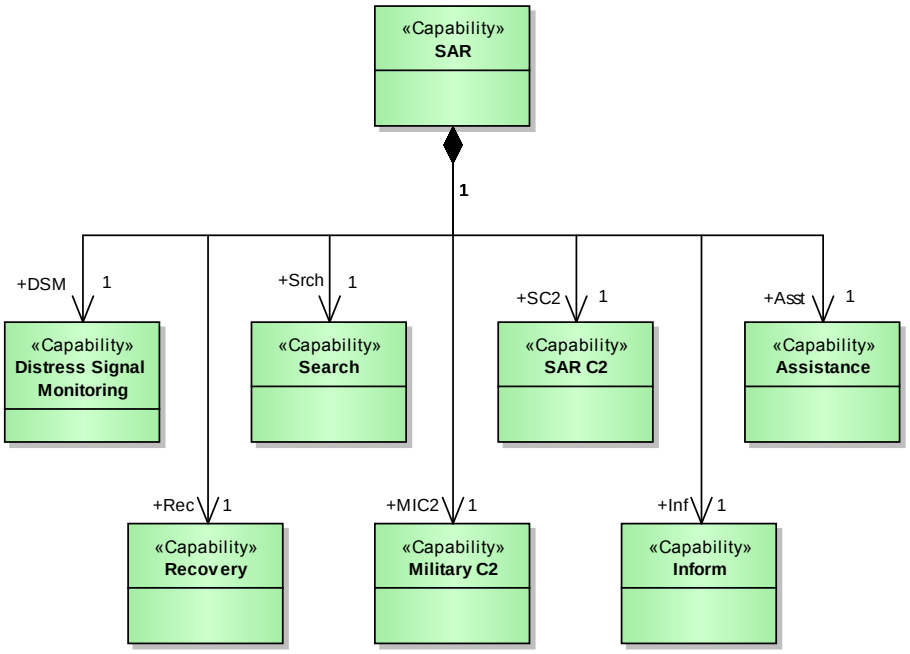


Figure 10: StV-4 Capability Dependencies (Class Diagram)

Related to:

- StV-2 Capabilities Taxonomy

StV-5 Capability to Organization Deployment (DoDAF CV-5)

The **StV-5 Capability to Organization Deployment view** lays out how capability requirements are to be fulfilled using a mapping between the capability and the organization deployment. It is intended to model the planned capability deployment and interconnection for a particular capability Phase.

Figure 11 shows an example StV-5 diagram for the SAR reconnaissance model.

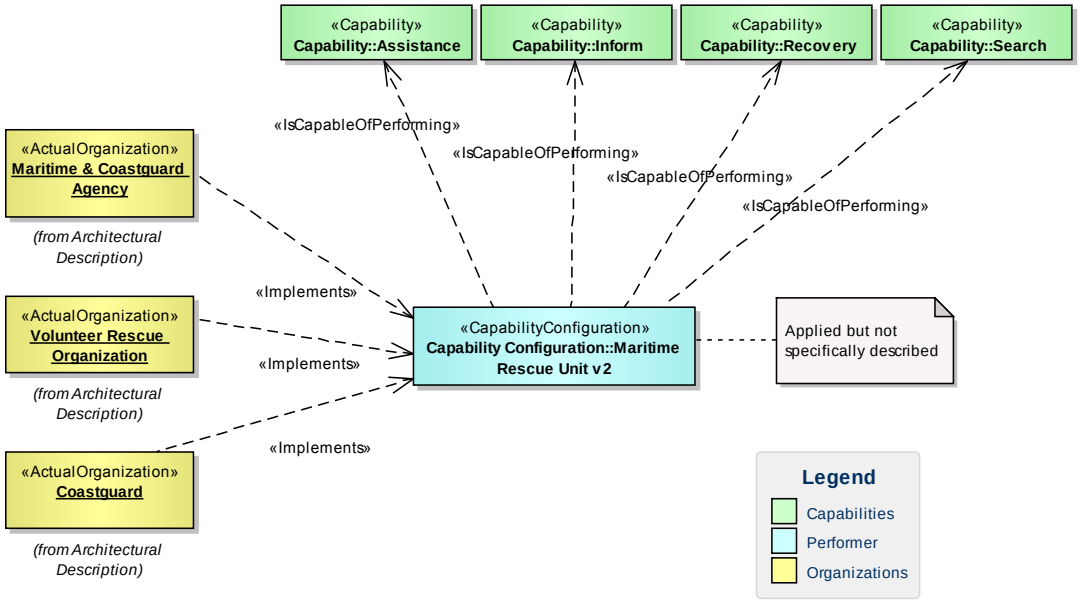


Figure 11: StV-5 -Capability to Organization Deployment from the SAR example

Related to:

- StV-2 Capabilities Taxonomy
- StV-3 Capability Phasing
- OV-4 Actual Organizations

StV-6 Operational Activity to Capability Mapping (DoDAF CV-6)

The **StV-6 Operational Activity to Capability Mapping view** identifies how operational activities support capabilities. It describes the mapping between the capabilities required by an enterprise and the operational activities that those capabilities support.

Figure 12 is an example ST-5 diagram from the SAR example, showing the operational activities necessary to achieve Search and Rescue support. These include monitoring health and providing medical assistance.

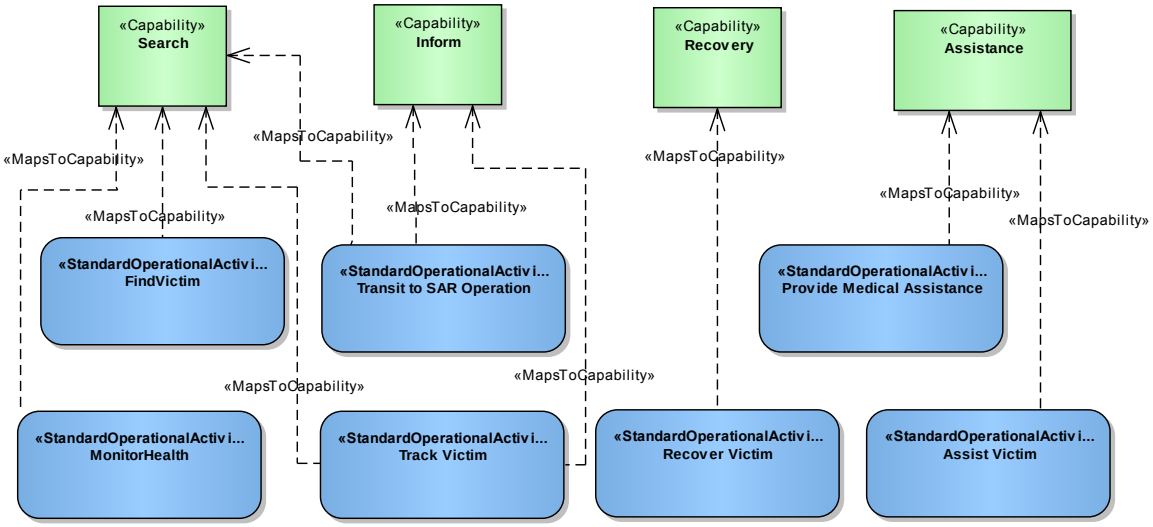


Figure 12: StV-6 Capabilities Mapping from the SAR example model

Related to:

- StV-2 Capabilities Taxonomy

Operational Views

Operational Views identify the key objectives that need to be accomplished in an operation, along with who is to accomplish them. These views lay out what is required to conduct the operations including:

- Tasks and activities
- Operational elements
- Exchanges of information
- Systems

For more detailed descriptions of Operational Views as defined for DoDAF and MODAF see:

- DoDAF Operational Viewpoint
- MODAF View Summary

OV-1 Operational Context Graphic

The **OV-1 Operational Context Graphic** view gives a textual and graphic representation of the operation being modeled. It describes a mission, class of mission or scenario, showing the main operational concepts and interesting or unique aspects of the operations.

In the SAR example this is a view of the key components and communications involved in a search and rescue operation, as shown in Figure 13:

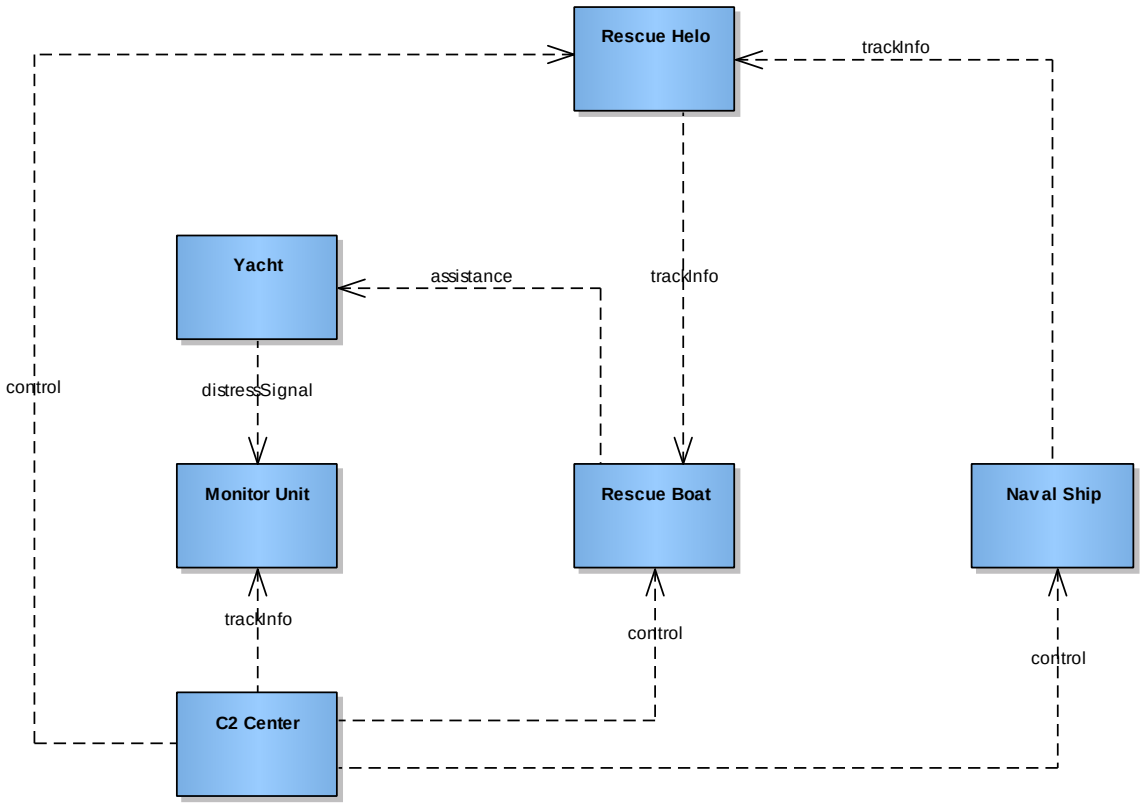


Figure 13: An OV-1 Operational Context view from the SAR example

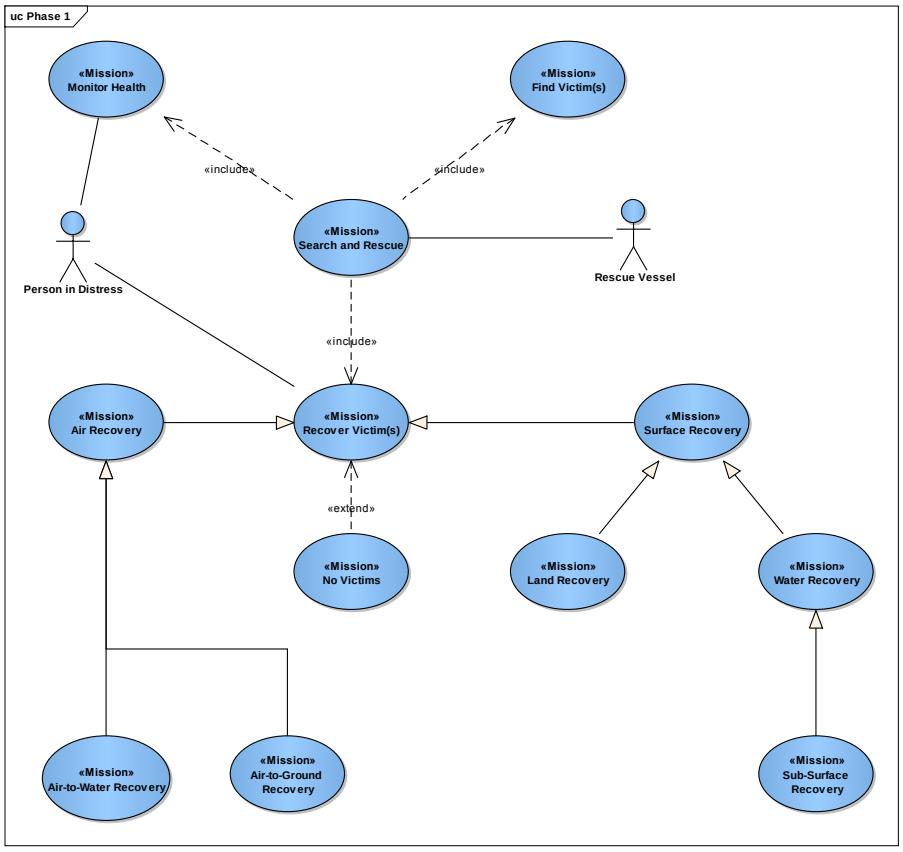


Figure 14: An alternate OV-1 Operational Context view from the SAR example

Figure 14 is an alternate OV-1 view depicting the Operational Context Use Case view (Fit for Purpose).

It is popular to model this Operational Context Use Case view using graphical symbols on the elements. For example a graphic of a ship for the Water Recovery element and set on a background image of a landscape. To set alternate images for elements see the **Select Alternate Image** option in the Appearance Menu Selection Help topic. To set a background image see the Create Custom background Diagram Help topic.

OV-2 Operational Node Relationship Description (DoDAF Operational Resource FlowDescription)

The **OV-2 Operational Node Relationship Description view** lays out the context of the operational capability for any anticipated users. It depicts the key players (operational nodes) involved in an operation and the exchange of information (interactions) between these nodes. An example of this from the SAR model is shown in Figure 15.

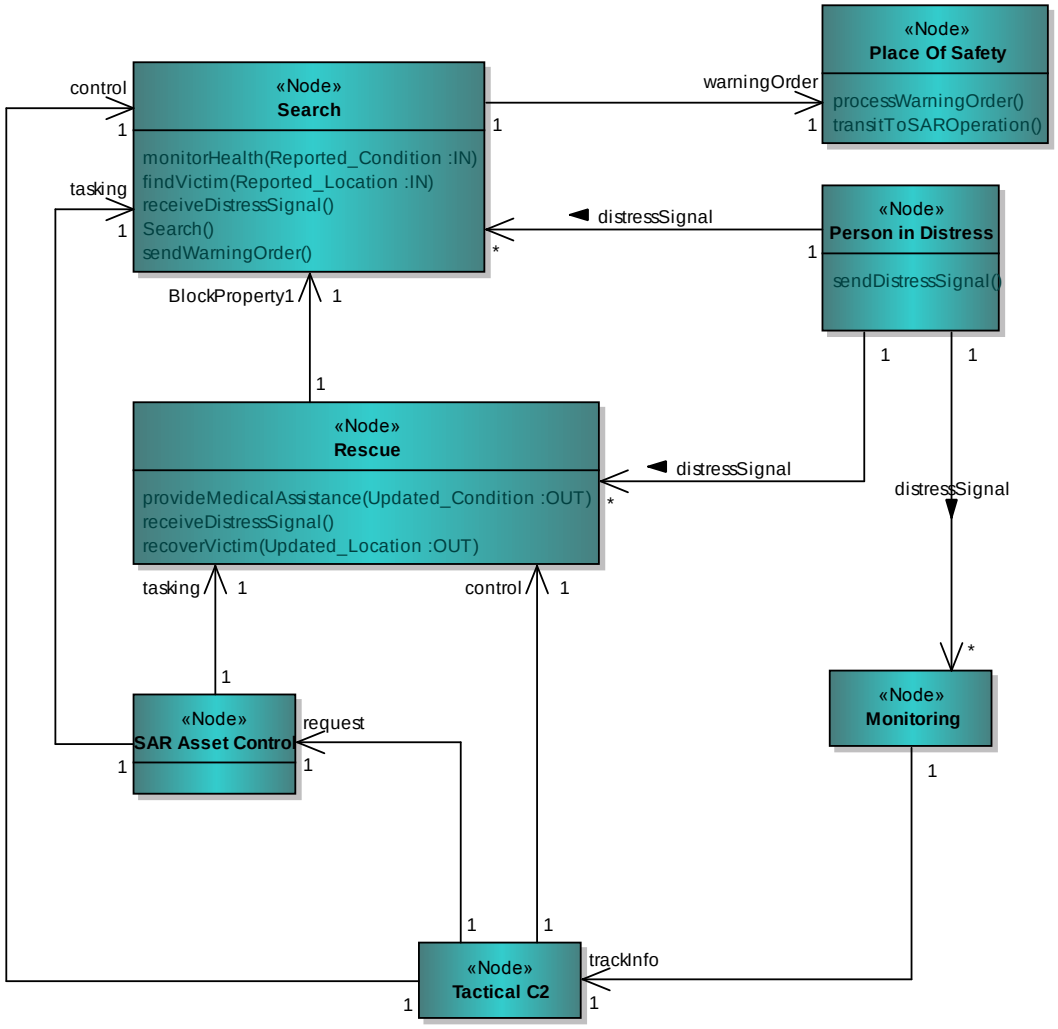


Figure 15: OV-2 Operational Node Connectivity Description

The OV-2 diagram uses Information Flow connectors for conveying information on a flow. For an overview on how to use these connectors see the Help topics:

- Using Information Flows
- Convey Information on a Flow
- Realize an Information Flow

Related to:

- OV-5 Operational Activity Model

OV-3 Operational Exchange Summary (DoDAF Operational Resource Flow Matrix)

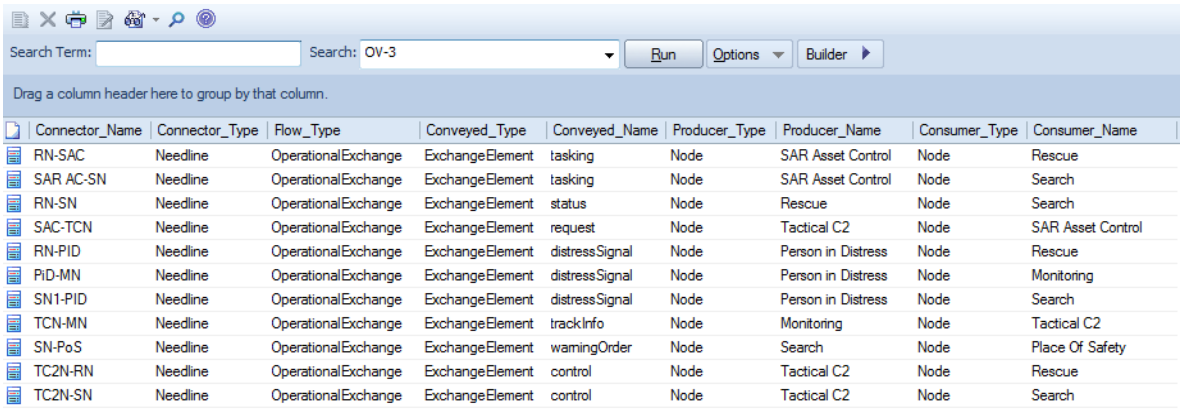
The **OV-3 Operational Information Exchange Summary** view is used for mapping the operational information exchanges between the capabilities and the services. It addresses operational information exchanges between these nodes.

The OV-3 view can be provided as a simple text document stored within the model using a Document Artifact element, or it can be generated from the model using the OV-3 UPDM Search for listing elements in the model that are connected by Needline connectors.

Tips:

1) To access the Search view select Edit | Model Search from the main menu (Ctrl+F). Select OV-3 from the UPDM 2.0 group.
2) On running the Search you can find the conveyed elements in the Project Browser by right-clicking on an entry in the table and selecting Find in Project Browser.
3) On creating an OV-3 diagram you can set up a Hyperlink to the Search. For more detail see the: Hyperlinks Help topic.

Figure 16 is an OV-3 listing for the example SAR reconnaissance model.



Connector_Name	Connector_Type	Flow_Type	Conveyed_Type	Conveyed_Name	Producer_Type	Producer_Name	Consumer_Type	Consumer_Name
RN-SAC	Needline	OperationalExchange	ExchangeElement	tasking	Node	SAR Asset Control	Node	Rescue
SAR AC-SN	Needline	OperationalExchange	ExchangeElement	tasking	Node	SAR Asset Control	Node	Search
RN-SN	Needline	OperationalExchange	ExchangeElement	status	Node	Rescue	Node	Search
SAC-TCN	Needline	OperationalExchange	ExchangeElement	request	Node	Tactical C2	Node	SAR Asset Control
RN-PID	Needline	OperationalExchange	ExchangeElement	distressSignal	Node	Person in Distress	Node	Rescue
PiD-MN	Needline	OperationalExchange	ExchangeElement	distressSignal	Node	Person in Distress	Node	Monitoring
SN1-PID	Needline	OperationalExchange	ExchangeElement	distressSignal	Node	Person in Distress	Node	Search
TCN-MN	Needline	OperationalExchange	ExchangeElement	trackInfo	Node	Monitoring	Node	Tactical C2
SN-PoS	Needline	OperationalExchange	ExchangeElement	warningOrder	Node	Search	Node	Place Of Safety
TC2N-RN	Needline	OperationalExchange	ExchangeElement	control	Node	Tactical C2	Node	Rescue
TC2N-SN	Needline	OperationalExchange	ExchangeElement	control	Node	Tactical C2	Node	Search

Figure 16: OV-3 view from the SAR example model

OV-4 Organizational Relationships Chart

The **OV-4 Organizational Relationships view** is used to document the organizational structure by modeling the relationships between organizational-entities and depicting their role within the model structure.

An OV-4 view can consist of a Typical Organizational Overview represented by a Class Diagram, as well as an Actual Organizational Overview represented by an Object Diagram.

A typical Organizational Overview represents the broad relationships between the organizations involved in the system being modeled, from a corporation down to key players in the model.

Figure 17 is a typical OV-4 diagram from the SAR reconnaissance model example.

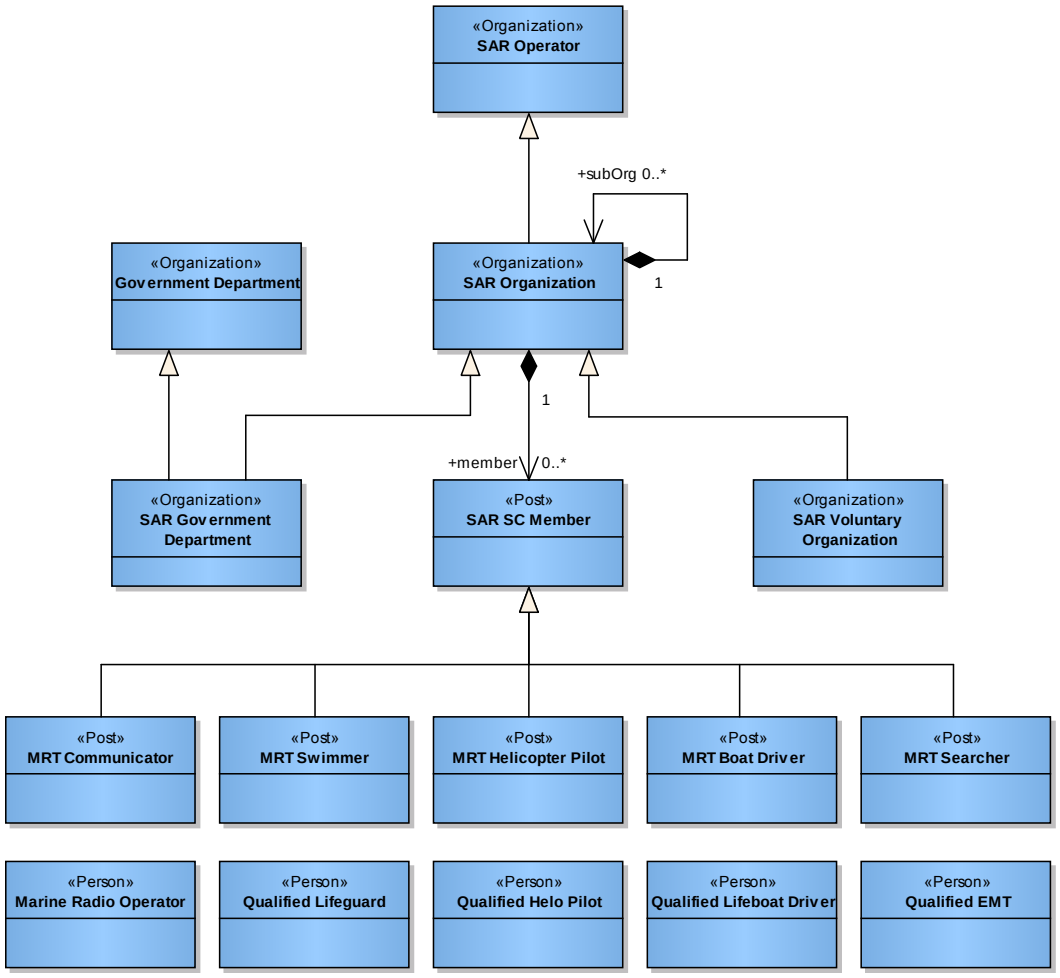


Figure 17: Typical Organizational Overview OV-4

An Actual Organizational overview depicts the structure of the organization and the posts within it, along with the People filling these roles (e.g. '**Ron Radio**' as depicted in Figure 18).

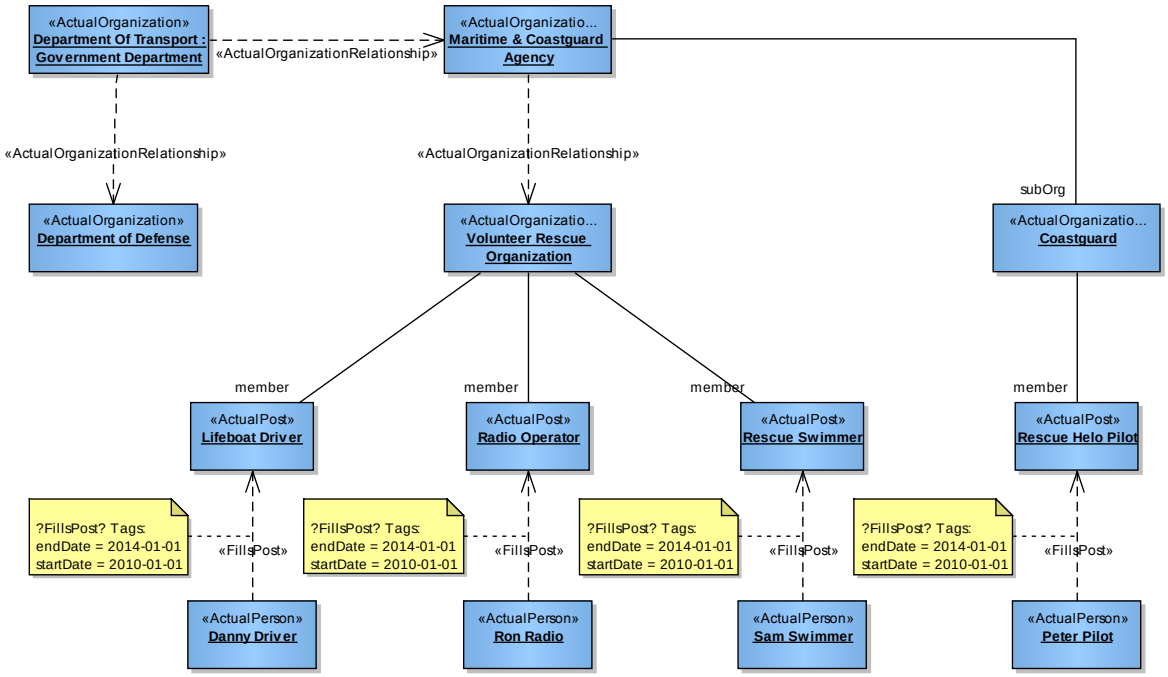


Figure 18: An OV-4Actual Organizational Overview from the SAR example model

Relates to:

- StV-5 Capability to Organization Deployment

OV-5 Operational Activity Model (DoDAF Operational Activity Decomposition Tree – OV-5a)

An **OV-5 Operational Activity Model** view describes the Operational Activities that are conducted in the course of achieving a mission or a business goal. It provides details on the allocation of service functions to resources, and the flow of resources between service functions. An example of this is shown in Figure 19.

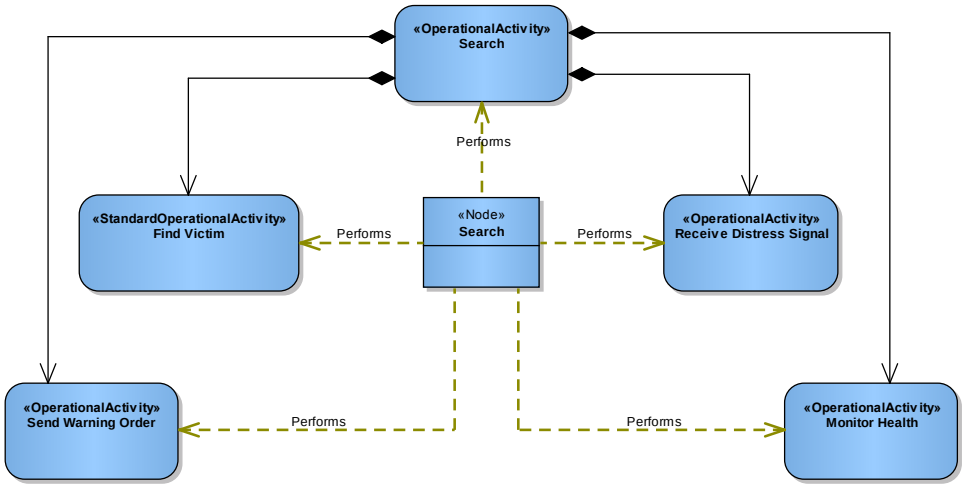


Figure 19: Operational Activities (Search) OV-5

An alternate representation uses an Activity diagram. This uses Swimlanes to represent the context of the Activity, which describes the Operational Activity actions. These actions are derived from the nodes defined in the OV-2 view. Figure 20 represents the execution of the Search activity.

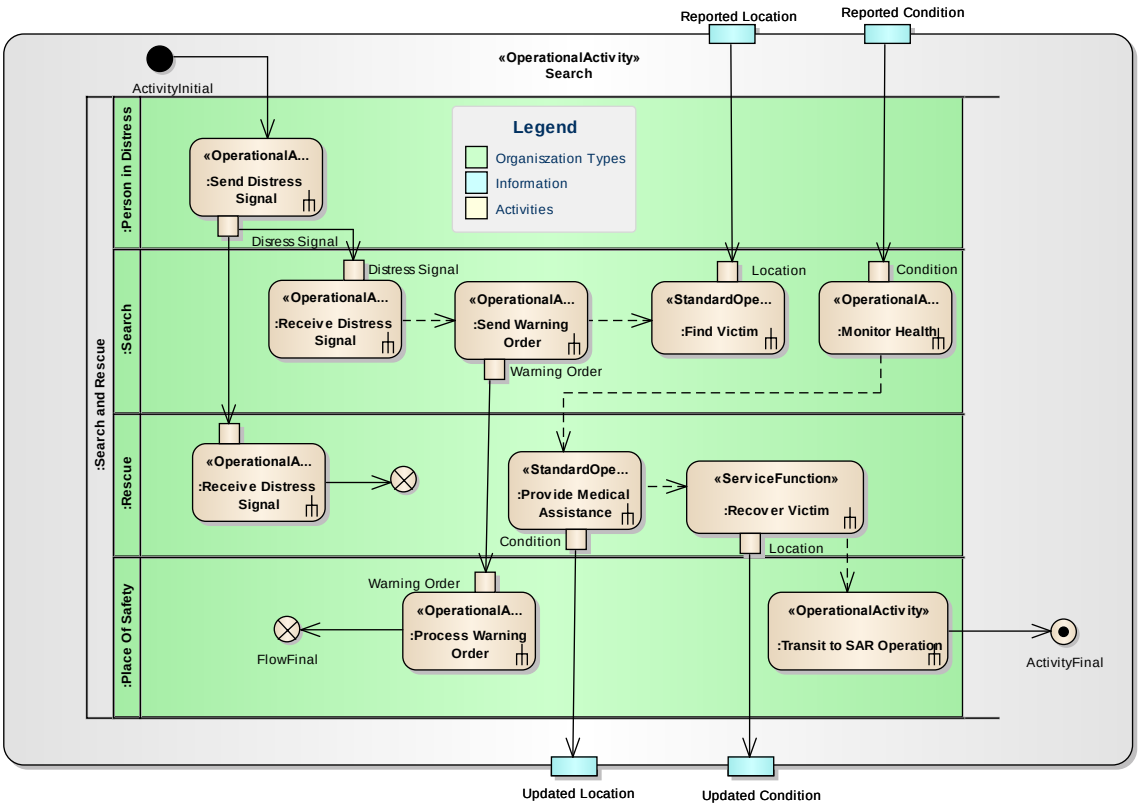


Figure 20: Alternate OV-5 Shown as an Activity Diagram

Related to:

- OV-2 Operational Node Connectivity Description View

OV-6a Operational Rules Model

The **OV-6a Operational Rules Model view** specifies operational or business rules that are constraints on the way that business is done in the enterprise. Figure 21 is a view of operational rules laid out for a search and rescue operation from the SAR example.

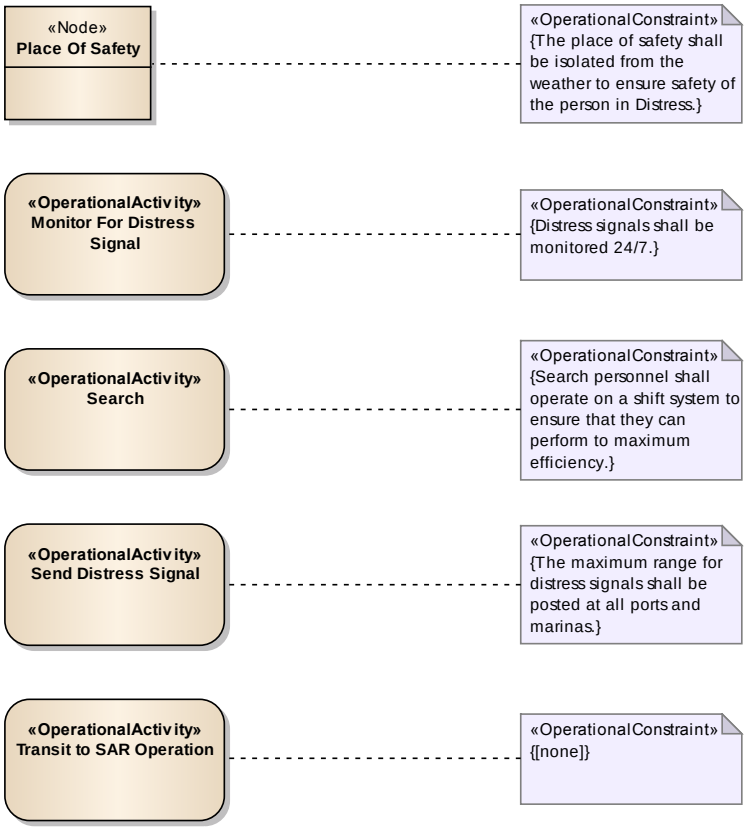


Figure 21: OV-6a Operational Rules

OV-6b Operational State Transition Description

The **OV-6b Operational State Transition Description view** uses a State Chart to lay out the behavior of an operation. Figure 22 depicts the State changes based on Events, Guards and Transitions for a Search Operation.

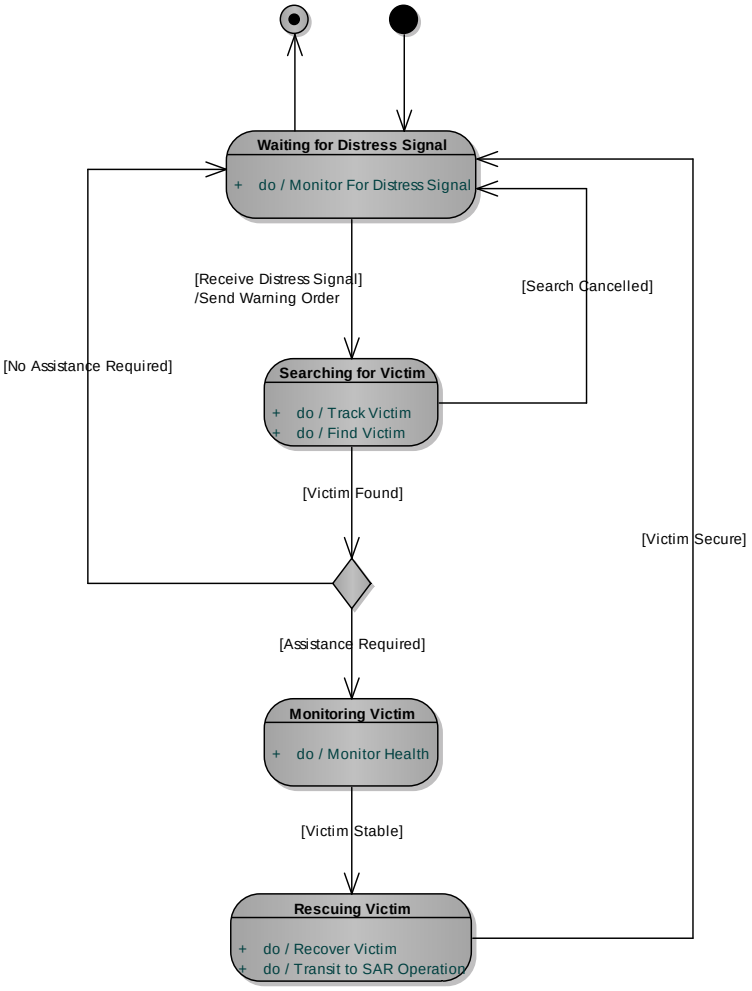


Figure 22: OV-6b Operational State Transition Description

Related to:

- OV-2 Operational Node Connectivity Description View
- OV-5 Operational Activity Model View

OV-6c Operational Event Trace

The **OV-6c Operational Event Trace** view provides a time-ordered examination of the resource flows/information exchanges between participating operational nodes as a result of a particular scenario. Figure 23 is an OV-6c view from the SAR example that uses NodeRoles defined in the OV-2 View (and used in OV-5 views).

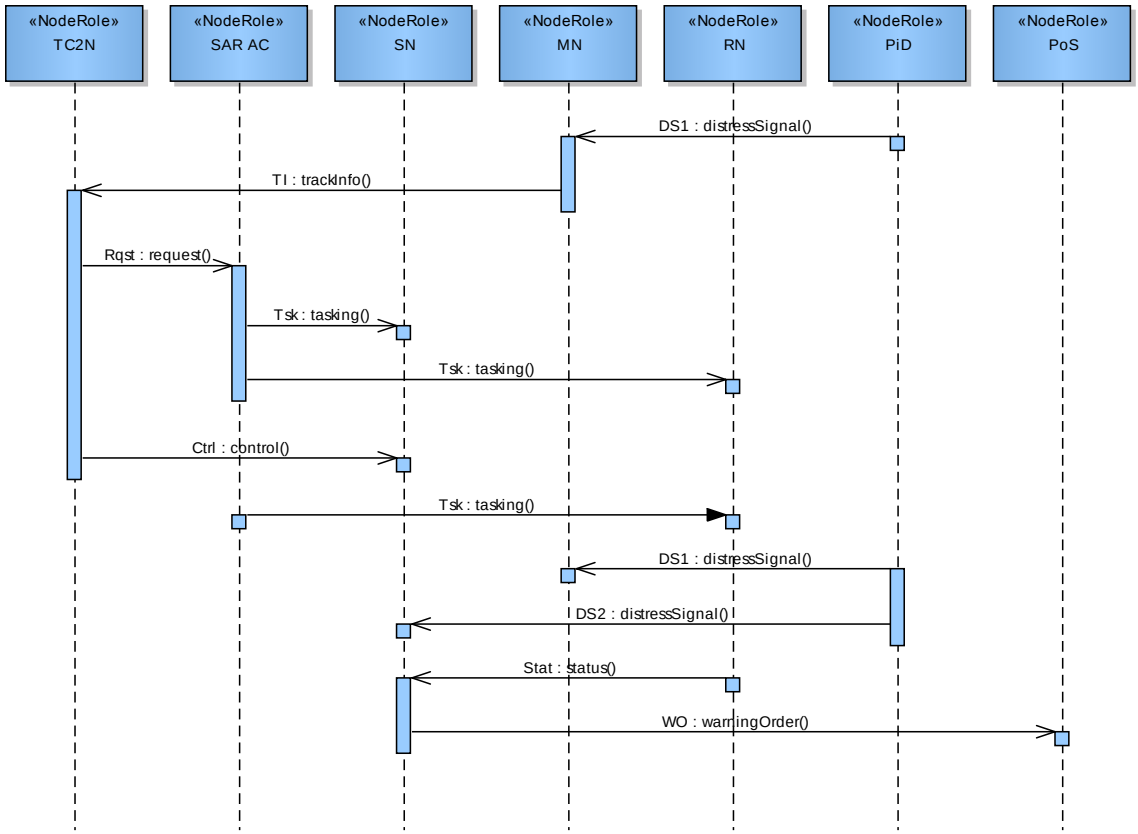


Figure 23: OV-6c Operational Event Trace Description

Relates to:

- OV-2 Operational Node Connectivity Description View
- OV-5 Operational Activity Model View

OV-7 Logical Data Model (DoDAF DIV-1/DIV-2)

The **OV-7 Logical Data Model** view defines domain data types and their interrelationships as are commonly defined in a Logical Data Model. Within them you can define entities with attributes and the relationships that exist between entities.

This view can be used in conjunction with existing Enterprise Architect data modeling features, allowing you to define Conceptual Data models, Logical Data models and DBMS-specific Physical Data models. MDA Transformations can be used to generate Physical models from the Logical models.

For more detail on the data modeling features of Enterprise Architect see the Data Models Help topic.

Figure 24 describes the information elements and entities used in the operational context for the SAR reconnaissance model. Attributes represent characteristics of what would be later used as table-fields.

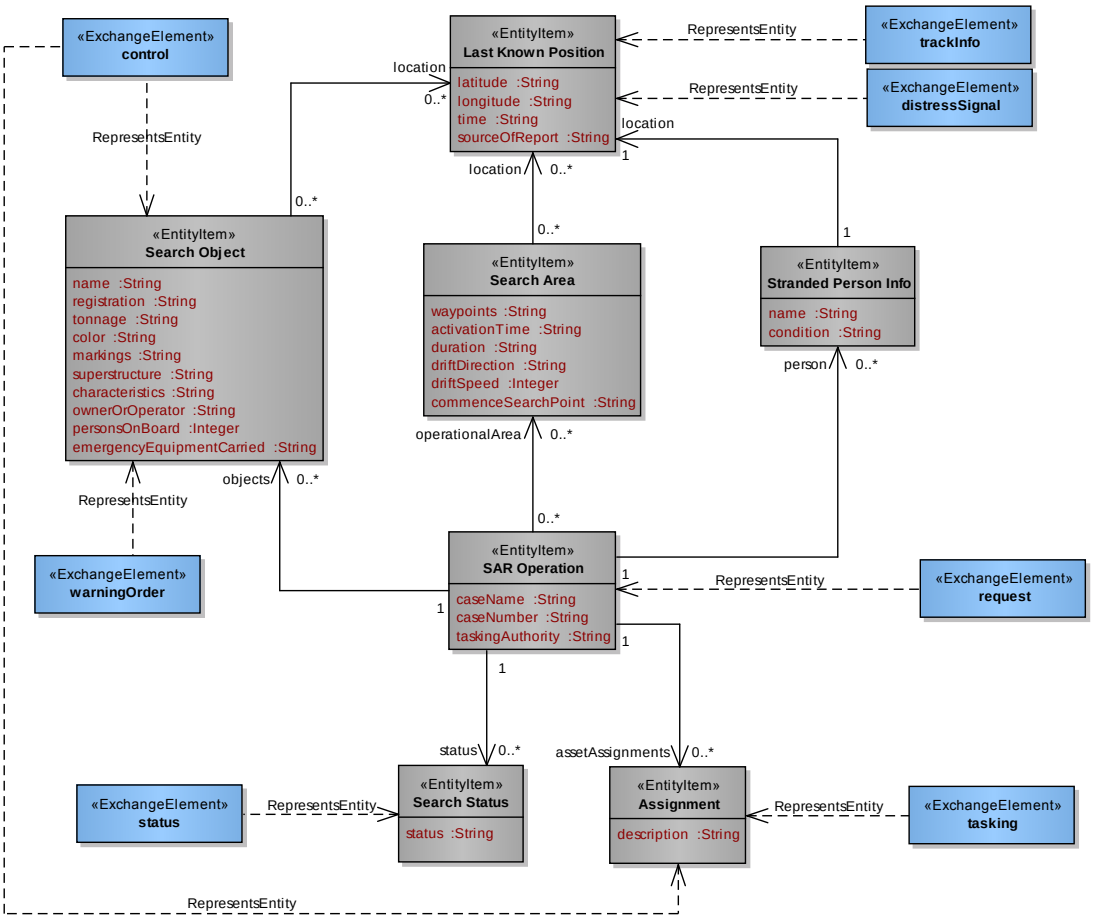


Figure 24: OV-7 Logical Data Model

Service Oriented Views

The Service Oriented Views are used to model the services needed to carry out the operation being modeled. These views provide a description of any independent services and their capabilities, along with how the services are to be orchestrated to perform the modeled operation.

For descriptions of the DoDAF and MODAF Service Oriented view see:

- DoDAF Services Viewpoint
- MODAF View Summary

SOV-1 Service Taxonomy (DoDAF SvcV-1: Services Interface Description)

The **SOV-1 Service Taxonomy** view specifies a hierarchy of Services. The elements in the hierarchy are service specifications (i.e. service interfaces), and the relationships between the elements are generalizations (i.e. one service is a general type of another). Along with the SOV-2 view, SOV-1 specifies a standard library of service specifications for an enterprise, which service implementers are expected to conform to. Figure 25 is an example service taxonomy view for the SAR reconnaissance model.

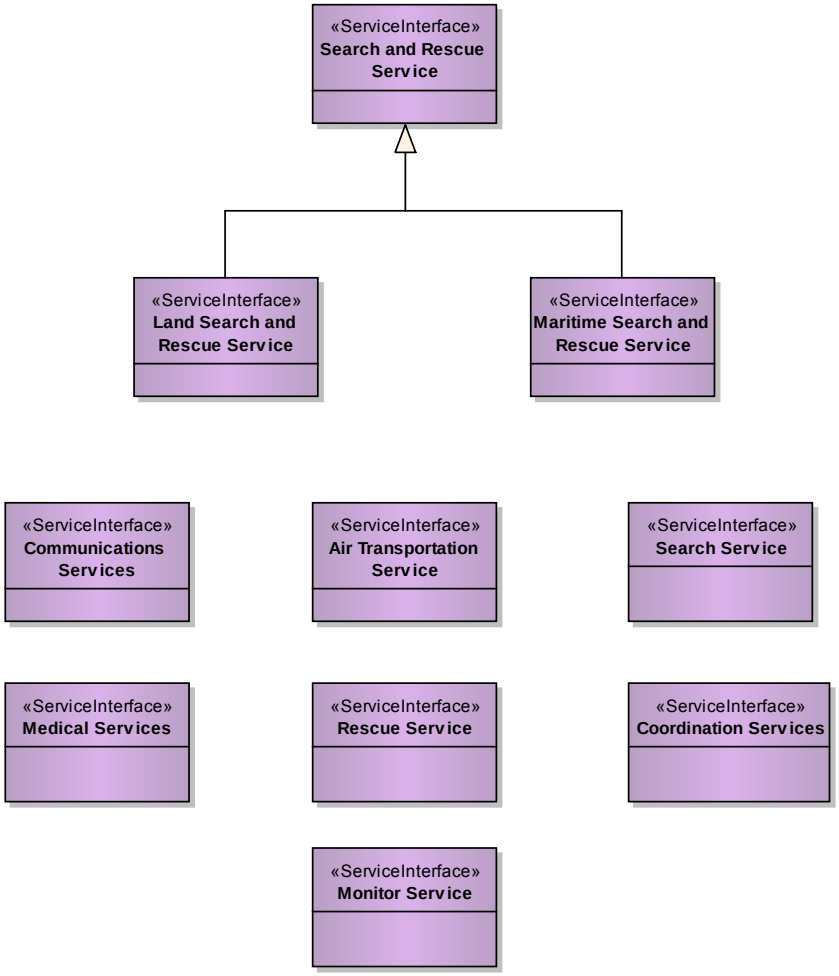


Figure 25: SOV-1 – Service Taxonomy Views

SOV-2 Service Interface Specification (DoDAF SvcV-2)

The **SOV-2 Service Interface Specification** view is used to define the interfaces presented by a service. A service presents one or more interfaces to consumers (a **consumer** being any agent capable of using the service - a person, an organization, a system or another service). In this case, the architect specifies provided interfaces. A service can also be capable of using interfaces exposed by other services, and the architect might specify these as required interfaces. Figure 26 is an example of a Service Interface Specification view used in the SAR reconnaissance model.

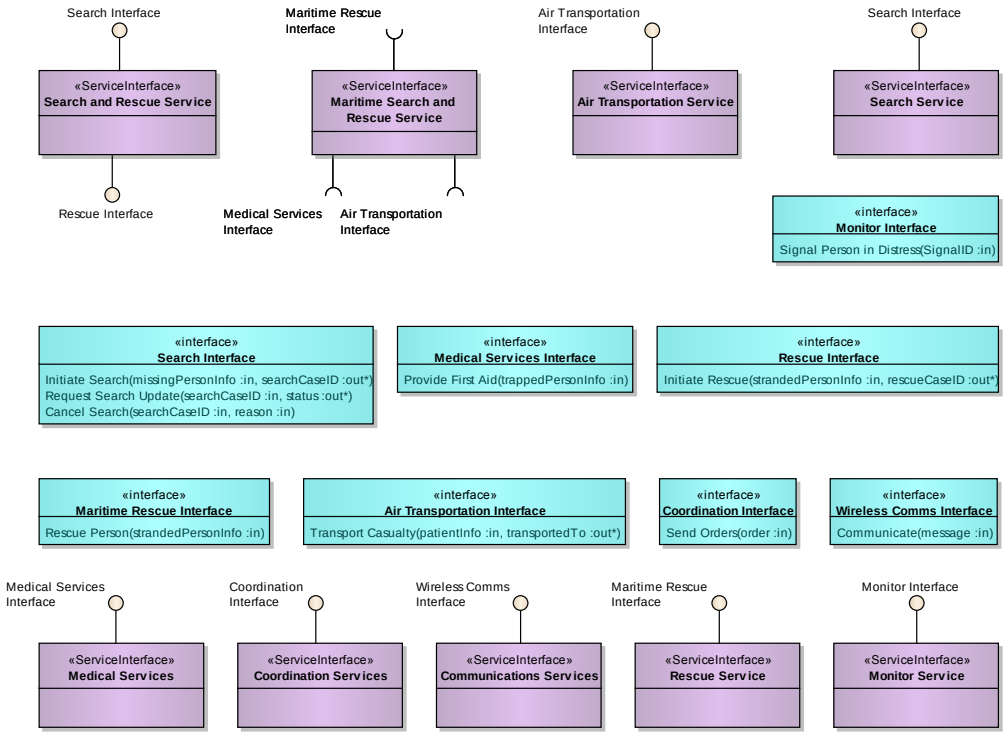


Figure 26: SOV-2 - Services (Interfaces)

The Service Interfaces depicted in Figure 26 are defined in the SOV-1 View.

Related to:

- SOV-1 Service Interface Specification View
- SOV-3 Capability to Service Mapping View

SOV-3 Capability to Service Mapping (DoDAF CV-7)

The **SOV-3 Capability to Service Mapping** view depicts which services contribute to the achievement of a capability. It is in the form of a table generated from the database. If network enabled capability is to be delivered by the orchestration of loosely coupled services (i.e. a service-oriented architecture), it is important to know which services have the potential to support particular capabilities. This helps to prevent redundant services or capabilities, (except where specifically required) and what is known as stovepipe development. An SOV-3 presents a simple mapping of services to capabilities, showing which services contribute to which capabilities. Figure 27 is an example used in the SAR reconnaissance model.

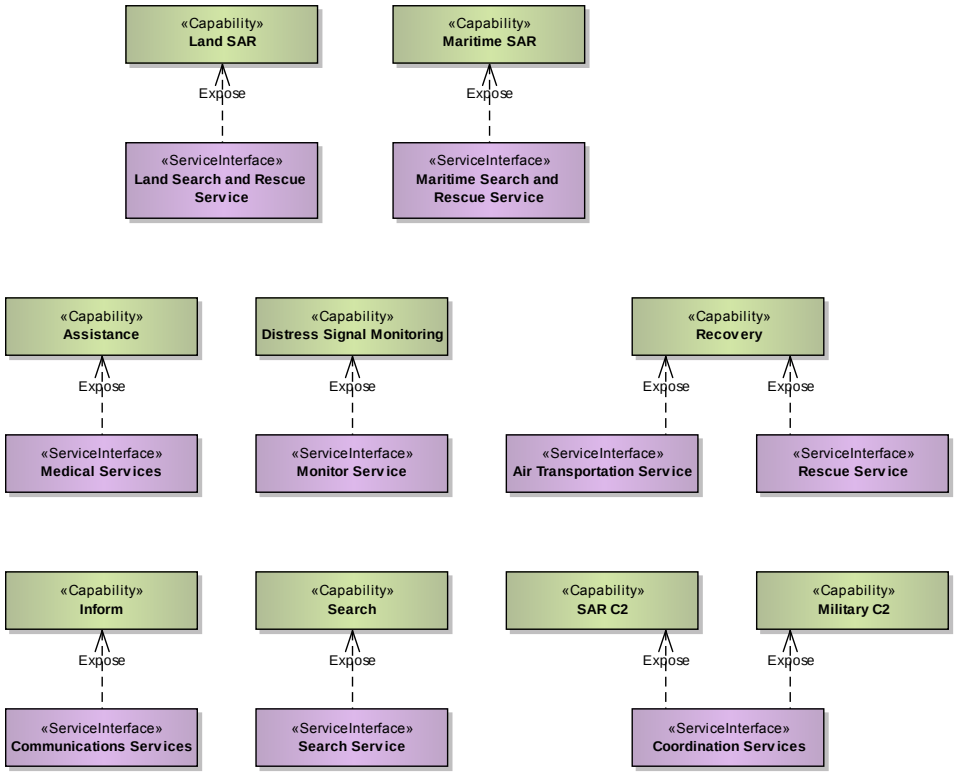


Figure 27: SOV-3 Capability Service Mapping

The Service Interfaces shown in Figure 27are defined in the SOV-1 View.

Relates to:

- SOV-1 View

SOV-4a Service Behaviors and Constraints (DoDAF SvcV-10a)

The **SOV-4a Service Behaviors and Constraints** view is used to specify constraints that apply to any service that is to be implemented. It can be used to discern which potential service-providers meet the constraints required to carry out the service.

The constraints are specified in text and can be functional or structural (i.e. non-functional).

Figure 28 shows examples from the SAR reconnaissance model showing the model representation of this view.

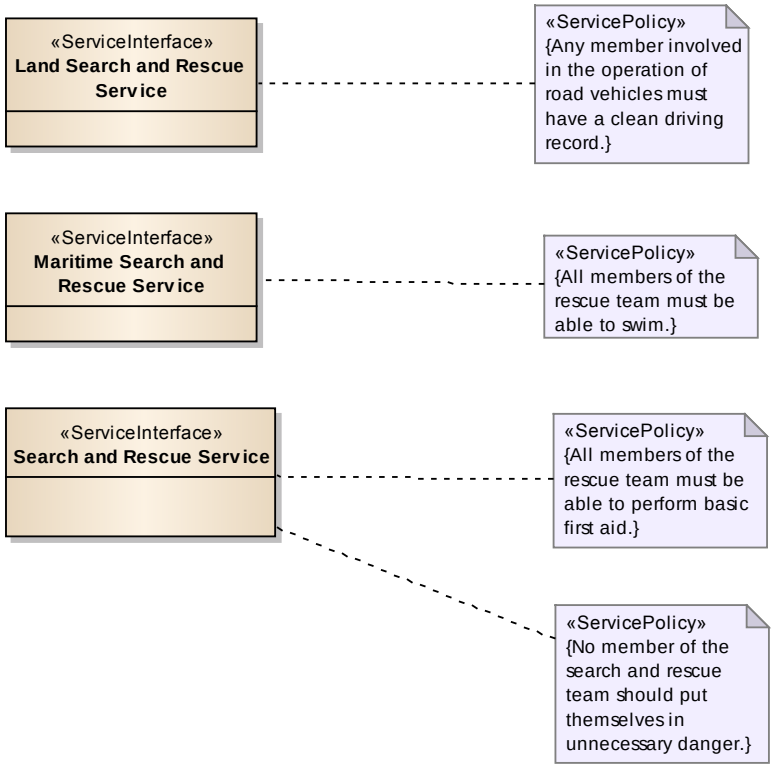


Figure 28: SOV-4a - Service Policies

The Service Behaviors and Constraints view can also be reported using a pre-defined Model Search (accessible using Ctrl+F, then selecting the **SOV-4a** search): see Figure 29.

Search Term: Search: SOV-4a Run Options Builder

Drag a column header here to group by that column.

Service Interface Name	Service Policy Name	Text
Search and Rescue Service	Danger	No member of the search and rescue team should put themselves in unnecessary danger.
Land Search and Rescue Service	Driving Record	Any member involved in the operation of road vehicles must have a clean driving record.
Search and Rescue Service	First Aid	All members of the rescue team must be able to perform basic first aid.
ServiceInterface1		Constraint
Maritime Search and Rescue Service	Swim	All members of the rescue team must be able to swim.

Figure 29: SOV-4a view using SOV-4a Model Search

SOV-4b Service State model (DoDAF SvcV-10b)

The **SOV-4b Service State Model** view is used to specify the possible states a service must provide, and the possible transitions between those states, along with any behavioral constraints to be adhered to.

Figure 30 is a State diagram used in the SAR reconnaissance model covering the state based behavior required for Maritime Search and Rescue.

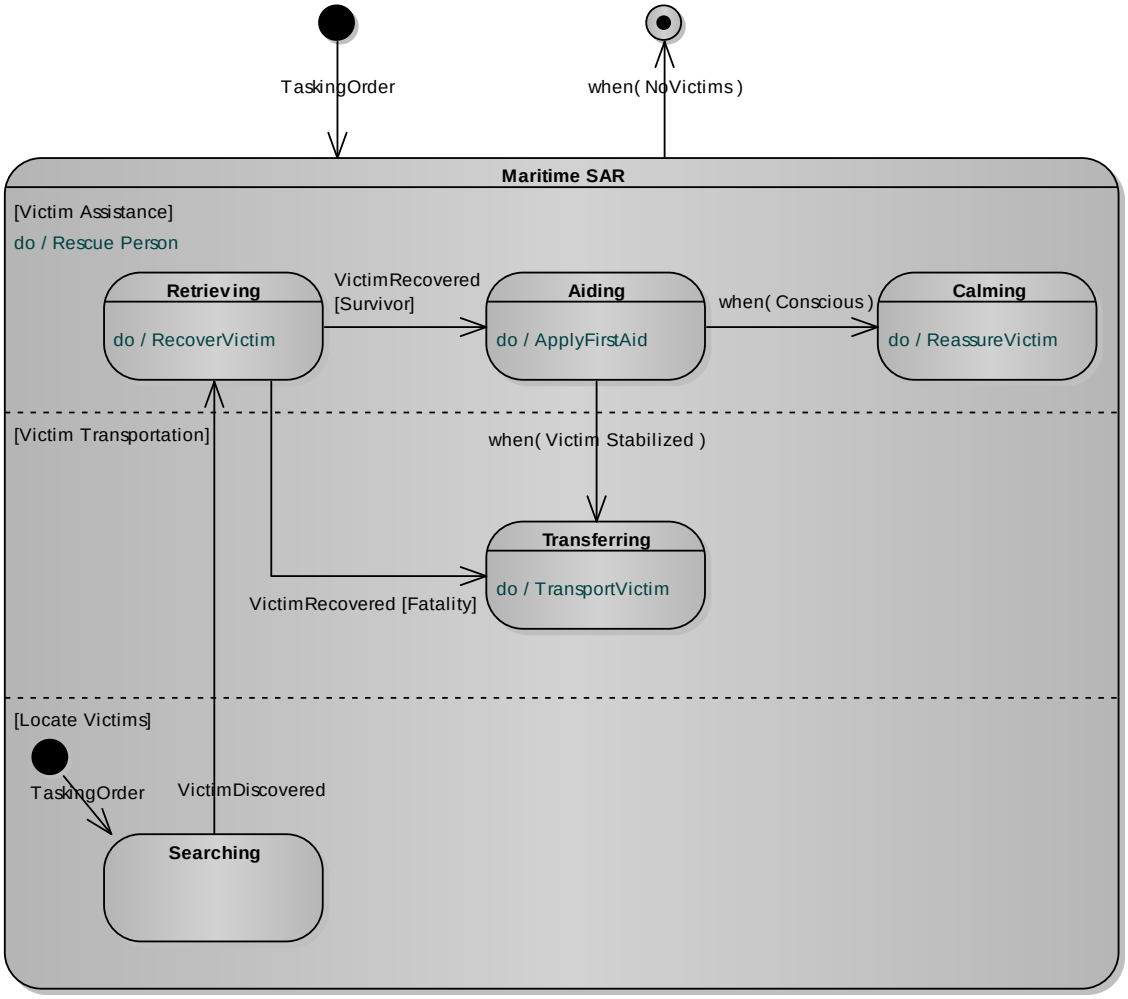


Figure 30: An SOV-4b diagram of the Maritime Search and Rescue service

SOV-4c Service Interaction Specification

The **SOV-4c Service Interaction Specification** view is used to specify how a service interacts with external agents, and the sequence and dependencies of those interactions.

An SOV-4c product does not specify the sequencing of an orchestrated set of services (see OV-6c). Its purpose is to specify the general sequence of interactions that are possible for a given service.

Related to:

- OV-6c Operational Event Trace

SOV-5 Service Functionality (DoDAF SvcV-4)

The **SOV-5 Service Functionality view** defines the behavior of a service in terms of the functions it is expected to perform.

This view enables the description of a service by means of a State diagram, an Activity model or an Event Trace description. Event Trace descriptions are useful in fully defining the sequencing of messages and operations that form part of the service interface. State descriptions are useful in fully defining the handling that takes place in a service due to possible different internal states. For all of these descriptions, standard UML entities provide appropriate representation.

Figure 31 shows an SOV-5 view of the SAR example which is a decomposition of the Maritime Search and Rescue service functions.

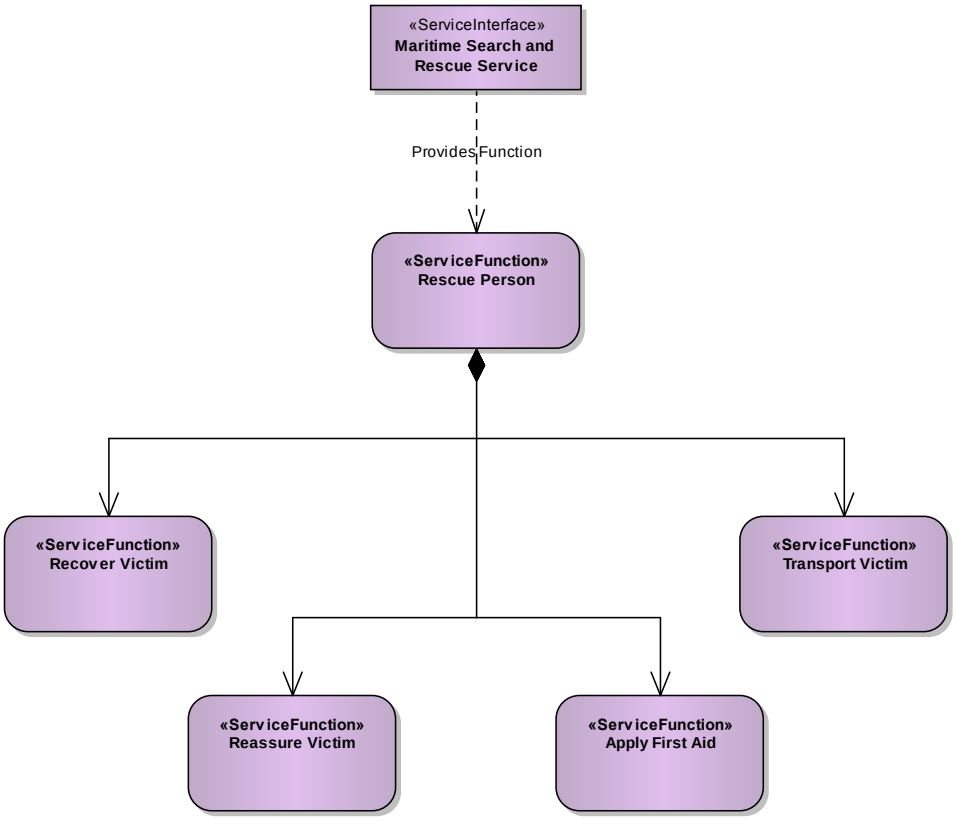


Figure 31: SOV-5 - Services (Functionality)

System Views

The System Views model the resources required to realize the capabilities and implement the desired services. They model what functionality is required of the resource and the interactions between resources, as well as provide details on the interfaces between systems.

System Views can cover 'as is' and 'to be' scenarios, used for trade-off analysis. You can perform this type of analysis using the Enterprise Architect Gap Analysis features. Where there is a need for defining requirements and tracing them through the model you can also use Requirements modeling.

For more detailed DoDAF and MODAF descriptions of System Views see:

- DoDAF Systems Viewpoint
- MODAF View Summary

SV-1 Resource Interaction Specification

The SV-1 **Resource Interaction Specification** provides a means of identifying system resources and modeling their interconnections and interactions. This incorporates any human elements as types of performer.

The SV-1 view can be interconnected with the **Fit for Purpose** model (OV-1), which models these entities showing organizational interactions.

Figure 32 is an example of an SV-1 view from the SAR example, depicting roles that make up the Maritime Search and Rescue team and their interactions with entities that allow the personnel to carry out the role, such as a driver for the MR Boat.

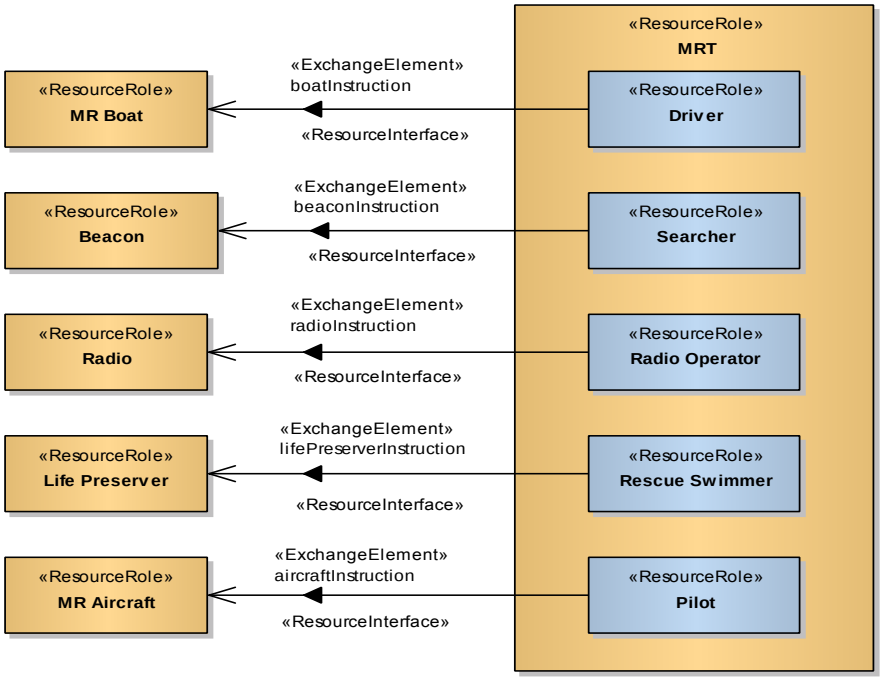


Figure 32: SV-1 Resource Interaction Specification - Maritime Rescue Unit v1

Related to:

- OV-1 View
- TV-1 Standards Profile
- TV-2 Standards Forecast

SV-2 Capability Configuration

The **SV-2 Capability Configuration view** describes the communication between systems, showing the communications networks, pathways and resource flows, and provides details regarding their configuration.

Figure 33 shows the connections between the key entities in the maritime search and rescue model.

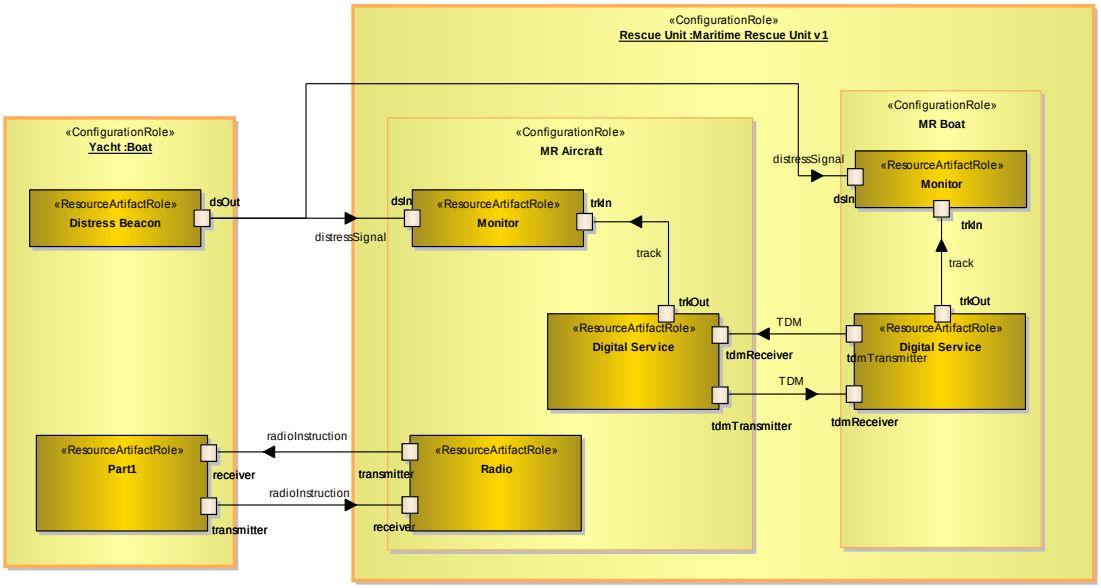


Figure 33: SV-2 Capability Configuration view showing communications for the Maritime Rescue Unit

SV-4 Functionality Description (DoDAF Systems Functionality Description)

The **SV-4 Functionality Description view** addresses human and system functionality. It defines the functions carried out by the resources involved in an operation (including any organizational resources) and provides a mapping of the resource use to function.

Figure 34 is from the SAR example, depicting the resources to be used and the actions to be performed.

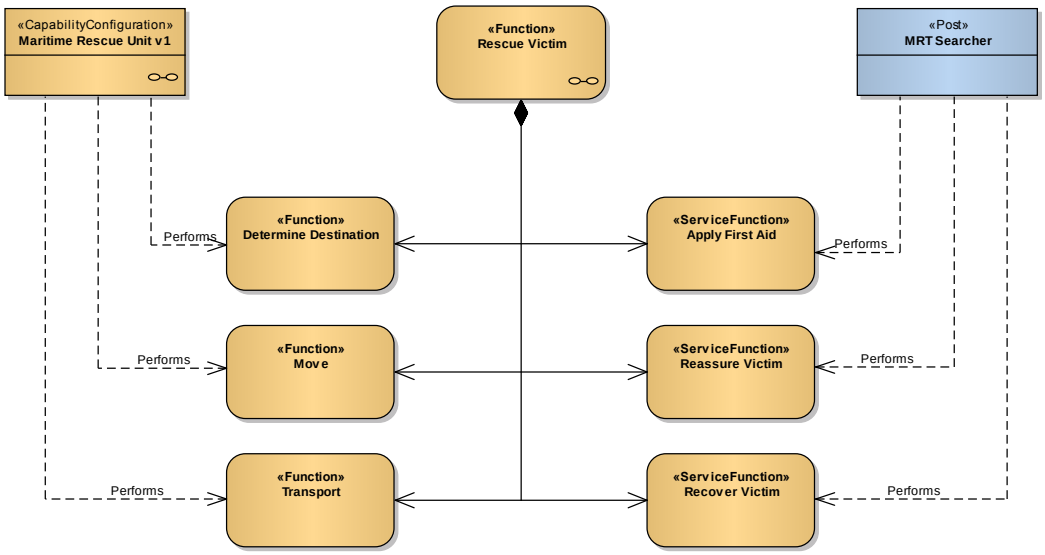


Figure 34: SV-4 Functionality Descriptions

An alternative diagram is an Activity diagram showing the overall workflow of resources using functions. Figure 35 shows a Workflow of Resources from the SAR example, implementing the Rescue Victim Activity. This Activity diagram depicts how the Resources make use of the available Functions.

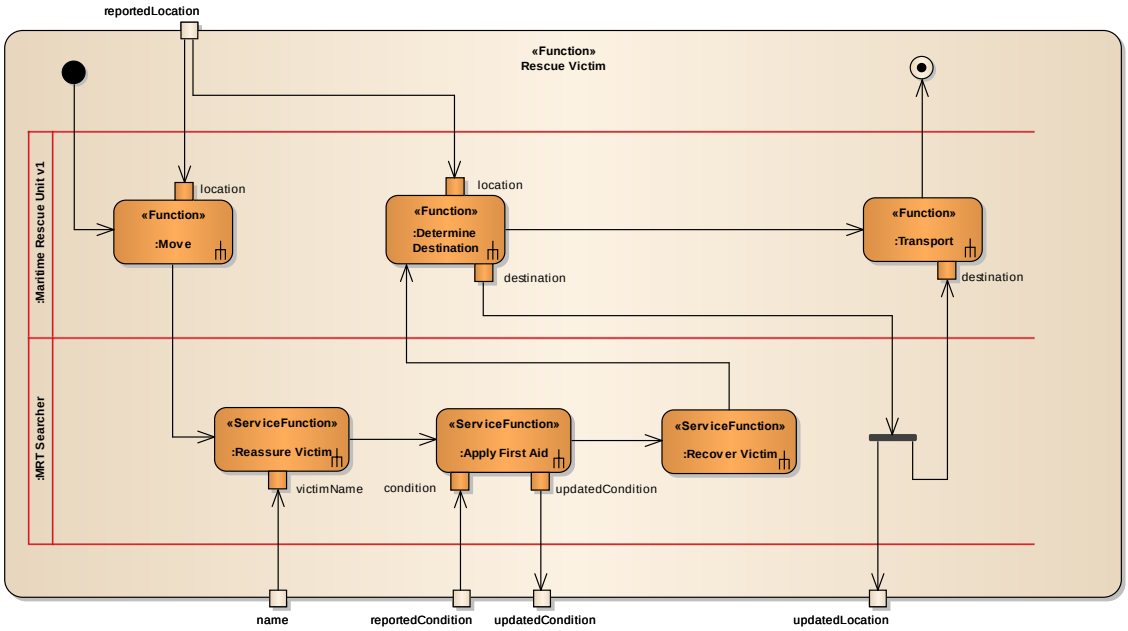


Figure 35: Activity diagram as an alternate SV-4 view, from the SAR example

SV-5 Function to Operational Activity/Service Function Traceability

The **SV-5 Function to Operational Activity view** provides a traceability view from system functions to service functions and operational activities. It is intended to provide requirements traceability between functions and the operational activity. These views can be used in validating what has been implemented and what is yet to be implemented.

The SV-5 view provides a graphical method of defining the relationships to the functions laid out in SV-4.

Figure 36 shows an SV-5 view of the operational activities and the services that implement them, from the SAR reconnaissance model. This is a means of tracing the capability requirements to verify what functions implement what operational activities.

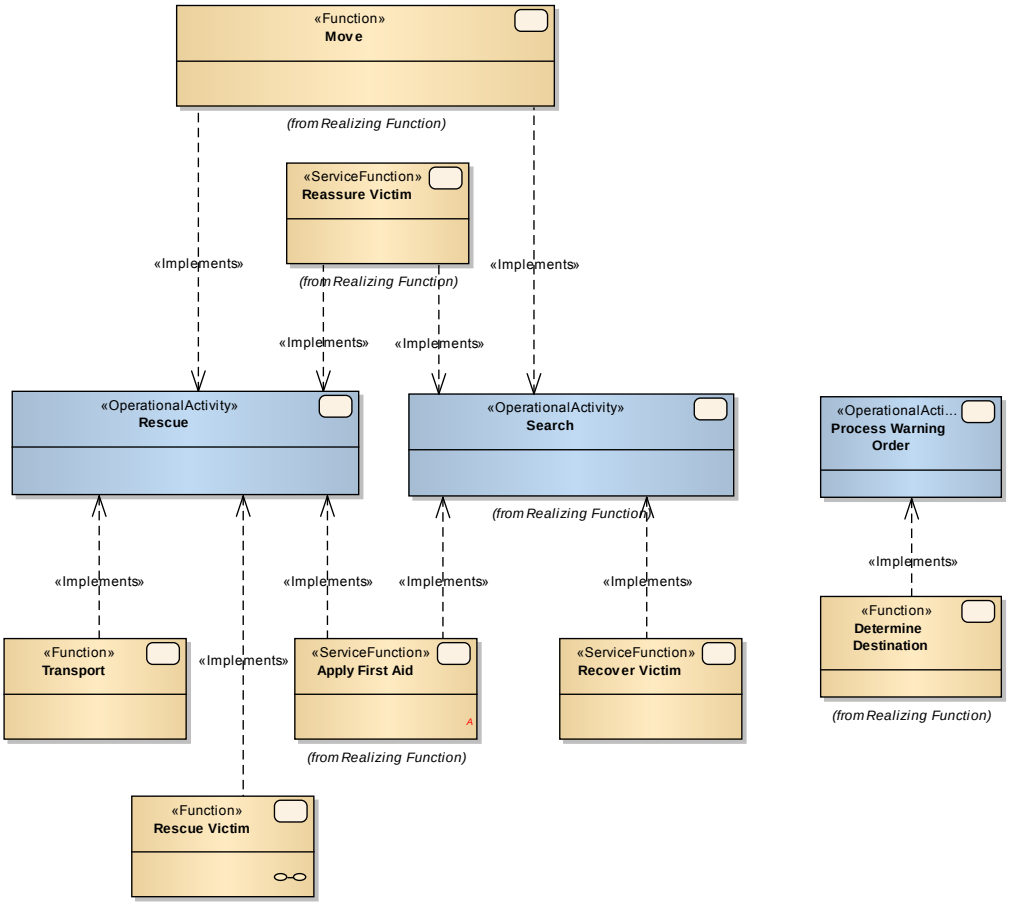


Figure 36: SV-5 view of SAR Function Relationships to Operations

These relationships can also be displayed using a pre-defined Relationship Matrix profile, as shown in Figure 37:

	Monitor For Distress Signal	Process Warning Order	Receive Distress Signal	Rescue	Search	Search	Send Distress Signal	Send Warning Order	Transit To SAR Operation
Apply First Aid				↑	↑	↑			
Determine Destination		↑							
Move				↑	↑	↑			
Reassure Victim					↑	↑			
Recover Victim									
Recover Victim						↑			
Search									
Transport Victim				↑					

Figure 37: SV-5 Function to Operational Activity view using a Relationship Matrix

To access the Relationship Matrix select **View | Relationship Matrix** from the main menu, and in the **Profile** drop-down, select **SV-5**.

> **Tip:** The SV-5 Relationship Matrix profile is one of a number of predefined Relationship Matrix profiles used in UPDM. For more information on setting up your own Relationship Matrix profiles see the Relationship Matrix Help topic.

Related to:

- SV-4 View
- TV-1 Standards Profile

SV-6 System Exchange Matrix (DoDAF Systems Resource Flow Matrix)

The **SV-6 System Exchange Matrix** specifies the characteristics of the system data/resource flows exchanged between systems. The focus is on data crossing the system boundary. Figure 38 shows an SV-6 system change matrix view from the SAR reconnaissance model.

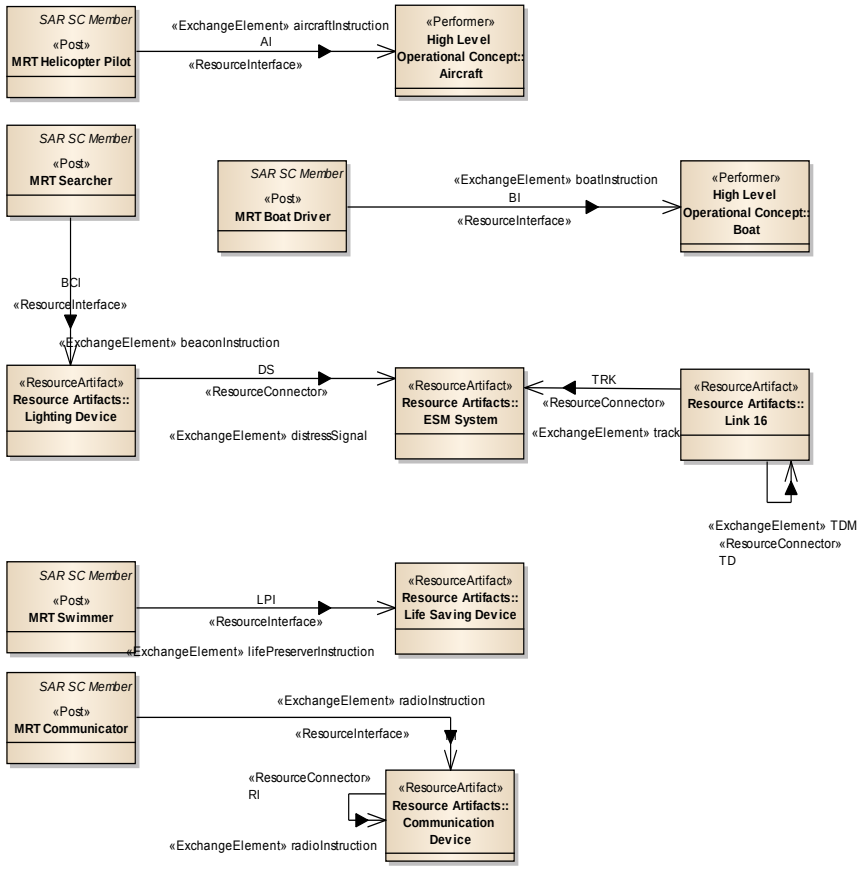
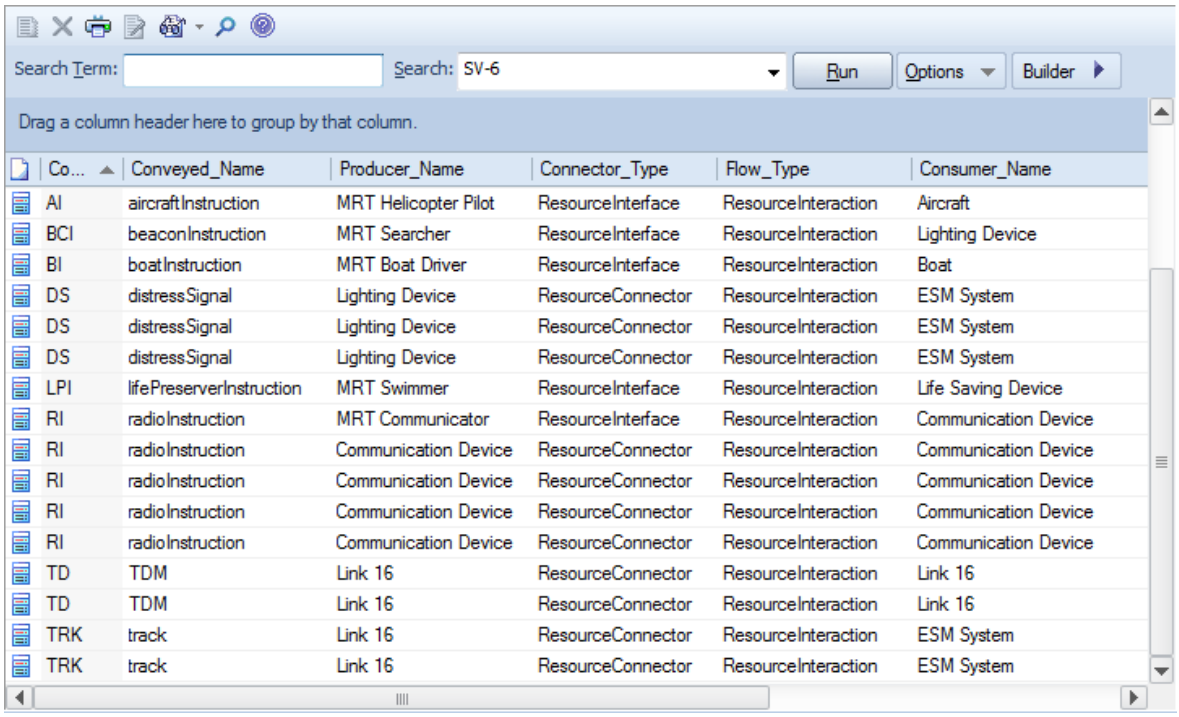


Figure 38: SV-6 System Exchange Matrix diagram for the SAR example

This can also be reported using a Search Query. Figure 39 is an SV-6 listing returned for the SAR example model.



Co...	Conveyed_Name	Producer_Name	Connector_Type	Flow_Type	Consumer_Name
AI	aircraftInstruction	MRT Helicopter Pilot	ResourceInterface	ResourceInteraction	Aircraft
BCI	beaconInstruction	MRT Searcher	ResourceInterface	ResourceInteraction	Lighting Device
BI	boatInstruction	MRT Boat Driver	ResourceInterface	ResourceInteraction	Boat
DS	distressSignal	Lighting Device	ResourceConnector	ResourceInteraction	ESM System
DS	distressSignal	Lighting Device	ResourceConnector	ResourceInteraction	ESM System
DS	distressSignal	Lighting Device	ResourceConnector	ResourceInteraction	ESM System
LPI	lifePreserverInstruction	MRT Swimmer	ResourceInterface	ResourceInteraction	Life Saving Device
RI	radioInstruction	MRT Communicator	ResourceInterface	ResourceInteraction	Communication Device
RI	radioInstruction	Communication Device	ResourceConnector	ResourceInteraction	Communication Device
RI	radioInstruction	Communication Device	ResourceConnector	ResourceInteraction	Communication Device
RI	radioInstruction	Communication Device	ResourceConnector	ResourceInteraction	Communication Device
RI	radioInstruction	Communication Device	ResourceConnector	ResourceInteraction	Communication Device
TD	TDM	Link 16	ResourceConnector	ResourceInteraction	Link 16
TD	TDM	Link 16	ResourceConnector	ResourceInteraction	Link 16
TRK	track	Link 16	ResourceConnector	ResourceInteraction	ESM System
TRK	track	Link 16	ResourceConnector	ResourceInteraction	ESM System

Figure 39: SV-6 System Exchange using a Search Query

To access this search in the model select from the main menu: Edit | Find Project or (Ctrl+F), then in the Search field select **SV-6**.

For more tips on using Searches, see Search tips.

Related to:

- TV-1 Standards Profile

SV-7 Resource Performance Parameters (DoDAF Systems Measures Matrix)

The **SV-7 Resource Performance Parameters** view is used for modeling the performance characteristics of resources. It provides more details on the items defined in SV-1 and can be defined using:

- A table created in a spreadsheet or
- SV-7 diagram elements

If using a spreadsheet from an external application, you can include a hyperlink in the diagram to this spreadsheet. When you double-click on the hyperlink it will launch the file in its appropriate application.

Figure 40 is an SV-7 diagram for System Measurements from the SAR example model.

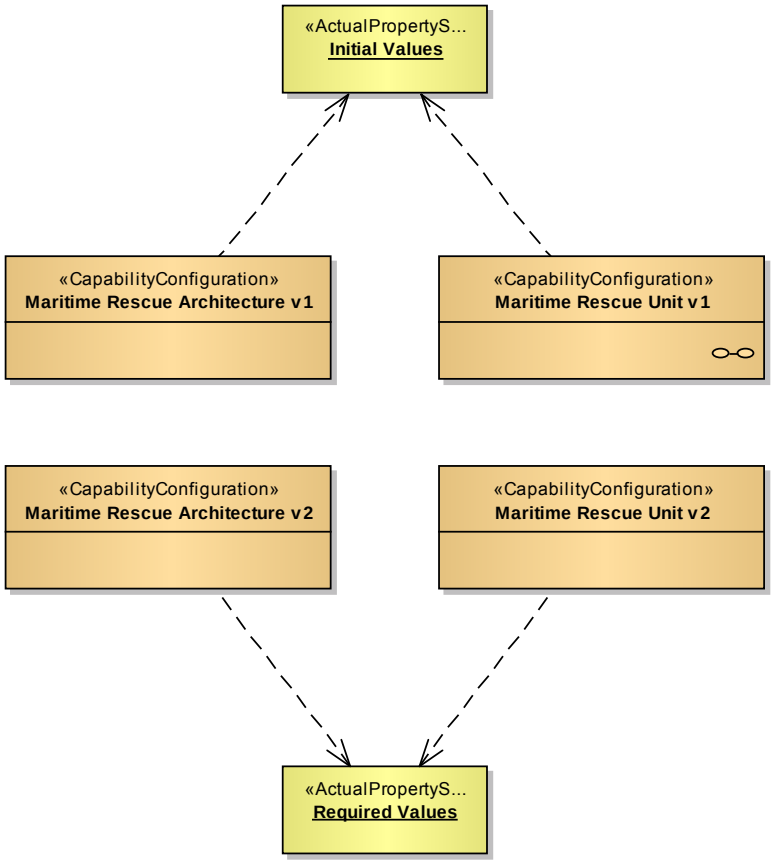


Figure 40: SV-7 - Resource Performance Parameters for the SAR model

Figure 41 shows an example RTF report detailing the Capability Configurations for the SAR model derived from the STV-1 view.

Capability	Name	Measurement	Value	Unit
Phase 1	Initial Values	weatherConditions	Heavy Rain	Weather Severity Index
		searchCoverage	400	Square Kilometers
		persistence	15	Hours
		findTime	8	Hours
		areaCoverage	500	Square Kilometers
		seaConditions	Sea State 6	Meter
Maritime SAR Phase 2	Required Values	weatherConditions	Stormy	Weather Severity Index
		searchCoverage	500	Square Kilometers
		persistence	20	Hours
		findTime	5 hours	Hours
		areaCoverage	600	Square Kilometers
		seaConditions	Sea State 8	Meter
Maritime Rescue Unit v2	Final Values	weatherConditions	Stormy	Weather Severity Index

		searchCoverage	550	Square Kilometers
		persistence	20	Hours
		findTime	4	Hours
		areaCoverage	650	Square Kilometers
		seaConditions	Sea State 8	Meter

Figure 41: SV-7 Report in Tabular Format

Related to:

- SV-1 Resource Interaction View

SV-8 System Capability Configuration Management (DoDAF Systems Evolution Matrix)

The **SV-8 System Capability Configuration Management view** provides a whole lifecycle overview of how a resource/capability configuration structure changes over time. It shows the structure of several resource/capability configurations mapped against a timeline. The SV-8 view is modeled using Swimlanes; for more details on options for setting these up see the Swimlanes Help topic.

Figure 42 is an SV-8 diagram for System Capability from the SAR example model.

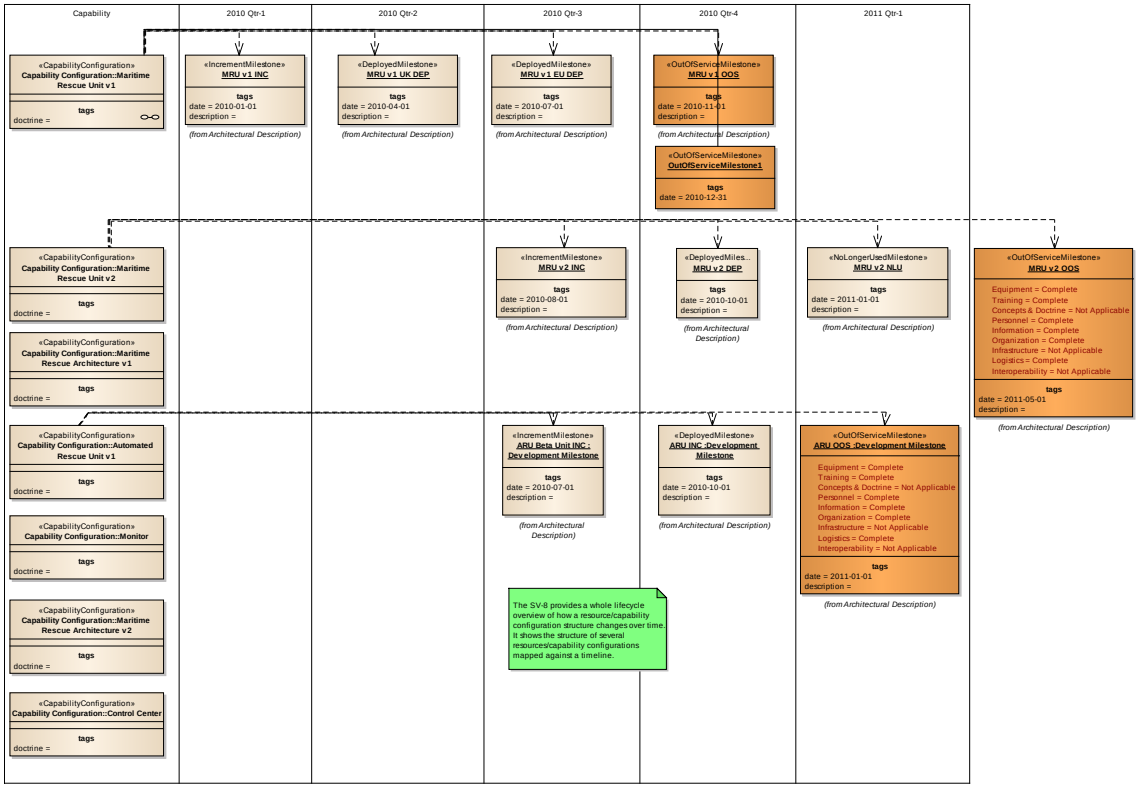


Figure 42: An SV-8 System Capability View for SAR

Related to:

- StV-3 Capability Phasing
- ACV-2 Project Timeline
- TV-2 Standards Forecast

SV-9 Technology and Skills Forecast (DoDAF Systems Technology and Skills Forecast)

The **SV-9 Technology and Skills Forecast view** defines what technologies and skills are currently supported, along with any expected improvements. Expected support technologies and skills are those that can be reasonably forecast as emerging, given the current state, and trends towards their improvement. New technologies and skills will be tied to specific time periods, which can correlate against periods that are used in SV-8 milestones and that are linked to enterprise phases.
Figure 43 is an SV-9 diagram for a Technology and Skills Forecast view from the SAR example model.

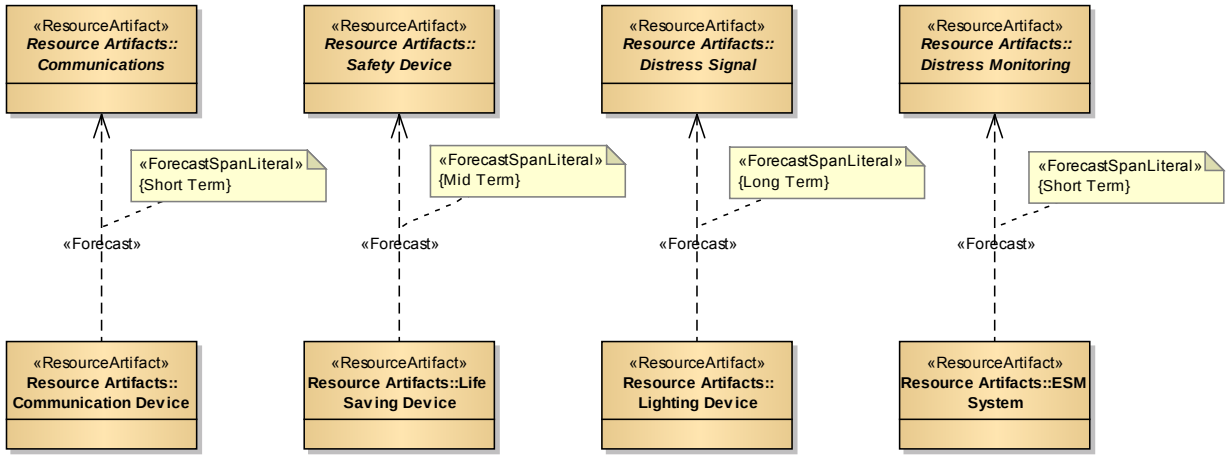


Figure 43: SV-9 - Boat & Aircraft Systems Forecast

Related to:

- TV-2 Standards Forecast

SV-10a System Rules and Constraints (DoDAF Systems Rules Model)

The **SV-10a System Rules and Constraints view** describes functional and non-functional constraints on the implementation aspects of the architecture (resources, functions, data and ports).
Figure 44 is an SV-8 diagram for System Rules and Constraints from the SAR example model.

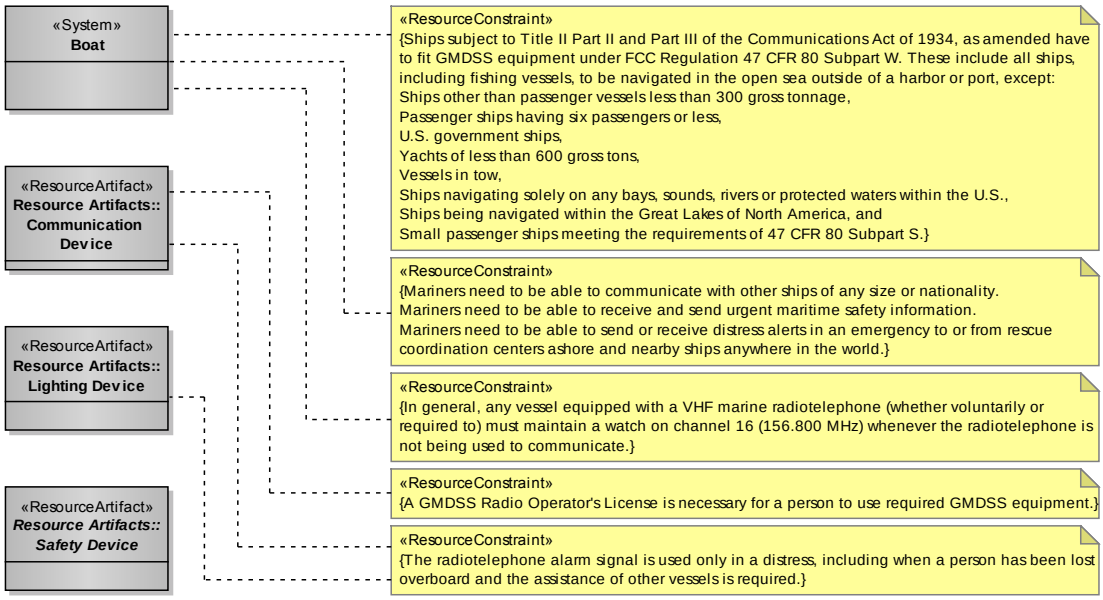


Figure 44: SV-10a System Rules and Constraints example

Details in this view can also be generated as an RTF report:

Resource	Resource Constraint	
Boat	GMDSS Vessel Requirements	Ships subject to Title II Part II and Part III of the Communications Act of 1934, as amended have to fit GMDSS equipment under FCC Regulation 47 CFR 80 Subpart W. These include all ships, including fishing vessels, to be navigated in the open sea outside of a harbor or port, except: Ships other than passenger vessels less than 300 gross tonnage, Passenger ships having six passengers or less, U.S. government ships, Yachts of less than 600 gross tons, Vessels in tow, Ships navigating solely on any bays, sounds, rivers or protected waters within the U.S., Ships being navigated within the Great Lakes of North America, and Small passenger ships meeting the requirements of 47 CFR 80 Subpart S.
	Marine Vessel Communications	Mariners need to be able to communicate with other ships of any size or nationality. Mariners need to be able to receive and send urgent maritime safety information. Mariners need to be able to send or receive distress alerts in an emergency to or from rescue coordination centers ashore and nearby ships anywhere in the world.

	Radio Watch Keeping	In general, any vessel equipped with a VHF marine radiotelephone (whether voluntarily or required to) must maintain a watch on channel 16 (156.800 MHz) whenever the radiotelephone is not being used to communicate.
Communication Device	Distress System Usage	The radiotelephone alarm signal is used only in a distress, including when a person has been lost overboard and the assistance of other vessels is required.
	GMDSS Equipment Operation	A GMDSS Radio Operator's License is necessary for a person to use required GMDSS equipment.
Lighting Device	Distress System Usage	The radiotelephone alarm signal is used only in a distress, including when a person has been lost overboard and the assistance of other vessels is required.
Safety Device		

Related to:

- SV-4 Functionality Description
- SV-10b Resource State Transition Description
- SV-10c Resource Event Trace Description

SV-10b Resource State Transition Description (DoDAF System State Transition Description)

The **SV-10b Resource State Transition Description view** is a graphical method of describing behavior of a resource. It defines the response to various events using state changes modeled in a State Chart. The SV-10b diagram represents the set of events to which the resources in the architecture will respond (by taking an action to move to a new state), as a function of its current state. Each transition specifies an event and an action. SV-10b typically provides a more detailed analysis of the actions to be carried out by functions defined in an SV-4 view.

Figure 45 shows the behavior of an aircraft (a SV-4 Transport Function) from the SAR example model.

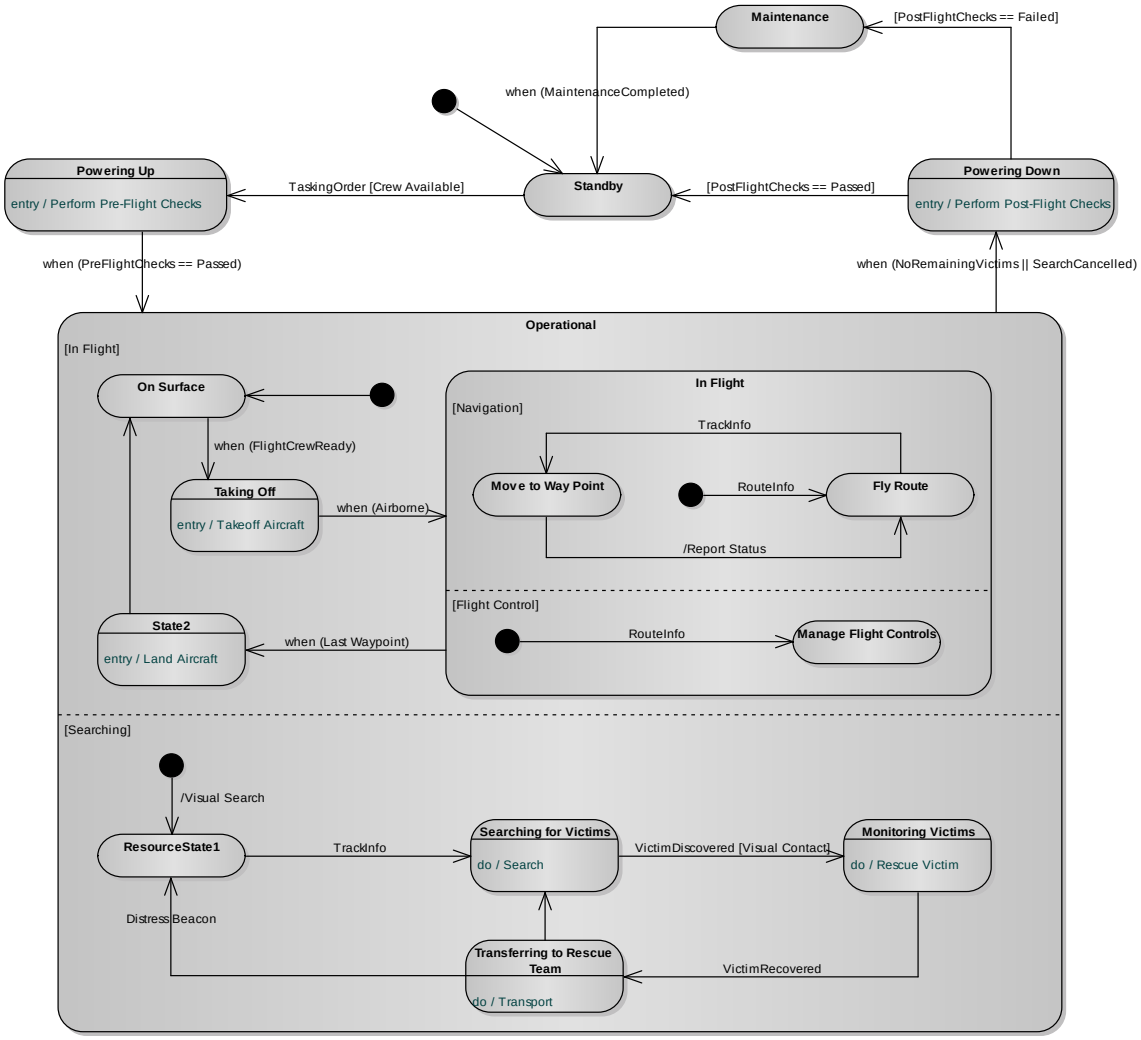


Figure 45: SV-10b Resource State Transition Description view

Related to:

- SV-4 Functionality Description

SV-10c Resource Event Trace Description (DoDAF System Event Trace Description)

The **SV-10c Resource Event Trace Description view** provides a time-ordered examination of the interactions between resources. It lays out the sequence of interactions involving these resources. Each Event-Trace diagram will have an accompanying description that defines the particular scenario or situation. This view is typically defined in combination with the SV-10b view.

Figure 46 is an SV-10c diagram from the SAR rescue example model.

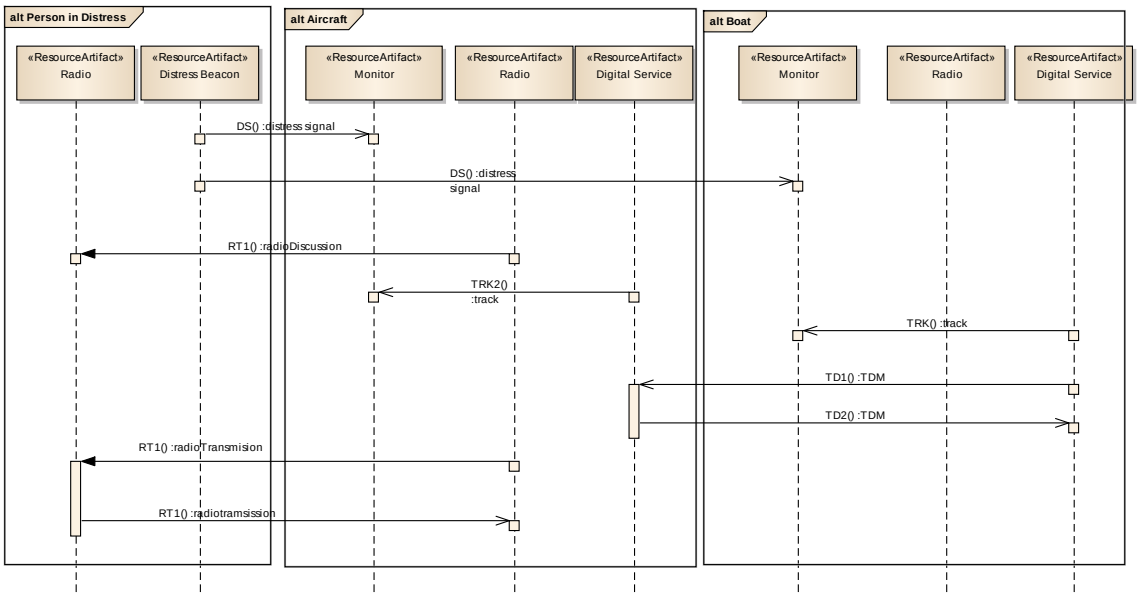


Figure 46: SV 10c view from the SAR example model

Related to:

- SV-4 Functionality Description
- SV-10a System Rules and Constraints
- SV-10b Resource State Transition Description

SV-11 System Data Model (DoDAF DIV-3 Physical Data model)

The UPDM **SV-11 System Data Model view** corresponds to the MODAF SV-11 view and the DoDAF DIV-3 Physical Data Model view. It models the structure of the system data used within the architecture.

Figure 47 is an SV-11 Physical Data model for the SAR reconnaissance example.

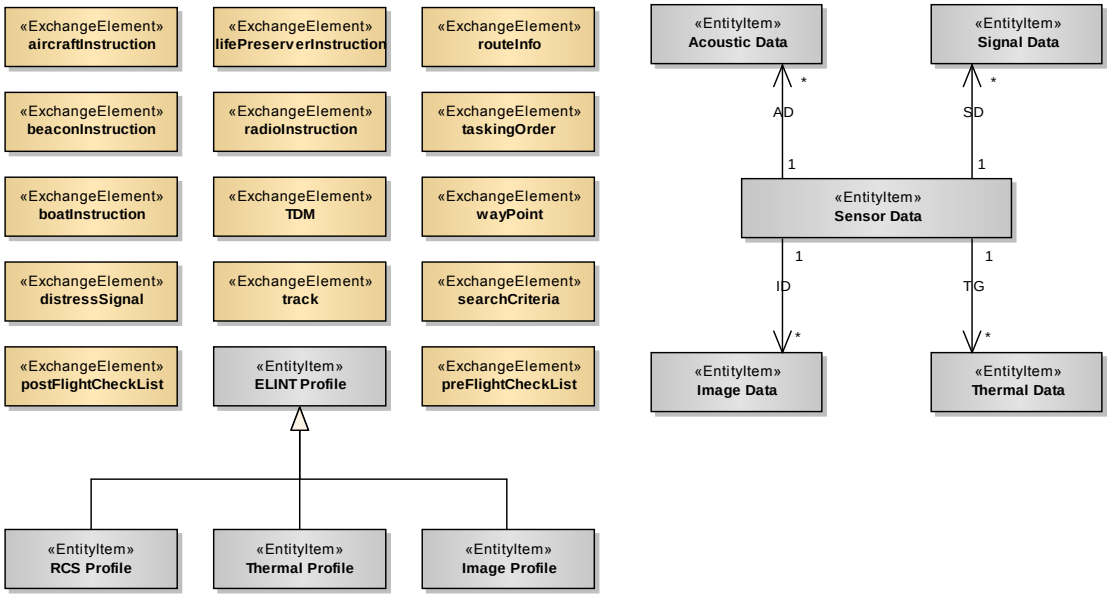


Figure 47: SV-11 Physical Data Model for the SAR example model

For more detail on options for creating Physical Data models in Enterprise Architect, see the Help topics on:

- Database Engineering
- Data modeling

Related to:

- SV-1 Resource Interaction Specification
- SV-2 Capability Configuration
- SV-4 Functionality Description
- SV-10c Resource Event Trace Description

Acquisition Views

During the lifecycle of a project it will be necessary to acquire the resources needed to fulfill the mandate of the project. The **Acquisition views** provide a means of outlining the high-level tasks for acquiring assets, resources and capabilities that will be required during the full lifecycle of the operation.

For more details on Acquisition views see:

- DoDAF Project Viewpoint
- MODAF View Summary

AcV-1 System of Systems Acquisition Clusters (DoDAF PV-1)

The **AcV-1 System of Systems Acquisition Clusters view** represents, from a high-level perspective of the program, how acquisition processes are to be grouped. It lays out the modeling of the organizational structures needed to manage a portfolio of projects.

Figure 48 is an AcV-1 diagram for System of Systems Acquisition Clusters from the SAR example model.

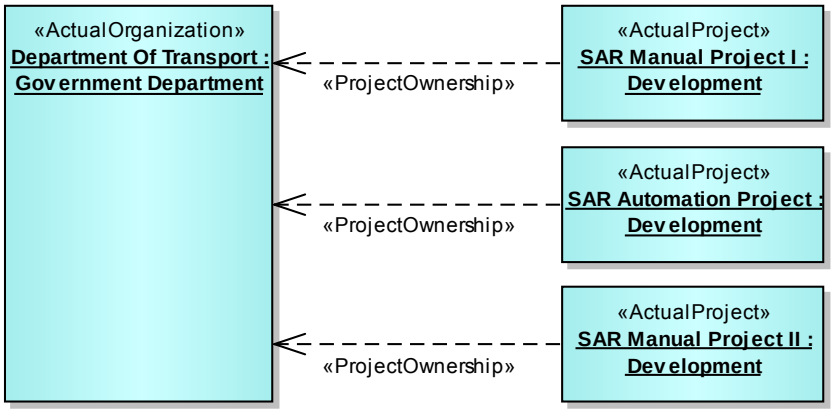


Figure 48: AcV-1 System of Systems Acquisition Clusters example

AcV-2 Program Timeline (DoDAF PV-2)

The **AcV-2 Program Timeline view** provides a timeline perspective on projects. It is used to summarize, using milestones, the status of key aspects being developed within the project.

The AcV-2 calendar view can be set using Swimlanes, which can depict annual, quarterly or monthly periods. For more details see the Swimlanes Help topics.

Each milestone can have DLOD's defined using element Run-States. For more information on setting the DLOD see the Run Time States Help topic. These are predefined in the AcV-3 (PV-3) diagram.

Figure 49 is an AcV-2 diagram for Program Timelines from the SAR example model.

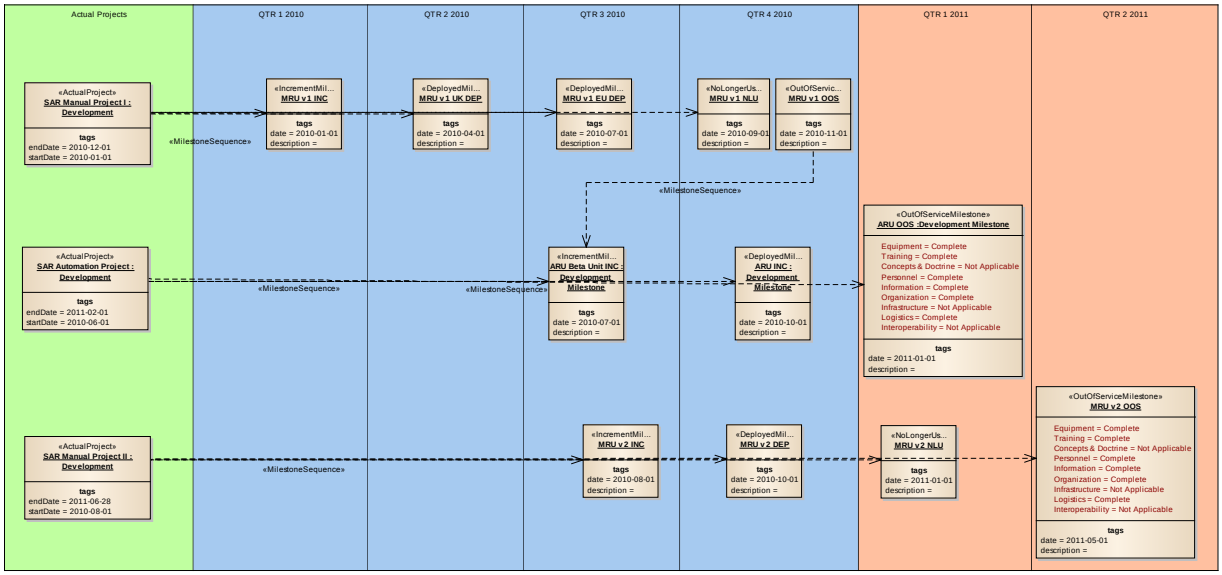


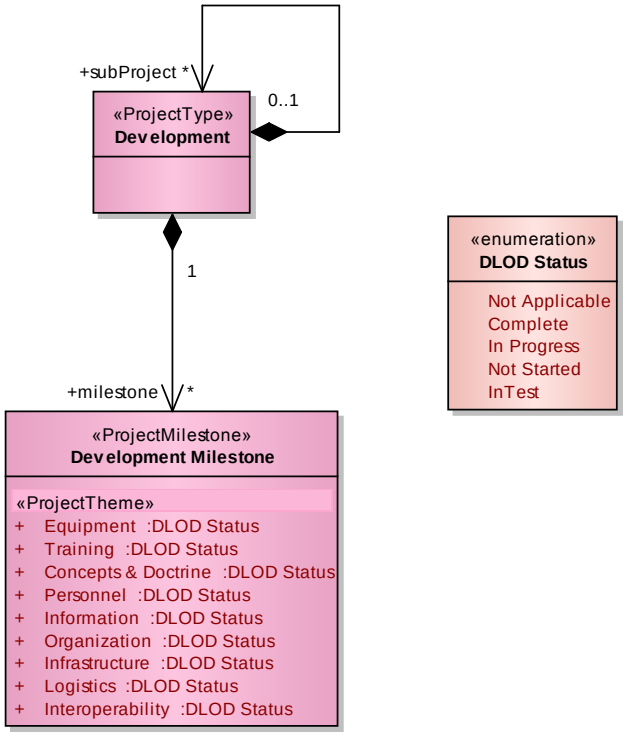
Figure 49: AcV-2 diagram showing the quarterly milestones.

Related to:

- StV-3 Capability Phasing
- SV-8 System Capability Configuration Management
- AcV-3 Typical Project

AcV-3 Typical Project (DoDAF PV-3)

The AcV-3 Typical Project view can be used to define Projects and Project types. This is where you can define what specific details can be set as Run Time states in the milestone instances used in AcV-2 diagrams.



Related to:

- AcV-2 Typical Project

AcV-3 Actual Project Instance (DoDAF PV-3)

The **AcV-3 Actual Project Instance view** can be defined using a DoDAF PV-3 view. This allows for defining the actual project and actual project milestones. Figure 50 depicts when events are initially deployed and when they are intended to be withdrawn from service.

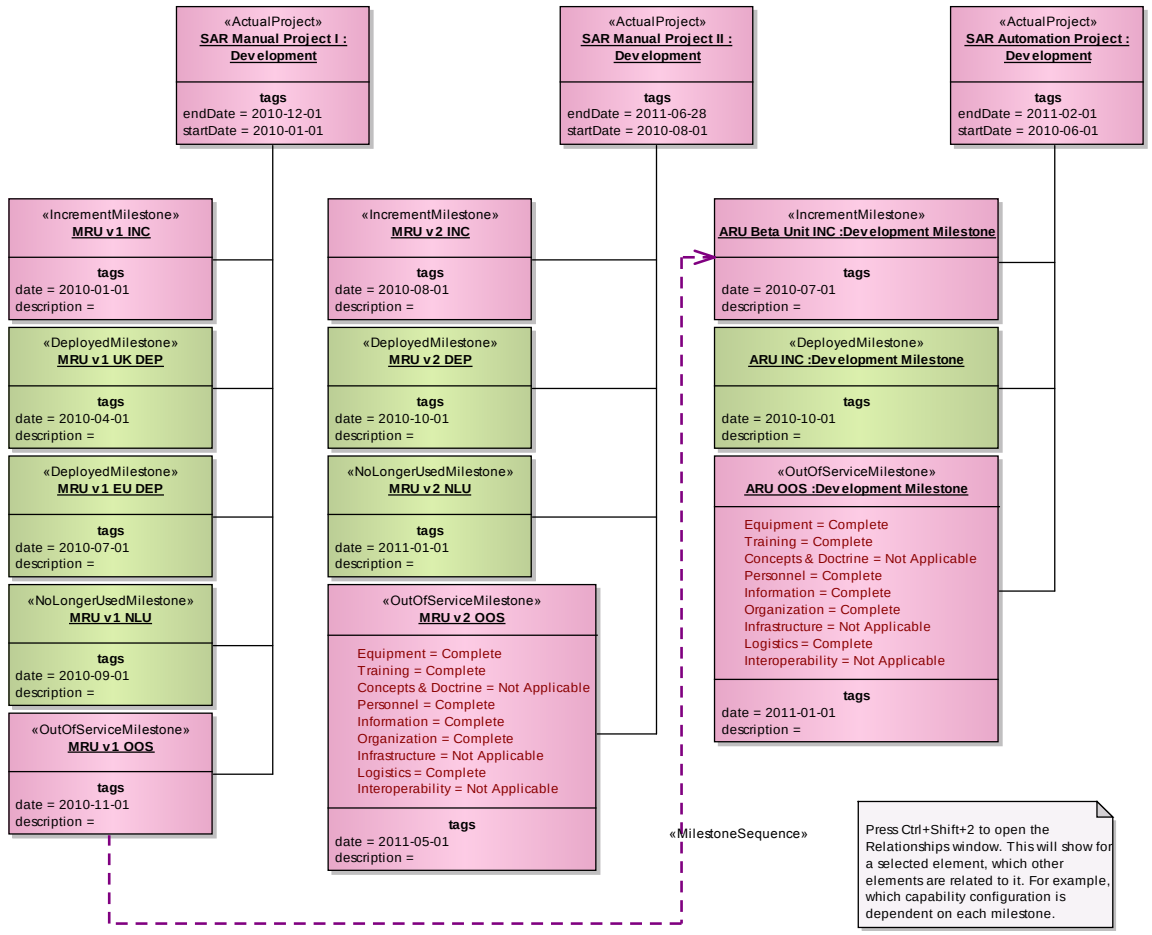


Figure 50: AcV-3 Actual Project Instance used in the SAR example model

Related to:

- StV-3 Capability Phasing
- SV-8 System Capability Configuration Management
- AcV-3 Typical Project

Technical Views

The Technical Views (Standards view in DoDAF), are used to lay out the standards, rules and policies that are used in the architectural modeling of a project.

For more detail on Standards views see:

- DoDAF Standards ViewPoint
- MODAF View Summary

TV-1 Standards Profile (DoDAF StdV-1)

The **TV-1 Standards Profile view** or Technical Standards view lays out the set of standards that may influence any elements depicted in the systems and services views.

Standards identified in the Technical Standards Profile (TV-1) should be the same as those identified in the Systems Interface Description (SV-1). The TV-1 collects the various systems standards rules that implement and sometimes constrain the choices that can be made in the design and implementation of architecture.

The standards cited are referenced as relationships to the systems, system functions, system data, hardware/software items or communication protocols in SV-1, SV-2, SV-4, SV-6, OV-7, and SV-11 Products, where applicable.

Figure 51 is a TV-1 diagram for a Standards Profile from the SAR example model. An alternative representation of this using a Relationship Matrix is shown in Figure 52.

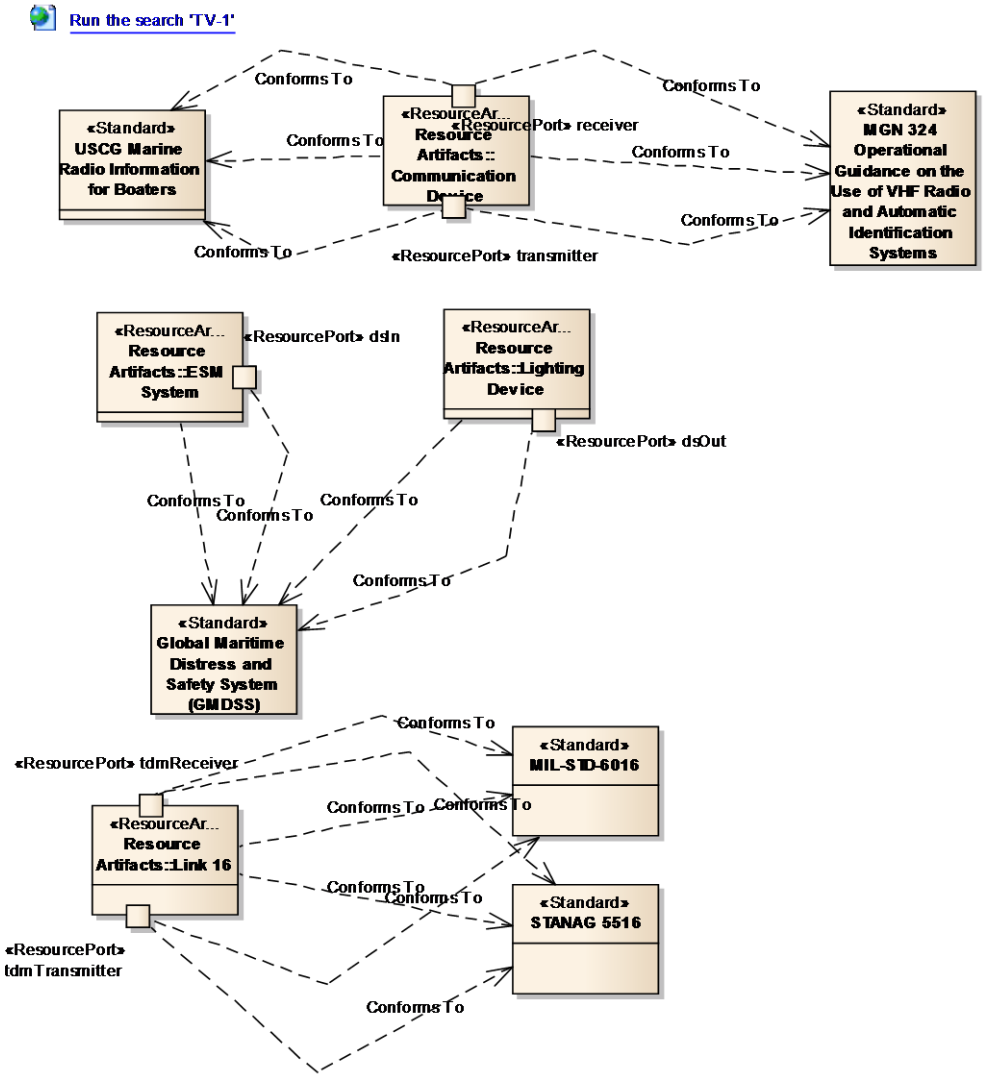


Figure 51: TV-1 Standards Profile from the SAR model example

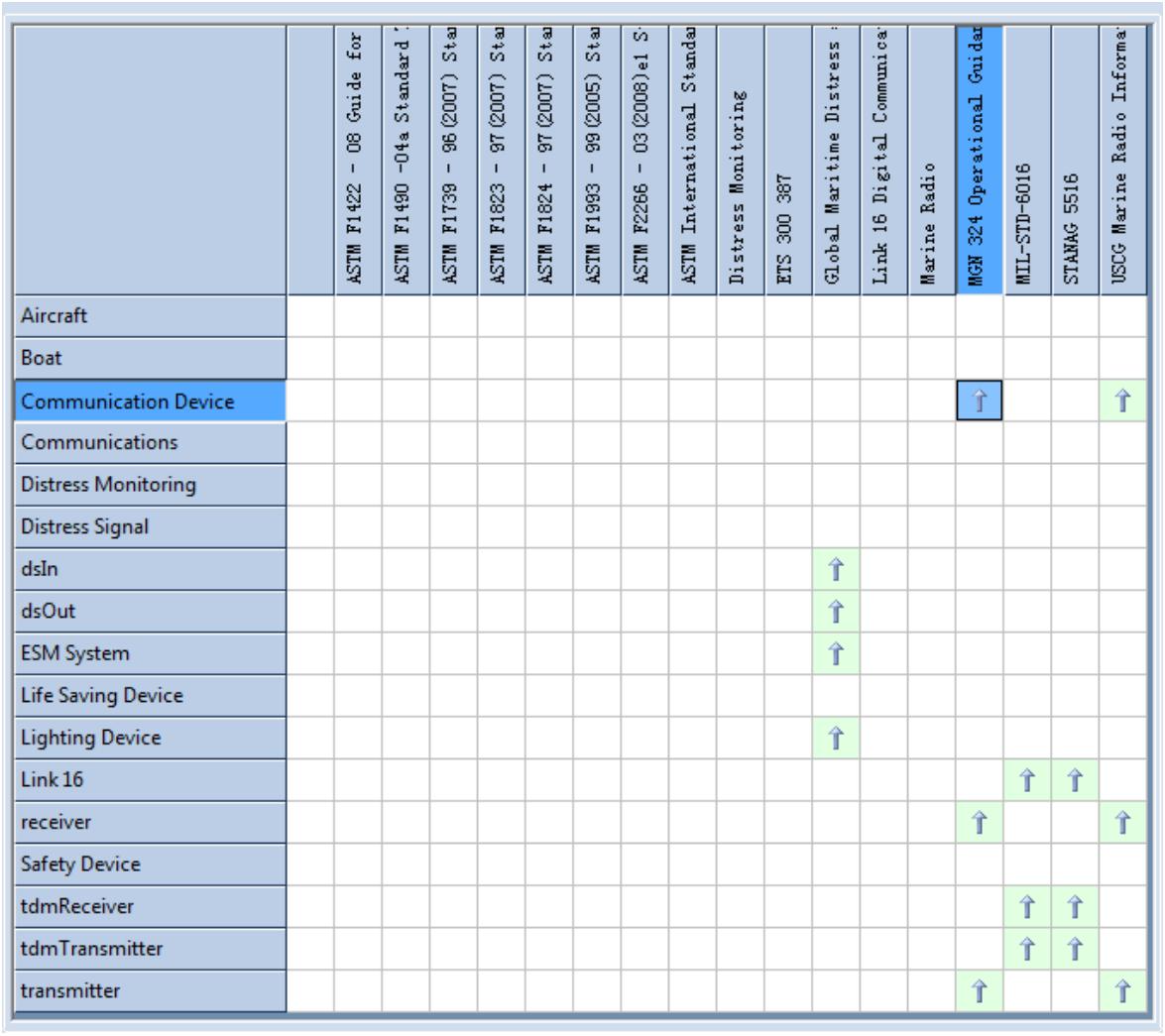


Figure 52: TV-1 Shown Using a Relationship Matrix

Related to:

- SV-1 Resource Interaction Specification
- SV-2 Systems Capabilities View
- SV-4 Functionality Description
- SV-6 Systems Exchange Matrix
- SV-11 System Data Model
- TV-2 Standards Forecast

TV-2 Standards Forecast (DoDAF StdV-2)

The **TV-2 Technical Standards Forecast view** provides a description of emerging standards and their potential impact on current systems and services view elements, within a set of time frames. The forecast for evolutionary changes in the standards should be correlated against the time periods as mentioned in the SV-8 and SV-9 products. A TV-2 complements and

expands on the Standards Profile (TV-1) product and should be used when more than one emerging standard time-period is applicable to the architecture.

Figure 53 is a TV-2 diagram for System Standards from the SAR example model. An International Standards representation of this is shown in Figure 52.

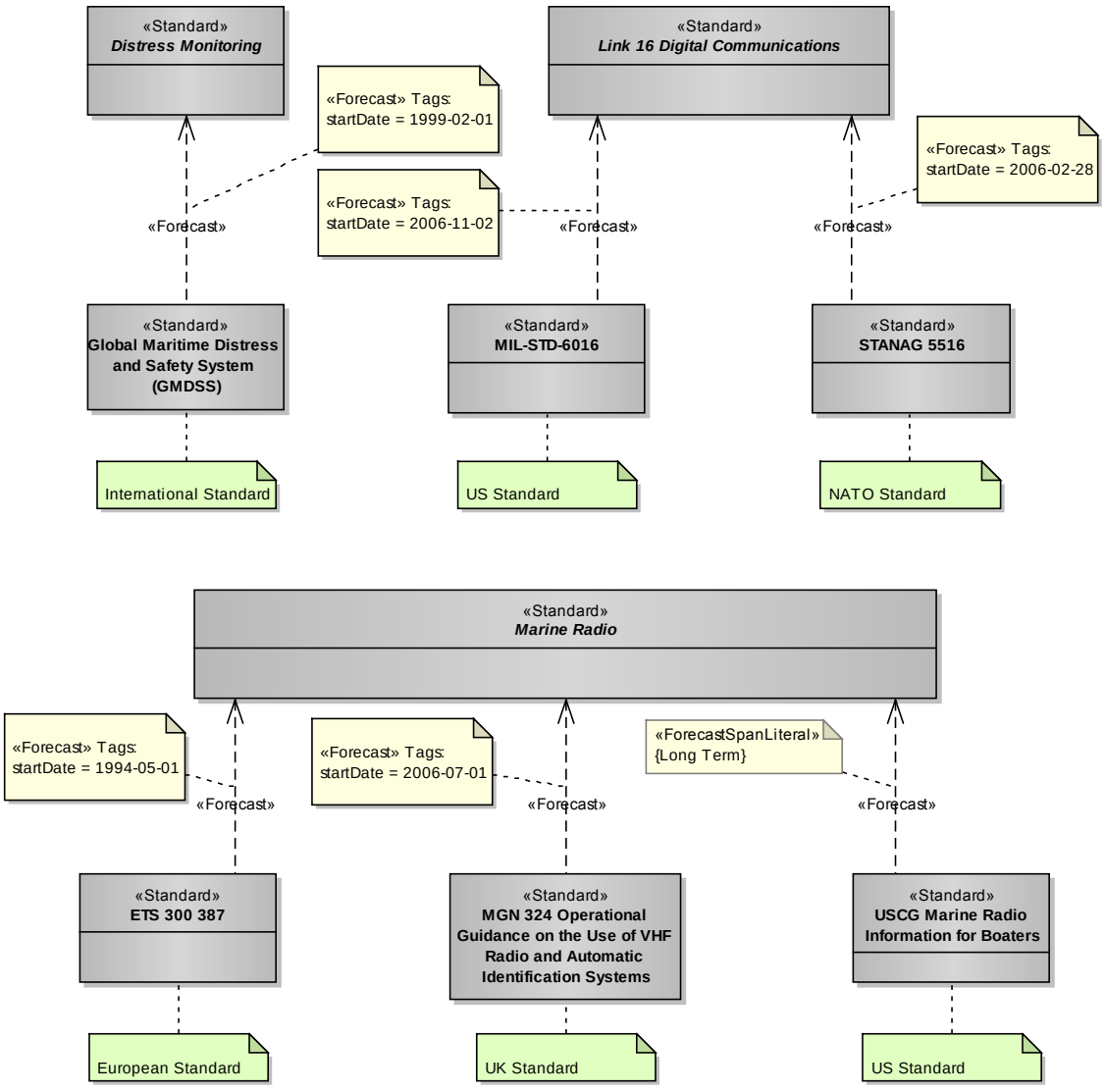


Figure 53: TV-2 System Standards from the SAR model example

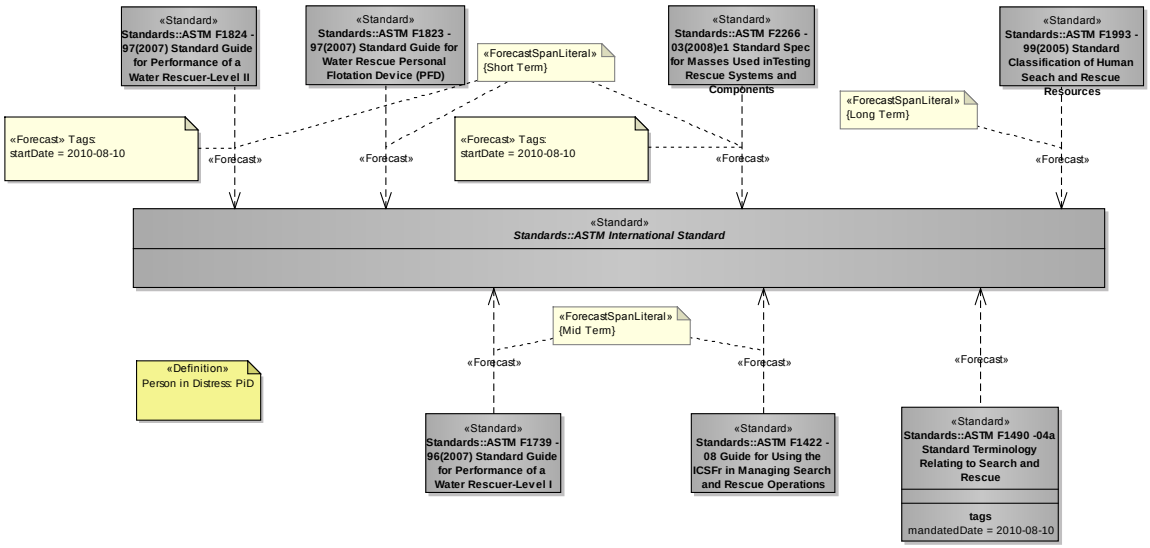


Figure 54: TV-2 International Standards from the SAR model example

Related to:

- TV-1 Standards Profile
- SV-2 Capability Configuration
- SV-8 System Capability Configuration Management
- SV-9 Technology and Skills Forecast

Conclusion

When modeling joint task operations involving different organizational groups, the modeling structure must be consistent - hence the need for the unified profile on defense modeling. In this paper we have highlighted the comprehensive features of Enterprise Architect used to design models of combined operations, using UPDM for modeling in the DoDAF and MODAF frameworks.