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How to Build DoDAF 2-Based Architectures with UNICOM® System Architect®

Version 4
(for System Architect® 11.4.3 and later)

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Publication information

April 2016

Information in this publication is subject to change. Changes will be published in new editions.

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Operational Views

Overview

The operational view establishes a logical view of the architecture -- what is going on, who is doing it, how it is getting done, under what conditions -- without specifying the physical details of the systems involved and the actual locations of those systems (that is done in the Systems or Services view).

At the core of the operational viewpoint you are modeling:

- The Activities that are being performed,
- The flow of Resources between Activities. A Resource can be Information, Data, People (Person definition type), Organizations, Systems, or any kind of Performer (including Services, Ports) (see figure below). An Activity transforms a Resource into another state or Resource.
- Who is performing those Activities -- where 'who' is in general terms a Performer that can be for example, a logical organization or role (people perform roles that usually have something to do with their job title, but sometimes they perform a role outside of their job responsibilities),
- Precisely what Performer performing what Activity sends Resources to what other Performer performing what Activity -- this is called an Operational Exchange. The notion of Operational Exchange enables you to specify measures on how two performers exchange information or resources.
- What Performers need to communicate with each other (send Resources to/from each other) based on the Activities that they perform. This is an indirect relationship -- if Performer A performs Activity A, and Activity A sends resources to Activity B, and Performer B performs Activity B, then there is a need for Performer A to communicate with Performer B. This relationship is called a Needline -- it is a logical channel of Resource passage; a grouping of Operational Exchanges.

You use the following diagrammatic views to show this information:

- The OV-05a Operational Activity Decomposition diagram to show the hierarchy of Activities -- visualizing a tree of Activities and their sub-Activities.
- The OV-05b Operational Activity Model to show the flow of Resources between Activities. An ActivityResourceOverlap relationship line is used to show the flow of Resources, and within the relationship, you model the list of Resources that go from one Activity to another.
- Optionally, the 'fit-for-purpose' OV-02z to diagrammatically formulate Operational Exchanges.
- The OV-02 Operational Resource Flow diagram to show Performers and the Needlines between them.

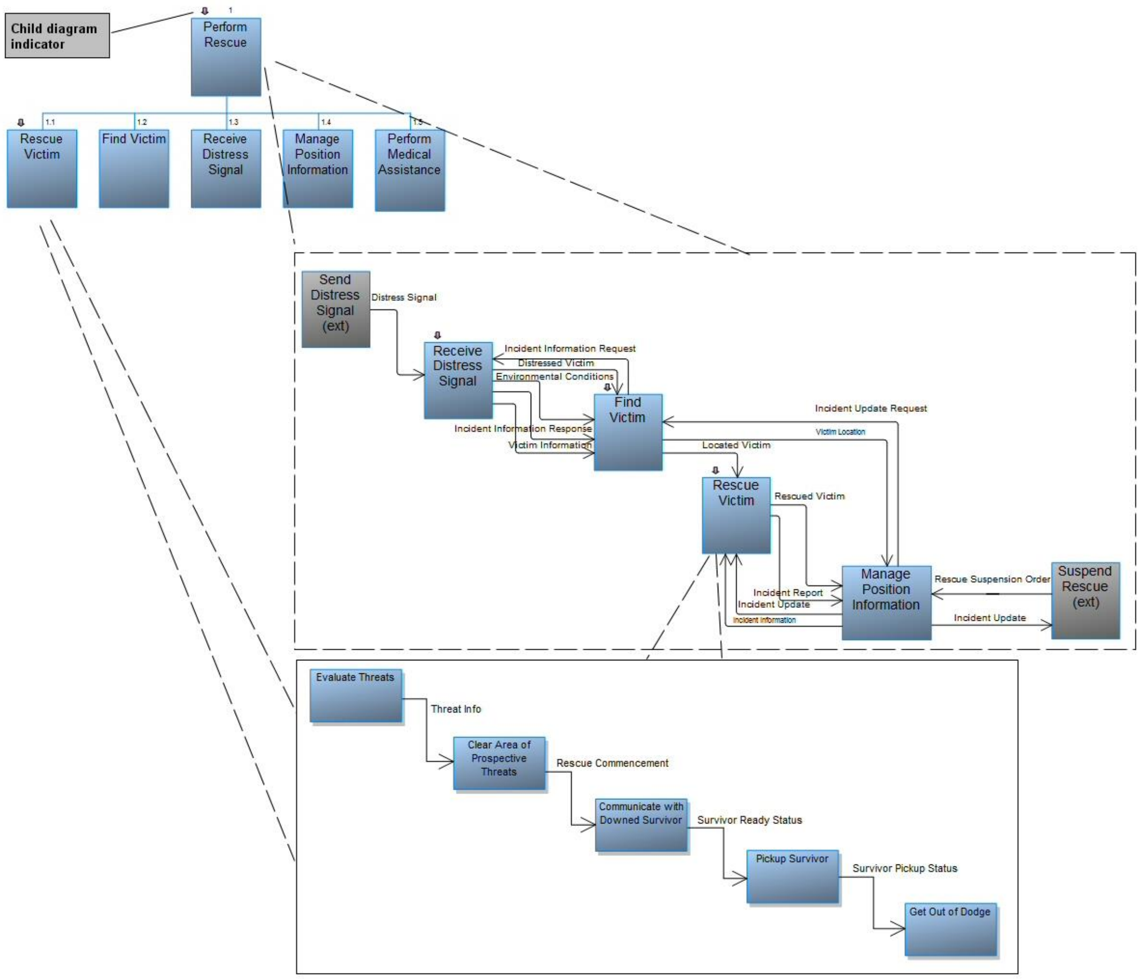
How to Build OV's in System Architect -- Workflow Summary

You may build the operational views in System Architect by adding information and relationships through definitions, or by building/visualizing diagrams, or by adding information and relationships through matrices.

Overview

The overall workflow to create Operational Exchanges and Needlines is described by the picture below, and detailed in the steps below.

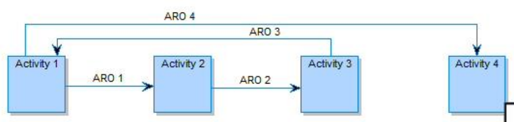
1. **Model the hierarchy of Activities** and their sub Activities using the OV-05a Operational Activity Decomposition diagram.
2. **Model Resource flow between Activities** using the OV-05b Operational Activity Model. Draw an ActivityResourceOverlap relationship line between Activities; within it you model the Resources passed between Activities.
3. **Specify what Performer performs each Activity**, using the ActivityPerformedbyPerformer relationship. You can do this on the OV-05b diagram, or, if you wish to keep that diagram clean with only Activities on it, then you can use the OV-02 Alternative diagram.
4. **Create Operational Exchanges** using the fit-for-purpose OV-02z diagram. On this diagram you model ActivityPerformedbyPerformer relationships as nodes, and draw Operational Exchanges between them. Remember that OperationalExchange is the exchange between a particular Performer performing a particular Activity, and another particular Performer performing a particular Activity -- in other words, a relationship between two ActivityPerformedbyPerformers. An Explorer Relationship Report provides automatic guidance on what Operational Exchanges you should create.
5. **On each OperationalExchange, point at the ActivityResourceOverlap line that carries the Resources between the two Activities involved.** An Operational Exchange has a reference to one and only one ActivityResourceOverlap. The same Explorer Relationship Report provides mentioned in the previous step offers automatic guidance on what ActivityResourceOverlap you should relate to each Operational Exchange.
6. **Model Needlines between Performers on the OV-02 diagram.** An Explorer Relationship Report provides automatic guidance on what Needlines to create and the Operational Exchanges they should carry.
7. **Generate OV-3 report**.



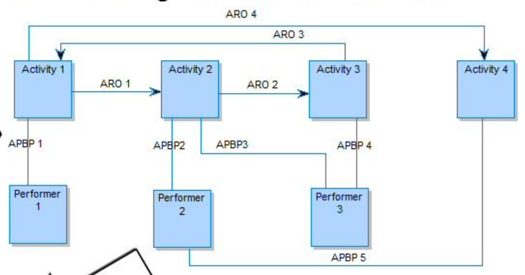
OV-5a hierarchical diagram breaking out into child OV-5b diagrams for each level of hierarchy, with Activities decomposed to lower-level child diagrams with lower-level Activities. An Activity that is not decomposed further is a 'leaf-level' Activity.

Work Flow OV-05b to OV-02

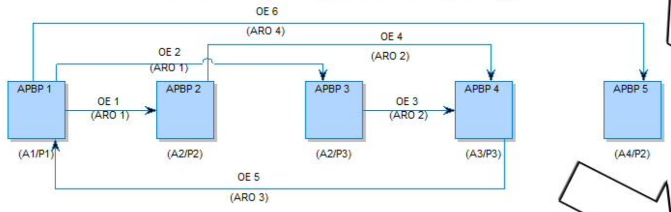
OV-05b Operational Activity Model



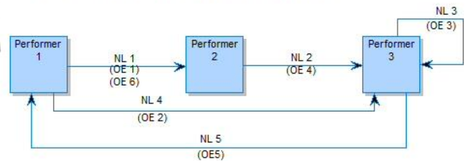
OV-05b Assign Performers to Activities



OV-02z Create Operational Exchanges



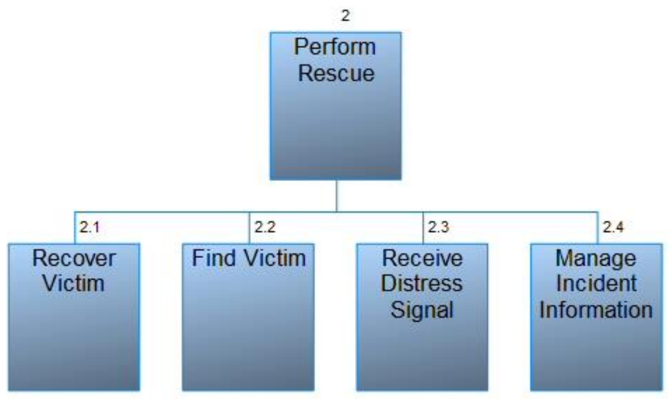
OV-02 Create Need Lines



ARO = ActivityResourceOverlap
APBP = ActivityPerformedByPerformer
OE = Operational Exchange
NL = Need Line

OV-05a Operational Activity Decomposition diagram

You use the OV-05a Operational Activity Decomposition diagram to view the hierarchical relationship between Operational Activities (see figure below). Activities and their sub-Activities are joined via the ActivityPartofActivity relationship.

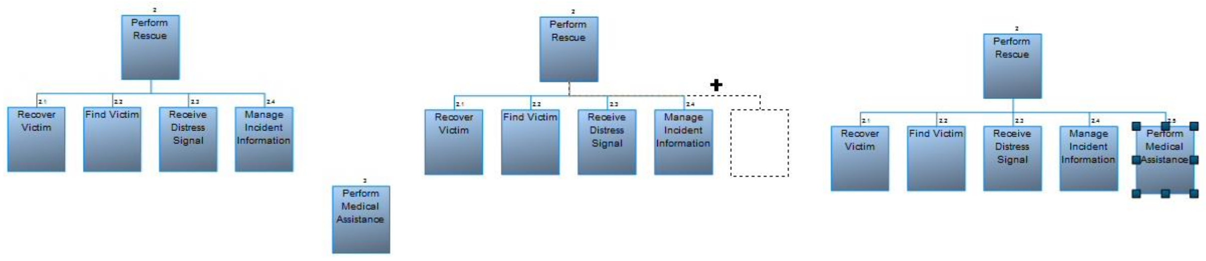


The hierarchy can also reflect the nesting of parent-child OV-5 diagrams of a model.

Creating an Activity Hierarchy on the Diagram

With System Architect 11.4.1 and later, you use auto-connect functionality to relate an Activity to a parent Activity. Simply move an Activity that you wish to be a child of another Activity underneath it until a line automatically appears. The relationship is formed.

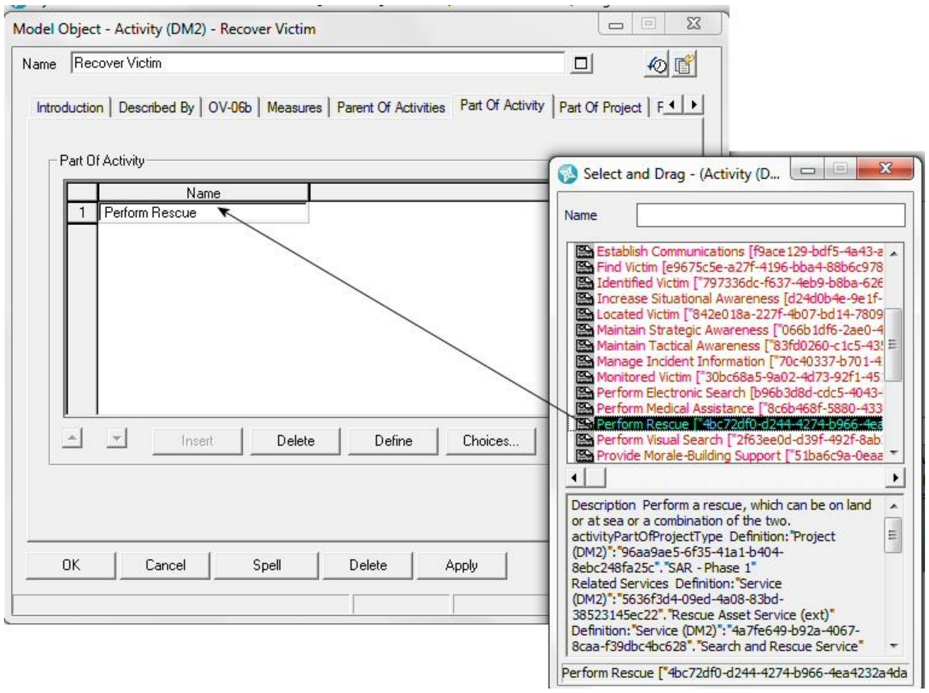
You may open the definition of the child Activity and in its **Part of Activity** tab, view the name of the parent Activity, automatically added based on the relationship you formed on the diagram.



Creating an Activity Hierarchy in the Definitions

You can relate an Activity to its parent Activity in its definition, without having any diagram open, and then auto-draw an OV-5a diagram.

1. Open the definition of an Activity and in its **Part of Activity** tab, you can specify the name of its parent Activity. You can also specify its sub-Activities by populating its **Parent of Activities** tab. All Activities must exist already -- you drag them in by clicking the Choices button.



Name: Recover Victim

Part Of Activity

	Name
1	Perform Rescue

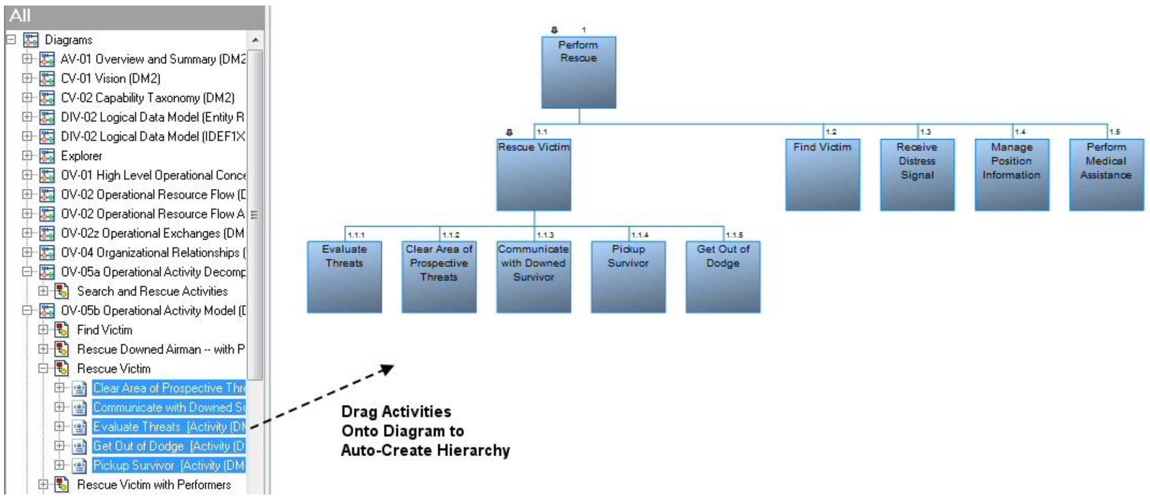
Name

Establish Communications [f9ace129-bdf5-4a43-a
Find Victim [e9675c5e-a27f-4196-bba4-88b6c978
Identified Victim ["797336dc-f637-4eb9-b8ba-626
Increase Situational Awareness [d24d0b4e-9e1f-
Located Victim ["842e018a-227f-4b07-bd14-7809
Maintain Strategic Awareness ["066b1df6-2ae0-4
Maintain Tactical Awareness ["83fd0260-c1c5-43
Manage Incident Information ["70c40337-b701-4
Monitored Victim ["30bc68a5-9a02-4d73-92f1-45
Perform Electronic Search [b96b3d8d-cdc5-4043-
Perform Medical Assistance ["8c6b468f-5880-433
Perform Rescue ["4bc72df0-d244-4274-b966-4ea
Perform Visual Search ["2f63ee0d-d39f-492f-8ab
Provide Morale-Building Support ["51ba6c9a-0eaa

Description Perform a rescue, which can be on land or at sea or a combination of the two.
activityPartOfProjectType Definition:"Project (DM2)":"96aa9ae5-6f35-41a1-b404-8ebc248fa25c"."SAR - Phase 1"
Related Services Definition:"Service (DM2)":"5636f3d4-09ed-4a08-83bd-38523145ec22"."Rescue Asset Service (ext)" Definition:"Service (DM2)":"4a7fe649-b92a-4067-8caa-f39dbc4bc628"."Search and Rescue Service"

Perform Rescue ["4bc72df0-d244-4274-b966-4ea4232a4da

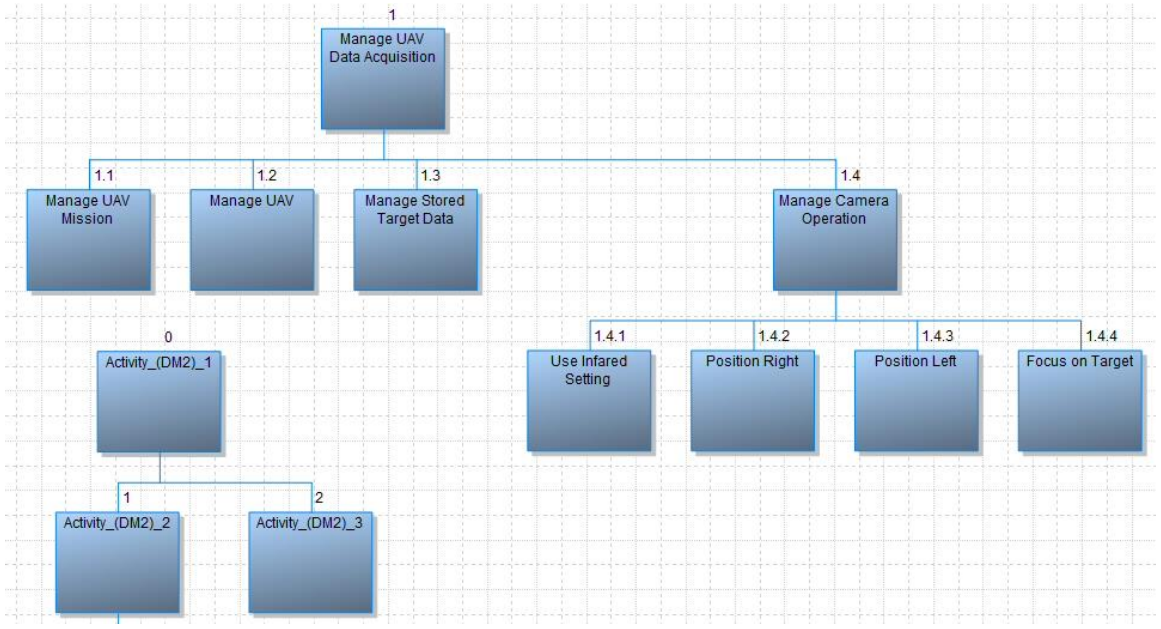
2. Create an OV-05a Operational Activity Decomposition diagram and drag-and-drop Activities from the Explorer tree onto the diagram workspace; the diagram draws itself, with appropriate relationships.


All
Diagrams
AV-01 Overview and Summary (DM2
CV-01 Vision (DM2)
CV-02 Capability Taxonomy (DM2)
DIV-02 Logical Data Model (Entity R
DIV-02 Logical Data Model (IDEF1X
Explorer
OV-01 High Level Operational Conce
OV-02 Operational Resource Flow (D
OV-02 Operational Resource Flow A
OV-02z Operational Exchanges (DM
OV-04 Organizational Relationships (
OV-05a Operational Activity Decomp
Search and Rescue Activities
OV-05b Operational Activity Model (D
Find Victim
Rescue Downed Airman -- with P
Rescue Victim
Clear Area of Prospective Thr
Communicate with Downed Su
Evaluate Threats [Activity (DM
Get Out of Dodge [Activity (D
Pickup Survivor [Activity (DM
Rescue Victim with Performers
1 Perform Rescue
1.1 Rescue Victim
1.2 Find Victim
1.3 Receive Distress Signal
1.4 Manage Position Information
1.5 Perform Medical Assistance
1.1.1 Evaluate Threats
1.1.2 Clear Area of Prospective Threats
1.1.3 Communicate with Downed Survivor
1.1.4 Pickup Survivor
1.1.5 Get Out of Dodge
Drag Activities Onto Diagram to Auto-Create Hierarchy

	LEAF ACTIVITIES -- Leaf Level Activities are Activities that are not decomposed further by a Sub Activity. In the diagram pictured above, Evaluate Threats, Clear Area of Prospective Threats, Communicate with Downed Airman, Pickup Survivor, and Get Out of Dodge are 'leaf-level' Activities.

Specifying Hierarchical Numbering

Hierarchical numbering of Activities allows you to easily see the decomposition level of an Activity.



To turn on hierarchical numbering in SA 11.4.2.1 and later, perform the following steps:

1. In an open OV-05a Operational Decomposition diagram, edit its Diagram properties -- right-mouse click on an empty area of the diagram workspace and choose **Diagram Properties**, or select **Edit, Diagram Properties**.
2. In the Diagram Properties dialog of the OV-05a Operational Decomposition, make sure the **Hierarchical Numbering** property is toggled on; the property is located in the **Hierarchical Numbering** tab of the dialog. You may also set the **First Node Number** -- this will set the number of the highest-parent symbol on the diagram; if you leave it blank, the default is 0.
3. Select (or draw and then select) an Activity symbol on the diagram, and select **Format, Symbol Format, Symbol Style**.
4. Make sure the options **Auto number** and **Level numbers** in the **Allow** group are toggled on. Note the value of the **Next number** property -- this number will automatically be updated as you draw.
5. Select **Tools, Preferences**, and in the **Preferences** dialog, make sure the **Number** property in the **Auto** group is toggled on.

Note that Prefix code is superceded in DoDAF 2 by Alternate Depiction functionality. In SA 11.4.2 and later, you may right-mouse click on any symbol and choose Display Selected Symbols with Adornment. This provides similar functionality the prefix code, which annotated a symbol as a Process (prefix code P), Activity (prefix code A), etc.

OV-05b Operational Activity Model

The OV-05b Operational Activity Model describes the Resources exchanged between Activities in the architecture, and Resources exchanged with Activities that are outside the scope of the model, considered External Activities.

A best practice is to create a high-level 'context' OV-5b diagram, which shows the highest-level Activity in the architecture, and how it interchanges with External Activities. You then decompose that highest-level Activity with a child OV-5b diagram that shows its Sub Activities and how Resources flow between those Activities.

Modeling Flow Between Activities

You use an ActivityResourceOverlap line to model flow of Resources between Activities. Within each ActivityResourceOverlap you may specify the actual Resources that flow from one Activity to the other.

To specify one or more Resources flowing between two Activities, do the following:

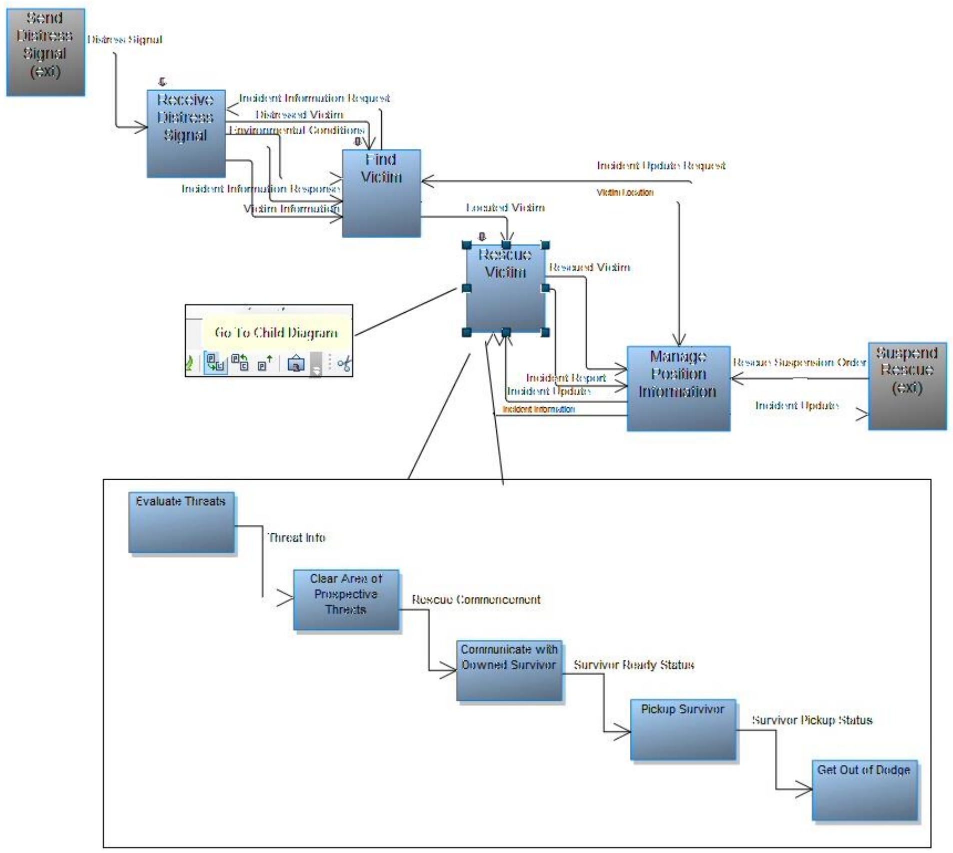
1. Relate the two Activities by an ActivityResourceOverlap line.
2. On the Resources tab of the ActivityResourceOverlap definition, click the Choices button to view all Resources already created in the encyclopedia. The list shows all definitions of type Resource and sub types: Information, Data, DomainInformation, ServiceDescription Performer, Person Type, Organization Type, System, Service, and Port.
3. Select one or more definitions in the Choices list and drag-and-drop them into the Resources grid.

Modeling Decomposition of Activities

You may model decomposition of an Activity through the use of Parent-Child diagramming for navigation and visualization, and also relating the Activity to its children through their definitions.

To graphically show decomposition of an Activity, you may do the following:

1. Right-mouse click on an Activity on an OV-5b diagram, and select **Create Child Diagram** (note: you may also use the menu choice Edit, Child Diagram, Create Child Diagram)
2. Name the new diagram, accept the default diagram type of OV-05b Operational Activity Model (DM2), and click OK, then select Yes to save changes to the previously current diagram.
3. Model Sub Activities on the new diagram.



You will now be able to navigate between parent and child Activities on two different OV-5b diagrams, however the definitions must still be related to one another via a composition relationship, described in the steps below.

Creating a Chain of Parent/Child OV-5b's that Reflect the OV-5a

Creating a parent/child linkage between OV-5b diagrams provides easy navigation through the model, but it does not relate the Activity definitions that are pictured on the diagram in an ActivityPartofActivity relationship. Once you have created a parent/child linkage between two OV-5b diagrams, and modeled sub Activities on the child OV-5b, you must perform the following steps:

1. Open the definition of an Activity on the child diagram and in its **Part of Activity** tab, click the **Choices** button and drag-and-drop in the name of the parent Activity.
2. Repeat step 1 for all Activities on the diagram that you wish to model as sub Activities to the parent. Note that this step can be performed independently of the parent/child diagrams -- they just serve as a navigation and logic aid.

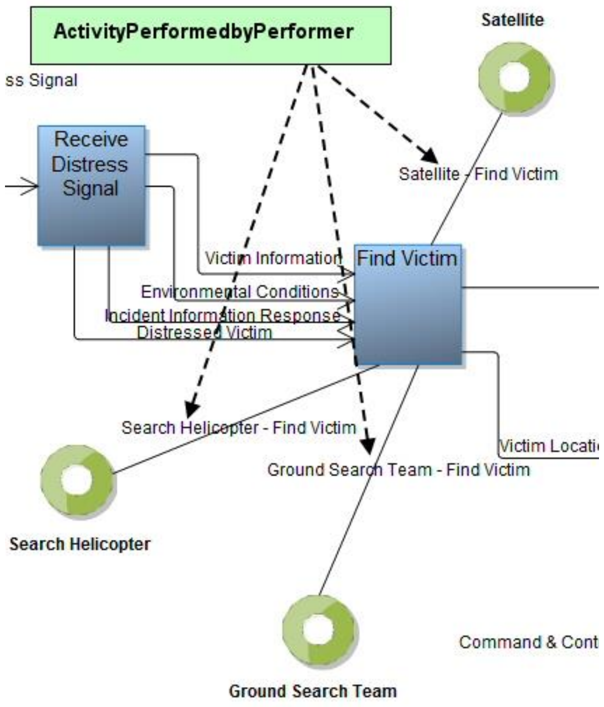
Furthermore, once you have related Activities to their parent Activity in the **Part of Activity** tab of the Activity definition, you may auto-build an OV-5a diagram by simply dragging the Activities onto the diagram -- as discussed earlier. Data centric behavior will autodraw the relationships on the diagram for you. This provides two ways of working:

A. Build the OV-5a first -- within which you visually build the Activity/SubActivity relationships, then build the OV-5b's for each main Activity level
B. Build the OV-5b leveled set of diagrams first, and at each level make sure you relate the sub Activity to its parent Activity in the definition; then autodraw the OV-5a.

Specifing the Performer(s) of an Activity

You may specify the Performer that performs an Activity via the ActivityPerformedbyPerformer relationship, available on the following diagram types:

- OV-05b Operational Activity Model (DM2)
- OV-01 High Level Operational Concept (DM2)
- OV-02 Operational Resource Flow Alternative (DM2)
- CV-01 Vision (DM2)



ActivityPerformedbyPerformer lines drawn between Performers and Activities on an OV-05b. If you wish to keep your OV-05b clean (only Activites), then use the OV-02 Alternative diagram to model Performers performing Activities.

Best Practice: Naming Convention for ActivityPerformedbyPerformer

A best practice for naming an ActivityPerformedbyPerformer relationship is:

Performer Name - Activity Name

For example, ***Search Helicopter - Find Victim***

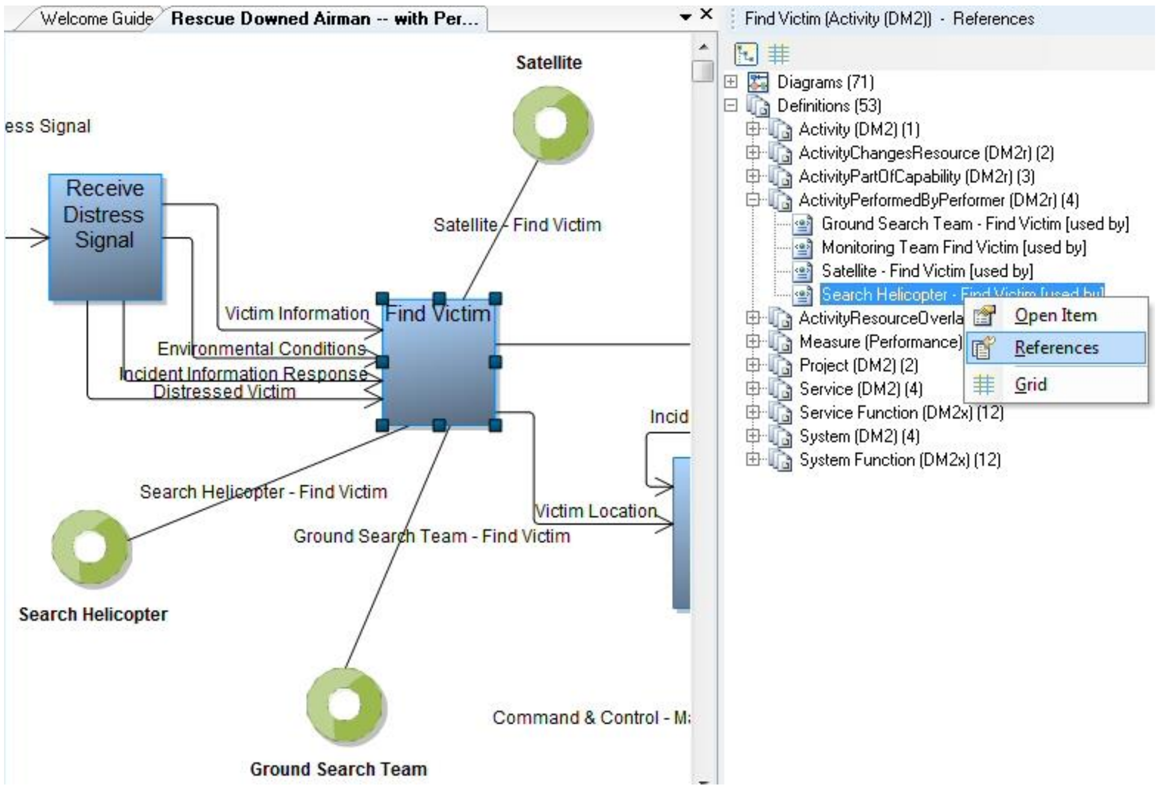
Following such a naming standard comes in handy in various aspects of your modeling:

- Looking through a list of relationships already formed in the repository and represent

them on a diagram.
- Modeling ActivityPerformedbyPerformers as vertical lifelines on the OV-6c Operational Exchanges diagram or SV-10c Performer-Role Event Trace diagram.

Note that a list of Activities is not provided in the Performer (and subtypes Person, Organization, etc) definition; nor is a list of Performers (and subtypes) provided in the Activity definition. The relationship is an explicit join -- Performer has a relationship to ActivityPerformedbyPerformer which relates it to Activity. To get a quick view of what Activity is being performed by what Performer globally in your architecture, you can do the following:

1. Select an Activity in the Explorer (browser) or on any diagram.
2. Select View, References.
3. In the References pane that opens, expand Definitions, and expand ActivityPerformedbyPerformer within that.
4. Right mouse click on the name of a particular ActivityPerformedbyPerformer relationship and choose References -- another window will open that contains all referenced items for the selected relationship.


Welcome Guide
Rescue Downed Airman -- with Per...
Find Victim (Activity (DM2)) - References
Satellite
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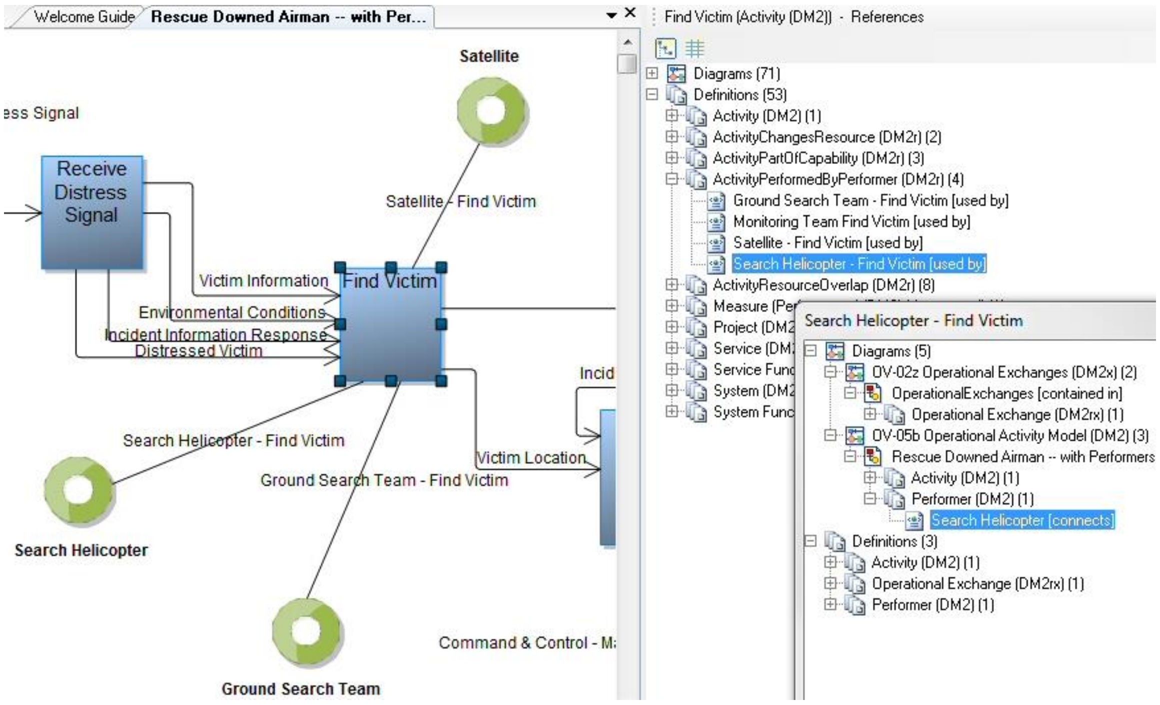
Receive Distress Signal
Satellite - Find Victim
Victim Information
Find Victim
Environmental Conditions
Incident Information Response
Distressed Victim
Incid
Search Helicopter - Find Victim
Victim Location
Ground Search Team - Find Victim
Search Helicopter
Command & Control - M
Ground Search Team
Diagrams (71)
Definitions (53)
Activity (DM2) (1)
ActivityChangesResource (DM2r) (2)
ActivityPartOfCapability (DM2r) (3)
ActivityPerformedByPerformer (DM2r) (4)
Ground Search Team - Find Victim [used by]
Monitoring Team Find Victim [used by]
Satellite - Find Victim [used by]
Search Helicopter - Find Victim [used by]
ActivityResourceOverla
Measure (Performance)
Project (DM2) (2)
Service (DM2) (4)
Service Function (DM2x) (12)
System (DM2) (4)
System Function (DM2x) (12)
Open Item
References
Grid

Select View, References to view, for anything that you select, what diagrams it is on, and what definitions it is related to.

5. Expand Definitions and Performer (see picture below).


Welcome Guide
Rescue Downed Airman -- with Per...
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Receive Distress Signal
Satellite - Find Victim
Victim Information
Find Victim
Environmental Conditions
Incident Information Response
Distressed Victim
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Search Helicopter - Find Victim
Victim Location
Ground Search Team - Find Victim
Search Helicopter
Command & Control - M
Ground Search Team
Find Victim (Activity (DM2)) - References
Diagrams (71)
Definitions (53)
Activity (DM2) (1)
ActivityChangesResource (DM2r) (2)
ActivityPartOfCapability (DM2r) (3)
ActivityPerformedByPerformer (DM2r) (4)
Ground Search Team - Find Victim [used by]
Monitoring Team Find Victim [used by]
Satellite - Find Victim [used by]
Search Helicopter - Find Victim [used by]
ActivityResourceOverlap (DM2r) (8)
Measure (Pe
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Service Func
System (DM2
System Func
Search Helicopter - Find Victim
Diagrams (5)
OV-02z Operational Exchanges (DM2x) (2)
OperationalExchanges [contained in]
Operational Exchange (DM2rx) (1)
OV-05b Operational Activity Model (DM2) (3)
Rescue Downed Airman -- with Performers
Activity (DM2) (1)
Performer (DM2) (1)
Search Helicopter [connects]
Definitions (3)
Activity (DM2) (1)
Operational Exchange (DM2rx) (1)
Performer (DM2) (1)

You can view references of a referenced item.

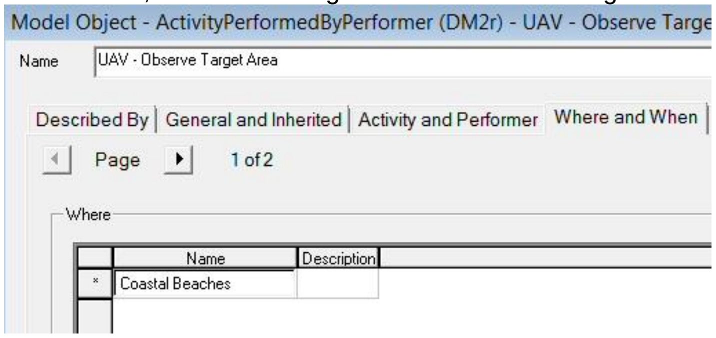
Modeling Where and When a Performer Performs an Activity

You may specify where and when a Performer performs an Activity in the ActivityPerformedbyPerformer relationship. You may model more than one ActivityPerformedbyPerformer relationship between a Performer and an Activity to specify different conditions, times, and locations.

Specifying Where a Performer Performs an Activity

You may specify ***where*** a Performer performs an Activity.

1. On an ActivityPerformedbyPerformer definition, select the **Where and When** tab.
2. On page 1, click on **Choices** for the **Where** property and view a list of Location type definitions (and subtypes of Location definition) that you have created in the architecture; select and drag items into the **Where** grid.



Name: UAV - Observe Target Area

Where

	Name	Description
*	Coastal Beaches	

The following definition types are available to describe location:

- Location (DM2), and the following subtypes

- GeoPoliticalExtent (DM2), and the following subtypes:
  - Installation (DM2)
  - GeoFeature (DM2)
  - RegionOfCountry (DM2)
  - Country (DM2)
  - RegionOfWorld (DM2)
  - RealProperty (DM2), and the following subtypes:
    - Facility (DM2)
    - Site (DM2)

<u>Specifying When a Performer Performs an Activity</u>

You may specify when the Performer performs an Activity.

1. Select the **Where and When** tab of the ActivityPerformedbyPerformer definition.
2. On page 2 you may click on Choices for the **When** property and view a list of the following definition type that you have created in the architecture:
   - Measure (Temporal)).

<u>Specifying Under What Environmental Conditions a Performer Performs an Activity</u>

You may specify under what conditions the Performer performs an Activity. An example of Environmental Condition is in the Desert, or in the Rain, or At Night, etc.

1. Select the **Caveats** tab of the ActivityPerformedbyPerformer definition.
2. On page 1 you may click on Choices for the **Conditions** property and view a list of the following definition type that you have created in the architecture:
   - Condition (Environmental) (DM2)

<u>Specifying Under What Rules a Performer Performs an Activity</u>

You may specify under what rules the Performer performs an Activity. Rules have subtype Standards -- so an example might be that a Performer rescues a ship under particular Maritime standard.

1. Select the **Caveats** tab of the ActivityPerformedbyPerformer definition.
2. On page 2 you may click on Choices for the **Rules** property and view a list of the following definition types that you have created in the architecture:

   - Rule (DM2), and the following subtype:
     - Standard (DM2), and the following subtype:
       - FunctionalStandard (DM2)

<u>Specifying the Measures of How a Performer Performs an Activity</u>

You may specify the measures of how a Performer performs an Activity. An example of a measure is that a Performer must rescue a downed airman in a certain amount of time in order to be successful, otherwise the airman may perish or the search may be called off.

Creating Operational Exchanges

An Operational Exchange specifies what Performer performing what Activity sends resources to what other Performer performing what other Activity. Essentially, it is a relationship between two ActivityPerformedbyPerformers. The Operational Exchange points at one (and only one) ActivityResourceOverlap between the two Activities involved.

ℹ	• An ActivityPerformedbyPerformer is a Role (and is noted as such in the DoDAF 2 specification Alias table). For example, a Drone (performer) performing Surveillance (activity) plays the Role of a Spy; a Drone (performer) injecting anti-fire chemicals on a fire (activity) plays the Role of Firefighter. • An Operational Exchange is a relationship between two ActivityPerformedbyPerformers, aka Roles. • The Operational Exchange points at one (and only one) ActivityResourceOverlap between the two Activities involved.

You may ***manually*** create Operational Exchanges on the fit-for-purpose OV-02z or on an OV-06c Activities Event Trace diagram. On these diagrams ActivityPerformedbyPerformers are visualized as node symbols, and you may draw an Operational Exchange relationship line between them.

Starting in version 11.4.2.4, System Architect provides capability to ***automatically*** create Operational Exchanges.

☝	• Automatically-generated Operational Exchanges have an 'SA-controlled' property set. • Manually-created Operational Exchanges will not be deleted when you run the automatic Operational Exchange function. • You can report on Operational Exchanges that were manually created, if you wish to remove them.

Operational Exchange Example

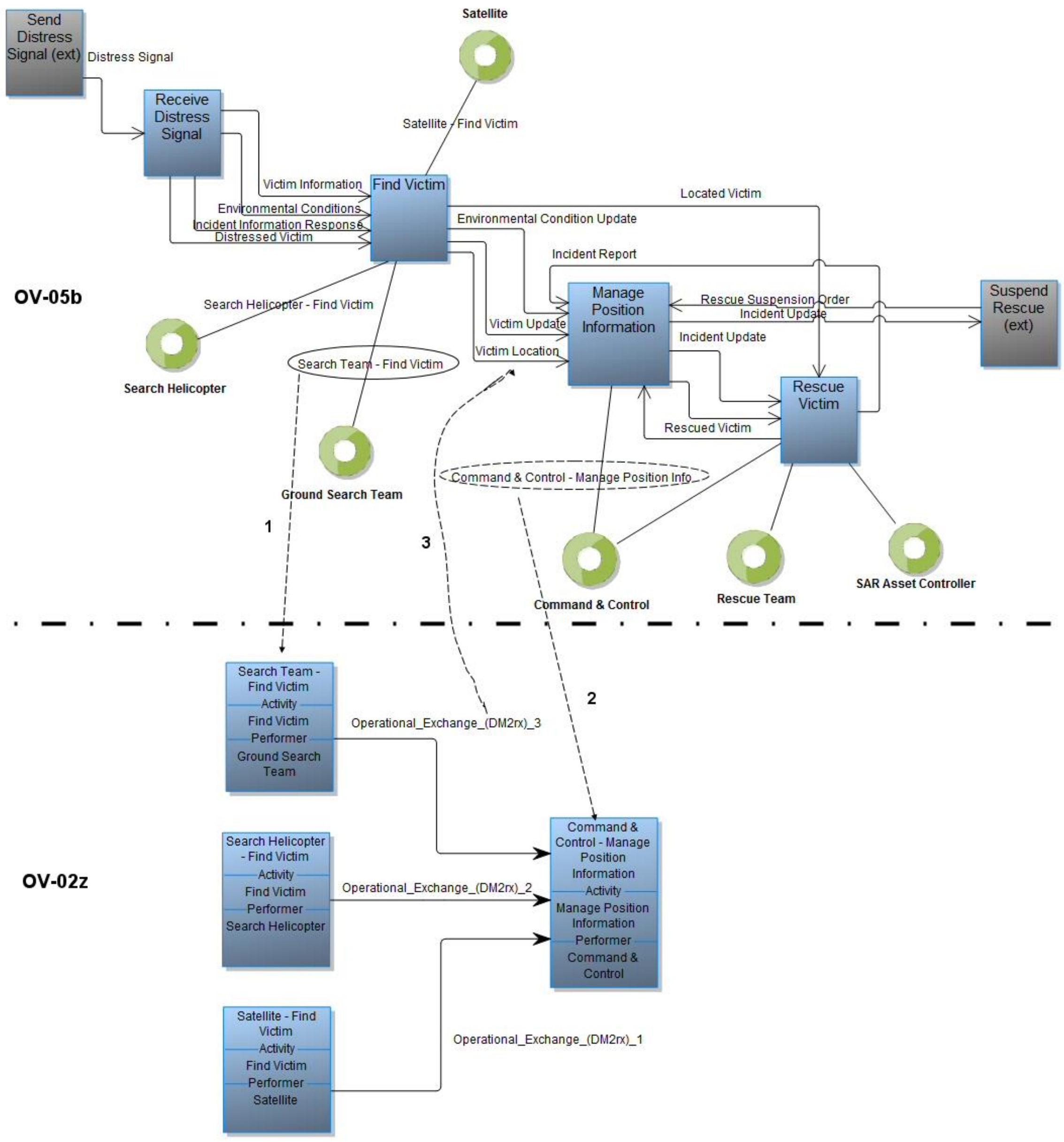
Consider this Search and Rescue example:

- Satellite finds/observes victim, reports victim position to Command & Control, which Manages Position Information
- Search Helicopter finds/observes victim, reports victim position to Command & Control, which Manages Position Information
- Ground Search Team finds/observes victim, reports victim position to Command & Control, which Manages Position Information

In each case, same Activities, same informational resource (victim position) comes across. However, the quality of the data, or the trust you have in it, may vary depending on the weather, the time of day, or other conditions.

- Search Helicopter finds victim, reports victim position to Command & Control -- this OperationalExchange may not provide good data when over enemy territory during clear skies when Search Helicopter can be observed or fired upon.
- Satellite finds victim, reports victim position to Command & Control -- this OperationalExchange may not provide good data in the rain.
- Ground Search Team finds victim, reports victim position to Command & Control -- this OperationalExchange may not provide good data in the dark (at night).

The figure below shows how the Operational Exchanges are created to reflect

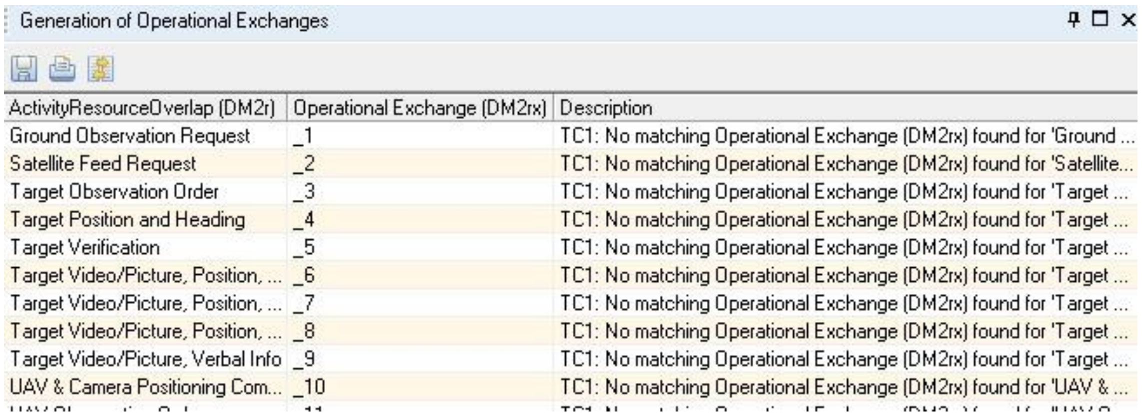


ActivityPerformedbyPerformer relationships are modeled as rectangular nodes on OV-2z (see 1 and 2 callouts), with OperationalExchanges drawn between them. Each OpExchange points at a particular ActivityResourceOverlap (3).

Automatically Creating Operational Exchanges

System Architect provides a smart-algorithm utility to automatically generate Operational Exchanges based on information you have entered into the architecture.

1. Select **Tools, DoDAF 2 Utilities, Generate Operational Exchanges**.The operational exchanges are automatically generated and a report opens in a grid on the screen.


Generation of Operational Exchanges

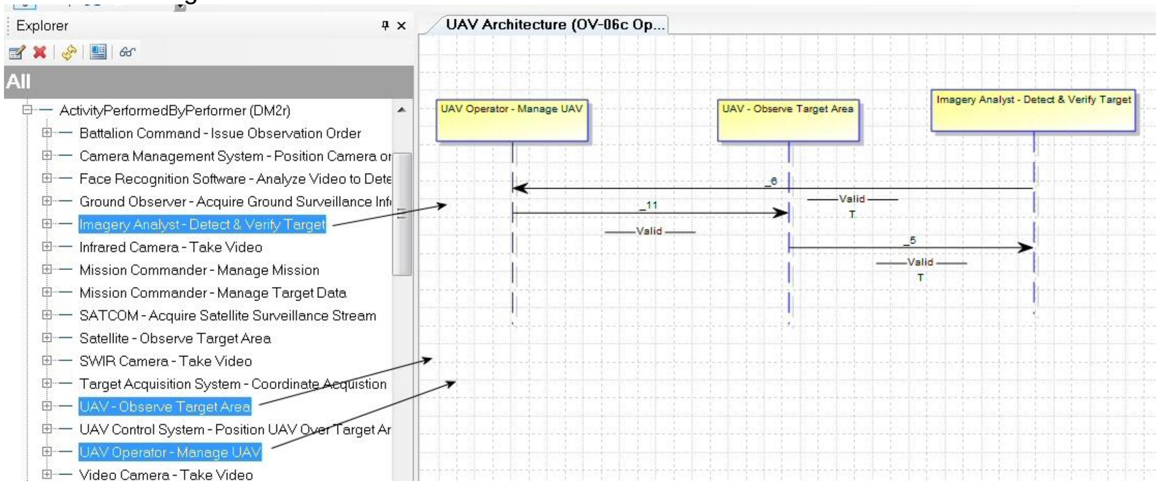
ActivityResourceOverlap (DM2r)	Operational Exchange (DM2rx)	Description
Ground Observation Request	_1	TC1: No matching Operational Exchange (DM2rx) found for 'Ground ...
Satellite Feed Request	_2	TC1: No matching Operational Exchange (DM2rx) found for 'Satellite...
Target Observation Order	_3	TC1: No matching Operational Exchange (DM2rx) found for 'Target ...
Target Position and Heading	_4	TC1: No matching Operational Exchange (DM2rx) found for 'Target ...
Target Verification	_5	TC1: No matching Operational Exchange (DM2rx) found for 'Target ...
Target Video/Picture, Position, ...	_6	TC1: No matching Operational Exchange (DM2rx) found for 'Target ...
Target Video/Picture, Position, ...	_7	TC1: No matching Operational Exchange (DM2rx) found for 'Target ...
Target Video/Picture, Position, ...	_8	TC1: No matching Operational Exchange (DM2rx) found for 'Target ...
Target Video/Picture, Verbal Info	_9	TC1: No matching Operational Exchange (DM2rx) found for 'Target ...
UAV & Camera Positioning Com...	_10	TC1: No matching Operational Exchange (DM2rx) found for 'UAV & ...

2. Examine the report. The Description specifies where no Operational Exchange was found, due to an ActivityResourceOverlap between two Activities performed by Performers, it created one -- and states the name of that Operational Exchange in the middle column.
3. Note that in the column headers:
   - (DM2r) = DM2 relationship
   - (DM2rx) = DM2 relationship extension, where extension means the type is not explicitly in the DM2 metamodel, but can be inferred from interpretation of the spec.

Manually Creating/Visualizing Operational Exchanges on OV-06c

You may use the OV-02z diagram to create new ActivityPerformedbyPerformer relationships, or visualize existing ones already created in the repository.

1. Create a new OV-06c *Operational Exchanges* diagram.
2. From the Explorer tree, drag-and-drop ActivityPerformedbyPerformers onto the diagram.


Explorer
All
UAV Architecture (OV-06c Op...
UAV Operator - Manage UAV
UAV - Observe Target Area
Imagery Analyst - Detect & Verify Target
_6
_11
Valid
T
Valid
_5
Valid
T

ActivityPerformedByPerformer (DM2r)
- Battalion Command - Issue Observation Order
- Camera Management System - Position Camera or
- Face Recognition Software - Analyze Video to Dete
- Ground Observer - Acquire Ground Surveillance Inf
- Imagery Analyst - Detect & Verify Target
- Infrared Camera - Take Video
- Mission Commander - Manage Mission
- Mission Commander - Manage Target Data
- SATCOM - Acquire Satellite Surveillance Stream
- Satellite - Observe Target Area
- SWIR Camera - Take Video
- Target Acquisition System - Coordinate Acquistion
- UAV - Observe Target Area
- UAV Control System - Position UAV Over Target Ar
- UAV Operator - Manage UAV
- Video Camera - Take Video

3. Note that on this diagram, you can create new ActivityPerformedbyPerformer relationships (which are represented by the object lifeline symbol) and create new Operational Exchanges between them by drawing an Operational Exchange relationship line, available in the Draw toolbar.

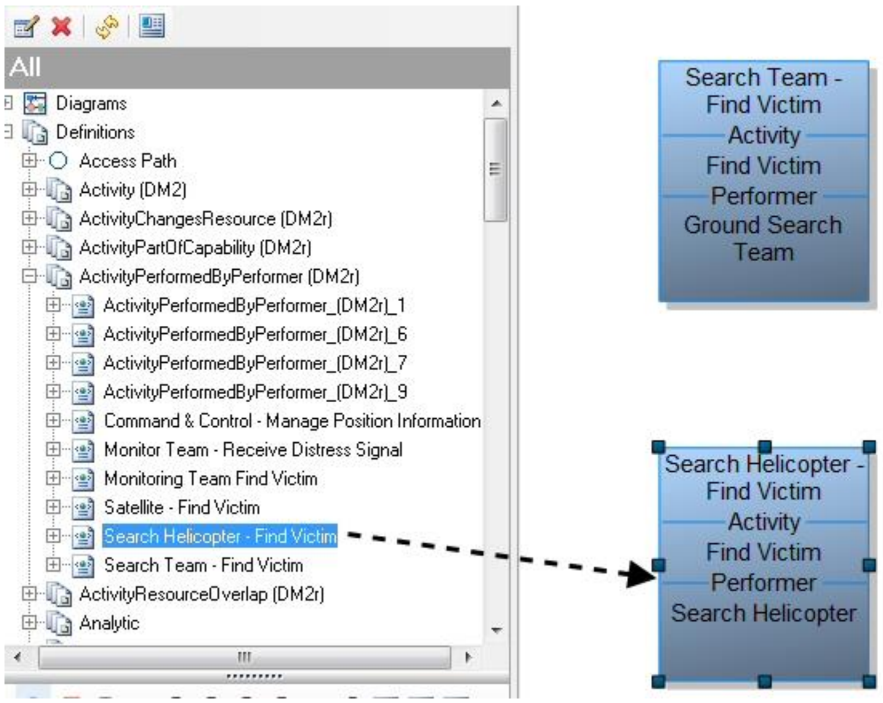
Manually Creating/Visualizing Operational Exchanges on OV-02z

You may use the OV-02z diagram to create new ActivityPerformedbyPerformer relationships, or visualize existing ones already created in the repository. The following steps show you how to do the later.

1. Create an OV-02z Operational Exchanges diagram.

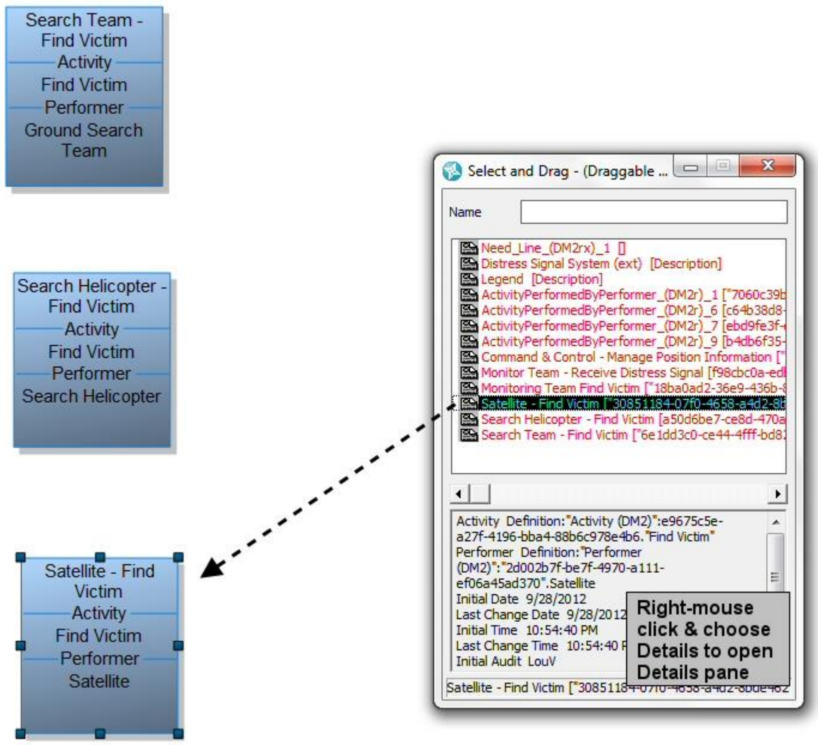
Add Existing ActivityPerformedbyPerformer Relationships to OV-02z Diagram

2. In the Explorer (Browser), expand Definitions, and then ActivityPerformedbyPerformer to reveal all such relationships already formed in the repository. Expand each one to see the Performer and Activity involved. Select one or more and drag-and-drop onto the diagram.


All
Diagrams
Definitions
Access Path
Activity (DM2)
ActivityChangesResource (DM2r)
ActivityPartOfCapability (DM2r)
ActivityPerformedByPerformer (DM2r)
ActivityPerformedByPerformer_(DM2r)_1
ActivityPerformedByPerformer_(DM2r)_6
ActivityPerformedByPerformer_(DM2r)_7
ActivityPerformedByPerformer_(DM2r)_9
Command & Control - Manage Position Information
Monitor Team - Receive Distress Signal
Monitoring Team Find Victim
Satellite - Find Victim
Search Helicopter - Find Victim
Search Team - Find Victim
ActivityResourceOverlap (DM2r)
Analytic
Search Team - Find Victim
Activity
Find Victim
Performer
Ground Search Team
Search Helicopter - Find Victim
Activity
Find Victim
Performer
Search Helicopter

Drag-and-drop ActivityPerformedbyPerformers onto OV-02z diagram.

Alternatively, you can right-mouse click on the diagram workspace and click Choices from the popup menu. In the Select and Drag dialog that opens, right-mouse click on it and choose Details to get the details of each ActivityPerformedbyPerformer relationship listed. You may see the Performer and Activity involved in each relationship already created in the repository, and drag-and-drop one or more relationships onto the diagram.



Select and Drag - (Draggable ...

Name

```
Need_Line_(DM2rx)_1  []
Distress Signal System (ext)  [Description]
Legend  [Description]
ActivityPerformedByPerformer_(DM2r)_1 ["7060c39b
ActivityPerformedByPerformer_(DM2r)_6 [c64b38d8-
ActivityPerformedByPerformer_(DM2r)_7 [ebd9fe3f-
ActivityPerformedByPerformer_(DM2r)_9 [b4db6f35-
Command & Control - Manage Position Information ["
Monitor Team - Receive Distress Signal [f98cbc0a-ed
Monitoring Team Find Victim ["18ba0ad2-36e9-436b-
Satellite - Find Victim ["30851184-07f0-4658-a4d2-8b
Search Helicopter - Find Victim [a50d6be7-ce8d-470a
Search Team - Find Victim ["6e1dd3c0-ce44-4fff-bd8

Activity  Definition:"Activity (DM2)":e9675c5e-
a27f-4196-bba4-88b6c978e4b6."Find Victim"
Performer  Definition:"Performer
(DM2)":"2d002b7f-be7f-4970-a111-
ef06a45ad370".Satellite
Initial Date  9/28/2012
Last Change Date  9/28/2012
Initial Time  10:54:40 PM
Last Change Time  10:54:40 P
Initial Audit  LouV

Satellite - Find Victim ["30851184-07f0-4658-a4d2-8bde462
```

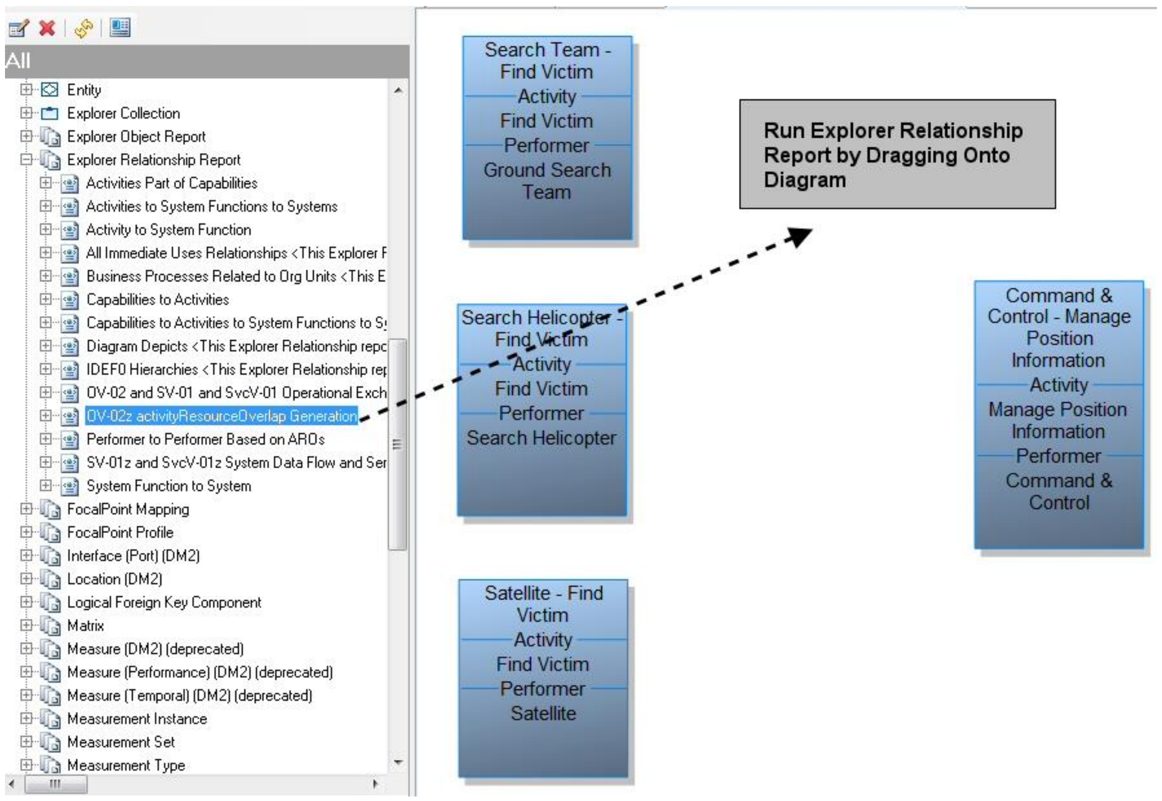
Alternate way to drag-and-drop ActivityPerformedbyPerformers onto OV-02z diagram.

Explorer Relationship Reports for OpExchange Guidance

A number of Explorer Relationship reports are available in the **Resource Flow Generation Reports.xml file**, provided on DeveloperWorks. To use these reports, you can import the xml file into each encyclopedia you are using, as follows:

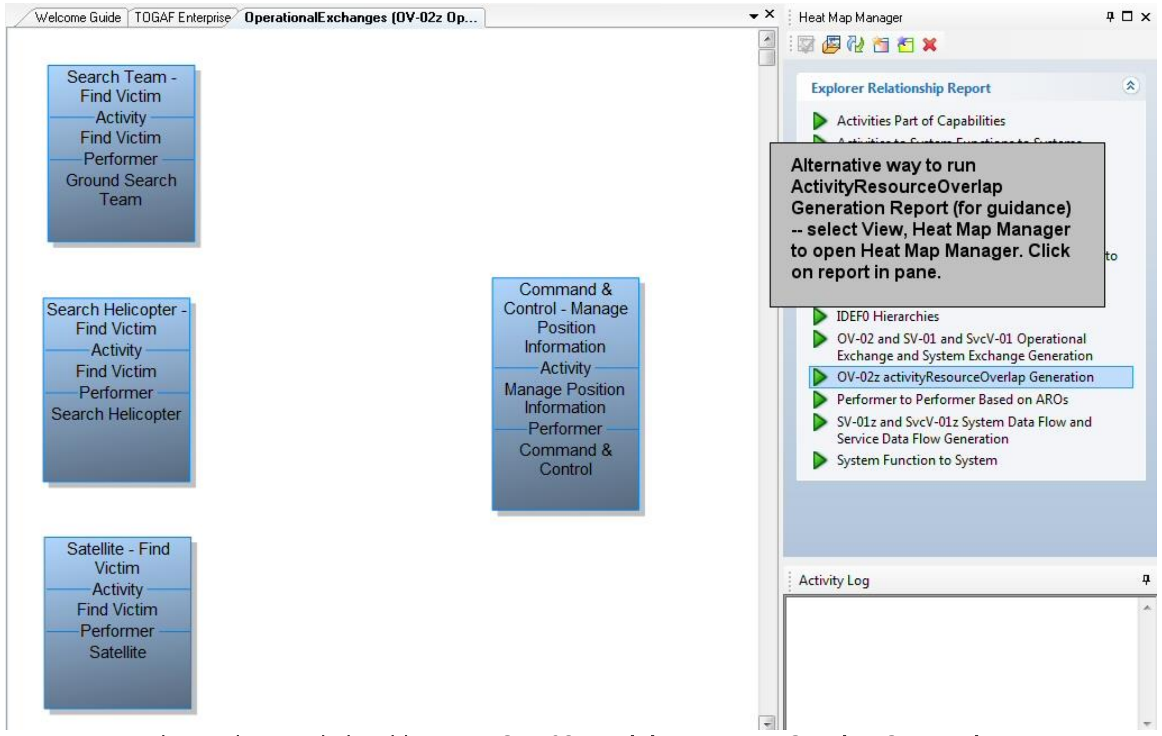
1. Download the **Resource Flow Generation Reports.xml** file from DeveloperWorks.
2. In System Architect, right-mouse click on the Definitions selection in the Explorer (Browser), and select Import XML.
3. Find and select the **Resource Flow Generation Reports.xml** file; use default collision options.

3. After having imported the **Resource Flow Generation Reports.xml** file into the encyclopedia, run the Explorer Relationship report named **OV--02z activityResourceOverlap Generation**. This is done in one of two ways:
   a. Expand the Definition type, Explorer Relationship Report in the Explorer (Browser), and drag-and-drop the **OV--02z activityResourceOverlap Generation** definition onto the OV-02z diagram.
   b. Select View, Heat Map Manager to open the Heat Map Manager pane. Click on the Explorer Relationship Report **OV--02z activityResourceOverlap Generation**.


All
Entity
Explorer Collection
Explorer Object Report
Explorer Relationship Report
Activities Part of Capabilities
Activities to System Functions to Systems
Activity to System Function
All Immediate Uses Relationships <This Explorer F
Business Processes Related to Org Units <This E
Capabilities to Activities
Capabilities to Activities to System Functions to S
Diagram Depicts <This Explorer Relationship repo
IDEF0 Hierarchies <This Explorer Relationship rep
OV-02 and SV-01 and SvcV-01 Operational Exch
OV-02z activityResourceOverlap Generation
Performer to Performer Based on AROs
SV-01z and SvcV-01z System Data Flow and Ser
System Function to System
FocalPoint Mapping
FocalPoint Profile
Interface (Port) (DM2)
Location (DM2)
Logical Foreign Key Component
Matrix
Measure (DM2) (deprecated)
Measure (Performance) (DM2) (deprecated)
Measure (Temporal) (DM2) (deprecated)
Measurement Instance
Measurement Set
Measurement Type
Search Team - Find Victim
Activity
Find Victim
Performer
Ground Search Team
Search Helicopter - Find Victim
Activity
Find Victim
Performer
Search Helicopter
Satellite - Find Victim
Activity
Find Victim
Performer
Satellite
Command & Control - Manage Position Information
Activity
Manage Position Information
Performer
Command & Control

Run Explorer Relationship Report by Dragging Onto Diagram

Run the Explorer Relationship report ***OV--02z activityResourceOverlap Generation*** *by dragging-and-dropping it onto the OV-02z diagram.*

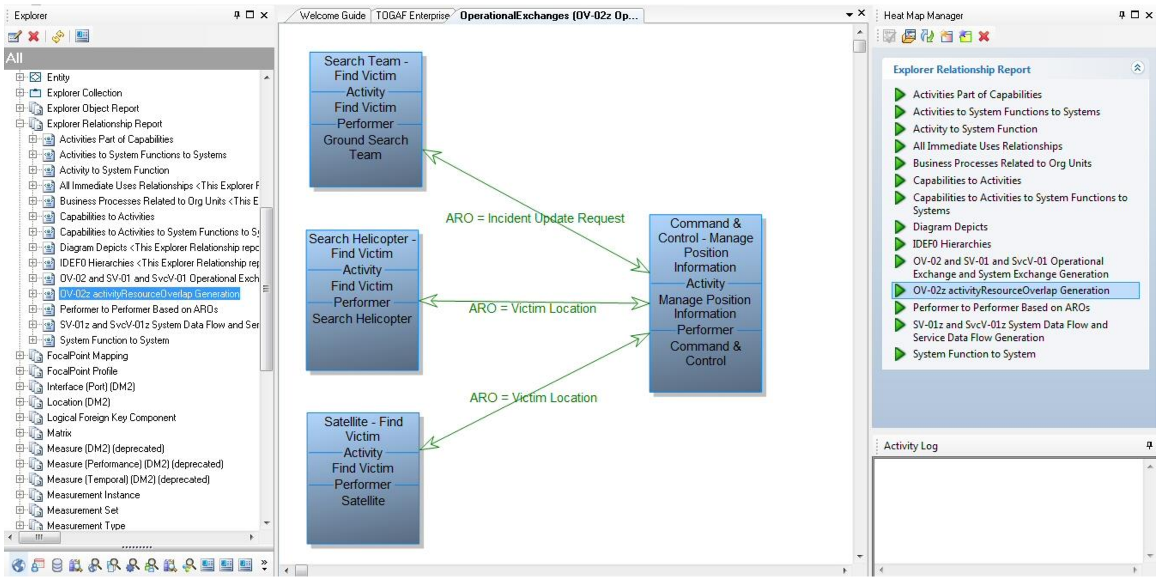

Welcome Guide
TOGAF Enterprise
OperationalExchanges (OV-02z Op...
Heat Map Manager
Explorer Relationship Report
Activities Part of Capabilities
IDEF0 Hierarchies
OV-02 and SV-01 and SvcV-01 Operational Exchange and System Exchange Generation
OV-02z activityResourceOverlap Generation
Performer to Performer Based on AROs
SV-01z and SvcV-01z System Data Flow and Service Data Flow Generation
System Function to System
Activity Log
Search Team - Find Victim
Activity
Find Victim
Performer
Ground Search Team
Search Helicopter - Find Victim
Activity
Find Victim
Performer
Search Helicopter
Satellite - Find Victim
Activity
Find Victim
Performer
Satellite
Command & Control - Manage Position Information
Activity
Manage Position Information
Performer
Command & Control

Alternative way to run ActivityResourceOverlap Generation Report (for guidance) -- select View, Heat Map Manager to open Heat Map Manager. Click on report in pane.

Run the Explorer Relationship report ***OV--02z activityResourceOverlap Generation*** *from the Heat Map Manager pane.*

The report runs, providing a visual of what OperationalExchanges should be formed, and the ActivityResourceOverlap that should be related to the OperationalExchange.

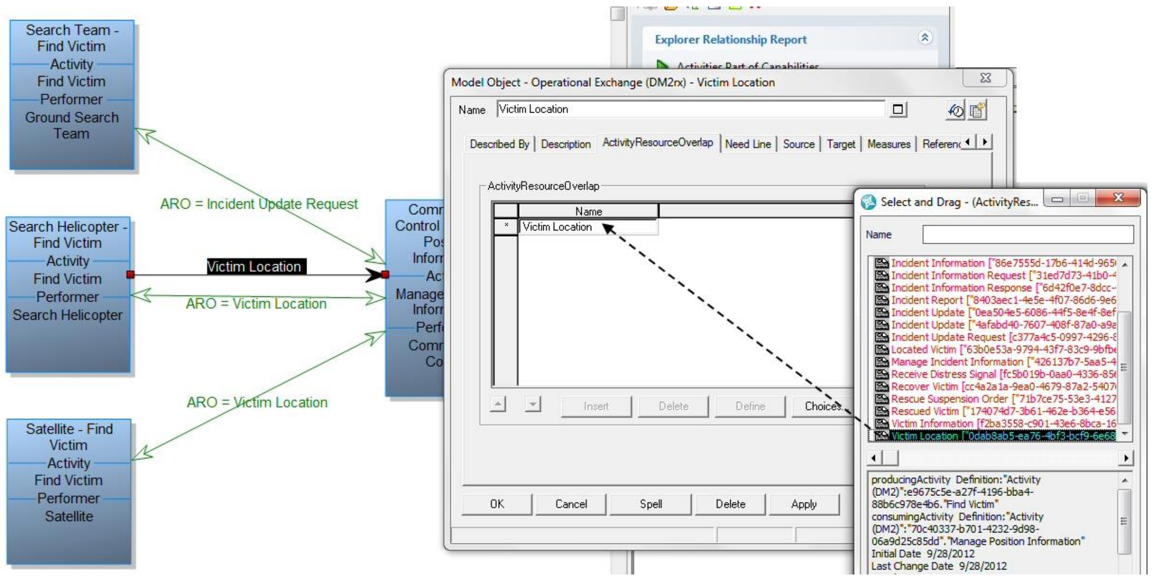
The lines drawn are ***not*** relationships formed in the model -- they are simply visualizations of a report run of what relationships ***should*** exist -- based on the logic that says if Performer A performs Activity A, and Performer B performs Activity B, and Activity A has an ActivityResourceOverlap to Activity B, then there is a an OperationalExchange between Performer A/Activity A and Performer B/Activity B. The ActivityResourceOverlap that causes the inferred relationship is provided as a name of the report line.


Explorer
All
Entity
Explorer Collection
Explorer Object Report
Explorer Relationship Report
Activities Part of Capabilities
Activities to System Functions to Systems
Activity to System Function
All Immediate Uses Relationships <This Explorer F
Business Processes Related to Org Units <This E
Capabilities to Activities
Capabilities to Activities to System Functions to S
Diagram Depicts <This Explorer Relationship repo
IDEF0 Hierarchies <This Explorer Relationship rep
OV-02 and SV-01 and SvcV-01 Operational Exch
OV-02z activityResourceOverlap Generation
Performer to Performer Based on AROs
SV-01z and SvcV-01z System Data Flow and Ser
System Function to System
FocalPoint Mapping
FocalPoint Profile
Interface (Port) (DM2)
Location (DM2)
Logical Foreign Key Component
Matrix
Measure (DM2) (deprecated)
Measure (Performance) (DM2) (deprecated)
Measure (Temporal) (DM2) (deprecated)
Measurement Instance
Measurement Set
Measurement Type
Welcome Guide
TOGAF Enterprise
OperationalExchanges (OV-02z Op...
Search Team - Find Victim Activity Find Victim Performer Ground Search Team
Search Helicopter - Find Victim Activity Find Victim Performer Search Helicopter
Satellite - Find Victim Activity Find Victim Performer Satellite
Command & Control - Manage Position Information Activity Manage Position Information Performer Command & Control
ARO = Incident Update Request
ARO = Victim Location
ARO = Victim Location
Heat Map Manager
Explorer Relationship Report
Activities Part of Capabilities
Activities to System Functions to Systems
Activity to System Function
All Immediate Uses Relationships
Business Processes Related to Org Units
Capabilities to Activities
Capabilities to Activities to System Functions to Systems
Diagram Depicts
IDEF0 Hierarchies
OV-02 and SV-01 and SvcV-01 Operational Exchange and System Exchange Generation
OV-02z activityResourceOverlap Generation
Performer to Performer Based on AROs
SV-01z and SvcV-01z System Data Flow and Service Data Flow Generation
System Function to System
Activity Log

*Run the Explorer Relationship report **OV--02z activityResourceOverlap Generation** from the Heat Map Manager pane.*

<u>Create Operational Exchange Relationships</u>

4. Use the OperationalExchange symbol on the Draw toolbar of the OV-02z diagram to draw an Operational Exchange between a pair of ActivityPerformedbyPerformer symbols on the diagram, using the Explorer Relationship report lines as a guide.
5. In the Operational Exchange definition, go to the ActivityResourceOverlap tab to specify the ActivityResourceOverlap that relates the two Activities involved. Again, use the name of the Explorer Relationship report line as a guide



Model Object - Operational Exchange (DM2rx) - Victim Location

Name: Victim Location

ActivityResourceOverlap

	Name
*	Victim Location

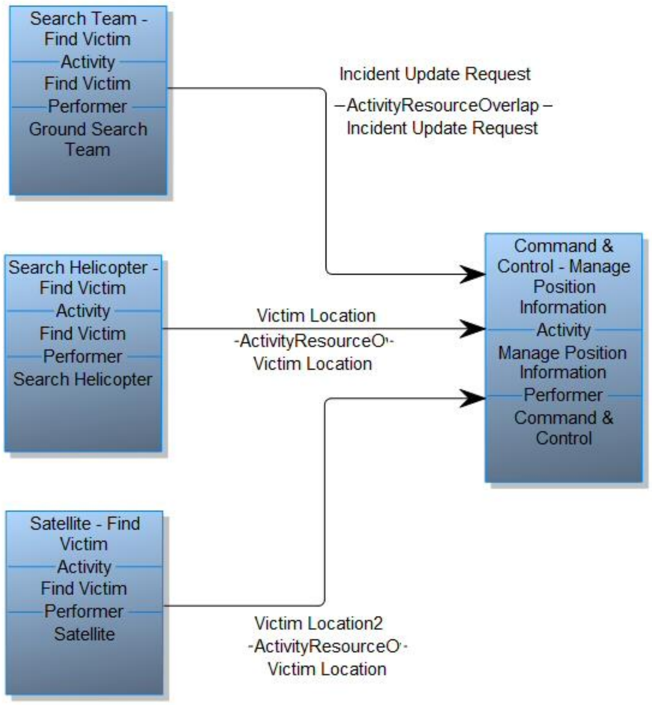
Select and Drag - (ActivityRes...

Name:

Incident Information ["86e7555d-17b6-414d-965
Incident Information Request ["31ed7d73-41b0-4
Incident Information Response ["6d42f0e7-8dcc-
Incident Report ["8403aec1-4e5e-4f07-86d6-9e6
Incident Update ["0ea504e5-6086-44f5-8e4f-8ef
Incident Update ["4afabd40-7607-408f-87a0-a9a
Incident Update Request [c377a4c5-0997-4296-8
Located Victim ["63b0e53a-9794-43f7-83c9-9bfb
Manage Incident Information ["426137b7-5aa5-4
Receive Distress Signal [fc5b019b-0aa0-4336-85
Recover Victim [cc4a2a1a-9ea0-4679-87a2-5407
Rescue Suspension Order ["71b7ce75-53e3-4127
Rescued Victim ["174074d7-3b61-462e-b364-e56
Victim Information [f2ba3558-c901-43e6-8bca-16
Victim Location ["0dab8ab5-ea76-4bf3-bcf9-6e68

producingActivity Definition:"Activity (DM2)":e9675c5e-a27f-4196-bba4-88b6c978e4b6."Find Victim"
consumingActivity Definition:"Activity (DM2)":"70c40337-b701-4232-9d98-06a9d25c85dd"."Manage Position Information"
Initial Date 9/28/2012
Last Change Date 9/28/2012

6. Draw an Operational Exchange matching each of the Explorer Relationship Report lines.
7. Once all Operational Exchanges have been created, delete the Explorer Relationship lines.



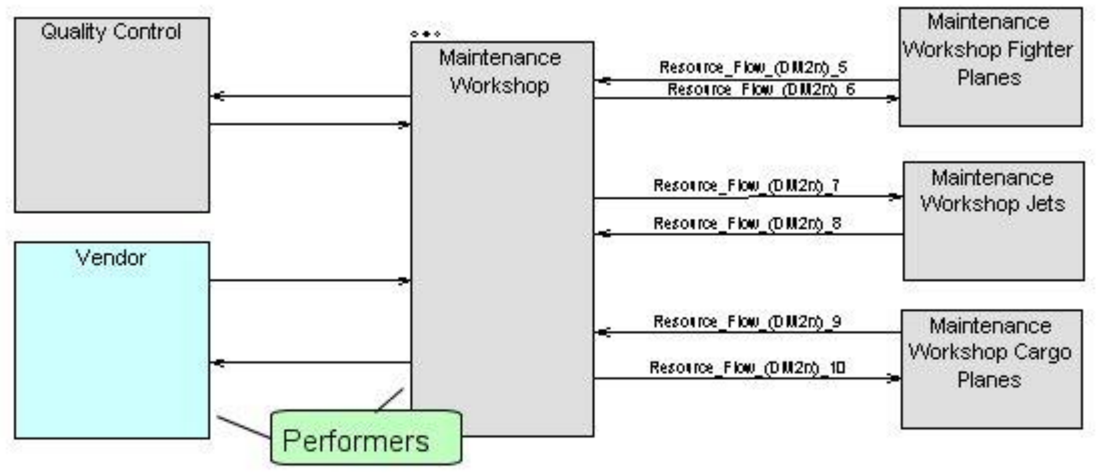
OV-02z diagram with Operational Exchanges between ActivityPerformedbyPerformer joins.

Building the OV-2 Viewpoint

The OV-02 Viewpoint enables you to understand the high-level, operational view of what performers need to communicate with one another to exchange resources -- where a resource flow can be information, funding, personnel, or materiel. The need for resource flow -- or Needline -- between performers is established without prescribing the way that the Resources handled or without prescribing solutions.

You can draw the following symbols on an OV-02 Operational Resource Flow Description diagram:

- Performer, and any of its subtypes, such as Interface (Port), Organization, Performer, Person, Service. Service Interface, or System
- Needline relationship lines between Performers



The OV-02 can also show the location of Operational facilities (**Related Locations** is a displayable property of Performer), and can optionally be annotated to show flows of information, funding, people, or materiel between Operational Activities.

Creating the OV-02

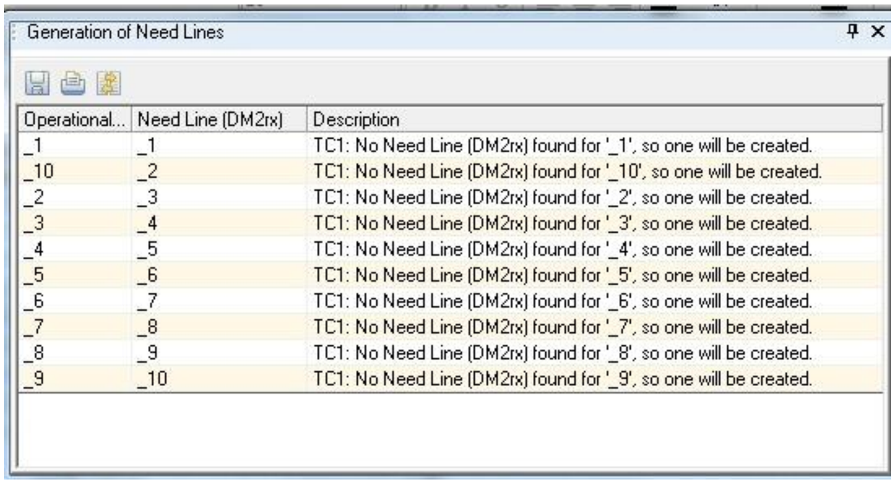
On the OV-02 you model Performers found at the Operational level -- typically Organizations, Persons, or the generic Performer definition type.

The basic steps of creating an OV-02 are as follows:

1. If you have started with modeling of the OV-05 views, use System Architect's Needline generator to automatically generate Needlines.
2. Create an OV-02 Operational Resource Description diagram.
3. Create or drag-and-drop existing Performers on the diagram. If Needlines have been autogenerated, they will be automatically displayed.
4. If you have not modeled the OV-5 views yet, or wish to add Needlines to the architecture, relate the Performers with Needlines by drawing them from the Draw toolbar.
5. Within each Needline, specify the Operational Exchanges that cause the Needline to exist, in the Exchanges tab.

Automatically Generating Needlines

1. Select **Tools, DoDAF 2 Utilities, Generate Needlines**. A dialog opens to show you what is generated.



Generation of Need Lines

Operational...	Need Line (DM2rx)	Description
_1	_1	TC1: No Need Line (DM2rx) found for '_1', so one will be created.
_10	_2	TC1: No Need Line (DM2rx) found for '_10', so one will be created.
_2	_3	TC1: No Need Line (DM2rx) found for '_2', so one will be created.
_3	_4	TC1: No Need Line (DM2rx) found for '_3', so one will be created.
_4	_5	TC1: No Need Line (DM2rx) found for '_4', so one will be created.
_5	_6	TC1: No Need Line (DM2rx) found for '_5', so one will be created.
_6	_7	TC1: No Need Line (DM2rx) found for '_6', so one will be created.
_7	_8	TC1: No Need Line (DM2rx) found for '_7', so one will be created.
_8	_9	TC1: No Need Line (DM2rx) found for '_8', so one will be created.
_9	_10	TC1: No Need Line (DM2rx) found for '_9', so one will be created.

2. Examine the report. The Description specifies where no Needline was found, due to a Operational Exchange existing, it created one -- and states the name of that Needline in the middle column.

	Remember that the automatic generation algorithm may encounter Needlines already created -- either by an earlier automatic generation, or ones that a user has manually added to the architecture. If a Needline is encountered that has been manually created, a new Needline will not be created -- the original one will remain in place.

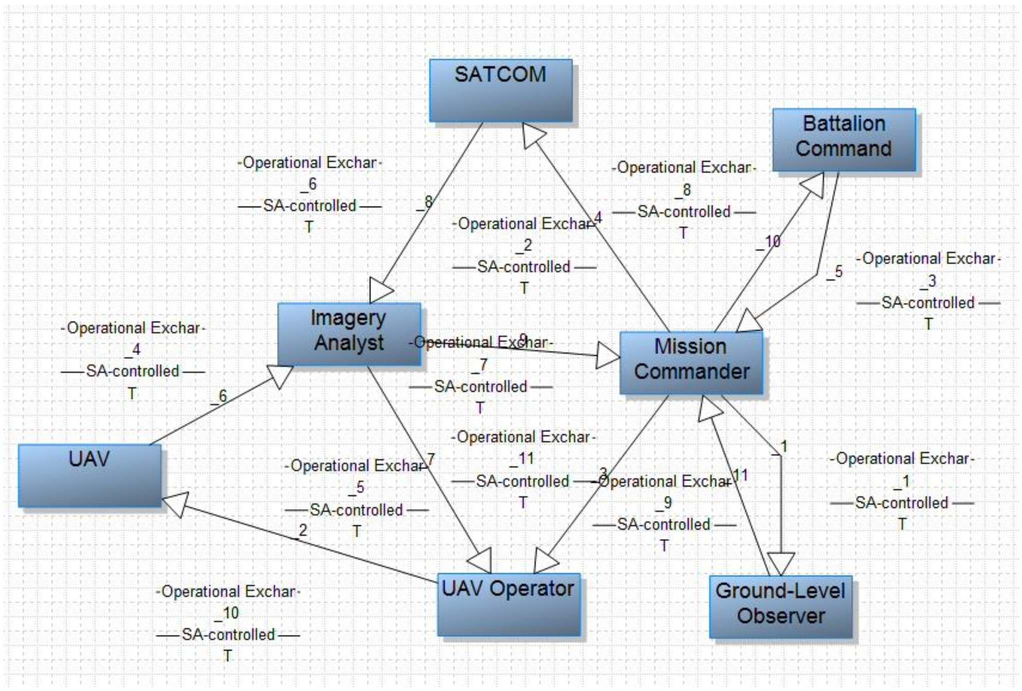
3. Create an OV-02 Operational Resource Flow diagram.

<u>Optionally Set Recommended Style Settings</u>

4. Select **Format, Symbol Format, Line**, and choose a style of **Straight - Any Orientation.**
5. Select **Format, Center-to-Center Routing**.
6. Select **Format, Diagram Auto-Routing, Assign Connections**.

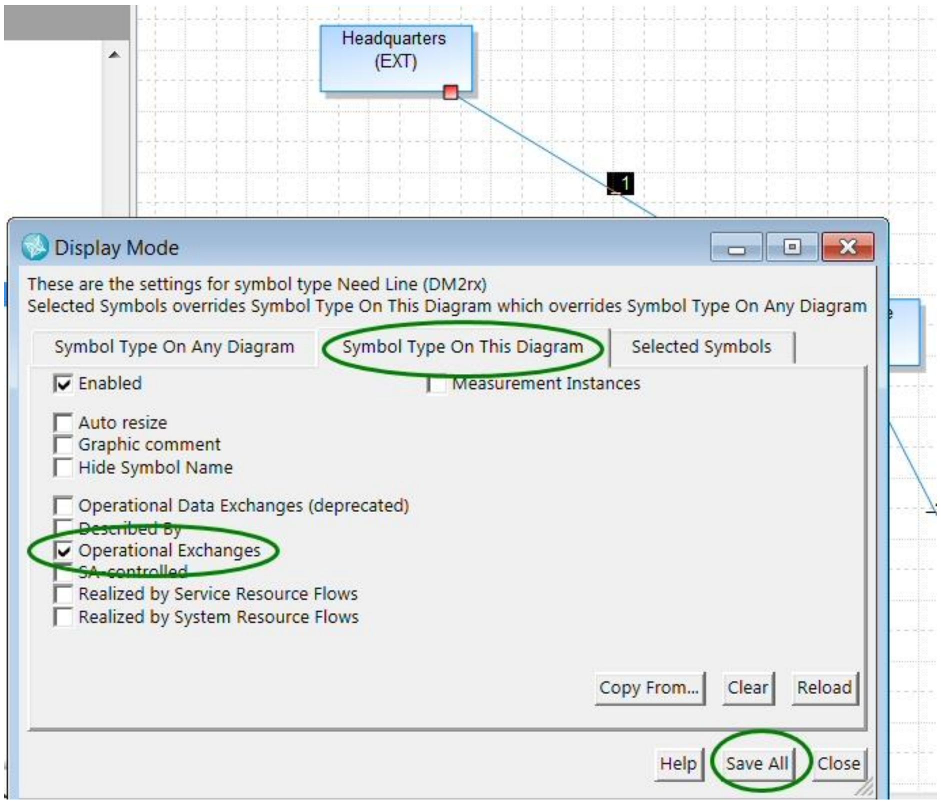
<u>Visualize Performers on the OV-2</u>

7. From the Explorer, drag Performers onto the diagram.


SATCOM
Battalion Command
Imagery Analyst
Mission Commander
UAV
UAV Operator
Ground-Level Observer
-Operational Exchar-_6 SA-controlled T
-Operational Exchar-_8 SA-controlled T
-Operational Exchar-_2 SA-controlled T
-Operational Exchar-_3 SA-controlled T
-Operational Exchar-_4 SA-controlled T
-Operational Exchar-_7 SA-controlled T
-Operational Exchar-_11 SA-controlled T
-Operational Exchar-_5 SA-controlled T
-Operational Exchar-_9 SA-controlled T
-Operational Exchar-_1 SA-controlled T
-Operational Exchar-_10 SA-controlled T

Optionally Set Display Settings

1. Right-mouse click on one of the lines and choose **Display Mode**.
2. In the Display Mode dialog, select the **Symbol Type on This Diagram** tab, select Enabled, and select **Operational Exchanges** – then click **Save All** and **Close**.



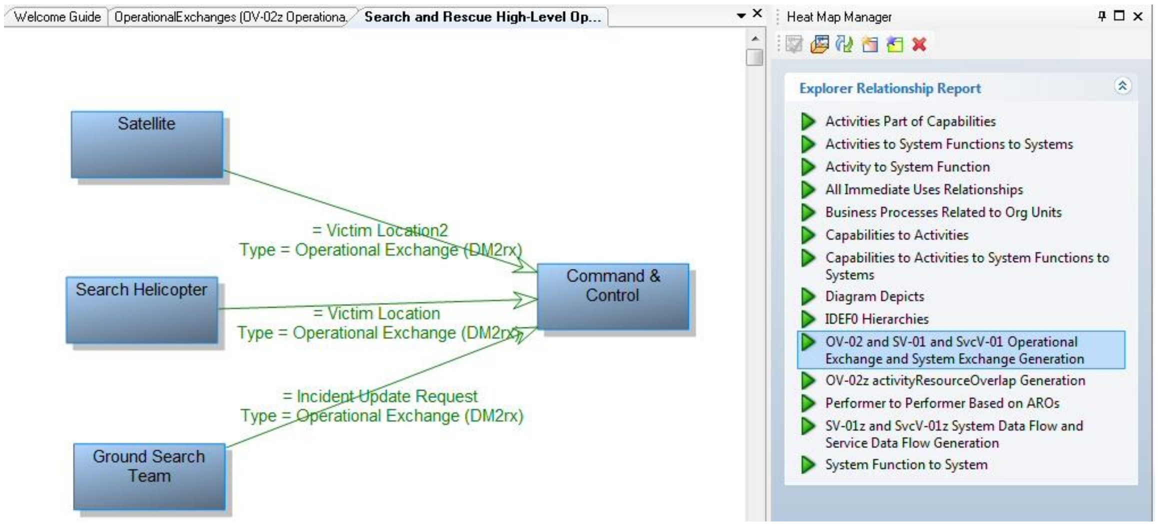
These are the settings for symbol type Need Line (DM2rx)
Selected Symbols overrides Symbol Type On This Diagram which overrides Symbol Type On Any Diagram

- [✓] Enabled
- [ ] Measurement Instances
- [ ] Auto resize
- [ ] Graphic comment
- [ ] Hide Symbol Name
- [ ] Operational Data Exchanges (deprecated)
- [ ] Described By
- [✓] Operational Exchanges
- [ ] SA-controlled
- [ ] Realized by Service Resource Flows
- [ ] Realized by System Resource Flows

<u>Optional: Best Practice on Manually Creating Needlines on OV-02</u>

System Architect comes with several Explorer Relationship reports that can tell you where (between what Performers) Needlines should be drawn on an OV-2. This functionality predated automatic generation of Needlines, so is not really needed in building an OV-2, but you might want to use it when manually creating needlines.

1. Select View, Heat Map Manager to open the Heat Map Manager pane.
2. Click on the Explorer Relationship Report **OV-02 and SV-01 and SvcV-01 Operational Exchange and System Exchange Generation**.

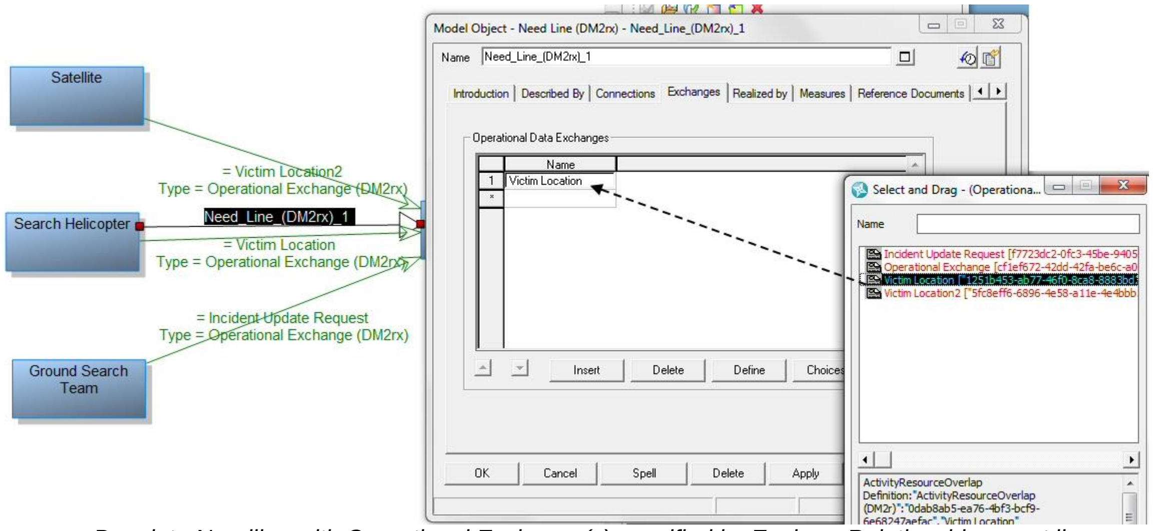

Welcome Guide
OperationalExchanges (OV-02z Operationa
Search and Rescue High-Level Op...
Satellite
= Victim Location2
Type = Operational Exchange (DM2rx)
Search Helicopter
= Victim Location
Type = Operational Exchange (DM2rx)
Command & Control
= Incident Update Request
Type = Operational Exchange (DM2rx)
Ground Search Team
Heat Map Manager
Explorer Relationship Report

Explorer Relationship Report

- Activities Part of Capabilities
- Activities to System Functions to Systems
- Activity to System Function
- All Immediate Uses Relationships
- Business Processes Related to Org Units
- Capabilities to Activities
- Capabilities to Activities to System Functions to Systems
- Diagram Depicts
- IDEF0 Hierarchies
- OV-02 and SV-01 and SvcV-01 Operational Exchange and System Exchange Generation
- OV-02z activityResourceOverlap Generation
- Performer to Performer Based on AROs
- SV-01z and SvcV-01z System Data Flow and Service Data Flow Generation
- System Function to System

Explorer Relationship Report run to report on Needlines that should be formed.

7. Draw a Needline to correspond to each report line on the diagram.
8. In each Needline, add the Operational Exchange as specified on the report line.



Model Object - Need Line (DM2rx) - Need_Line_(DM2rx)_1

Name: Need_Line_(DM2rx)_1

Operational Data Exchanges

	Name
1	Victim Location
*	

Select and Drag - (Operationa...

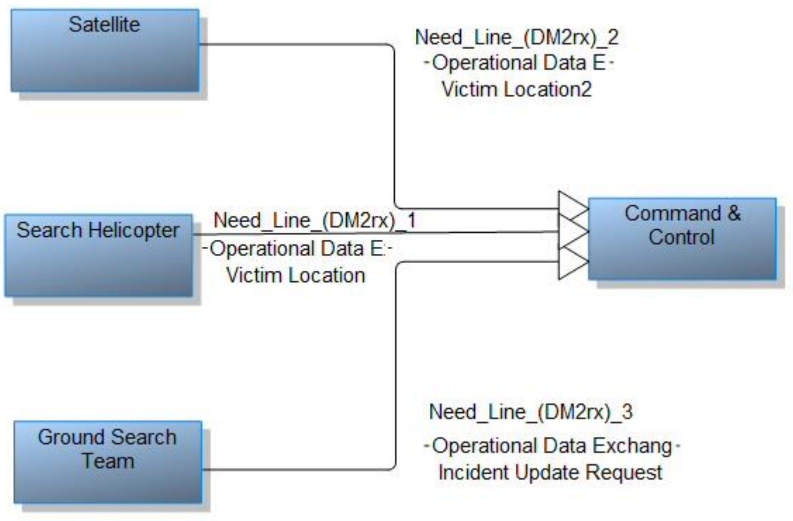
Name

- Incident Update Request [f7723dc2-0fc3-45be-9405
- Operational Exchange [cf1ef672-42dd-42fa-be6c-a0
- Victim Location ["1251b453-ab77-46f0-8ca8-8883bd
- Victim Location2 ["5fc8eff6-6896-4e58-a11e-4e4bbb

ActivityResourceOverlap
Definition:"ActivityResourceOverlap (DM2r)":"0dab8ab5-ea76-4bf3-bcf9-6e68247aefac","Victim Location"

Populate Needline with Operational Exchange(s) specified by Explorer Relationship report lines.

5. Once all Needlines have been created, delete the Explorer Relationship lines. They are simply visual reports – they are not real relationships.



OV-02 shows Needlines between Performers.

Systems Views

How to Build SV's in System Architect -- Workflow Summary

Overview

Systems modeling involves the following steps that you may do in the following order although it is not mandatory:

1. **Model the hierarchy of System Functions** and their sub Functions using an SV-04a Systems Functionality Decomposition diagram.
2. **Build a leveled set of SV-04 Systems Resource Flow Description diagrams**, typically starting with a context diagram and then a series of child diagrams that are built to examine the sub-Functions of each System Function, until you get down to a level wherein all System Functions do not need to be decomposed further. A System Function that is not decomposed by Sub Functions is considered a 'leaf-level' function.
3. **Relate the Activities from the Operational View to System Functions** that perform them via the SV-05a Activity to System Function matrix.
4. **Specify what System performs each System Function**, using the ActivityPerformedbyPerformer relationship. You can do this on the SV-04 Systems Functionality Description diagram.
5. **Create System Exchanges** using the fit-for-purpose SV-01z System Exchanges diagram. On this diagram you model ActivityPerformedbyPerformer relationships as nodes, and draw System Exchanges between them. A System Exchange is the exchange between a particular System performing a particular System Function, and another particular System performing a particular System Function -- in other words, a relationship between two ActivityPerformedbyPerformers. An Explorer Relationship Report provides automatic guidance on what System Exchanges you should create.
6. **On each System Exchange, point at the System Data Flow line that carries the Resources between the two Systems involved.** A System Exchange has a reference to one and only one System Data Flow. The same Explorer Relationship Report mentioned in the previous step offers automatic guidance on what System Data Flow you should relate to each System Exchange.
7. **Model System Resource Flows between Systems on the SV-01 diagram.** An Explorer Relationship Report provides automatic guidance on what System Resource Flows to create and the System Exchanges they should carry.
8. **View what Systems are related in the SV-03 System to System (System Resource Flow) matrix.** At the intersection of each join is the System Resource Flow definition. You may also add/remove/edit relationships in the matrix.
9. Generate the **SV-06 report**.

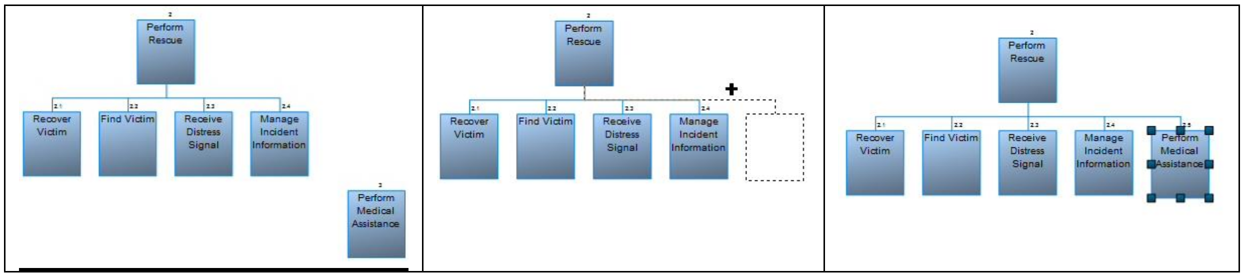
SV-04a Systems Functionality Decomposition diagram

You use the SV-04a Systems Functionality Decomposition diagram to view the hierarchical relationship between System Functions (see figure below).

Creating a System Hierarchy on the Diagram

With System Architect 11.4.1 and later, you use auto-connect functionality to relate a System Function to a parent System Function. Simply move a System Function that you wish to be a child of another System Function underneath it until a line automatically appears. The relationship is formed.

You may open the definition of the child System Function and in its **Part of Function** tab, view the name of the parent System Function, automatically added based on the relationship you formed on the diagram.

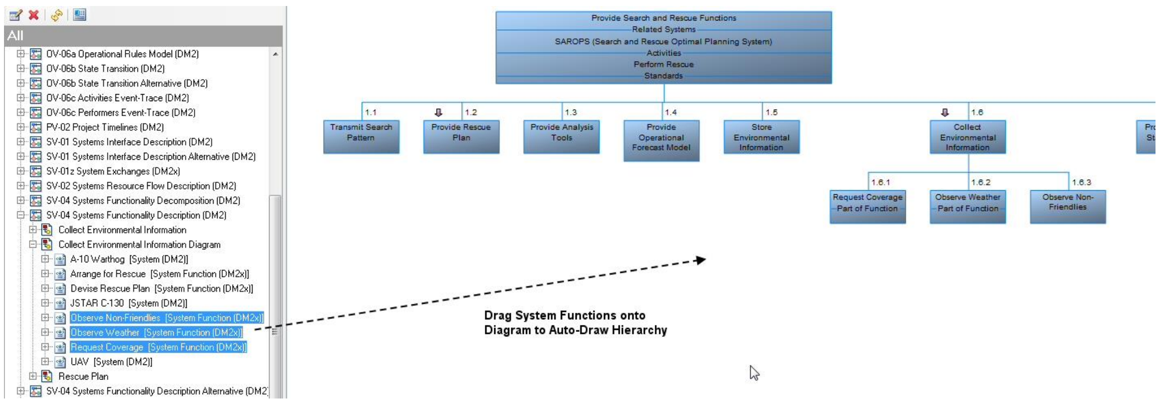


Creating a System Hierarchy in the Definitions

You can relate a System Function to its parent System Function in its definition, without having any diagram open, and then auto-draw an SV-4a diagram.

1. Open the definition of a System Function and in its **Part of Function** tab, you can specify the name of its parent System Function. You can also specify its sub-Functions by populating its **Parent of Functions** tab. All System Functions must exist already **--** you drag them in by clicking the Choices button.

2. Create an SV-04a Systems Functionality Decomposition diagram and drag-and-drop System Functions from the Explorer tree onto the diagram workspace; the diagram draws itself, with appropriate relationships.

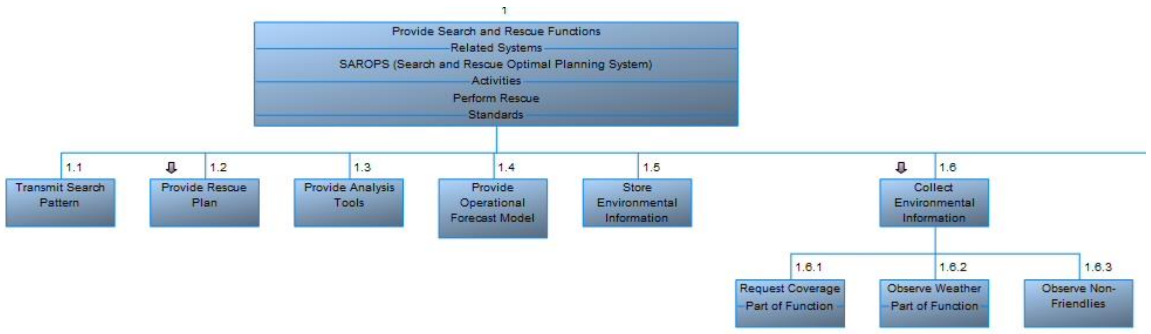


All
OV-06a Operational Rules Model (DM2)
OV-06b State Transition (DM2)
OV-06b State Transition Alternative (DM2)
OV-06c Activities Event-Trace (DM2)
OV-06c Performers Event-Trace (DM2)
PV-02 Project Timelines (DM2)
SV-01 Systems Interface Description (DM2)
SV-01 Systems Interface Description Alternative (DM2)
SV-01z System Exchanges (DM2x)
SV-02 Systems Resource Flow Description (DM2)
SV-04 Systems Functionality Decomposition (DM2)
SV-04 Systems Functionality Description (DM2)
Collect Environmental Information
Collect Environmental Information Diagram
A-10 Warthog [System (DM2)]
Arrange for Rescue [System Function (DM2x)]
Devise Rescue Plan [System Function (DM2x)]
JSTAR C-130 [System (DM2)]
Observe Non-Friendlies [System Function (DM2x)]
Observe Weather [System Function (DM2x)]
Request Coverage [System Function (DM2x)]
UAV [System (DM2)]
Rescue Plan
SV-04 Systems Functionality Description Alternative (DM2)
Provide Search and Rescue Functions
Related Systems
SAROPS (Search and Rescue Optimal Planning System)
Activities
Perform Rescue
Standards
1.1 Transmit Search Pattern
1.2 Provide Rescue Plan
1.3 Provide Analysis Tools
1.4 Provide Operational Forecast Model
1.5 Store Environmental Information
1.6 Collect Environmental Information
1.6.1 Request Coverage Part of Function
1.6.2 Observe Weather Part of Function
1.6.3 Observe Non-Friendlies
Drag System Functions onto Diagram to Auto-Draw Hierarchy

	LEAF FUNCTIONS -- Leaf Level System Functions are System Functions that are not decomposed further by a Sub Function. In the diagram pictured above, Request Coverage, Observe Non-Friendlies, and Observe Weather are 'leaf-level' Activities.

Specifying Hierarchical Numbering

Hierarchical numbering of System Functions allows you to easily see the decomposition level of an Activity.



To turn on hierarchical numbering in SA 11.4.2.1 and later, perform the following steps:

1. In an open SV-04 Systems Functionality Decomposition diagram, edit its Diagram properties -- right-mouse click on an empty area of the diagram workspace and choose **Diagram Properties**, or select **Edit, Diagram Properties**.
2. In the Diagram Properties dialog of the SV-04 Systems Functionality Decomposition, make sure the **Hierarchical Numbering** property is toggled on; the property is located in the **Hierarchical Numbering** tab of the dialog. You may also set the **First Node Number** -- this will set the number of the highest-parent symbol on the diagram; if you leave it blank, the default is 0.
3. Select (or draw and then select) an Activity symbol on the diagram, and select **Format, Symbol Format, Symbol Style**.
4. Make sure the options **Auto number** and **Level numbers** in the **Allow** group are toggled on. Note the value of the **Next number** property -- this number will automatically be updated as you draw.
5. Select **Tools, Preferences**, and in the **Preferences** dialog, make sure the **Number** property in the **Auto** group is toggled on.

Note that Prefix code is superceded in DoDAF 2 by Alternate Depiction functionality. In SA 11.4.2 and later, you may right-mouse click on any symbol and choose Display Selected Symbols with Adornment. This provides similar functionality the prefix code, which annotated a symbol as a Process (prefix code P), Activity (prefix code A), etc.

SV-04b Systems Functionality Description Diagram

The SV-04b Systems Functionality Description diagram describes the Resources exchanged between System Functions in the architecture, and Resources exchanged with System Functions that are outside the scope of the model, considered External Functions.

A best practice is to create a high-level 'context' SV-04b diagram, which shows the highest-level System Functions in the architecture, and how it interchanges with External Functions. You then decompose that highest-level System Function with a child SV-04b diagram that shows its Sub Functions and how Resources flow between those System Functions.

Modeling Flow Between System Functions

You use an System Data Flow line to model flow of Resources between Activities. Within each System Data Flow you may specify the actual Resources that flow from one System Function to the other.

To specify one or more Resources flowing between two System Functions, do the following:

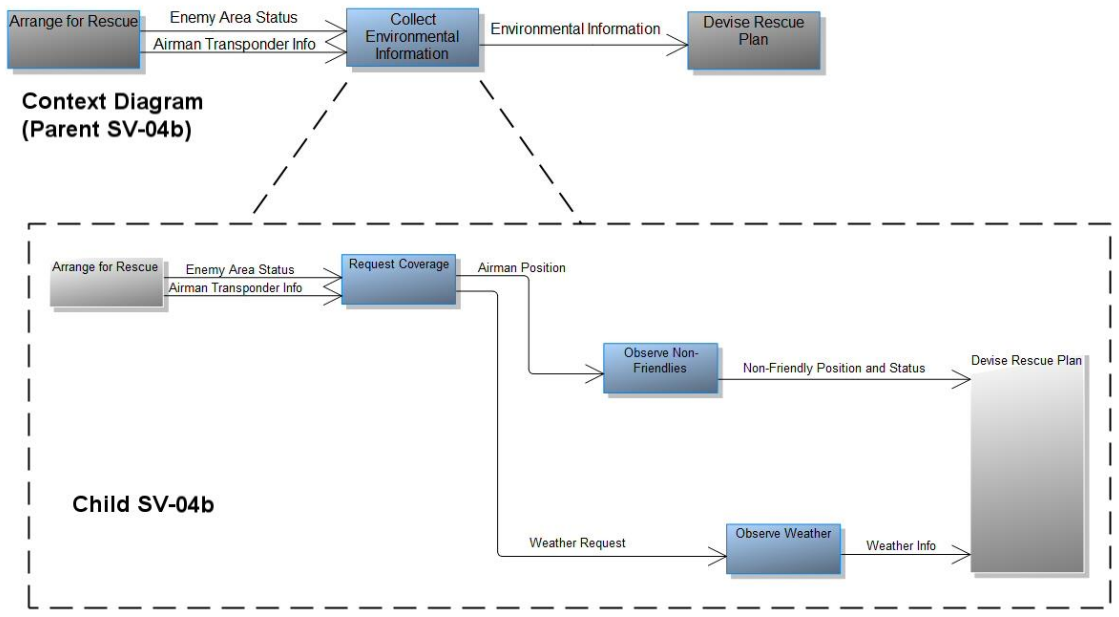
1. Relate the two System Functions by a System Data Flow line.
2. On the Resources tab of the System Data Flow definition, click the Choices button to view all Resources already created in the encyclopedia. The list shows all definitions of type Resource and sub types: Information, Data, DomainInformation, ServiceDescription Performer, Person Type, Organization Type, System, Service, and Port.
3. Select one or more definitions in the Choices list and drag-and-drop them into the Resources grid.

Modeling Decomposition of System Functions

You may model decomposition of a System Function through the use of Parent-Child diagramming for navigation and visualization, and also relating the System Function to its children through their definitions.

To graphically show decomposition of an System Function, you may do the following:

1. Right-mouse click on a System Function on an SV-4b diagram, and select **Create Child Diagram** (note: you may also use the menu choice Edit, Child Diagram, Create Child Diagram)
2. Name the new diagram, accept the default diagram type of SV-04b Systems Functionality Description (DM2), and click OK, then select Yes to save changes to the previously current diagram.
3. Model Sub Functions on the new diagram



You will now be able to navigate between parent and child System Functions on two different SV-4b diagrams, however the definitions must still be related to one another via a composition relationship, described in the steps below.

Creating a Chain of Parent/Child SV-4b's that Reflect the SV-4a

Creating a parent/child linkage between SV-04b diagrams provides easy navigation through the model, but it does not relate the System Function definitions that are pictured on the diagram in an Function-part-of-Function relationship. Once you have created a parent/child linkage between two SV-4b diagrams, and modeled sub Functions on the child SV-4b, you must perform the following steps:

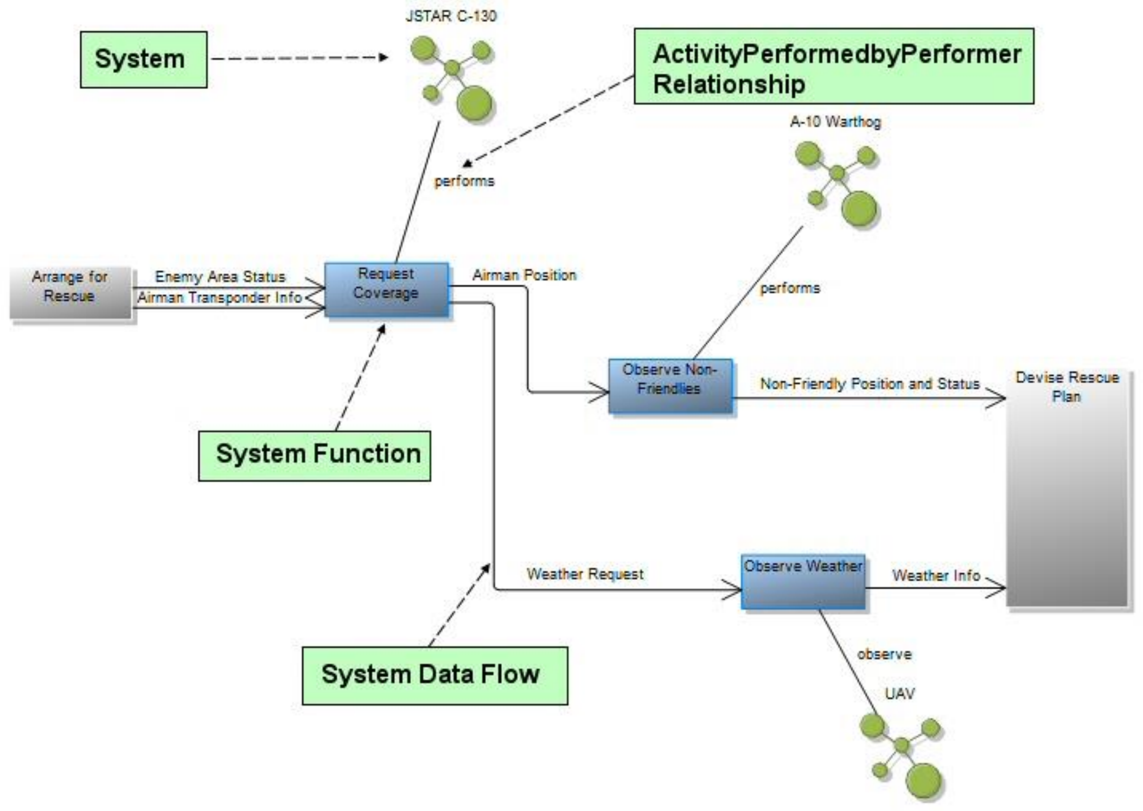
1. Open the definition of a System Function on the child diagram and in its **Part of Function** tab, click the **Choices** button and drag-and-drop in the name of the parent System Function.
2. Repeat step 1 for all System Functions on the diagram that you wish to model as sub Functions to the parent. Note that this step can be performed independently of the parent/child diagrams -- they just serve as a navigation and logic aid.

Furthermore, once you have related System Functions in the **Part of Function** tab of the definition, you may auto-build an SV-04a diagram by simply dragging the System Functions onto the diagram -- as discussed earlier. Data centric behavior will autodraw the relationships on the diagram for you. This provides two ways of working:

A. Build the SV-4a first -- within which you visually build the System Function/Sub-System Function relationships, then build the SV-4b's for each main System Function level.
B. Build the SV-4b leveled set of diagrams first, and at each level make sure you relate the sub Function to its parent System Function in the definition; then autodraw the SV-4a.

Specifing the Systems that Perform a System Function

You may specify the System (a type of Performer) that performs a System Function via the ActivityPerformedbyPerformer relationship line, available on the SV-04b Systems Functionality Description (DM2) diagram type.



SV-04b Systems Functionality Description diagram enables you to model Systems that perform System Functions via ActivityPerformedbyPerformer relationship. Note that in this example, a poor choice is used for the name of ActivityPerformedbyPerformer -- a better choice would be to use "System Name - System Function Name".

Best Practice: Naming Convention for ActivityPerformedbyPerformer

A best practice for naming an ActivityPerformedbyPerformer relationship is:

System Name - System Function Name

For example, ***JSTAR C-130 - Request Coverage***

Following such a naming standard comes in handy in various aspects of your modeling:

- Looking through a list of relationships already formed in the repository and represent them on a diagram.
- Modeling ActivityPerformedbyPerformers as vertical lifelines on the OV-6c Operational Exchanges diagram or SV-10c Performer-Role Event Trace diagram.

Note that In the current version of System Architect, a list of System Functions is not provided in the System definition; nor is a list of Systems provided in the System Function definition. The relationship is an explicit join -- System has a relationship to ActivityPerformedbyPerformer which relates it to System Function. To get a quick view of what System Function is being performed by what System globally in your architecture, you can do the following:

1. Select a System Function or a System in the Explorer (browser) or on any diagram.
2. Select View, References.
3. In the References pane that opens, expand Definitions, and expand ActivityPerformedbyPerformer within that.

Right mouse click on the name of a particular ActivityPerformedbyPerformer relationship and choose References -- another window will open that contains all referenced items for the selected relationship.

Modeling Where and When a System Performs a System Function

You may specify where and when a System performs a System Function in the ActivityPerformedbyPerformer relationship. You may model more than one ActivityPerformedbyPerformer relationship between a System and a System Function to specify different conditions, times, and locations.

Specifying Where a Performer Performs an Activity

You may specify ***where*** a System performs a System Function.

1. On an ActivityPerformedbyPerformer definition, select the **Where and When** tab.
2. On page 1, click on **Choices** for the **Where** property and view a list of Location type definitions (and subtypes of Location definition) that you have created in the architecture; select and drag items into the **Where** grid.

The following definition types are available to describe location:

- Location (DM2), and the following subtypes
  - GeoPoliticalExtent (DM2), and the following subtypes:
    - Installation (DM2)
    - GeoFeature (DM2)
    - RegionOfCountry (DM2)
    - Country (DM2)
    - RegionOfWorld (DM2)
    - RealProperty (DM2), and the following subtypes:
      - Facility (DM2)
      - Site (DM2)

Specifying When a System Performs a System Function

You may specify when the System performs a System Function.

1. Select the **Where and When** tab of the ActivityPerformedbyPerformer definition.
2. On page 2 you may click on Choices for the **When** property and view a list of the following definition type that you have created in the architecture:
   - Measure (Temporal).

Specifying Under What Environmental Conditions a System Performs an System Function

You may specify under what conditions the System performs a System Function. An example of Environmental Condition is in the Desert, or in the Rain, or At Night, etc.

1. Select the **Caveats** tab of the ActivityPerformedbyPerformer definition.

2. On page 1 you may click on Choices for the **Conditions** property and view a list of the following definition type that you have created in the architecture:
   - Condition (Environmental) (DM2)

Specifying Under What Rules a System Performs a System Function

You may specify under what rules System performs a System Function. Rules have subtype Standards -- so an example might be that a System rescues a ship under particular Maritime standard.

1. Select the **Caveats** tab of the ActivityPerformedbyPerformer definition.
2. On page 2 you may click on Choices for the **Rules** property and view a list of the following definition types that you have created in the architecture:

   - Rule (DM2), and the following subtype:
     - Standard (DM2), and the following subtype:
       - FunctionalStandard (DM2)

Specifying the Measures of How a System Performs a System Function

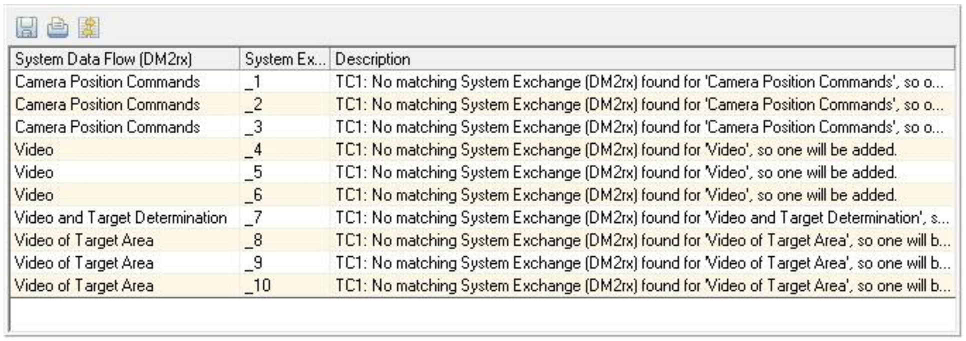
You may specify the measures of how a System Performs a System Function. An example of a measure is that a System must rescue a downed airman in a certain amount of time in order to be successful, otherwise the airman may perish or the search may be called off.

Creating System Exchanges

A System Exchange specifies what System performing what System Function sends resources to what other System performing what other System Function. Essentially, it is a relationship between two ActivityPerformedbyPerformers. The System Exchange points at one (and only one) System Data Flow between the two System Functions involved.

Automatically Creating System Exchanges

1. Select **Tools, DoDAF2 Utilities, Generate System Exchanges from System Data Flows.**



System Data Flow (DM2rx)	System Ex...	Description
Camera Position Commands	_1	TC1: No matching System Exchange (DM2rx) found for 'Camera Position Commands', so o...
Camera Position Commands	_2	TC1: No matching System Exchange (DM2rx) found for 'Camera Position Commands', so o...
Camera Position Commands	_3	TC1: No matching System Exchange (DM2rx) found for 'Camera Position Commands', so o...
Video	_4	TC1: No matching System Exchange (DM2rx) found for 'Video', so one will be added.
Video	_5	TC1: No matching System Exchange (DM2rx) found for 'Video', so one will be added.
Video	_6	TC1: No matching System Exchange (DM2rx) found for 'Video', so one will be added.
Video and Target Determination	_7	TC1: No matching System Exchange (DM2rx) found for 'Video and Target Determination', s...
Video of Target Area	_8	TC1: No matching System Exchange (DM2rx) found for 'Video of Target Area', so one will b...
Video of Target Area	_9	TC1: No matching System Exchange (DM2rx) found for 'Video of Target Area', so one will b...
Video of Target Area	_10	TC1: No matching System Exchange (DM2rx) found for 'Video of Target Area', so one will b...

Optional: Visualize the System Exchanges on an SV-01z

You can optionally use the **SV-01z System Exchanges** to visualize System Exchanges and the ActivityPerformedbyPerformers (alias Roles) they are relating, using the fit-for-purpose SV-01z diagram, which has been introduced into System Architect for this purpose (it is not prescribed by the DoDAF 2 spec).

1. Create a new diagram of type **SV-01z System Exchanges**

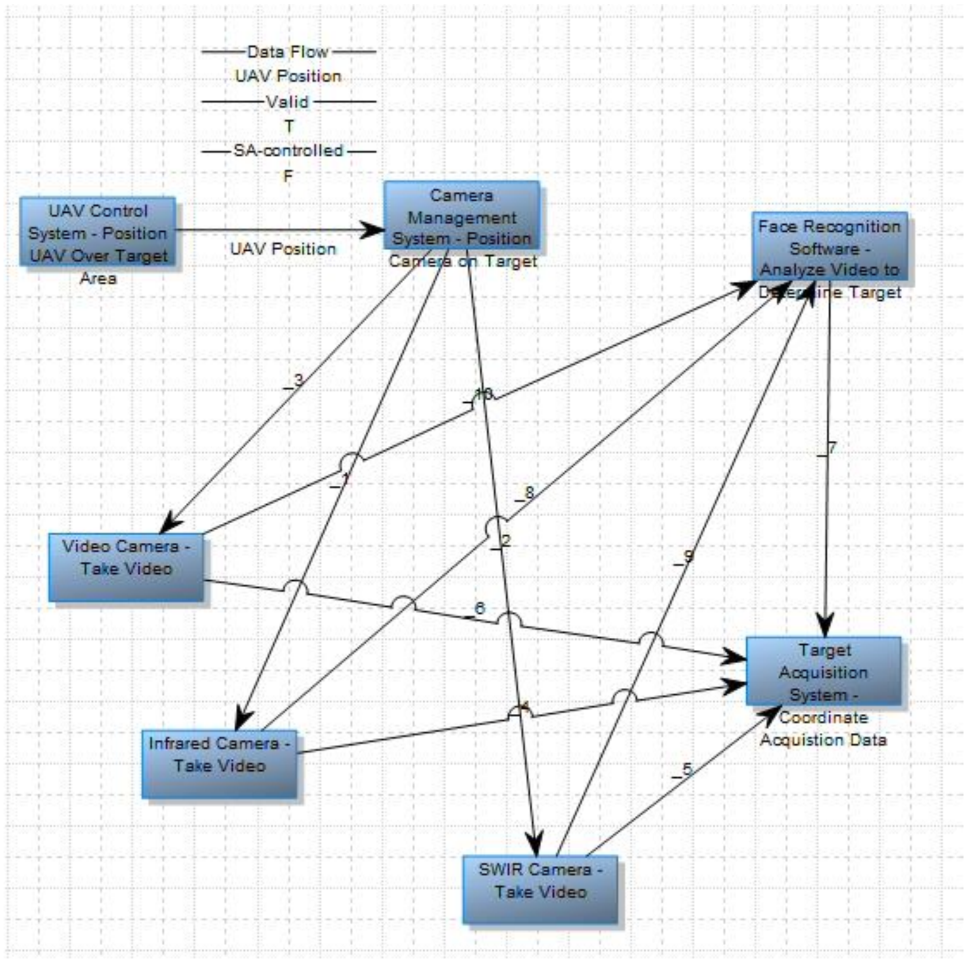
Optional: Select Draw Styles

For best visualization, optionally select these choices:

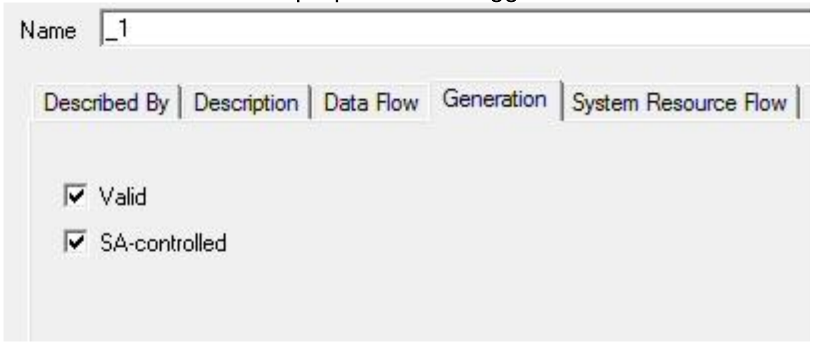
2. Select Straight - Any Orientation line style, and center-to-center routing selected.
3. Select **Format, Symbol Format, Line**, and choose a style of **Straight - Any Orientation.**
4. Select **Format, Center-to-Center Routing**.
5. Select Format, Diagram Auto Routing, Assign Connections.

Auto-Visualize the System Exchanges

6. Drag and drop Performers from the Explorer tree onto the diagram.


Data Flow
UAV Position
Valid
T
SA-controlled
F
UAV Control System - Position UAV Over Target Area
UAV Position
Camera Management System - Position Camera on Target
Face Recognition Software - Analyze Video to Determine Target
_3
_10
_1
_7
_8
Video Camera - Take Video
_2
_9
_6
Target Acquisition System - Coordinate Acquistion Data
_4
Infrared Camera - Take Video
_5
SWIR Camera - Take Video

Double click on System Exchange '_1' to open its definition. Note that on the Generation tab, its Valid and SA-Controlled properties are toggled on.



Name _1

Described By | Description | Data Flow | Generation | System Resource Flow

☑ Valid

☑ SA-controlled

Right-mouse click in the Explorer (browser) and select Refresh. Note that under the System Exchange definition type, all the System Exchanges are listed, including any manually added ones.

Optional: Manually Creating System Exchanges on SV-01z

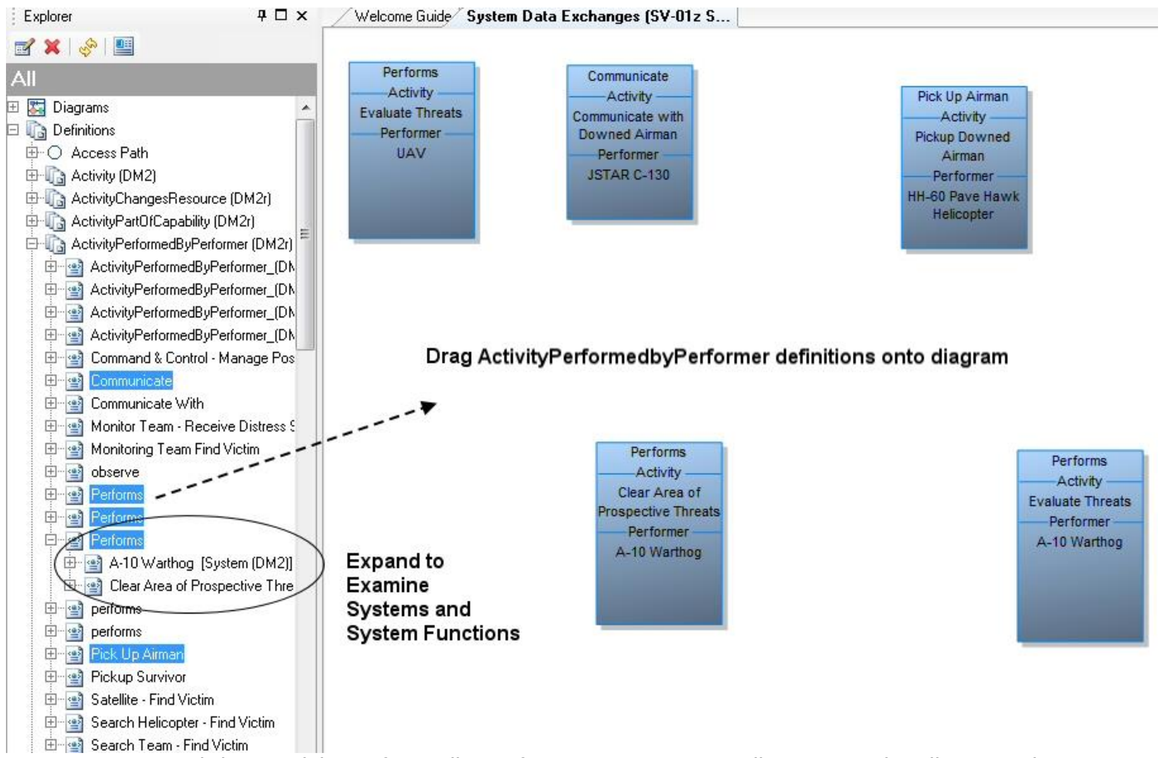
You may optionally create System Exchanges on the fit-for-purpose SV-01z diagram. On this diagram ActivityPerformedbyPerformers are visualized as node symbols, and you may draw a System Exchange relationship line between them.

1. Create an SV-01z System Exchanges diagram.

You may use the SV-01z diagram to create new ActivityPerformedbyPerformer relationships, or visualize existing ones already created in the repository. The following steps show you how to do the later.

Add Existing ActivityPerformedbyPerformer Relationships to SV-01z Diagram

2. In the Explorer (Browser), expand Definitions, and then ActivityPerformedbyPerformer to reveal all such relationships already formed in the repository. Expand each one to see the System and System Function involved. Select one or more and drag-and-drop onto the diagram.


Explorer
All
Diagrams
Definitions
Access Path
Activity (DM2)
ActivityChangesResource (DM2r)
ActivityPartOfCapability (DM2r)
ActivityPerformedByPerformer (DM2r)
ActivityPerformedByPerformer_(DM
ActivityPerformedByPerformer_(DM
ActivityPerformedByPerformer_(DM
ActivityPerformedByPerformer_(DM
Command & Control - Manage Pos
Communicate
Communicate With
Monitor Team - Receive Distress S
Monitoring Team Find Victim
observe
Performs
Performs
Performs
A-10 Warthog [System (DM2)]
Clear Area of Prospective Thre
performs
performs
Pick Up Airman
Pickup Survivor
Satellite - Find Victim
Search Helicopter - Find Victim
Search Team - Find Victim
Welcome Guide
System Data Exchanges (SV-01z S...
Performs Activity Evaluate Threats Performer UAV
Communicate Activity Communicate with Downed Airman Performer JSTAR C-130
Pick Up Airman Activity Pickup Downed Airman Performer HH-60 Pave Hawk Helicopter
Drag ActivityPerformedbyPerformer definitions onto diagram
Expand to Examine Systems and System Functions
Performs Activity Clear Area of Prospective Threats Performer A-10 Warthog
Performs Activity Evaluate Threats Performer A-10 Warthog

Drag-and-drop ActivityPerformedbyPerformers onto SV-01z diagram. Optionally expand ActivityPerformedbyPerformer to see the System and System Function it relates.

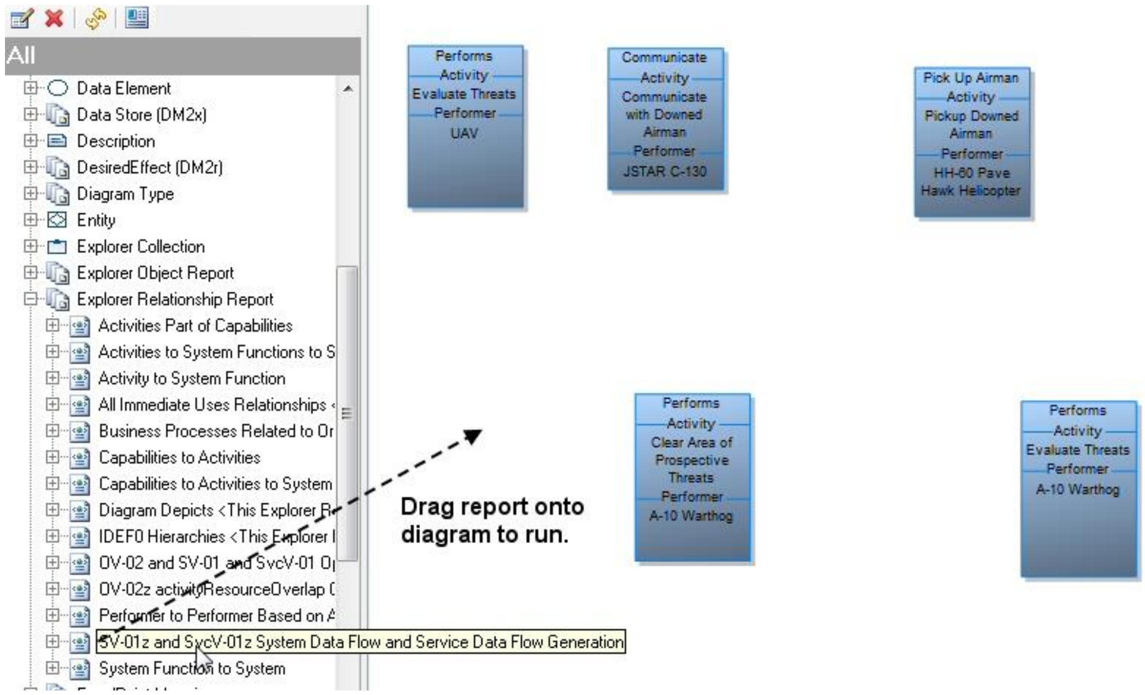
a. Alternatively, right-mouse click on the diagram workspace and click Choices from the popup menu. In the Select and Drag dialog that opens, right-mouse click on it and choose Details to get the details of each ActivityPerformedbyPerformer relationship listed. You may see the System and System Function involved in each relationship already created in the repository, and drag-and-drop one or more relationships onto the diagram.

Explorer Relationship Reports for OpExchange Guidance

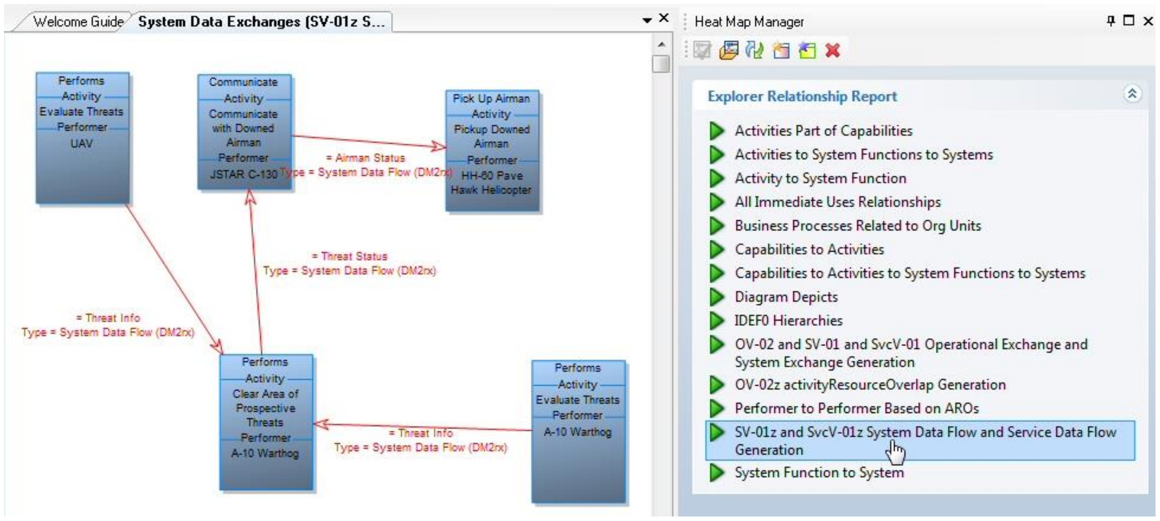
A number of Explorer Relationship reports are available in the **Resource Flow Generation Reports.xml** file, provided on DeveloperWorks. To use these reports, you can import the xml file into each encyclopedia you are using, as follows:

1. Download the **Resource Flow Generation Reports.xml** file from DeveloperWorks.
2. In System Architect, right-mouse click on the Definitions selection in the Explorer (Browser), and select Import XML.
3. Find and select the **Resource Flow Generation Reports.xml** file; use default collision options.

3. After having imported the **Resource Flow Generation Reports.xml** file into the encyclopedia, run the Explorer Relationship report named **SV-01z and SvcV-01 System Data Flow and Service Data Flow Generation**. This is done in one of two ways:
   c. Expand the Definition type, Explorer Relationship Report in the Explorer (Browser), and drag-and-drop the **SV-01z and SvcV-01 System Data Flow and Service Data Flow Generation** definition onto the OV-02z diagram.
   d. Select View, Heat Map Manager to open the Heat Map Manager pane. Click on the Explorer Relationship Report **SV-01z and SvcV-01 System Data Flow and Service Data Flow Generation**.


All
Data Element
Data Store (DM2x)
Description
DesiredEffect (DM2r)
Diagram Type
Entity
Explorer Collection
Explorer Object Report
Explorer Relationship Report
Activities Part of Capabilities
Activities to System Functions to S
Activity to System Function
All Immediate Uses Relationships
Business Processes Related to Or
Capabilities to Activities
Capabilities to Activities to System
Diagram Depicts <This Explorer R
IDEF0 Hierarchies <This Explorer I
OV-02 and SV-01 and SvcV-01 O
OV-02z activityResourceOverlap C
Performer to Performer Based on A
SV-01z and SvcV-01z System Data Flow and Service Data Flow Generation
System Function to System
Performs Activity Evaluate Threats Performer UAV
Communicate Activity Communicate with Downed Airman Performer JSTAR C-130
Pick Up Airman Activity Pickup Downed Airman Performer HH-60 Pave Hawk Helicopter
Drag report onto diagram to run.
Performs Activity Clear Area of Prospective Threats Performer A-10 Warthog
Performs Activity Evaluate Threats Performer A-10 Warthog

*Run the Explorer Relationship report **SV-01z and SvcV-01 System Data Flow and Service Data Flow Generation** by dragging-and-dropping it onto the SV-01z diagram.*


Welcome Guide
System Data Exchanges (SV-01z S...
Performs
Activity
Evaluate Threats
Performer
UAV
Communicate
Activity
Communicate with Downed Airman
Performer
JSTAR C-130
= Airman Status
Type = System Data Flow (DM2rx)
Pick Up Airman
Activity
Pickup Downed Airman
Performer
HH-60 Pave Hawk Helicopter
= Threat Status
Type = System Data Flow (DM2rx)
= Threat Info
Type = System Data Flow (DM2rx)
Performs
Activity
Clear Area of Prospective Threats
Performer
A-10 Warthog
= Threat Info
Type = System Data Flow (DM2rx)
Performs
Activity
Evaluate Threats
Performer
A-10 Warthog
Heat Map Manager
Explorer Relationship Report
Activities Part of Capabilities
Activities to System Functions to Systems
Activity to System Function
All Immediate Uses Relationships
Business Processes Related to Org Units
Capabilities to Activities
Capabilities to Activities to System Functions to Systems
Diagram Depicts
IDEF0 Hierarchies
OV-02 and SV-01 and SvcV-01 Operational Exchange and System Exchange Generation
OV-02z activityResourceOverlap Generation
Performer to Performer Based on AROs
SV-01z and SvcV-01z System Data Flow and Service Data Flow Generation
System Function to System

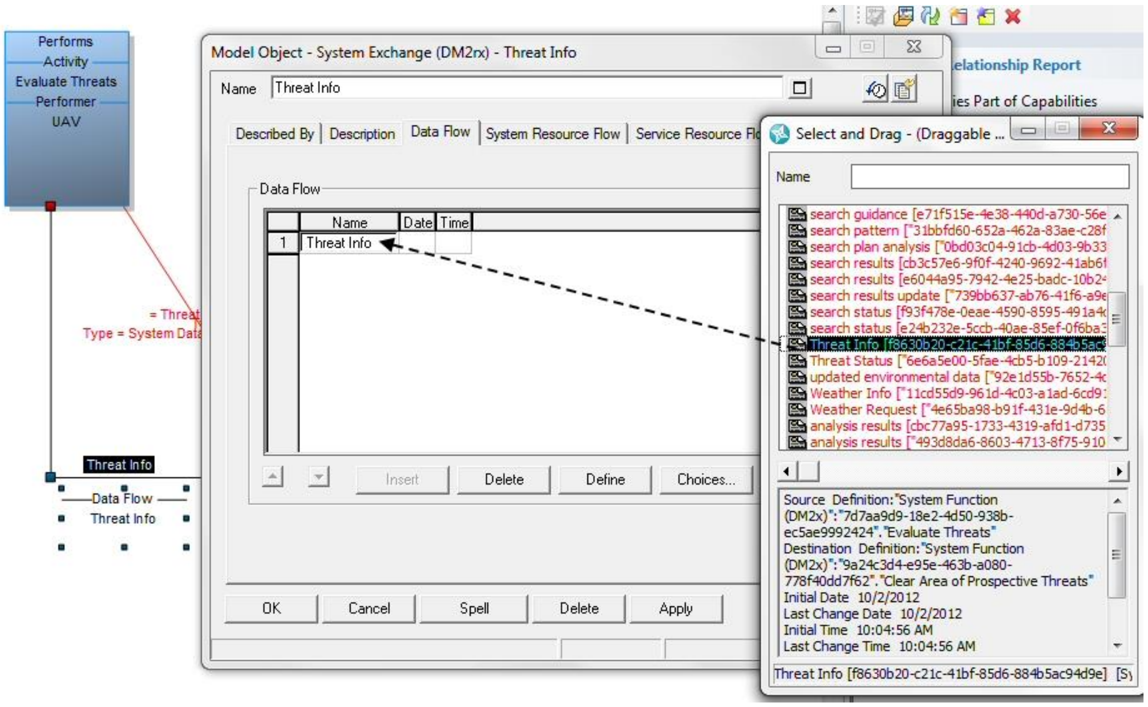
*Run the Explorer Relationship report **SV-01z and SvcV-01 System Data Flow and Service Data Flow Generation** from the Heat Map Manager pane.*

The report runs, providing a visual of what System Exchanges should be formed, and the System Data Flow that should be related to the System Exchange.

The lines drawn are ***not*** relationships formed in the model -- they are simply visualizations of a report run of what relationships ***should*** exist -- based on the logic that says if System A performs System Function A, and System B performs System Function B, and System Function A has a System Data Flow to System Function B, then there is a a System Exchange between System A/System Function A and System B/System Function B. The System Data Flow that causes the inferred relationship is provided as a name of the report line.

<u>Create Operational Exchange Relationships</u>

4. Use the System Exchange line symbol on the Draw toolbar of the SV-01z diagram to draw a System Exchange between a pair of ActivityPerformedbyPerformer symbols on the diagram, using the Explorer Relationship report lines as a guide.
5. In the System Exchange definition, go to the System Data Flow tab to specify the System Data Flow that relates the two Systems involved. Again, use the name of the Explorer Relationship report line as a guide.



Model Object - System Exchange (DM2rx) - Threat Info

Name: Threat Info

Data Flow

	Name	Date	Time
1	Threat Info		

Select and Drag - (Draggable ...

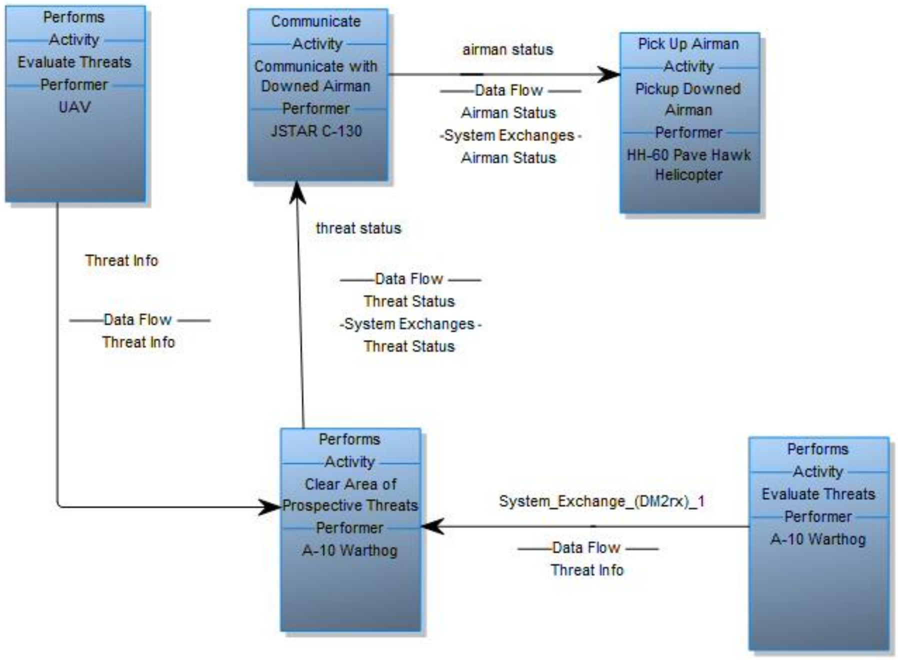
Name

search guidance [e71f515e-4e38-440d-a730-56e
search pattern ["31bbfd60-652a-462a-83ae-c28f
search plan analysis ["0bd03c04-91cb-4d03-9b33
search results [cb3c57e6-9f0f-4240-9692-41ab6f
search results [e6044a95-7942-4e25-badc-10b2
search results update ["739bb637-ab76-41f6-a9e
search status [f93f478e-0eae-4590-8595-491a4
search status [e24b232e-5ccb-40ae-85ef-0f6ba3
Threat Info [f8630b20-c21c-41bf-85d6-884b5ac
Threat Status ["6e6a5e00-5fae-4cb5-b109-2142
updated environmental data ["92e1d55b-7652-4c
Weather Info ["11cd55d9-961d-4c03-a1ad-6cd9
Weather Request ["4e65ba98-b91f-431e-9d4b-6
analysis results [cbc77a95-1733-4319-afd1-d735
analysis results ["493d8da6-8603-4713-8f75-910

Source Definition:"System Function (DM2x)":"7d7aa9d9-18e2-4d50-938b-ec5ae9992424"."Evaluate Threats"
Destination Definition:"System Function (DM2x)":"9a24c3d4-e95e-463b-a080-778f40dd7f62"."Clear Area of Prospective Threats"
Initial Date 10/2/2012
Last Change Date 10/2/2012
Initial Time 10:04:56 AM
Last Change Time 10:04:56 AM

Threat Info [f8630b20-c21c-41bf-85d6-884b5ac94d9e] [Sy

6. Draw a System Exchange matching each of the Explorer Relationship Report lines.
7. Once all System Exchanges have been created, delete the Explorer Relationship lines.



SV-01z diagram with System Exchanges between ActivityPerformedbyPerformer joins.

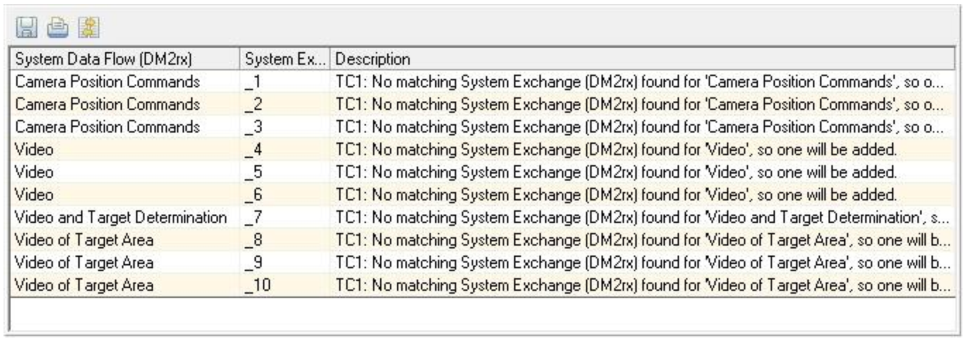
Building the SV-1 Viewpoint

On the SV-01 you model Systems and their need to interface, using System Resource Flow relationship lines. The SV-01 is modeled as follows:

1. If you have started the architecture by building SV-4's, then autogenerate System Resource Flows.
2. Create an SV-01 System Interface Description diagram.
3. Create or drag-and-drop existing Systems onto the diagram. If you have autogenerated System Resource Flows, they will automatically be represented.
4. You may manually relate the Systems with System Resource Flow relationship lines.
5. Within each System Resource Flow, specify the System Exchanges that cause the System Resource Flow to exist, in the Exchanges tab.

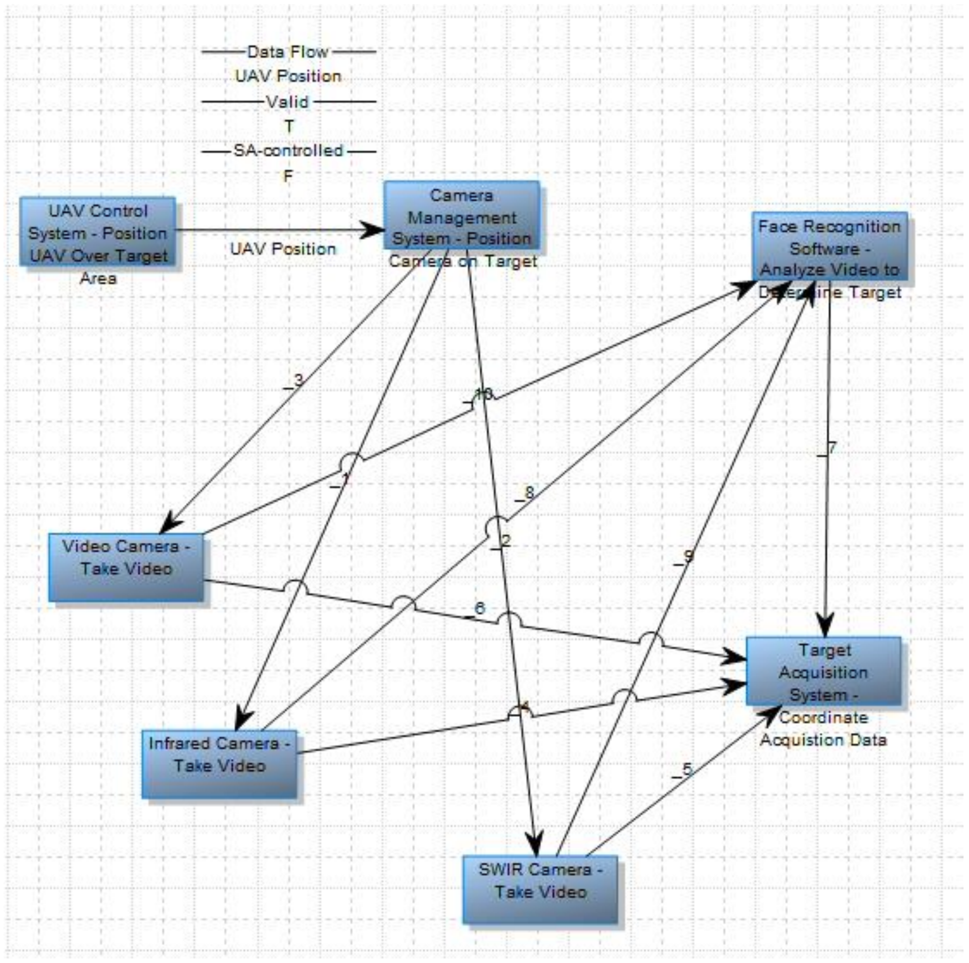
Automatically Generating System Resource Flows

1. Select **Tools, DoDAF2 Utilities, Generate System Exchanges from System Data Flows**.

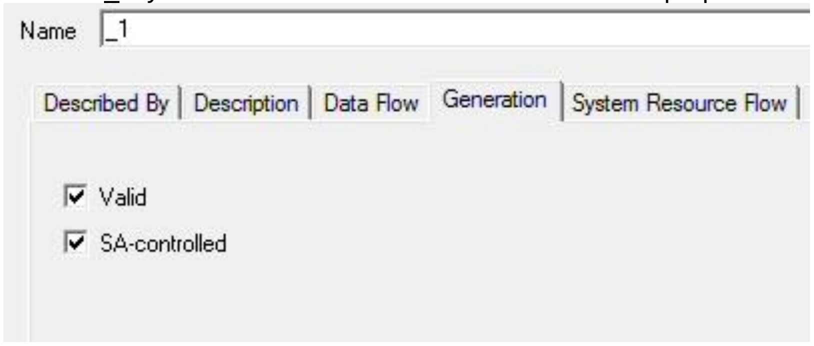


System Data Flow (DM2rx)	System Ex...	Description
Camera Position Commands	_1	TC1: No matching System Exchange (DM2rx) found for 'Camera Position Commands', so o...
Camera Position Commands	_2	TC1: No matching System Exchange (DM2rx) found for 'Camera Position Commands', so o...
Camera Position Commands	_3	TC1: No matching System Exchange (DM2rx) found for 'Camera Position Commands', so o...
Video	_4	TC1: No matching System Exchange (DM2rx) found for 'Video', so one will be added.
Video	_5	TC1: No matching System Exchange (DM2rx) found for 'Video', so one will be added.
Video	_6	TC1: No matching System Exchange (DM2rx) found for 'Video', so one will be added.
Video and Target Determination	_7	TC1: No matching System Exchange (DM2rx) found for 'Video and Target Determination', s...
Video of Target Area	_8	TC1: No matching System Exchange (DM2rx) found for 'Video of Target Area', so one will b...
Video of Target Area	_9	TC1: No matching System Exchange (DM2rx) found for 'Video of Target Area', so one will b...
Video of Target Area	_10	TC1: No matching System Exchange (DM2rx) found for 'Video of Target Area', so one will b...

2. Select Systems from the Explorer tree and drag them onto the diagram. The System Resource Flows between them will automatically visualize.


Data Flow
UAV Position
Valid
T
SA-controlled
F
UAV Control System - Position UAV Over Target Area
UAV Position
Camera Management System - Position Camera on Target
Face Recognition Software - Analyze Video to Determine Target
Video Camera - Take Video
Target Acquisition System - Coordinate Acquistion Data
Infrared Camera - Take Video
SWIR Camera - Take Video
_1
_2
_3
_4
_5
_6
_7
_8
_9
_10

3. Notice that in the diagram above, the System Resource Flow named UAV Position has a note under it that says SA Controled = F (false).
4. If you open the definition of one of the System Exchanges that are numbered – such as '_1' you will notice that Valid and SA-Controlled properties are toggled on.

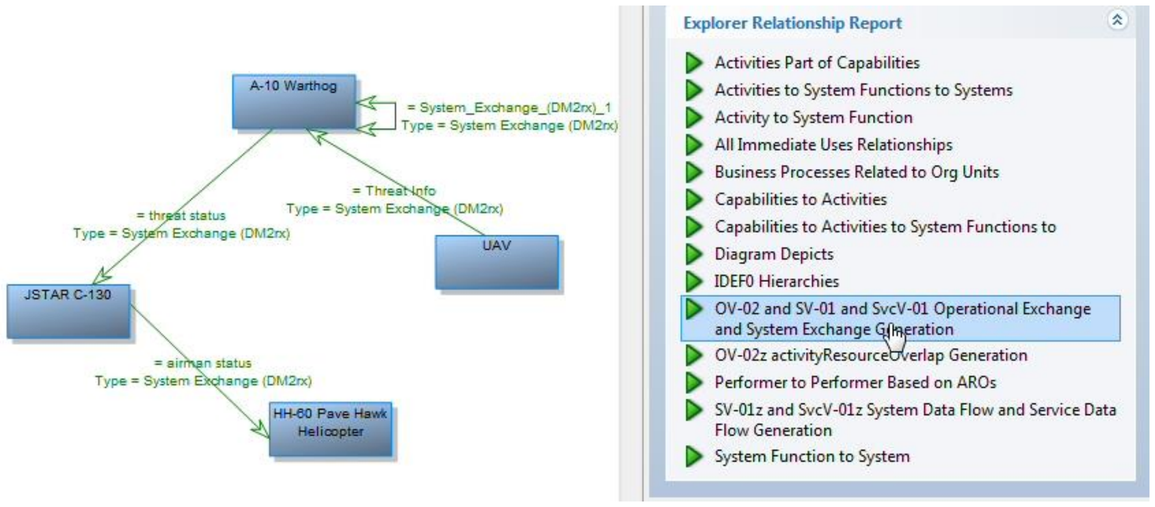


Name: _1

☑ Valid
☑ SA-controlled

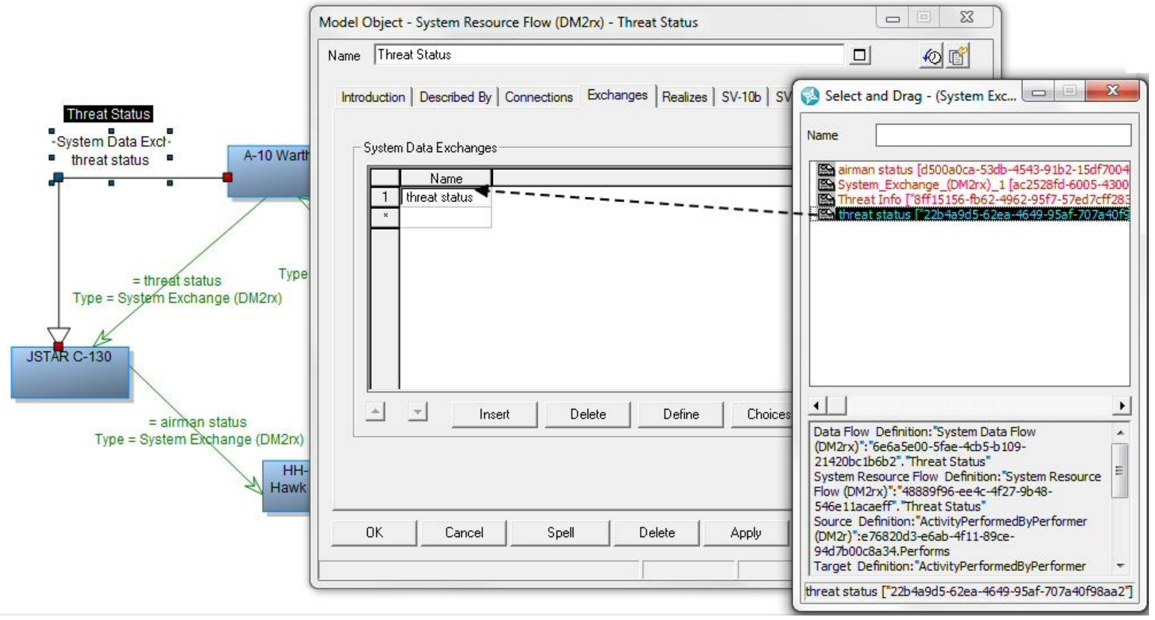
Optional: Aids on Manually Creating SV-01

1. SA provides guidance reports to help you manually create System Resource Flows on an SV-1 if you wish to.
2. On an SV-1, drag-and-drop Systems onto the diagram.
3. Select View, Heatmap Manager to open the Heatmap Manager.
4. From the Heatmap Manager, click on the Explorer Relationship report named **OV-02 and SV-01 and SvcV-01 Operational Exchange and System Exchange Generation.**


A-10 Warthog
= System_Exchange_(DM2rx)_1
Type = System Exchange (DM2rx)
= Threat Info
Type = System Exchange (DM2rx)
= threat status
Type = System Exchange (DM2rx)
UAV
JSTAR C-130
= airman status
Type = System Exchange (DM2rx)
HH-60 Pave Hawk Helicopter
Explorer Relationship Report
Activities Part of Capabilities
Activities to System Functions to Systems
Activity to System Function
All Immediate Uses Relationships
Business Processes Related to Org Units
Capabilities to Activities
Capabilities to Activities to System Functions to
Diagram Depicts
IDEF0 Hierarchies
OV-02 and SV-01 and SvcV-01 Operational Exchange and System Exchange Generation
OV-02z activityResourceOverlap Generation
Performer to Performer Based on AROs
SV-01z and SvcV-01z System Data Flow and Service Data Flow Generation
System Function to System

Explorer Relationship Report run to report on System Resource Flows that should be formed.

5. Draw a System Resource Flow to correspond to each report line on the diagram.
6. In each System Resource Flow, add the System Exchange as specified on the report line.

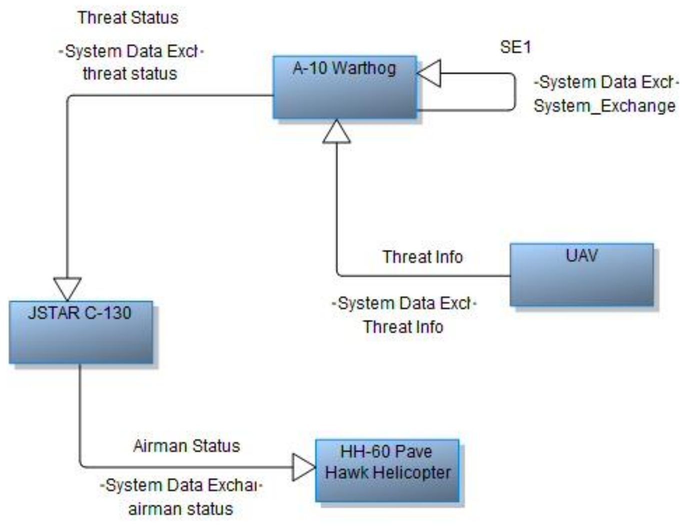

Threat Status
System Data Exch
threat status
A-10 Warth
= threat status
Type = System Exchange (DM2rx)
Type
JSTAR C-130
= airman status
Type = System Exchange (DM2rx)
HH-
Hawk
Model Object - System Resource Flow (DM2rx) - Threat Status
Name
Threat Status
Introduction
Described By
Connections
Exchanges
Realizes
SV-10b
SV
System Data Exchanges
Name
1
threat status
Insert
Delete
Define
Choices
OK
Cancel
Spell
Delete
Apply
Select and Drag - (System Exc...
Name
airman status [d500a0ca-53db-4543-91b2-15df7004
System_Exchange_(DM2rx)_1 [ac2528fd-6005-4300
Threat Info ["8ff15156-fb62-4962-95f7-57ed7cff283
threat status ["22b4a9d5-62ea-4649-95af-707a40f9

Data Flow Definition:"System Data Flow (DM2rx)":"6e6a5e00-5fae-4cb5-b109-21420bc1b6b2"."Threat Status"
System Resource Flow Definition:"System Resource Flow (DM2rx)":"48889f96-ee4c-4f27-9b48-546e11acaeff"."Threat Status"
Source Definition:"ActivityPerformedByPerformer (DM2r)":e76820d3-e6ab-4f11-89ce-94d7b00c8a34.Performs
Target Definition:"ActivityPerformedByPerformer

threat status ["22b4a9d5-62ea-4649-95af-707a40f98aa2"]

Populate System Resource Flow with System Exchange(s) specified by Explorer Relationship report lines.

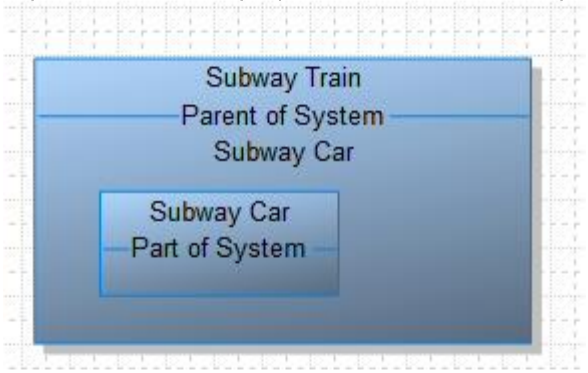
7. Once all System Resource Flows have been created, delete the Explorer Relationship lines.



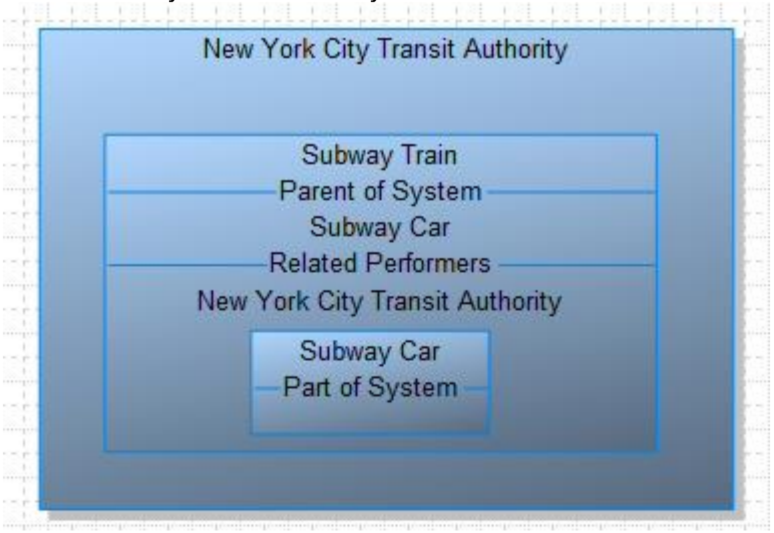
SV-01 shows System Resource Flows between Systems.

Modeling Systems of Systems

On the SV-1 diagram you can simply move one System inside the box of another symbol, and a relationship will automatically be formed (functionality available in SA 11.4.2 and later). In the System definition, there are two properties -- PartOf System (autopopulated to show the parent symbols of a system) and ParentOf System (autopopulated to show the children that the system is parent of. These properties will also auto display on the diagram.



You can move a system inside a Performer and get the same behavior. In the picture below, "New York City Transit Authority" is a Performer.



Modeling Systems of Systems on the SV-1 Alternative

The SV-1 Alternative diagram enables you to model the "Parent Symbol" relationship as a line drawn between two Systems -- same model behavior as on the SV-1, except that on the SV-1 you are forming the relationship via 'box in box' data centricy. (Note: You could on the SV-1 Alternative put one symbol inside the other, then right-mouse click on the line and hide it if you so choose.)

Location of System

You can specify the Location of a Performer in its definition -- within the Related Locations tab.

Location of System Performing Activity

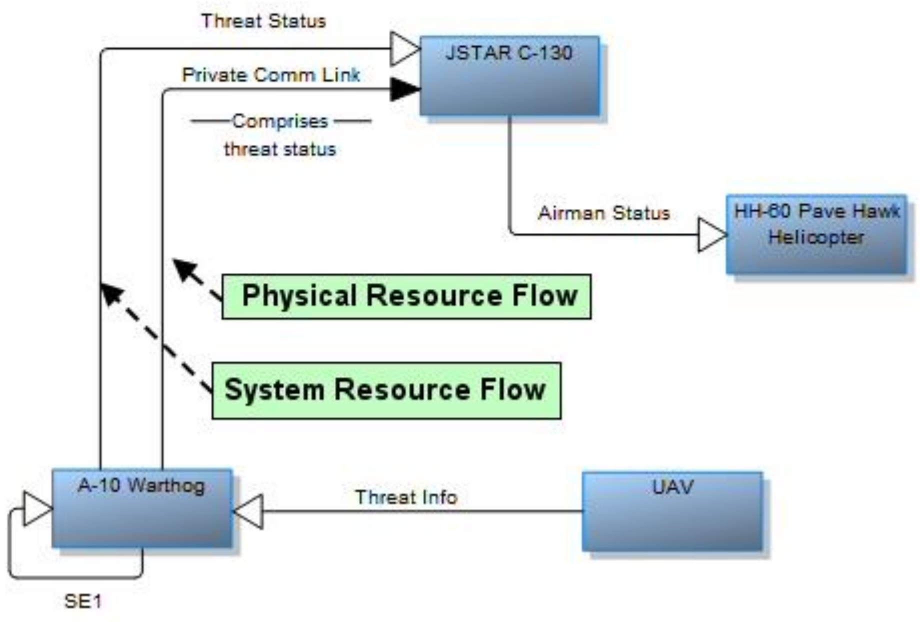
An ActivityPerformedbyPerformer definition has a Location property; so you can model, for example, that a "Subway Car" (system) 'carries passengers' (activity) in NYC (location) -- you'd model this on the ActivtyPerformedbyPerformer relationship between the system and the activity.

You could also model that "Amtrak" (system) 'carries passengers' (activity) between NYC and Washington, DC (location) on another ActivityPerformedbyPerformer relationship between that system and activity. You could also model time (temporal measure) on the ActivityPerformedbyPerformer relationship, as well as other measures and conditions. You can form multiple ActivityPerformedbyPerformer relationships between a system and an activity.

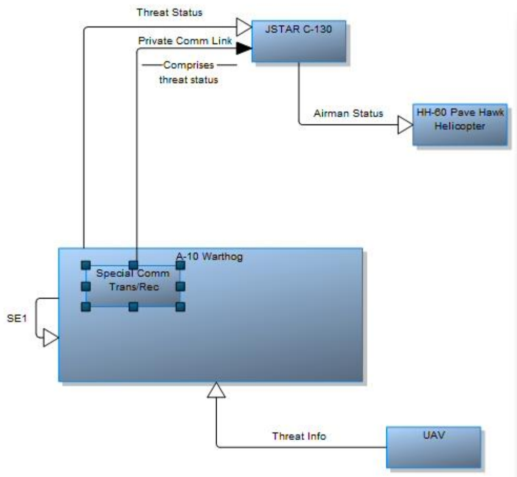
Building the SV-2 Viewpoint

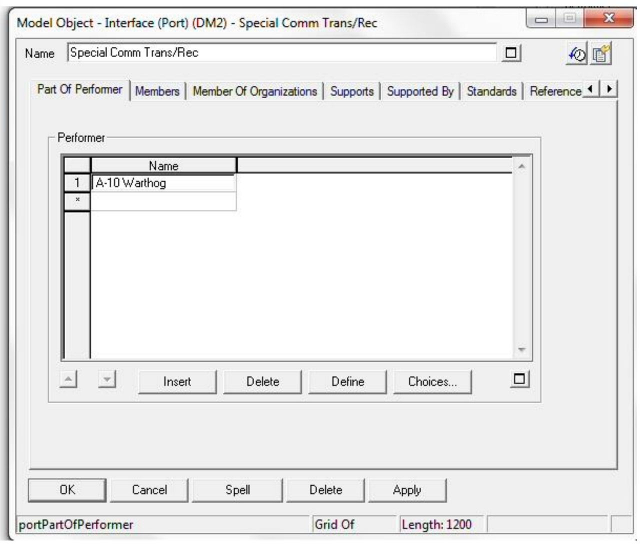
You use the SV-2 to specify the System Resource Flows between Systems and may also specify physical connection information, such as bandwidth or protocol stacks used in connections, in the Physical Resource Flow connection.

The Physical Resource Flow connection allows you to specify System Exchanges that cause an interface between systems.



Alternatively, you may wish to model ports of a system, and connect the systems through the ports. To do this you use a Port symbol, and place it inside the System; data centric behavior automatically updates the definitions to show containment of the port inside the system. You may draw a Physical Resource Flow line between Ports, or between a Port and another System (into a black box of the System, without needing to specify the other System's Port).




Model Object - Interface (Port) (DM2) - Special Comm Trans/Rec

Name: Special Comm Trans/Rec

Part Of Performer | Members | Member Of Organizations | Supports | Supported By | Standards | Reference

Performer

	Name
1	A-10 Warthog

portPartOfPerformer | Grid Of | Length: 1200

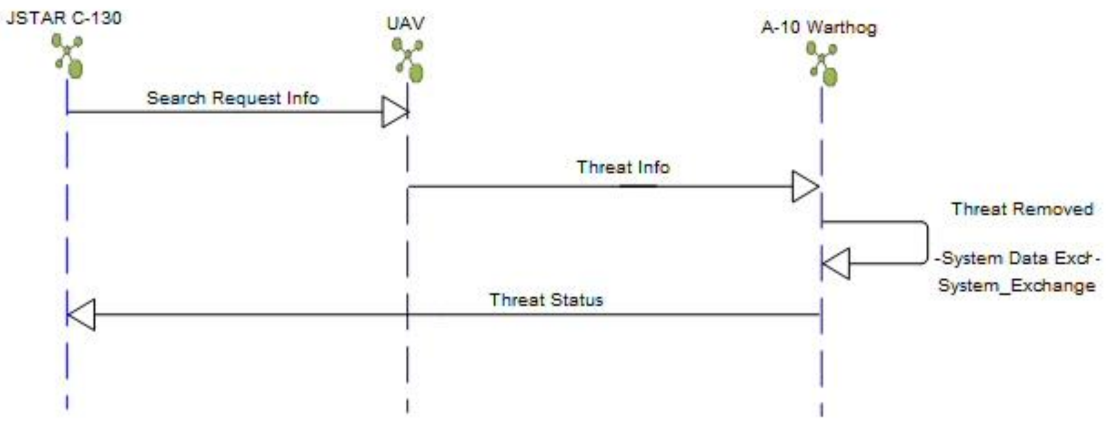
Modeling Timing of System Exchange Between Systems

To model the sequential timing of resource exchange between Systems, you can use one of three different types of SV-10c diagrams:

- SV-10c Systems Event Trace
- SV-10c System Functions Event Trace
- SV-10c Performer-Role Event Trace

SV-10c Systems Event Trace

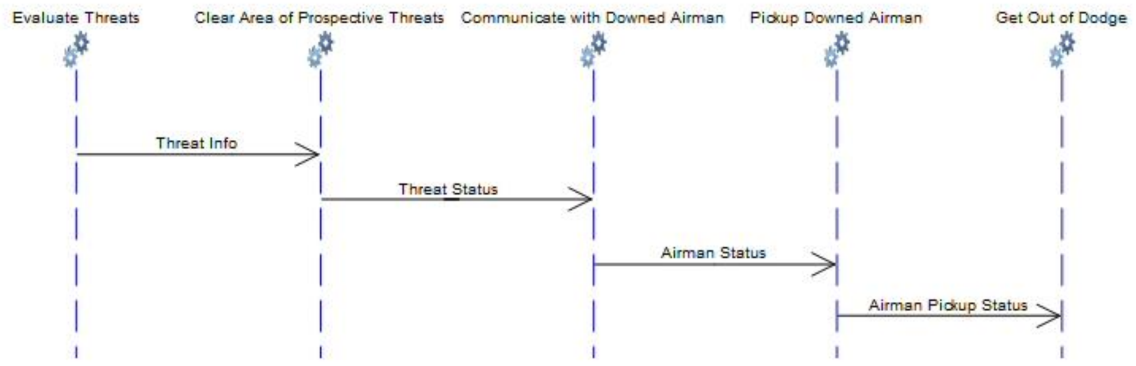
The SV-10c Systems Event Trace enables you to model Systems as vertical 'object lifelines', and System Resource Flows as lines drawn between the Systems, in a chronological fashion.



SV-10c System Functions Event Trace

The SV-10c System Functions Event Trace diagram enables you to focus on System Functions (represented by vertical 'object lifelines') and the System Data Flows as horizontal lines drawn between them, in chronological order from top to bottom on the diagram.

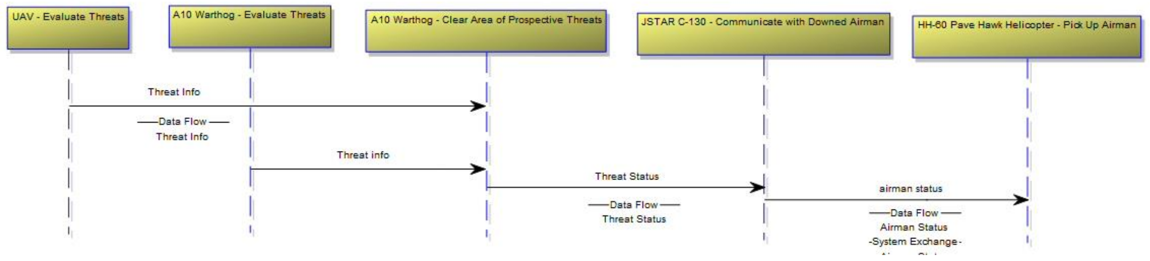
This view is an alternate to the SV-05b, enabling you to model timing.



SV-10c Performer-Role Event Trace

The SV-10c Performer-Role Event Trace enables you to model System Exchanges between ActivityPerformedbyPerformer pairs. This is a powerful view, and an alternate way to build System Exchanges than on the SV-01z diagram.

Each System performing a particular System Function, as represented by an ActivityPerformedbyPerformer relationship, is represented as a vertical 'object lifeline'. You may specify the particular location or time that the System is performing the System Function within the ActivityPerformedbyPerformer definition. System Exchanges are modeled as horizontal lines between the System/System Function lifelines, modeled in chronological order from top to bottom on the diagram.


UAV - Evaluate Threats
A10 Warthog - Evaluate Threats
A10 Warthog - Clear Area of Prospective Threats
JSTAR C-130 - Communicate with Downed Airman
HH-60 Pave Hawk Helicopter - Pick Up Airman
Threat Info
Data Flow
Threat Info
Threat info
Threat Status
Data Flow
Threat Status
airman status
Data Flow
Airman Status
-System Exchange-

Drawing Tip: Use *Diagram Auto Routing* Draw Option

System Architect comes with many drawing and line routing options. One useful option to turn on when drawing an SV-10c type diagram is Diagram Auto Routing. Select **Format, Diagram Auto Routing, Assign Connections** (or **Retain Connections**) to turn it on.

Measures

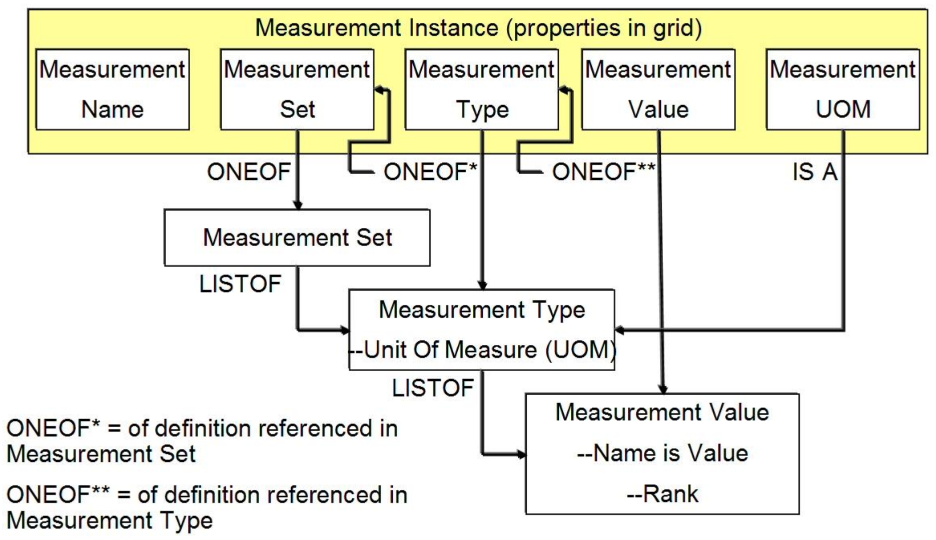
You may specify measures of how things get done or should get done for every DoDAF 2 definition type. An example of a measure is that a website must be operational 24 hours a day, and 7 days a week, or that communication between Performers must have a Security measure of Top Secret.

Measurement Sets, Measurement Types, Measurement Values

Every DoDAF 2 encyclopedia in SA 11.4.2.1 and later comes with a preloaded set of Measurement Set, Measurement Type, and Measurement Value definitions, listed in Appendix A.

There are several types of Measure definition types:

- **Measurement Set** -- a group Measurement Types (for example, **SecurityAttributes**)
- **Measurement Type** -- enables you to specify unit of measure, ranking, and list of values (for example, **Classification** type for the SecurityAttributes measurement set)
- **Measurement Value** -- enables you to specify values measurement types (example, **Top Secret** for the Classification type of the SecurityAttributes measurement set). You may create a set of Measurement Values to provide a preset list of values for a measurement attribute. Each Measurement Value has a Rank property that you may use for comparison purposes in reports, analytics, heatmaps, etc.
- **Measurement Instance** -- enables you to specify a measurement value to associate with a particular model artifact (Ex. S=Secret with ranking of 4). You may choose from a Measurement Type value list or enter your own value. Each Measurement Instance is an instance of Measurement Type and uses the Unit of Measure from Measurement Type. Each Measurement Instance is keyed by Name and GUID which allows duplicate names to be used, with different meaning.



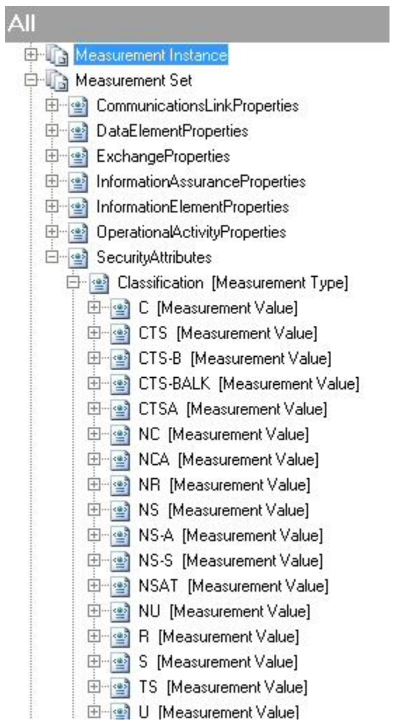
You may add to, delete, or change the Measurement Sets, Measurement Types and Measurement Values without property set changes (No USRPROPS changes).

How to Create and Apply Measurements

To create and apply measures, you do the following:

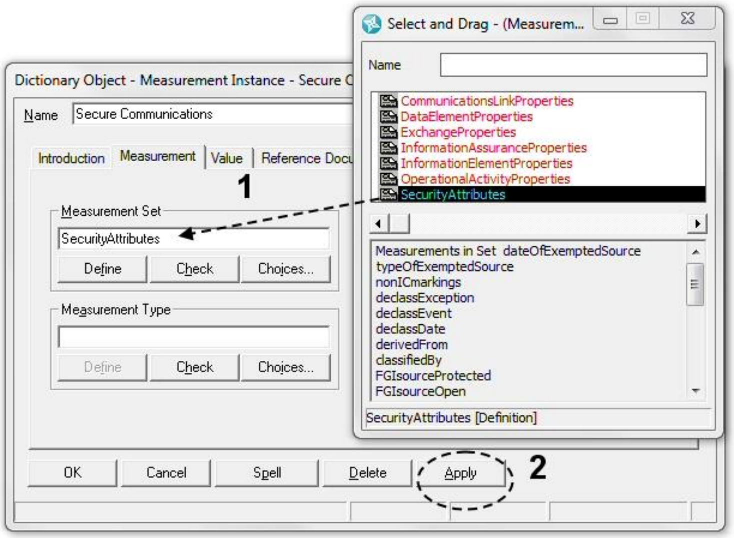
View the Measurement Sets and Types Available

1. Make sure there is a **Measurement Set** you wish to use. In the Explorer (Browser), expand the definition type Measurement Set to see what is available. (Note: you can add a new Measurement Set by creating a new definition.)
2. Make sure there is a **Measurement Type** that you wish to use. Expand Measurement Set to show the Measurement Types available for that Set. (Note: you can add new Measurement Types to a Set by creating new Measurement Type definitions.)
3. Make sure there is a **Measurement Value** that you wish to use. Expand a Measurement Type to see the Measurement Values available for that Type. (Note: you can add new Measurement Values to a Type by creating new Measurement Value definitions.)



```
All
+ Measurement Instance
- Measurement Set
  + CommunicationsLinkProperties
  + DataElementProperties
  + ExchangeProperties
  + InformationAssuranceProperties
  + InformationElementProperties
  + OperationalActivityProperties
  - SecurityAttributes
    - Classification [Measurement Type]
      + C [Measurement Value]
      + CTS [Measurement Value]
      + CTS-B [Measurement Value]
      + CTS-BALK [Measurement Value]
      + CTSA [Measurement Value]
      + NC [Measurement Value]
      + NCA [Measurement Value]
      + NR [Measurement Value]
      + NS [Measurement Value]
      + NS-A [Measurement Value]
      + NS-S [Measurement Value]
      + NSAT [Measurement Value]
      + NU [Measurement Value]
      + R [Measurement Value]
      + S [Measurement Value]
      + TS [Measurement Value]
      + U [Measurement Value]
```

4. Create a Measurement Instance that you will apply to a definition.
5. In the Measurement Instance definition, specify the Measurement Set it belongs to, by clicking on the **Choices** button in the **Measurement Set** field and drag-and-dropping a Measurement Set in.
6. Click **Apply**. (Note that you ***must*** click Apply to see the set of Measurement Types for a Measurement Set in the next step.)



Name: Secure Communications

Measurement Set: SecurityAttributes

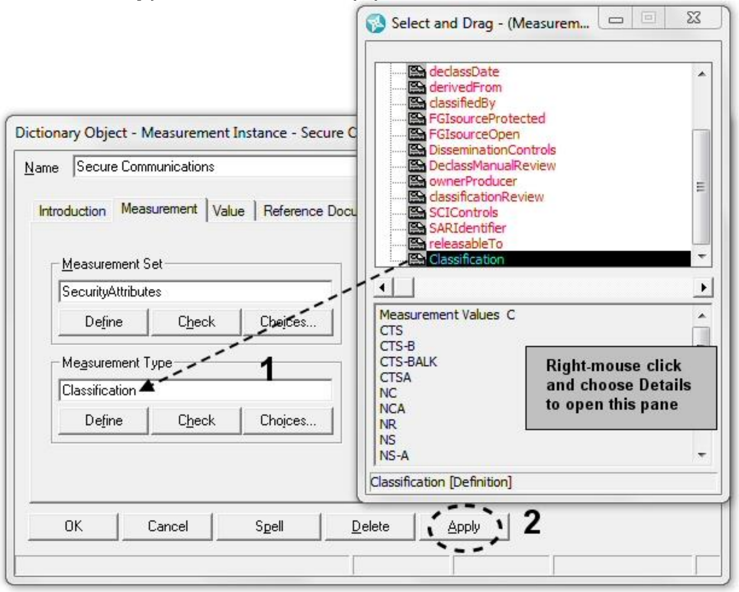
Measurement Type:

CommunicationsLinkProperties
DataElementProperties
ExchangeProperties
InformationAssuranceProperties
InformationElementProperties
OperationalActivityProperties
SecurityAttributes

Measurements in Set dateOfExemptedSource
typeOfExemptedSource
nonICmarkings
declassException
declassEvent
declassDate
derivedFrom
classifiedBy
FGIsourceProtected
FGIsourceOpen

SecurityAttributes [Definition]

7. Specify the Measurement Type the Measurement Instance belongs to, by clicking on the **Choices** button in the **Measurement Type** field and drag-and-dropping a Measurement Type in.
8. Click **Apply**. (Note that you ***must*** click Apply to see the set of Measurement Values for a Measurement Type in the next step.)



Name: Secure Communications

Measurement Set: SecurityAttributes

Measurement Type: Classification

declassDate
derivedFrom
classifiedBy
FGIsourceProtected
FGIsourceOpen
DisseminationControls
DeclassManualReview
ownerProducer
classificationReview
SCIControls
SARIdentifier
releasableTo
Classification

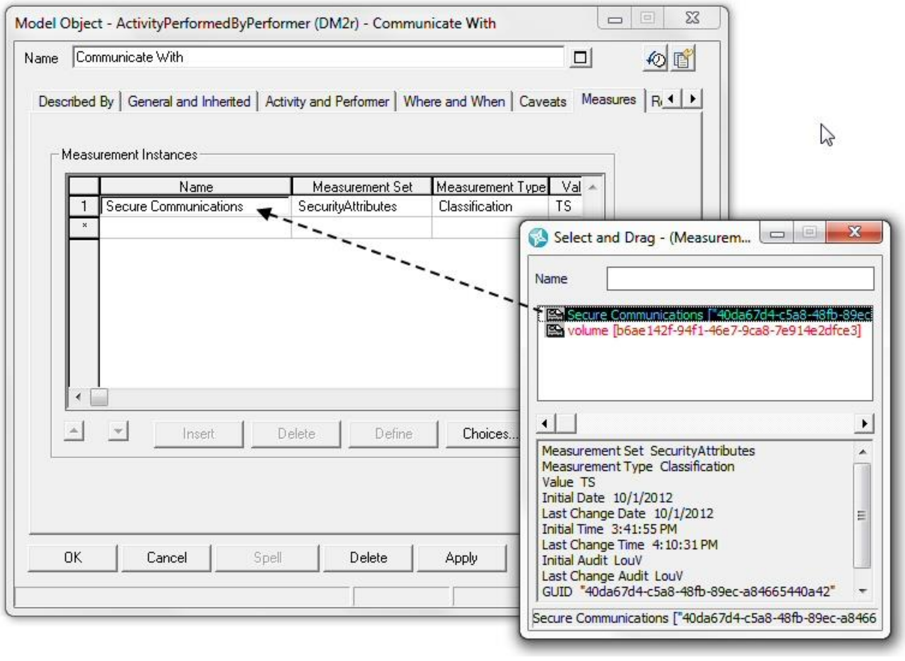
Measurement Values C
CTS
CTS-B
CTS-BALK
CTSA
NC
NCA
NR
NS
NS-A

Right-mouse click and choose Details to open this pane

Classification [Definition]

9. Specify the Measurement Value of the Measurement Instance by clicking on the **Choices** button in the **Measurement Value** field and drag-and-dropping a Measurement Value in.

10. Click **OK** to close and save the new definition.
11. Apply the Measurement Instance to the definition that you wish -- in the example below it is applied to an ActivityPerformedbyPerformer relationship, in this case stating that a *Downed Airman* must communicate with a *JSTAR* through *Secure Communications* that is *Top Secret (TS)* classification.



Name: Communicate With

	Name	Measurement Set	Measurement Type	Val
1	Secure Communications	SecurityAttributes	Classification	TS
*				

Secure Communications ["40da67d4-c5a8-48fb-89ec
volume [b6ae142f-94f1-46e7-9ca8-7e914e2dfce3]

Measurement Set SecurityAttributes
Measurement Type Classification
Value TS
Initial Date 10/1/2012
Last Change Date 10/1/2012
Initial Time 3:41:55 PM
Last Change Time 4:10:31 PM
Initial Audit LouV
Last Change Audit LouV
GUID "40da67d4-c5a8-48fb-89ec-a84665440a42"

Secure Communications ["40da67d4-c5a8-48fb-89ec-a8466

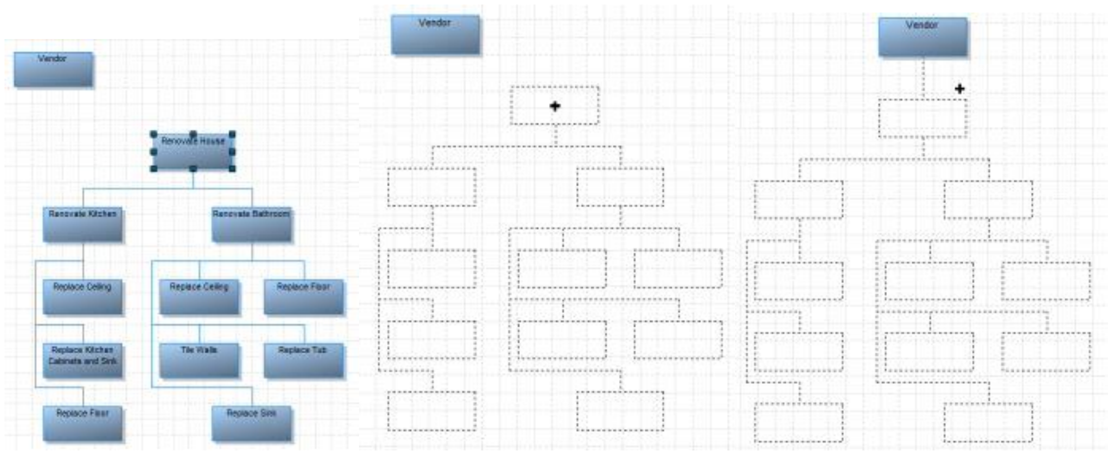
PV-01 Project Portfolio Relationships

The PV-01 viewpoint describes the breakdown of Projects into Sub Projects, and the dependency relationships between organizations and the Projects they own, and the organizational structures needed to manage a portfolio of projects.

Using the Diagram to Build the Model

The ***PV-01 Project Portfolio Relationships*** diagram is a data centric, hierarchically built diagram. It enables the following relationships to be created:

- You may attach a Project to a parent Project by moving it under the parent Project until a connection line appears, auto-connecting the Project to the parent Project. Once you do so, the definition of the parent Project will have its **Project Has Subprojects** property of its Hierarchy tab automatically filled in appropriately, and the definition of the child Project will have its **Project Part of Project** property automatically filled in appropriately.
- You may attach a Project (and its hierarchy) to its owning Organization by moving the Project under the owning Organization symbol until a connection line appears, auto-connecting the Project (and its hierarchy) to the owning Organization. Once you do so, the definition of the owning Organization's **Organization Owns Projects** property in its **Projects** tab will be automatically filled in appropriately, and the definition of the owned Project will have its **Project Owned by Organization** property in its **Organization** tab filled in appropriately.



Creating a hierarchy on the PV-1 diagram: Select ONE symbol and move it and its underlying hierarchy underneath another symbol to form the new hierarchy. In this case, a Project (and all its Sub Projects) is moved underneath an Organizational Unit, and auto-attached. You may also move Projects underneath each other to attach in a hierarchy on the PV-1 diagram. To model Organizations in a hierarchy, use the OV-4 diagram.

Using the Definitions to Build the Model -- Auto Visualizing the Diagram

Further, you may relate the Projects to their owning Projects or sub Projects or owning Organizations within the appropriate definition properties (as stated above), and drag and drop the Project definitions onto the PV-1 diagram -- the diagram and the hierarchical relationships will draw themselves.

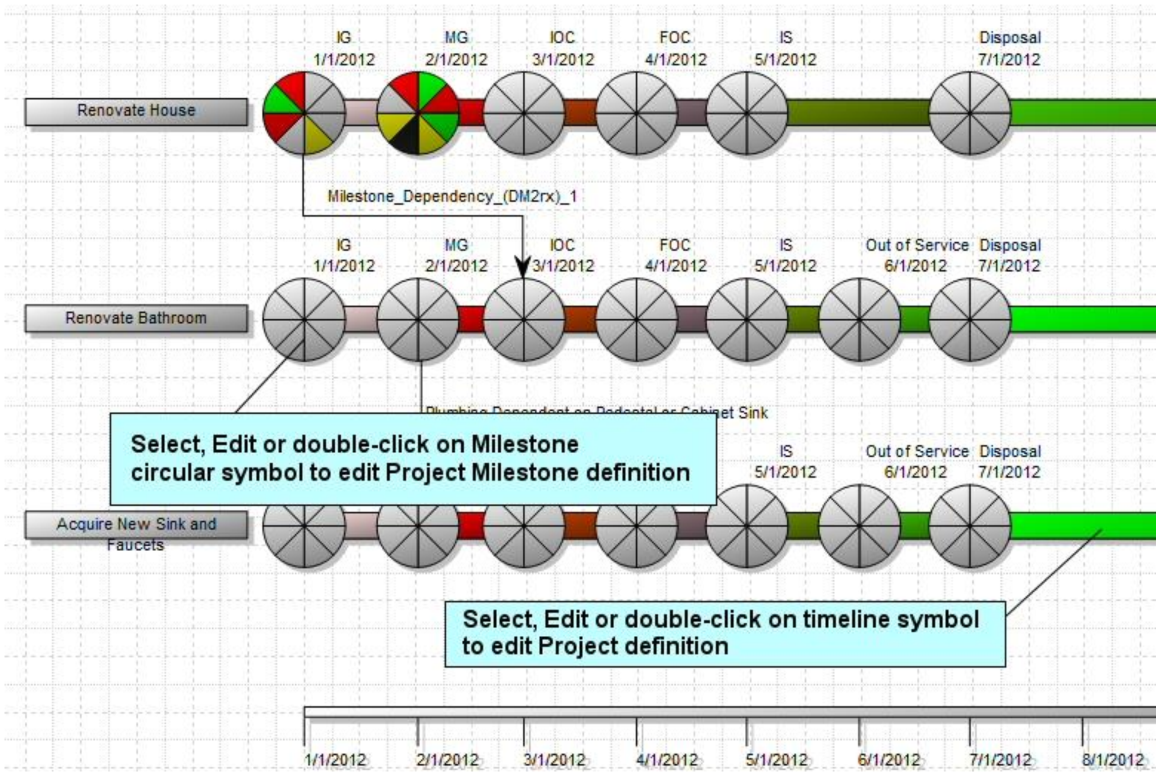
PV-01 Project Portfolio Relationships At Time

The ***PV-01 Project Portfolio Relationships At Time*** diagram is a **non**-data centric diagram that allows you to model Projects and their Hierarchy, and the Organizations that own them at a particular Milestone, or point in time. The Milestone is related to the diagram in the properties of the diagram.

Relationships that you form on this diagram do **not** effect the properties of the definitions on a global basis throughout the repository. This enables you to sketch out Projects and their owning Organizations without committing the changes to a global view.

PV-02 Project Timelines

A Project is a plan or scheme for a task that takes place over a period of time. It contains Milestones. The ***PV-2 Project Timelines*** diagram enables you to visualize a program or portfolio of Projects and their Milestones based on a timeline. You may also visualize interdependencies of Projects.



Select, Edit or double-click on Milestone circular symbol to edit Project Milestone definition

Select, Edit or double-click on timeline symbol to edit Project definition

You may specify that the Project tracks or does the following:

- **Desired Effect(s)** of the Project -- Desired Effect is a primary definition type in DoDAF 2. You may specify the Desired Effect of a Project on page 2 of the **DoDAF 2** tab of the Project definition. The Desired Effect definition must be created first, then dragged into the Project definition's Desired Effect field using the Choices button.
  - Example: A Desired Effect of the Project to "Renovate Kitchen" is "Modernize Kitchen So House Can Be Rented".
- **Activities** that are performed during the Project.
- **Capabilities that the Project enables at Each Milestone** -- you may specify the Capabilities that the Project enables at each Project Milestone. This is done in the Capability definition, within **the CV-3** tab -- click on Choices and populate the **Capability Increments** property with the Milestone at which it is enabled. (If you right-mouse click

anywhere in the **Select and Drag** dialog and click on **Details**, you can see the Project that each Milestone is associated with in the Details window.)

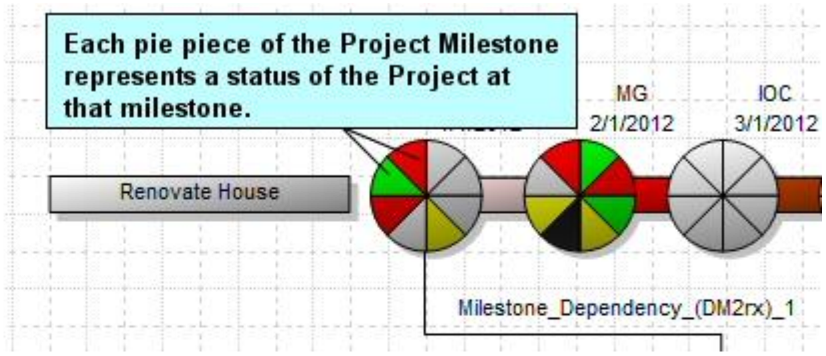
- **Hierarchy of Projects** -- You can specify whether the Project has Sub Projects, or is itself a Sub Project reporting to a Parent Project. This is done either in the Hierarchy tab of the definition of a Project or by visualizing/creating/editing the hierarchy on the **PV-1 Project Portfolio Relationships** diagram.
  - In the Hierarchy tab of the Project definition, you may specify that the Project is part of a higher-level Project in the **Part of Project** property. The parent Project must be already created in the repository; you click on Choices to drag it into the field.
  - You may specify that a Project has sub Projects in the **Project Has Sub Projects** field of the Hierarchy tab of the Project definition. You may automatically visualize the hierarchy of projects by dragging them onto the PV-1 Project Portfolio Relationships diagram. You may also use the diagram to place projects in a hierarchy (thereby editing the appropriate project definitions).
- **Who owns the Project** -- you may specify the Organization or Person that own the Project in the Organization tab of the Project definition.
- **Described By** -- this property enables you to provide a description of the Project through a reusable set of Information definitions. You must create the Information definition first, via the Explorer (Browser), and then drag it into the Project definition. The alternative is to use the Description textual property of the Project definition.
- **Measures --** you may specify Measures for the Project. You must create the Measure definition first (and any of its subtypes) via the Explorer (Browser) and then drag and drop the Measure definition into the Project definition.

Note: You may edit the Project timeline symbol by selecting to edit (or double-clicking on) its horizontal bar symbol. You may edit the Milestone of a Project timeline symbol by selecting to edit (or double-clicking on) its circle symbol.

You may also draw Dependency lines between Milestones of different projects, thereby modeling the interdependencies between the Project stages.

Project Milestones

Milestones are represented as circles positioned on the project's timeline bar. Each Milestone circle is divided into sections so that it resembles a pie. Each section of the Milestone 'pie' represents a particular **Project Thread** that you are tracking, such as Equipment, Logistics, Infrastructure, Organization, Doctrine, Information, Personal, and Training. The color of the pie section represents the **status** of that particular Project Thread at that Milestone, as specified later on this page.


Each pie piece of the Project Milestone represents a status of the Project at that milestone.
MG
2/1/2012
IOC
3/1/2012
Renovate House
Milestone_Dependency_(DM2rx)_1

Default Set of Project Milestones

For DoDAF 2, System Architect provides a standard set of Milestones which you can change (described later on this page). The standard set of Milestones is as follows:

- IG (Initial Gate)
- MG (Main Gate)
- IOC (Initial Operational Capability): The first attainment of the capability to employ effectively a weapon, item of equipment, or system of approved specific characteristics, and which is manned and operated by an adequately trained, equipped, and supported military force or unit.
- FOC (Full Operational Capability): Full capability to employ effectively a weapon, item of equipment, or system of approved specific characteristics, and which is manned and operated by an adequately trained, equipped, and supported military force or unit.
- IS (In Service)
- Out of Service
- Disposal

Creating Your Own Standard Set of Default Milestones for Projects

You may create your own set of Milestones for any Project. You may also set up a standard set of Milestones so that all new Projects that you add to a diagram automatically have the standard set. This is accomplished through use of the "Model Project" specified for an encyclopedia, within the Project definition set. All DoDAF 2 encyclopedias are prepopulated with a Project definition named "Model Project", and this project has the default set of Milestones. If you change the Milestones in this definition, then all new Projects will have your default set of Milestones through inheritance -- the milestones specified in this ‘Model Project' become the default milestone set for all new Projects drawn on a PV-2 diagram (if there are no existing Projects on the diagram).

1. In the **Definitions** grouping of the Rational System Architect Explorer (Browser) of a DoDAF 2 encyclopedia, navigate to the Project definition.
2. Notice that there is a Project named **Model Project**. This definition instance is loaded into the encyclopedia upon creation of any DoDAF 2 encyclopedia.
3. Open the **Model Project**.
4. Either leave the standard set of Milestones, or add your own.

Milestones filtered by topmost project, phase colors come from settings in topmost project: this setting may be set in the PV-02 diagram properties. When toggled on, it causes the following behavior: If there is at least one Project already drawn on an PV-2 diagram, then any additional new Projects drawn on the diagram will contain Milestones as specified in the top-most Project on the diagram.

Projects dragged onto a diagram from the Explorer (Browser) will display the Milestones contained in their definition – not the ones specified in the Model Project template definition, or the ones on the top-most Project on the diagram. Therefore, you may create a diagram that has a heterogeneous group of Project definitions.

Running Rules Checks for Creation of Milestones

Rules checks can be run to make sure that the Milestones on the diagram are in correct chronologic order based on their Milestone Date property (for example, Stage_2 always comes after Stage_1, and Stage_3 always comes after Stage_2, etc). You may run the Rules Check manually by selecting **Reports**, **Rules Check**.

You have the following options available for Rules Checks for the PV-2 diagram, available in the **Behavior** tab of the diagram's property dialog (either select **Edit, Diagram Properties** with the PV-2 diagram open, or right-mouse click on the diagram workspace and select **Diagram Properties**):

- **Base rules check on topmost project** - Rules checks are run to make sure that the Milestones on the diagram are in correct chronologic order based on their Milestone Date property. The Rules Check can be based on the "Model Project" or on the top-most Project on a diagram. To specify that the rules check be based on the top-most Project on a diagram, toggle this property on. Rules checks for new diagrams are based on the Model Project unless you toggle on this option.
- **Run rules check automatically** - As mentioned above, you may run the Rules Check manually by selecting **Reports**, **Rules Check**. If you toggle on the **Run rules check automatically** option, the Rules Check will run automatically when you open a diagram or draw symbols on it.

Milestone Types and Status

Each Milestone of a Project tracks the following threads:

- Equipment
- Logistics
- Infrastructure
- Organization
- Doctrine
- Information
- Personnel
- Training

You may specify the status of each of these threads for each Milestone on the **Project Threads** tab of the Milestone definition. Each status of a Milestone thread is represented on the Milestone pie-chart symbol by the following colors:

Milestone Types and Status Colors

- Not Specified -- White
- No Outstanding Issues -- Green
- Manageable Issues -- Yellow
- Critical Issues -- Red
- Not Known -- White
- Not Required -- Black

You may change these colors, and add new ones, by adjusting the metamodel via usrprops.txt. You may specify up to a maximum of eight statuses. For the out-of-box property set for this diagram, see C:\Program Files (x86)\IBM\Rational\System Architect Suite\System Architect\Property Set\dodaf2_pv2.cfg.

Filtering the Milestones Appearing on a Diagram

You are allowed to place Projects that have a disparate set of Milestones on a diagram. If you want to view these projects in terms of their common Milestones, toggle on the Diagram property named **Milestones filtered by topmost project, phase colors come from settings in topmost project**. To do this, perform the following steps:

1. Open the diagram's property dialog (either select **Edit, Diagram Properties** with the PV-2 diagram open, or right-mouse click on the diagram workspace and select **Diagram Properties**).
2. In the **Behavior** tab, toggle on the following setting: **Milestones filtered by topmost project, phase colors come from settings in topmost project.**

With this setting turned on, only the Milestones that exist in the top-most Project on the diagram will be displayed within all of the Projects on the diagram. Also, the in-between-Milestone phase colors for all Projects will also abide by what is set in the top-most Project.

Specifically, with this property set, all Milestones take their **Following Color** value from the common Milestones on the top-most Project. For example, let’s say you have two Projects on a diagram –Project_1 and Project_2, where Project_1 is the top-most project. Each Project has a Milestone named Stage_1. The **Following Color** property of Stage_1 Milestone on Project_1 is set to red, and the **Following Color** property of Stage_1 Milestone on Project_2 is set to blue. If you toggle this property on, then on the diagram, the color of the Project line after the Stage_1 Milestone on Acquisition Project_2 will be red (not blue).

Also, with this property set, all Projects take their **Pre-First Milestone Color** from the top-most project. So if the Pre-First Milestone Color property for Project_1 is green, and the Pre-First Milestone Color property for Project_2 is black, then on the diagram both Project lines will have a green color before their Stage_1 Milestone.

Setting Pink as the Default Color for the Pre-First Milestone

You may set the color of the Project timeline appearing before the first milestone to default to pink.

1. Open the diagram's property dialog (either select **Edit, Diagram Properties** with the AcV-2 diagram open, or right-mouse click on the diagram workspace and select **Diagram Properties**).
2. In the **Behavior** tab, toggle on the following setting: **Use pink as the default only for the pre-first milestone color when not filtering.**

Toggling this option on sets pink as the color of the Acquisition Project line before the first milestone, unless you have set a color in the Pre-first Milestone Color property in the Acquisition Project definition. This toggle choice is overridden if you have toggled on the **Milestones filtered by topmost project…** property.

Adding a Key Symbol (or Legend) to the Diagram

You may select the **Key** tool from the toolbar and place one on a PV-2 diagram. The Key symbol provides the Legend describing the color coding used for Milestones and Phases. The Key (or

Legend) is automatically based on all milestones in all projects on the diagram. Color codes for Milestone Project Thread Status can only be changed by altering the metamodel via usrprops.txt.

Milestone Dependency Line

You can use the Milestone Dependency line to indicate the direction of the flow of data as it moves from one point in the system to another.

Note: You may attach a diagram to a Milestone symbol as a 'child' diagram through normal Rational System Architect procedures. The child-diagram indicator is placed over the name of the Milestone (not to the upper left-hand corner as is normally done). This is because the name of a Milestone is forced to be outside the Milestone pie-chart symbol; it cannot be made to be inside the symbol.

Timeline

A Timeline symbol is automatically drawn once a PV-2 diagram has been created. The Timeline indicates the period over which the Project development is shown. The following properties apply:

- **Start Date**
- **End Date**
- **Interval Number**
- **Interval Units** displayed as : **Day**, **Month**, **Quarter**, **Week**, and **Year**.

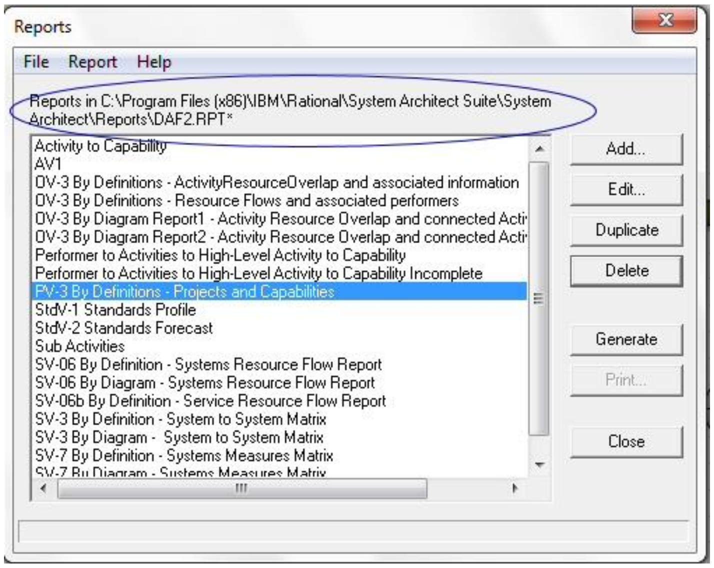
You may edit the Timeline through normal definition editing techniques -- double-clicking on the Timeline symbol on the diagram, right-mouse clicking on the symbol and choosing Edit Timeline, or selecting the symbol and choosing Edit, Edit Timeline from the main menu.

PV-3

The PV-3 is a report that generates all Projects, a description of each Project, and the Capabilities that it enables.

The PV-3 report is run by doing the following:

1. Select **Reports, Report Generator**. The Reports dialog will open. You need to be in the **DAF2.rpt** file -- the top of the dialog specifies what report file you are in.

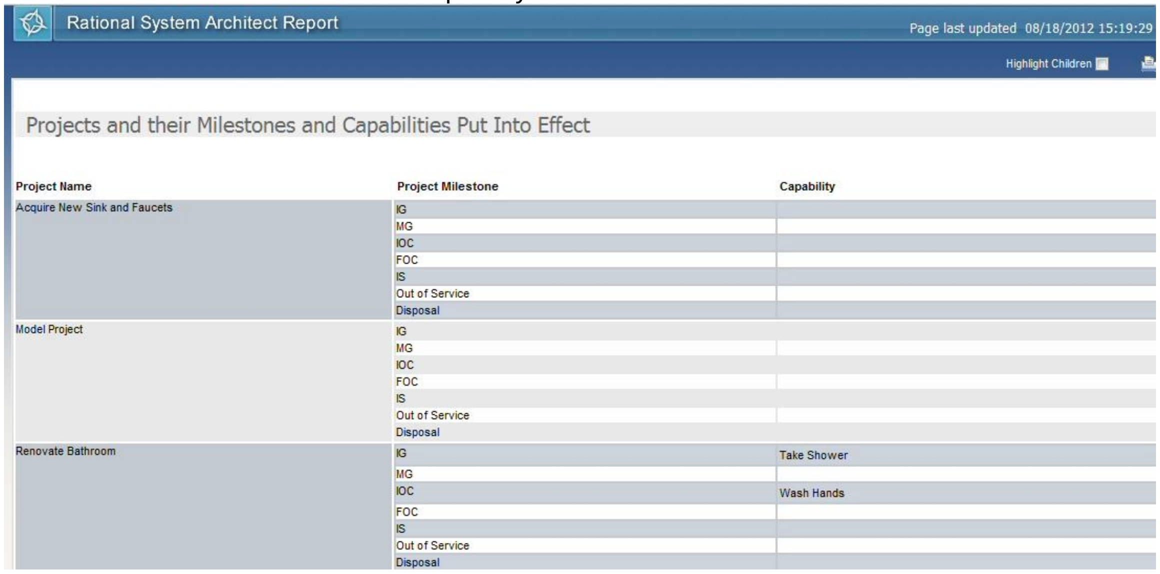


Reports in C:\Program Files (x86)\IBM\Rational\System Architect Suite\System Architect\Reports\DAF2.RPT*

Activity to Capability
AV1
OV-3 By Definitions - ActivityResourceOverlap and associated information
OV-3 By Definitions - Resource Flows and associated performers
OV-3 By Diagram Report1 - Activity Resource Overlap and connected Acti
OV-3 By Diagram Report2 - Activity Resource Overlap and connected Acti
Performer to Activities to High-Level Activity to Capability
Performer to Activities to High-Level Activity to Capability Incomplete
PV-3 By Definitions - Projects and Capabilities
StdV-1 Standards Profile
StdV-2 Standards Forecast
Sub Activities
SV-06 By Definition - Systems Resource Flow Report
SV-06 By Diagram - Systems Resource Flow Report
SV-06b By Definition - Service Resource Flow Report
SV-3 By Definition - System to System Matrix
SV-3 By Diagram - System to System Matrix
SV-7 By Definition - Systems Measures Matrix
SV-7 By Diagram - Systems Measures Matrix

2. If you are not in DAF2.rpt, do the following -- select **File, Open Report File**, and in the **Report File Selection** dialog, select **DAF2.rpt.**
3. In the **Reports** dialog, select **PV-3 By Definitions -- Projects and Capabilities** and press **Generate** (or simply double click on the report).

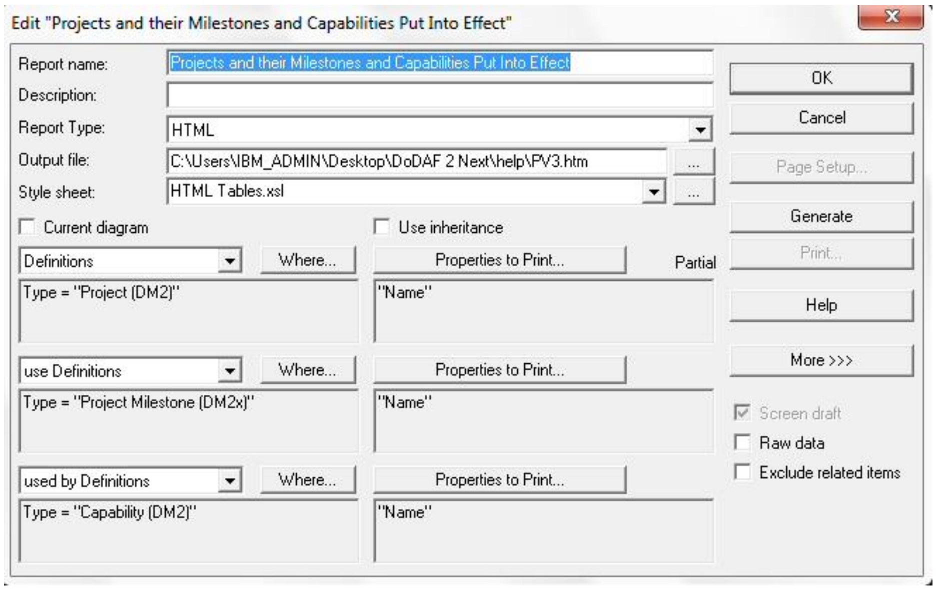
You may of course click Edit and adjust the out-of-box report, by adding additional properties for to publish for a Project. Below is a custom PV-3 report, which shows Projects, their Milestones, and the Capabilities enabled at each Milestone -- in our example, a new shower is added to a bathroom renovation to enable the capability "Take Shower".


Rational System Architect Report
Page last updated 08/18/2012 15:19:29
Highlight Children

Projects and their Milestones and Capabilities Put Into Effect

Project Name	Project Milestone	Capability
Acquire New Sink and Faucets	IG	
	MG	
	IOC	
	FOC	
	IS	
	Out of Service	
	Disposal	
Model Project	IG	
	MG	
	IOC	
	FOC	
	IS	
	Out of Service	
	Disposal	
Renovate Bathroom	IG	Take Shower
	MG	
	IOC	Wash Hands
	FOC	
	IS	
	Out of Service	
	Disposal	

The report above utilizes the "Partial" command at the upper-most layer -- in the Properties to Print for Project, the Partial command was toggled on, so that all Milestones for every Project are output to the report, and then the Capabilities enabled at each Milestone of a Project.


Edit "Projects and their Milestones and Capabilities Put Into Effect"

Report name: Projects and their Milestones and Capabilities Put Into Effect

Description:

Report Type: HTML

Output file: C:\Users\IBM_ADMIN\Desktop\DoDAF 2 Next\help\PV3.htm

Style sheet: HTML Tables.xsl

☐ Current diagram ☐ Use inheritance

Definitions — Type = "Project (DM2)" — Properties to Print: "Name"

use Definitions — Type = "Project Milestone (DM2x)" — Properties to Print: "Name"

used by Definitions — Type = "Capability (DM2)" — Properties to Print: "Name"

☑ Screen draft
☐ Raw data
☐ Exclude related items

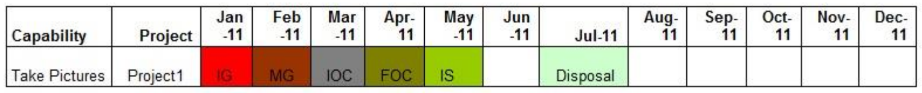
CV-03 -- Generating the Capability Phasing Report

The CV-03 shows the planned achievement of capability at different points in time or during specific periods of time. The CV-3 shows the capability phasing as activities, conditions, desired effects, rules complied with, resource consumption, production, and measures. It does so without regard to the performer and location solutions.

The CV-3 report can be used to assist in the identification of:

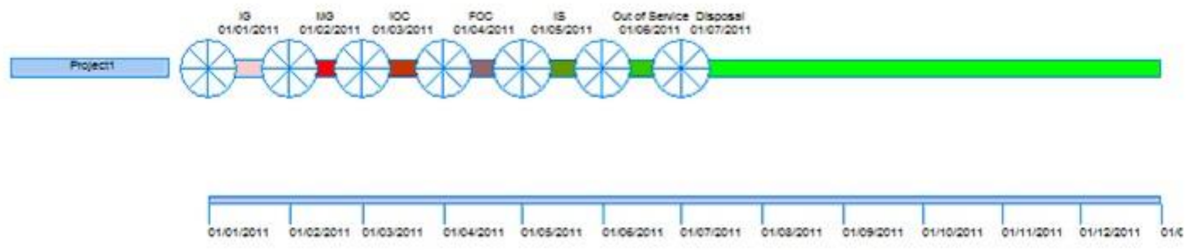
- capability shortfalls (no fielded capability to fulfill a particular **function**) or
- capability duplication (multiple fielded capabilities for a single function).

The CV-03 report, output to Excel, provides a roadmap of Capabilities that are fielded over time, and the name of the Project Milestone at which the Capability is fielded. It also colors the cell containing the Project Milestone with the color that signifies that phase of the Project -- the color is specified on the **Phase** tab of the Project Milestone's definition, in the **Following Color** property. An empty cell signifies that a Project Milestone is not associated with a Capability,



Capability	Project	Jan -11	Feb -11	Mar -11	Apr-11	May -11	Jun -11	Jul-11	Aug-11	Sep-11	Oct-11	Nov-11	Dec-11
Take Pictures	Project1	IG	MG	IOC	FOC	IS		Disposal					

The example CV-03 report above was generated from the PV-2 data shown below:



In Project1, each milestone is associated with the Capability ***Take Pictures***, except for the 'Out of Service' milestone, which causes that milestone to not be generated to the CV-03 report, causing a gap to appear.

In such a scenario:

- No sorting is applied to milestones, if more than one milestone is placed in an interval cell.
- All milestones which match, or are later than a time interval and before the following time interval, are listed within that interval.
- The cell color is set to the following color of the *first* milestone that matches the interval (if more than one milestone is placed in a time interval).
- Gaps are shown where a project milestone associated with an interval are not assigned to the capability.

Before you begin

To be able to generate the CV-3 report, you must first relate one or more Capabilities to the Project Milestone(s) each is achieved at, as follows:

1. Create one or more Capability (DM2) definitions.

2. Create one or more Projects with Milestones -- this is done by creating one or more Project (DM2) definitions in the Explorer (browser) or by modeling them on PV-01 or PV-02 diagrams.

3. Relate a Capability to the Project Milestone(s) it is achieved at -- on the CV-03 tab of the Capability (DM2) definition, click on the Choices button (see Important Note below) and drag-and-drop the Project Milesone(s) into the **Capability Increments** grid. You are saying that at this point in the Project, this Capability becomes available.

    - **Important Note:** In the **Select and Drag** dialog for Project Milestones, right-mouse click and select **Details**. You will see a summary of each Milestone that you select in the dialog, and can view its Project at the top of the Details dialog.

4. If you wish to change the Milestone Date while in the Capability definition, select the Capability in the **Capability Increment** grid, and click the Define button (you cannot change the date in the read-only grid).

Procedure

In Rational System Architect, you generate the CV-03 as a report, as follows:

1. Click the **Reports** menu and select **DoDAF2 Reports> CV-03 Capability Phasing Report**.

2. Specify the **Start date**, **End date**, **Timescale units ,and Interval.**

3. Click **OK**. The report is automatically generated to Microsoft Excel.

    Tip: If the report is empty ensure that **Project Milestones** are assigned to the capabilities. See Before You Begin section above.

Results

The Capability Phasing Report opens in a Microsoft Excel Spread sheet. The report contains the name of each Resource related to a Capability in the appropriate cells of the spreadsheet, per each Milestone Date of its related Acquisition Project. Each cell is colored with the Following Color property of each milestone.

More Information

For more information on DoDAF 2 and System Architect, please visit the following resources:

UNICOM® Systems, Inc. A Division of UNICOM Global	System Architect product pages on Unicomsi.com	http://unicomsi.com/products/system-architect/
YouTube	System Architect Train on Youtube	https://www.youtube.com/user/SystemArchitectTrain
	System Architect on Twitter	https://twitter.com/unicom_sa
	System Architect on Facebook	https://www.facebook.com/SystemArchitect/
	System Architect on Pinterest	https://www.pinterest.com/systemarchitect/

Appendix A -- List of Preloaded Measurement Sets, Types, and Values

Every time a System Architect encyclopedia is created, it is preloaded with a set of Measurement Sets, Types, and Values, as specified in the table below.

In order to adjust the list of preloaded definitions for Measurement Set, Measurement Type, and Measurement Value, you adjust the content in the csv files in the CSV Import\DoDAF2 directory of System Architect's program directory (usually <C>:\Program Files (x86)\IBM\Rational\System Architect Suite\System Architect\CSV Import\DoDAF2, as follows:

- 1457.csv -- contains preloaded Measurement Sets
- 1458.csv -- contains preloaded Measurement Types
- 1459.csv -- contains preloaded Measurement Values

Measurement Set	**Measurement Type**	**Measurement Value**
CommunicationsLinkProperties	capacity	
	infrastructureTechnology	
DataElementProperties	accuracy	
	content	
	formatType	
	mediaType	
	scope	
	unitOfMeasurement	
ExchangeProperties	Classification	C: Confidential CTS: Cosmic Top Secret CTS-B: Cosmic Top Secret - Bohemia CTS-BALK: Cosmic Top Secret -- Balk CTSA: Cosmic Top Secret Atomal NC: NATO Confidential NCA: NATO Confidential Atomal NR: NATO Restricted NS: NATO Secret NS-A: NATO Secret -- Atomal NSAT: NATO Secret Atomal NS-S: NATO Secret NU: NATO Unclassified R: Restricted Data (US Nuclear Information or For Official Use Only) S: Secret TS: Top Secret

		U: Unclassified
InformationAssuranceProperties	accessControl	
	availability	
	confidentiality	
	disseminationControl	
	integrity	
	nonRepudiationProducer	
	nonRepudiationConsumer	
InformationElementProperties	accuracy	
	content	
	language	
	scope	
OperationalActivityProperties	cost	
SecurityAttributes	Classification	C: Confidential CTS: Cosmic Top Secret CTS-B: Cosmic Top Secret - Bohemia CTS-BALK: Cosmic Top Secret -- Balk CTSA: Cosmic Top Secret Atomal NC: NATO Confidential NCA: NATO Confidential Atomal NR: NATO Restricted NS: NATO Secret NS-A: NATO Secret -- Atomal NSAT: NATO Secret Atomal NS-S: NATO Secret NU: NATO Unclassified R: Restricted Data (US Nuclear Information or For Official Use Only) S: Secret TS: Top Secret U: Unclassified
	DeclassManualReview	
	DisseminationControls	
	FGIsourceOpen	
	FGIsourceProtected	
	SARIdentifier	
	SCIControls	

	classificationReview	
	classifiedBy	
	dateOfExemptedSource	
	declassDate	
	declassEvent	
	declassException	
	derivedFrom	
	nonICmarkings	
	ownerProducer	
	releasableTo	
	typeOfExemptedSource	