Cameo and DoDAF Training – OV-5a & OV-5b

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DM23-0977

Agenda

1. DoDAF Operational Viewpoint Refresher
2. DoDAF OV-5a Operational Activity Decomposition Tree
3. DoDAF OV-5b Operational Activity Process Diagrams

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DoDAF Operational Viewpoint Refresher

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What is DoDAF*?

DoD Architecture Framework (DoDAF) – provides visualization infrastructure for specific stakeholders concerns through viewpoints organized by various views.

DoDAF Viewpoints

* Department of Defense Architecture Framework

https://dodcio.defense.gov/Library/DoD-Architecture-Framework/

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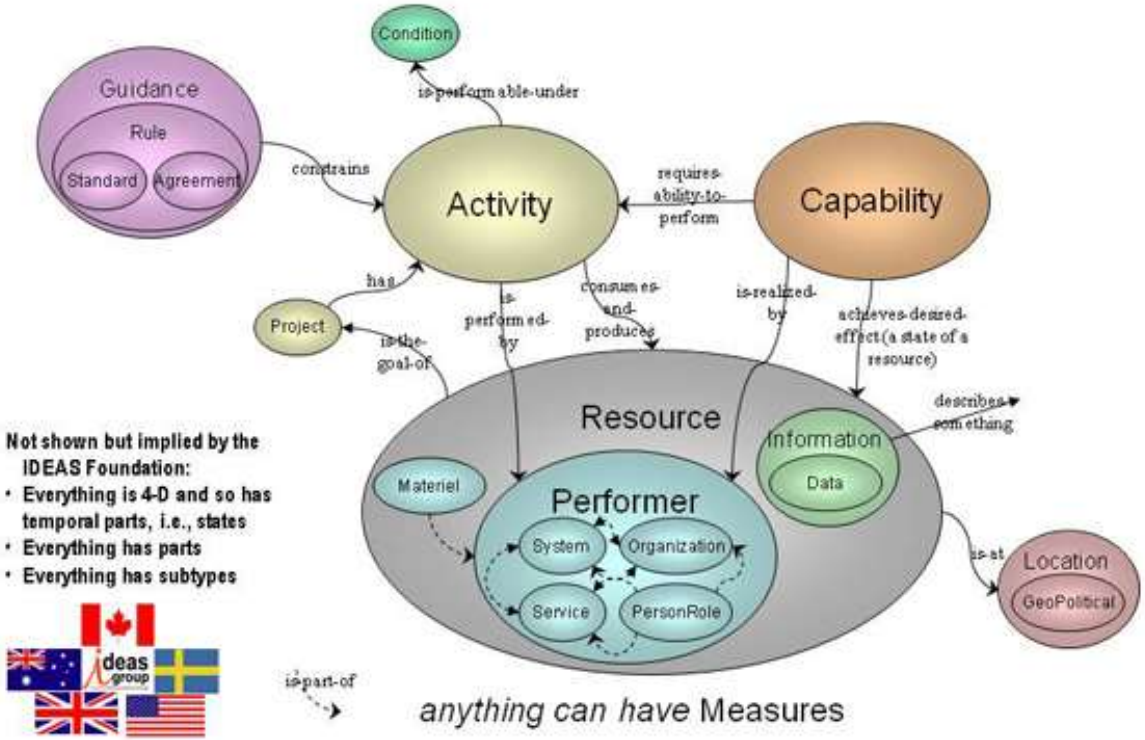
Architecture Concepts



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Key Definitions

Activity - A parameterized Behavior represented as a coordinated flow of Actions. It transforms inputs into outputs or changes their state.

Capability

- A high-level specification of the enterprise's ability to execute a specified course of action.
- The ability to achieve a desired effect under specified (performance) standards and conditions through combinations of ways and means (activities and resources) to perform a set of activities.

Operational Performer

- A logical entity that Is Capable To Perform Operational Activities which produce, consume and process resources. An Operational Performer can represent a system, module, human or physical device.
- Any aggregation of human and/or automated entity that performs an activity and provides a capability.

Operational Exchange - An Operational Exchange is formed when an activity of one operational node consumes items produced by the activity of another operational node.

An Operational Exchange describes the characteristics of the exchanged item which may be audio, video, image, text, etc. Characteristics include content, format, throughput requirements, security or classification level, timeliness requirements, and degree of interoperability.

Information Element - An Information Element is an item of information that flows between Operational Performers and is produced and consumed by the Activities that the Operational Performers are capable to perform.

Resource – Data, Information, Performers, Materiel, or Personnel Types that are produced or consumed.

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Operational Viewpoint Overview

Describes the tasks and activities, operational elements, and resource flow exchanges required to conduct operations to achieve a mission or goal

Identifies what needs to be accomplished and who does it

OV-1 – High-level operational concept diagram

OV-2 – Description of Operational Activity Interfaces/Resource flow exchanges

OV-3 – Description of Operational Activity Interfaces/Resource flows with relevant attributes

OV-4 – Organizational Chart with relationships among organizations

OV-5 – Functional Analysis of Operational Activities

OV-6 – Functional Analysis that includes Rules, States and Event-Trace

OV-7 (DoDAF v1.5) – Logical Data model; **DIV-2** in DoDAF v2.02

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DoDAF Operational Viewpoint (OV)

Describe the tasks and activities, operational elements, and resource flow exchanges required to conduct operations. A pure operational model is materiel independent. However, operations and their relationships may be influenced by new technologies, such as collaboration technology, where process improvements are in practice before policy can reflect the new procedures. There may be some cases in which it is necessary to document the way activities are performed, given the restrictions of current systems, to examine ways in which new systems could facilitate streamlining the activities. In such cases, operational models may have materiel constraints and requirements that need to be addressed. For this reason, it may be necessary to include some high-level system architectural data to augment information in the operational models.

OV-1 High Level Operational Concept

- Describes a mission, class of mission, or scenario.
- Shows the main operational concepts and any interesting or unique operational aspects.
- Describes the interactions between the subject architecture and its environment, and between the architecture and external systems.
- A pictorial representation of the written content of the AV-1 Overview and Summary Information. Graphics alone are not sufficient for capturing the necessary architectural data.

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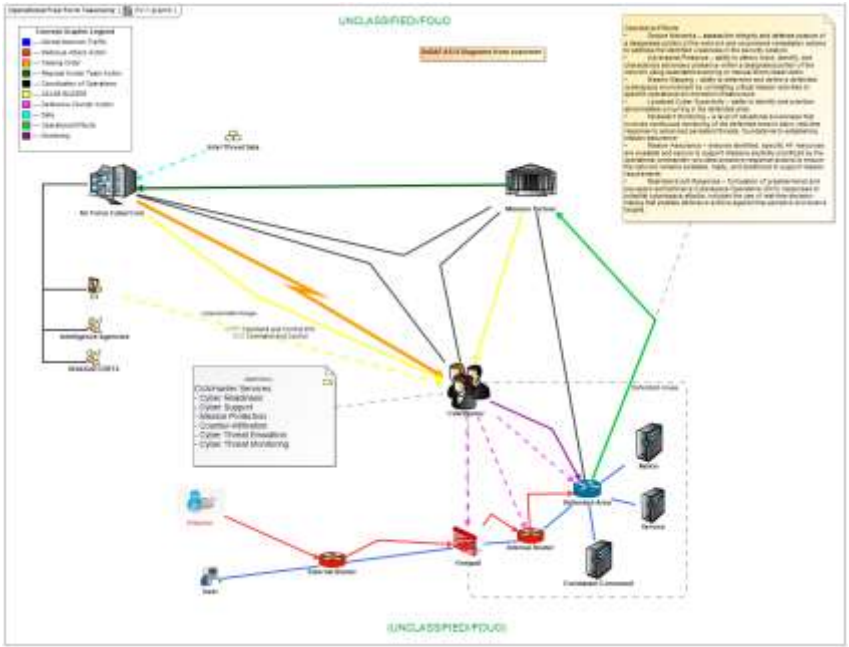
DoDAF Operational Viewpoint (OV) Cont.

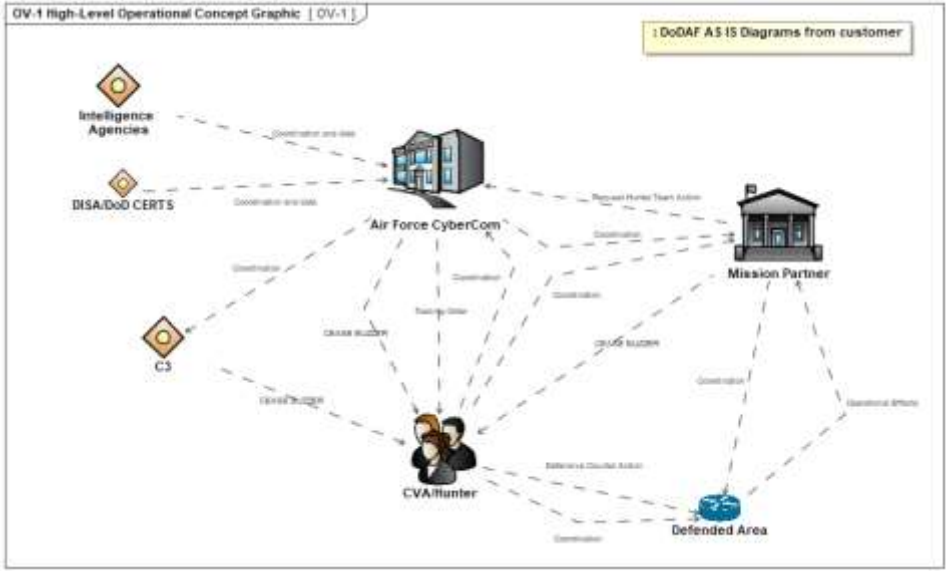
Operational Concept Graphic in model

- OV-1 graphic



OV-1 in model

- High Level Operational Concept



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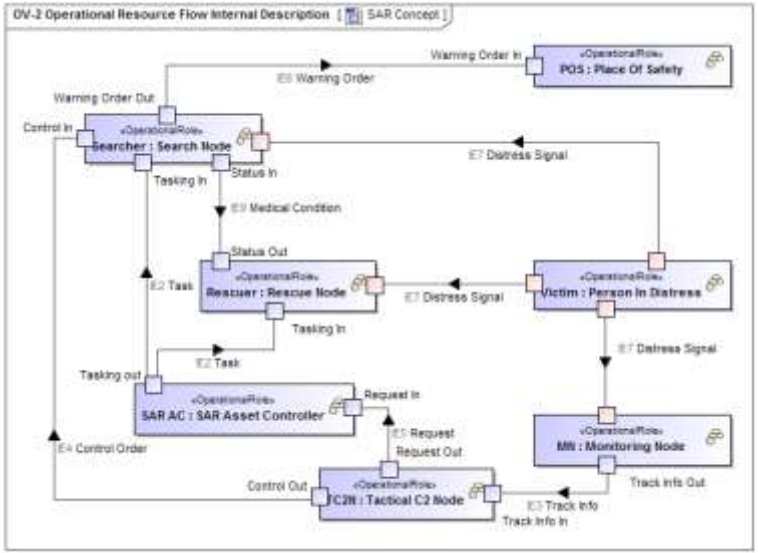
DoDAF Operational Viewpoint (OV) Cont.

OV-2 Operational Resource Flow Description

- Applies the context of the operational capability to a community of anticipated users.
- Defines the capability requirements within an operational context.
- May be used to express a capability boundary.
- A specific application is to describe a logical pattern of resource (information, funding, personnel, or materiel) internal flows.
  - Operational Activities in model
  - Operational Performers in model



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DoDAF Operational Viewpoint (OV) Cont.

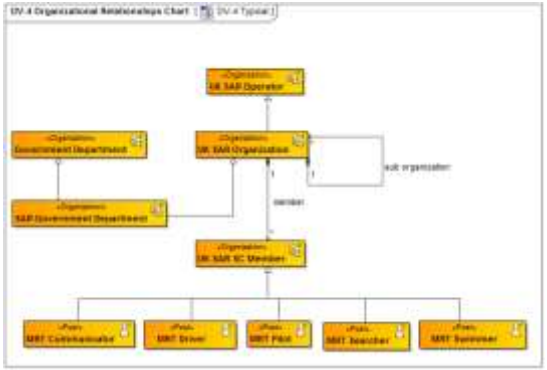
OV-3 Operational Resource Flows

- Addresses operational Resource Flows exchanged between Operational Activities and locations.
- Provides further detail of the interoperability requirements associated with the operational capability of interest. The focus is on Resource Flows that cross the capability boundary.
  - OV-3 Resource Flow Matrix in model
  - OV-3 Role-Based Matrix in model

#	Exchange ID	Operational Exchange Item	Sending Role	Sending Operational Performer	Receiving Role	Receiving Operational Performer	Producing Operational Activity	Consuming Operational Activity
1	OE1	Warning Order	Searcher	Search Node	POE	Place Of Safety	Send Warning Order	Process Warning Order
2	OE2	Medical Condition	Searcher	Search Node	Rescuer	Rescue Node	Monitor Health	Recover Victim Provide Medical Assistance
3	OE2	Medical Condition	Searcher	Search Node	Rescuer DE	Rescue Node	Monitor Health	Recover Victim Provide Medical Assistance
4	OE2	Medical Condition	Searcher	Search Node	Rescuer NE	Rescue Node	Monitor Health	Recover Victim Provide Medical Assistance
5	OE3	Distress Signal	Victim	Person In Distress	Rescuer	Rescue Node	Send Distress Signal	Receive Distress Signal
6	OE3	Distress Signal	Victim	Person In Distress	Rescuer NE	Rescue Node	Send Distress Signal	Receive Distress Signal
7	OE3	Distress Signal	Victim	Person In Distress	Rescuer DE	Rescue Node	Send Distress Signal	Receive Distress Signal
8	OE4	Distress Signal	Victim	Person In Distress	MH	Monitoring Node		
9	OE6	Track Info	MH	Monitoring Node	TCJN	Tactical C2 Node		
10	OE7	Control Order	TCJN	Tactical C2 Node	Searcher	Search Node		
11	OE8	Request	TCJN	Tactical C2 Node	SAR AC	SAR Asset Controller		
12	OE9	Task	SAR AC	SAR Asset Controller	Rescuer	Rescue Node		
13	OE9	Task	SAR AC	SAR Asset Controller	Rescuer DE	Rescue Node		
14	OE9	Task	SAR AC	SAR Asset Controller	Rescuer NE	Rescue Node		
15	OE12	Task	SAR AC	SAR Asset Controller	Searcher	Search Node		
16	OE13	Distress Signal	Victim	Person In Distress	Searcher	Search Node	Send Distress Signal	Receive Distress Signal

OV-4 Operational Relationships Chart

- Shows organizational structures and interactions. The organizations shown may be civil or military.
- Exists in two forms; role-based (e.g., a typical brigade command structure) and actual (e.g., an organization chart for a department or agency).



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DoDAF Operational Viewpoint (OV) Cont.

OV-5a Operational Activity Decomposition Tree & OV-5b Operational Activity Model

- Describes the operations that are normally conducted in the course of achieving a mission or business goal.
- Describes operational activities (or tasks); Input/Output flows between activities, and to/from activities that are outside the scope of the architectural description.
- Describes the operational activities that are being conducted within the mission or scenario.

OV-5b Operational Activity Model diagrams are based on the Business Process Model and Notation (BPMN) Process Diagram (BPD). They describe a sequence or flow of activities in an organization that shows how the business works. They show activities, events, and data that trigger or feed business activities.

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DoDAF Operational Viewpoint (OV) Cont.

OV-6a Operational Rules Model

- Specifies operational or business rules that are constraints on the way that business is done in the enterprise. At a top-level, rules should at least embody the concepts of operations defined in the OV-1 High Level Operational Concept Graphic and provide guidelines for the development and definition of more detailed rules and behavioral definitions that should occur later in the architectural definition process.

#	Applies To	Rule Specification	Rule Kind
1	Search Node Rescue Node Monitoring Node	Respond to emergencies 24 hours a day	Constraint
2	Rescue Node	Minimize the risk of pollution of the marine environment from ships	Constraint

OV-6b Operational State Transition Description

- A graphical method of describing how an Operational Activity responds to various events by changing its state.
- Represents the sets of events to which the Activities respond (by taking an action to move to a new state) as a function of its current state. Each transition specifies an event and an action.
- May be used to describe the detailed sequencing of activities or work flows in the business process.
- Useful for describing critical sequencing of behaviors and timing of operational activities that cannot be adequately described in the OV-5b Operational Activity Model.
- Relates events and states. A change of state is called a transition. Actions may be associated with a given state or with the transition between states in response to stimuli (e.g., triggers and events).

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DoDAF Operational Viewpoint (OV) Cont.

OV-6c Operational Event-Trace Description

- Provides a time-ordered examination of the Resource Flows as a result of a particular scenario. Each event-trace diagram should have an accompanying description that defines the particular scenario or situation.
- Sometimes called sequence diagrams, event scenarios, or timing diagrams
- Allows the tracing of actions in a scenario or critical sequence of events.
- May be used by itself or in conjunction with an OV-6b State Transition Description to describe the dynamic behavior of activities.

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DoDAF OV-5a Operational Activity Decomposition Tree

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OV 5a & 5b Terms

Operational Activity – An action performed in conducting the business of an enterprise. It is a process or task that can be at any level of the OV-5 hierarchy and is used to portray operational actions **NOT** hardware/software system functions

Operational Performer – A logical entity that "Is Capable To Perform" Operational Activities which produce, consume and process resources. An Operational Performer can represent a system, module, human or physical device

Operational Exchange [**]** – An Operational Exchange is formed when an activity of one operational node consumes items produced by the activity of another operational node. An Operational Exchange describes the characteristics of the exchanged item which may be audio, video, image, text, etc. Characteristics include content, format, throughput requirements, security or classification level, timeliness requirements, and degree of interoperability

Information Element - An Information Element is an item of information that flows between Operational Performers & Operational Activities. It is produced and consumed by the Activities that the Operational Performers are capable to perform

Operational Control Flow [- - ▸] – An activity edge that shows the flow of control between Operational Activity actions

Operational Object Flow [⟶] – An activity edge that shows the flow of Resources (objects/information) between Operational Activity actions

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Intended Usages of OV-5a & 5b

- Description of activities and workflows (independent of how the work is carried out)
- Requirements capture
- Definition of Roles and Responsibilities
- Support task analysis to determine training needs
- Problem space definition
- Operational Planning
- Logistic support analysis
- Information flow analysis

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OV-5a & 5b Benefits

- Clearly delineating lines of responsibility for performers and actions
- Uncovering redundancy
- Making decisions about streamlining, combining, or omitting activities
- Defining or flagging issues, opportunities or which activities and their interactions need further scrutiny
- Providing a foundation for depicting activity sequencing and timing

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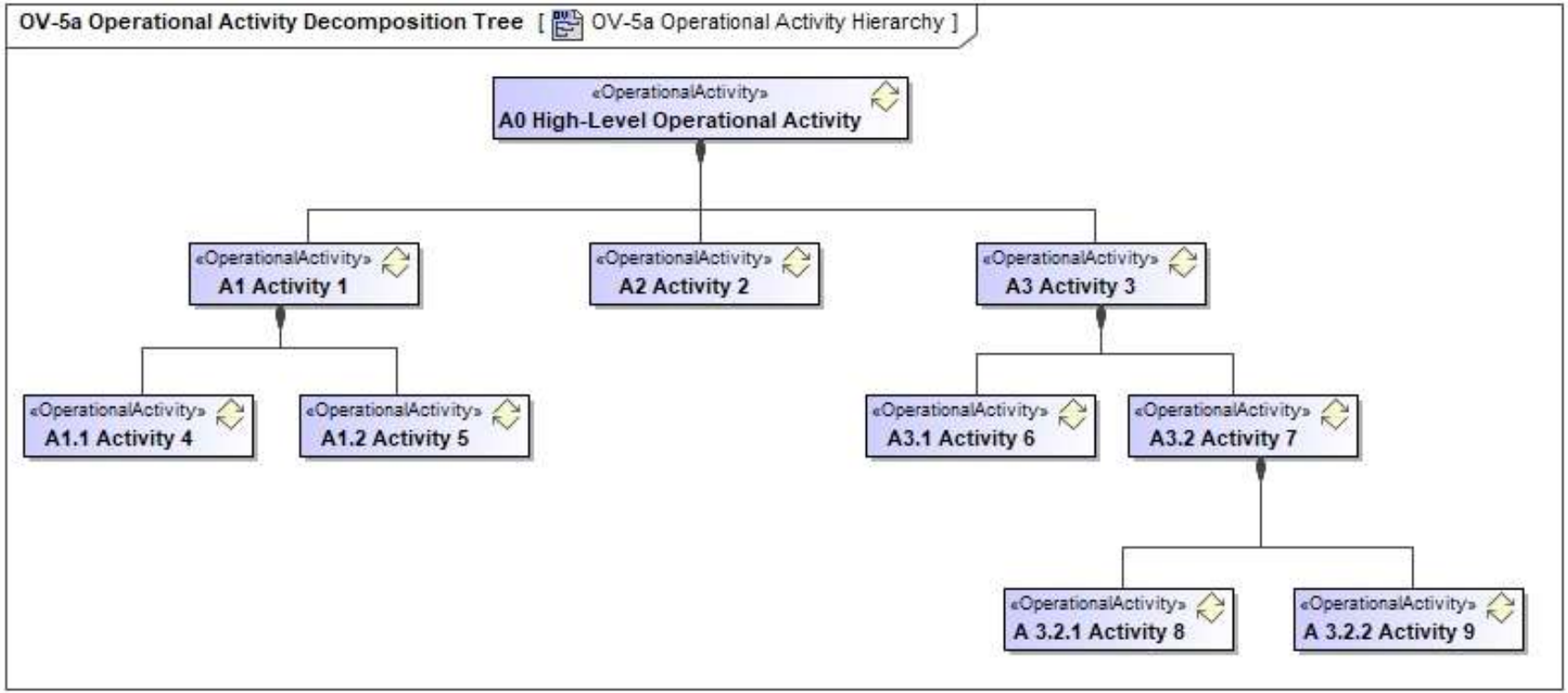
OV-5a Generic Example

OV-5a depicts the Operational Activity hierarchy



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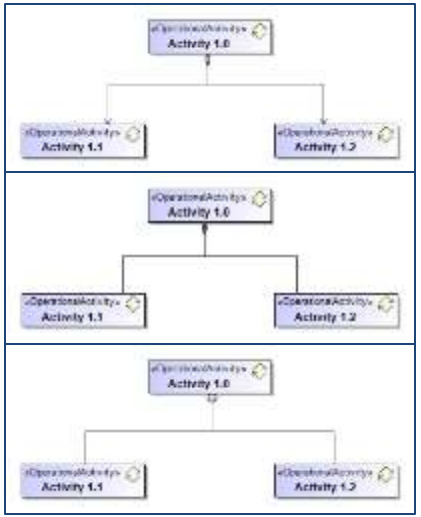
OV-5a Relationships



Relationship	Comments
Aggregation – An object is formed by a collection of other elements. Objects can exist independently	• Weak Relationship ("part of") • Activities are independent • Activities can be part of multiple activities
Composition – whole/part relationship.	• Strong Relationship ("composed of") • One Activity "owns" another
Containment – One to many relationship between a container and its contents. Often used for Requirements	• It is a nesting of elements • It's easier to show the activities as a tree in Dependency matrices • If you delete the parent Activity, all child Activities are also deleted

NOTE: Aggregation and Composition relationships can be ***Directed*** which means it is in one direction only. It is not bilaterally navigable.

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Other Relationships

Relationship	Description / Usage
Maps to Capability	Relationship where an operational element maps to a capability element
Implements	Relationship where a system element maps to an operational element
Is Capable to Perform	Relationship where an element maps to an operational activity or process element
Dependency ◄- - - - - - - -	Relationship where one or more elements require other elements for their specification or implementation. It is illustrated as a dashed arrow between elements. The supplier/target element is at the arrowhead and the client/source element is at the tail end of the arrow.

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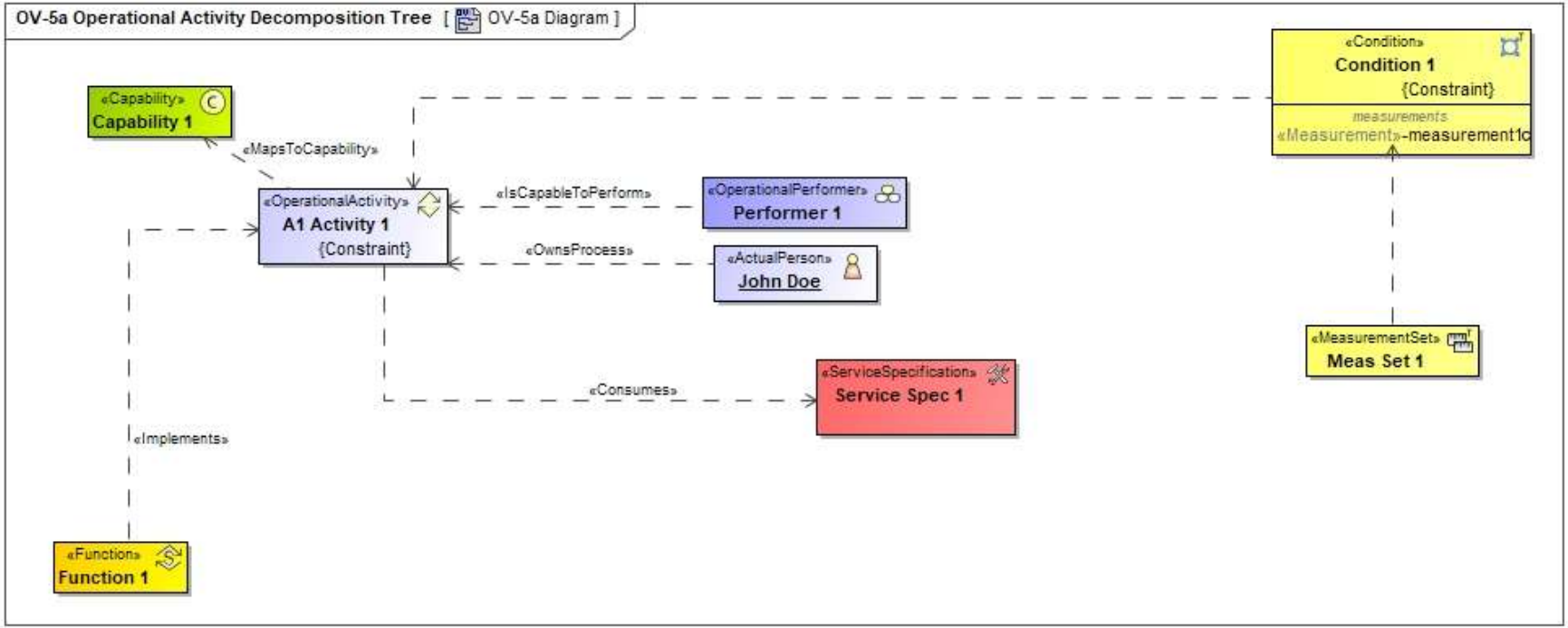
OV-5a Operational Activity Decomposition Tree with Connectivity/Traceability



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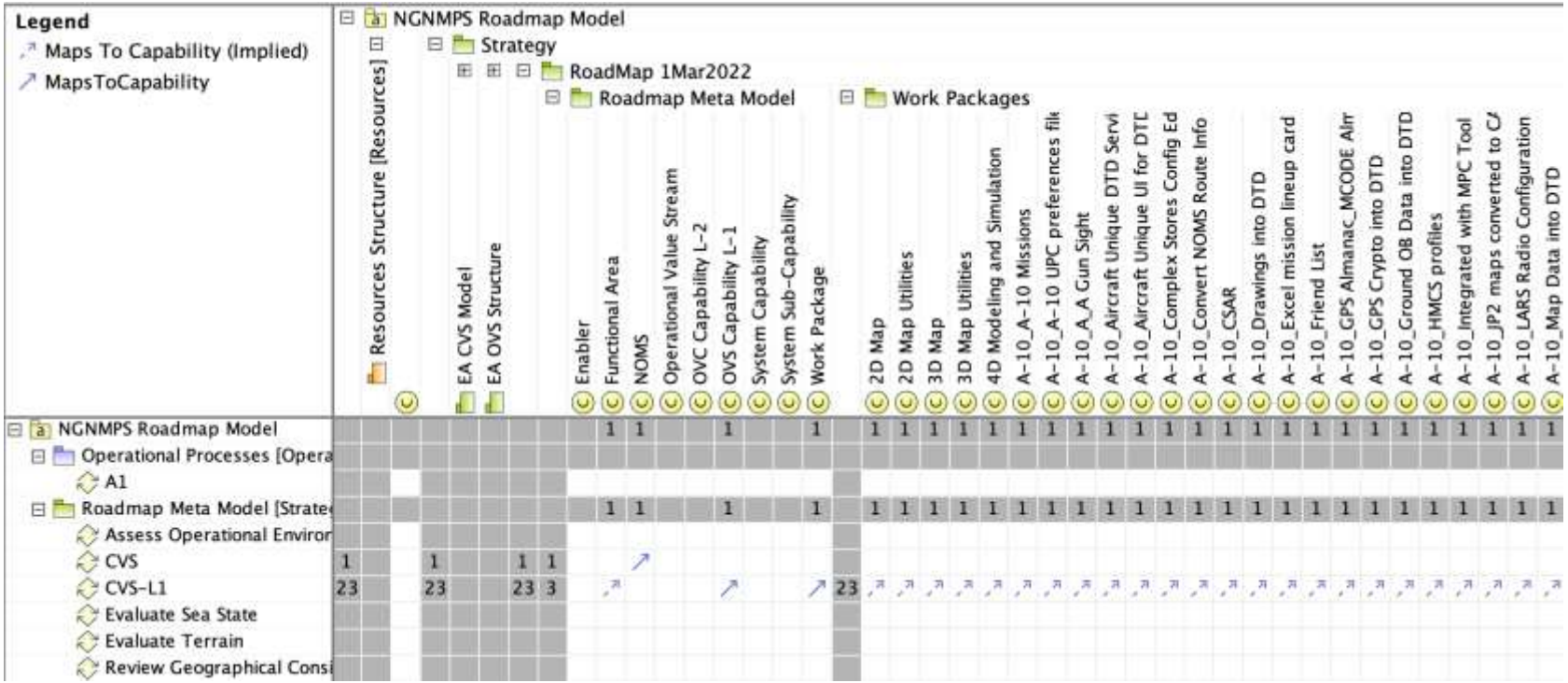
Operational Processes Traceability

(Example of mapping between Operational Activities and System Capabilities)



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DoDAF OV-5b Operational Activity Process Diagrams

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Before creating an Operational Flow

Required Information to create an OV-5b Operational Activity Flow diagram:

- Activity Decomposition
- Inputs
- Outputs
- Timing
- Sequencing

Whenever an activity is performed, at least one operational element is created, modified or destroyed

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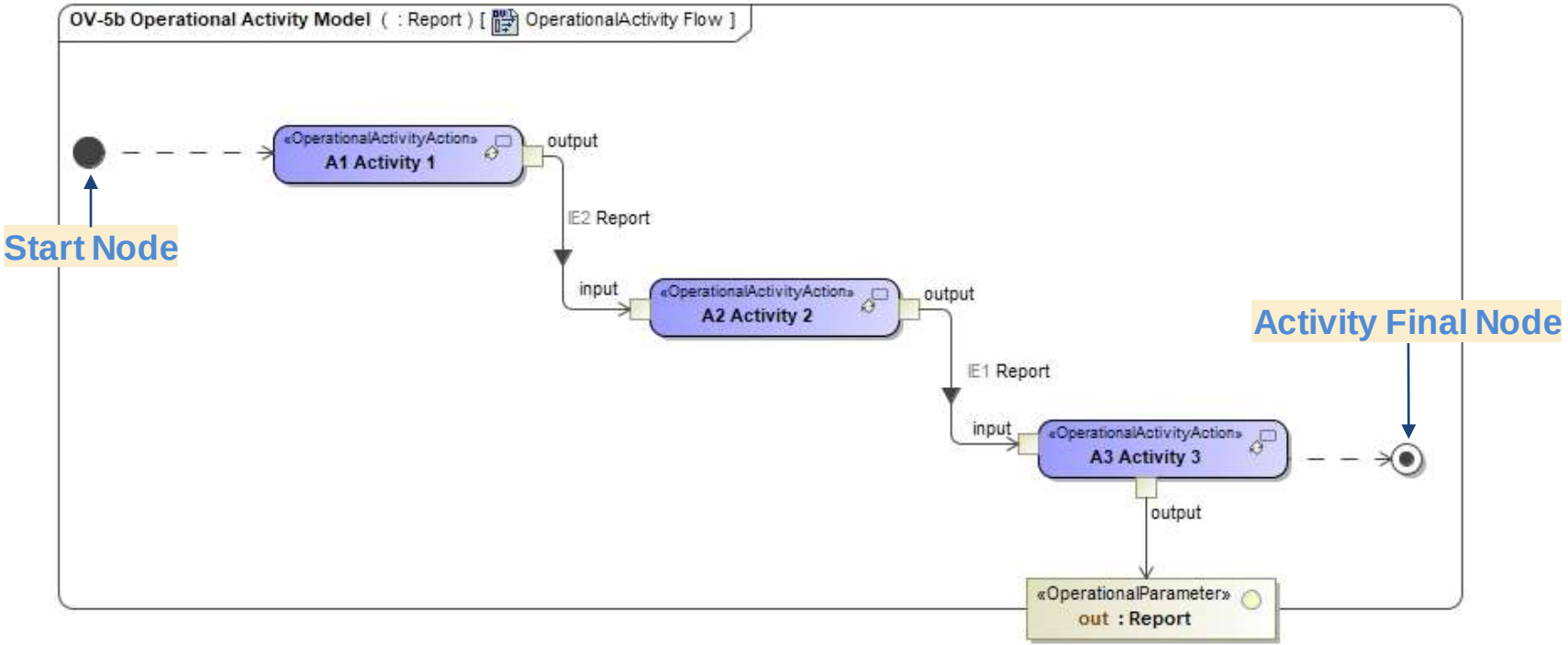
OV-5b Example

OV-5b depicts the information flow between operational activities including their inputs and outputs. (Cost, Operational Performers and other pertinent information may also be included.)



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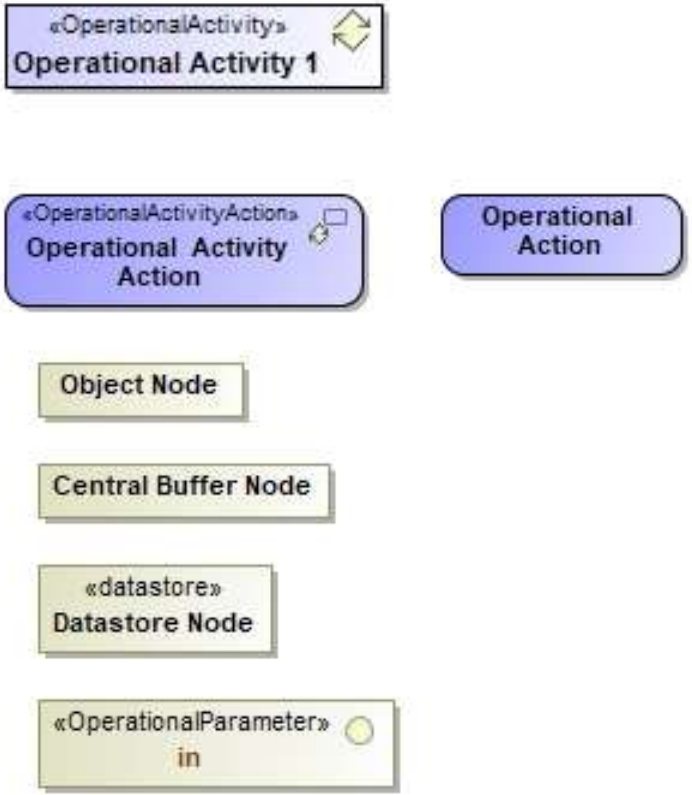
OV-5 Elements

Operational Activity is an action performed. It is on the OV-5a diagram and could be a process or task. It is not a hardware or software function.

Operational Activities on an OV-5a diagram become ***Operational Activity Actions*** on an OV-5b diagram. An Operational Activity Action is a call to an Operational Activity.

Object Node is an activity node that helps to define the object flow in an activity. Specific Object Nodes are Central Buffer Node and Datastore Node.

Operational Parameters are the Information or Data inputs and outputs from the activity.



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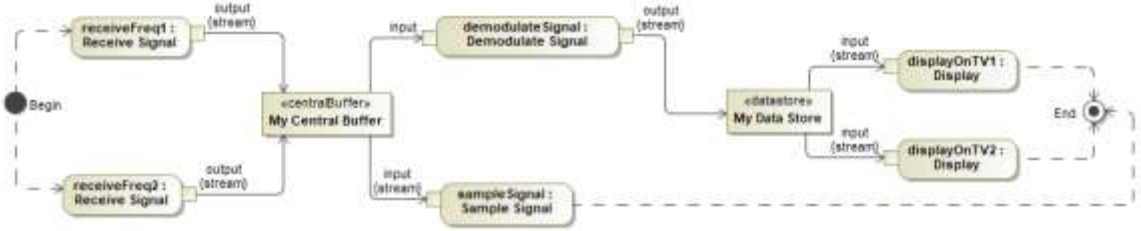
OV-5b Nodes



Node	Definition/Usage
Start Node / Initial Node	Control Node where flow starts when an Activity/Workflow is invoked. There may be more than one initial node.
Final / Flow Final Node	Terminates the flow in an activity that arrives at this node. The Flow Final Node swallows the control token while all other control tokens in the Activity/Workflow continue.
Activity Final Node	Terminates the entire Activity/Workflow as soon as a single flow arrives at the node.

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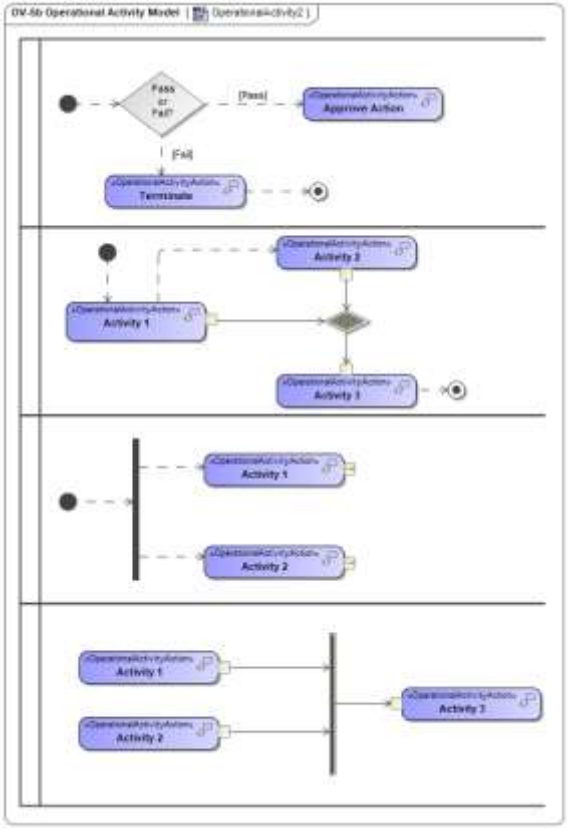
Ov-5b Decision, Merge, Fork and Join Nodes



Node	Description/Usage
Decision	A point in an Activity/Workflow where a single incoming flow divides into several outgoing flows. Constraints can be used on the outgoing flows to determine which path to follow
Merge	A point in an Activity/Workflow where several incoming flows merge into a single outgoing flow. When any incoming flow arrives, it is passed along the outgoing flow.
Fork	A point in an Activity/Workflow where a single incoming flow divides into several outgoing flows.
Join	A point in an Activity/Workflow where several incoming flows are synchronized into a single outgoing flow. All input flows must be present before the output flow will be sent.

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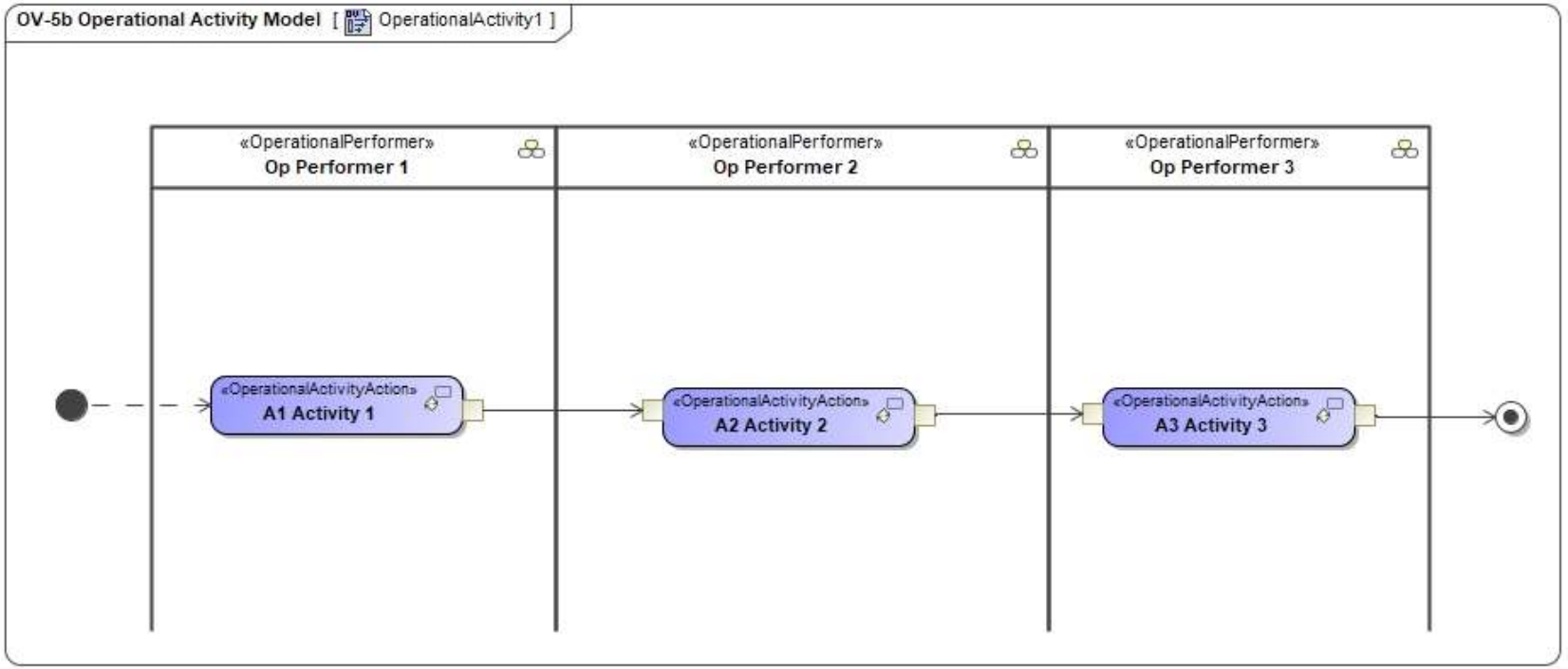
OV-5b Swim Lanes



Swim lanes may be horizontal or vertical and can be embedded within an existing swim lane.

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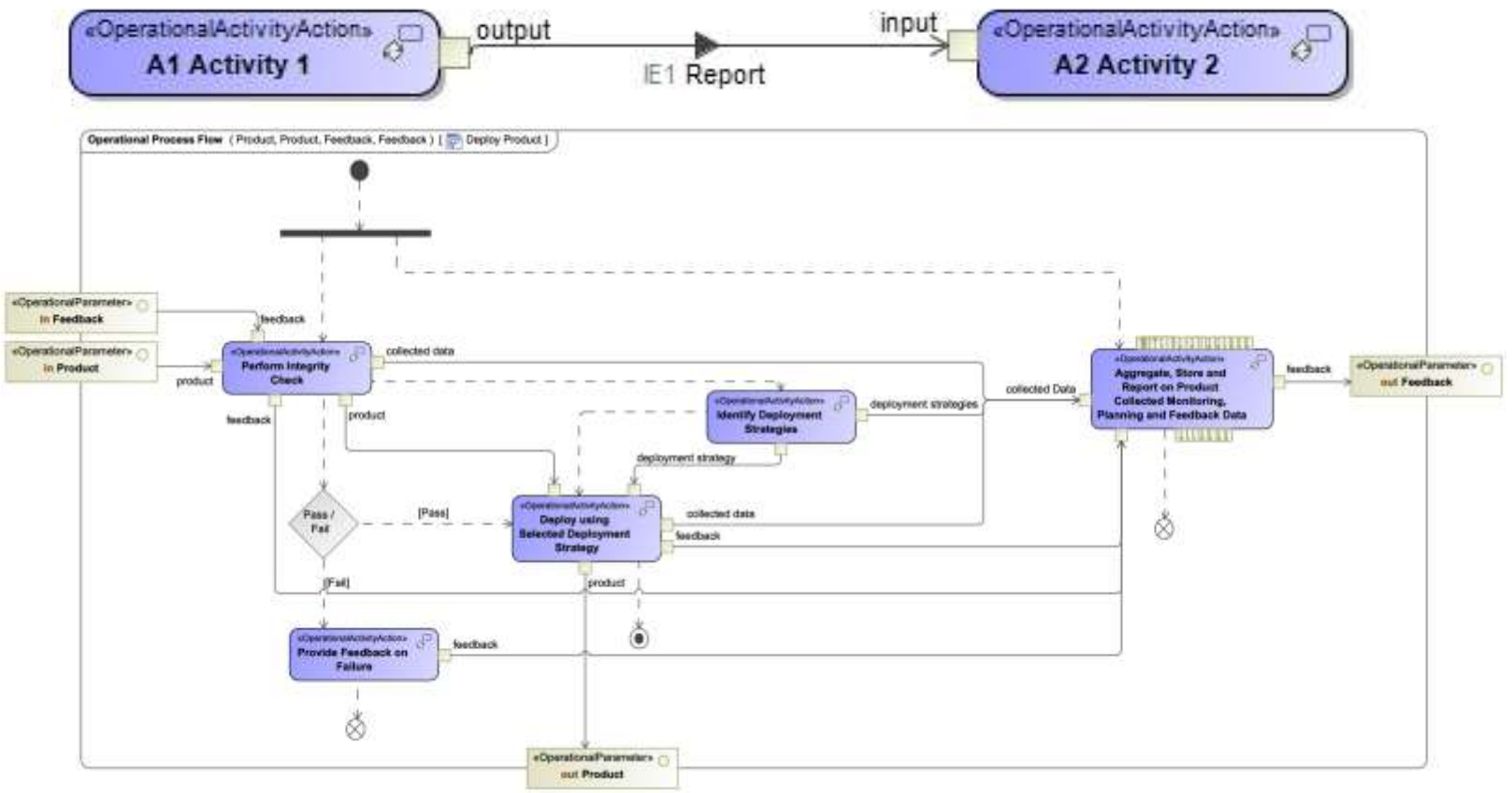
OV-5b Input/Output Pins, Parameters and Exchanges



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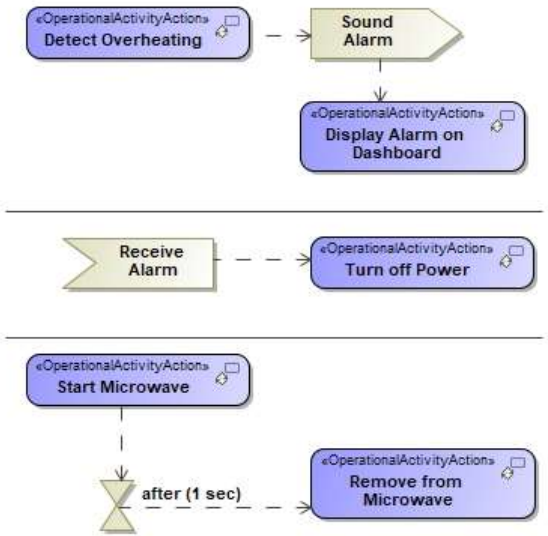
Ov-5b Send Signal and Accept Event Action and Time Event



Event Actions	Description/Usage
Send Signal	An action that creates a signal instance from its inputs and transmits it to the target where it may start a State Machine transition or the execution of an activity.
Accept Event Action	An Action that waits for the occurrence of an Event that meets specified conditions.
Time Event	An Action that waits for a particular time. It may be absolute (at) or relative (after).

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OV-5 Check list

- Are all the Operational Performers defined and do they make sense?
- Are all the Operational Exchanges defined and do they make sense?
- Do the Operational Workflows/Processes cover the most critical activities thoroughly?
- Does each Workflow/Process have a starting point and an end point?
- Do the Control Flow(s) exist and make sense?
- Are there constraints and do they make sense?
- Are there any warnings or error messages on the diagrams?
- Are critical paths identified and do they make sense?
- Are Operational Performers linked to Operational Activities?
- Are requirements linked to Operational Activities that are then linked to Capabilities?
- Are test scenarios linked to Operational Activities that are then linked to requirements?

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Requirements Traceability to Operational Processes

#	Name	Is Composed Of Operational Activities	Performed By Operational Performer	Satisfies
3	Update Product			
4	Plan Product	P2-1-1 Plan for Security Assurance P2-1-2 Design Product P2-1-7 Plan Backlog and Tasks P2-1-3 Plan for Measurement P2-15 Aggregate, Store and Report on Produ P2-1-4 Plan for Contracts, Procurement and I P2-1-5 Plan for Quality Assurance P2-1-6 Plan for Configuration Management	Business Expert Design Domain Governance Domain	Gov_6 System Assurance Gov_6_7 Quality Assurance Dev_6_1 Continuous Integration
45	Develop Product	P2-2-8 Store and Manage Collected Monitorin P2-2-2 Execute Dev Tests P2-2-5 Write Dev Tests P2-2-2 Plan and Detail Design Unit of Work P2-7 Monitor Product P2-2-9 Release Code for Validation P2-2-4 Write Code P2-2-6 Review Code and Artifacts P2-2-1 Select Unit of Work P2-14 Store and Manage Code and Artifacts	Design Domain Development and Test Domain	Gov_1 Track Changes Associated to Requirem Gov_6 System Assurance Gov_6_7 Quality Assurance Gov_6_7_3 Audit of Development Req_1 Document Requirements Req_1_1_1_1 Requirement Change Notificati Dev_6_2 Use of Verifiable Sources Dev_6_1 Continuous Integration
55	Validate Product	P2-4-6 Perform Dynamic Analysis P2-4-2 Build and Package Code P2-4-1 Perform Static Analysis Flow P2-4-5 Deliver to Production P2-15 Aggregate, Store and Report on Produ P2-4-3 Deliver to Testing/Staging Environmer P2-14 Store and Manage Code and Artifacts	Development and Test Domain	Gov_4 Metrics Gov_4_3 Code Coverage Metrics Gov_5 Knowledge Management Gov_5_1 Planning and Tracking Documentatio Gov_5_1_3 Stakeholder Review Gov_5_1_3_2 Test Activities Gov_5_6 Decision Points Gov_6 System Assurance Gov_6_7 Quality Assurance Gov_6_7_4 Audit of Testing Req_1 Document Requirements Req_1_1_1 Test Association Dev_6_2 Use of Verifiable Sources Dev_6_1 Continuous Integration Dev_10 Product Simulations Dev_11 Hardware Emulator Tes_7_1 Functional and Nonfunctional Testing Tes_7 Multi-phase Testing Tes_7_1 Hardware Specific Testing Tes_7_2 Hardware and Software Integration Sys_8 Support of Embedded and Cyber-physi Sys_8_2 Custom Security and Safety Assessme Sys_8_1 Support of Physical Testing Devices

Does Requirements Traceability to the Operational Processes exist and make sense?

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Demo in Cameo

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