IntegratedEA '08
Enterprise Architecture Conference

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The 2009 event will be held Feb 24-25

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Customer Success Is Our Mission

Integrated Enterprise Architecture Conference

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A Case Study in Using SysML for Model Driven Enterprise Architectures

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Abstract

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- The need for model driven approaches to address the challenges in Enterprise and System of Systems Architectures is addressed in this case study of SysML and MODAF.
- Alternative viewpoints are illustrated for representing Enterprise Architectures using SysML.
- Several SysML features including Block, FlowPort, Item flow, Allocation, Parametrics and Requirements are mapped to the MODAF meta-model and illustrated via examples derived from MODAF documentation.
- The benefits of using a SysML for Enterprise Architecture modeling are explored.
- The case study compares and contrasts SysML features with other domain specific languages tailored for Enterprise Modeling.

Agenda

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- Introduction
- Background
  - Zachman and TOGAF
  - MoDAF
  - SysML
- Case Study Perspectives
  - Contextual, Structural, Behavioral, and Parametrics
- SysML Model Summary
  - Enterprise Models from Each Perspective
- Conclusions

Introduction

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- A Few Assumptions From A System Engineering Perspective
  - Consider an Enterprise as a System
  - System Engineering Best Practices apply to Enterprise Analysis and Architecting
    - The Operational/Logical Architecture

      Focus on the “What”
    - The Solution/Physical Architecture

      Focus on the “How”
    - System Architecture and subsequent design specifies the Hardware and Software

      Focus on the instantiation of the “What” and “How”
  - Model Based System Engineering balances Abstraction and Rigor
    - Use IEEE 1471 Viewpoint and View Model to manage these perspectives

Background – Zachman Framework

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- Interrogatives
  - Who, What, When, Where, Why and How
- Perspectives
  - Scope (Contextual), Business Model (Conceptual), System Model (Logical), Technology Model (Physical), Detailed Representation ("Out of Context" Physical Instantiation), Functioning Enterprise
  - Consistent with the IEEE 1471 based SysML Viewpoint/View model
- Stakeholders
  - Planner → Contextual
  - Owner → Conceptual
  - Designer → Logical
  - Builder → Physical
  - Sub Contractor → Physical Instantiation

Source: www.zifa.com

Background – MoDAF

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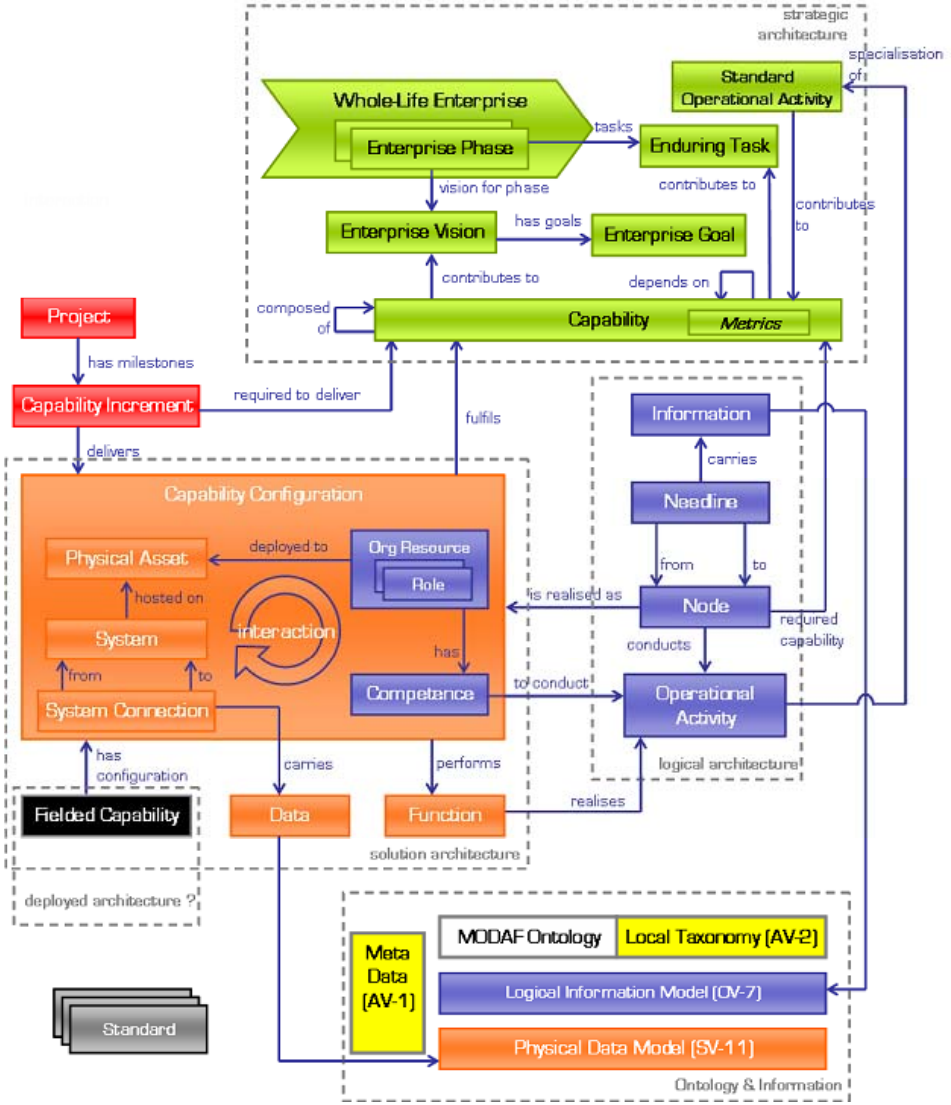

- Enhances and Clarifies DoDAF 1.x
  - ***Strategic*** Capability Perspective
    - Ability to Deliver an Effect
      Capabilities and Processes
  - ***Logical*** / Operational Perspective
    - Mission or Business Scenarios
      Nodes and Operational Activities
  - Resource ***Solution*** Perspective
    - Structure and Behavior
      Organizational Resources, Systems and System Functions
  - ***Acquisition*** Perspective
    - Time Phased
      Projects, Milestones and Capability Increments

Source: www.modaf.com

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Background – SysML

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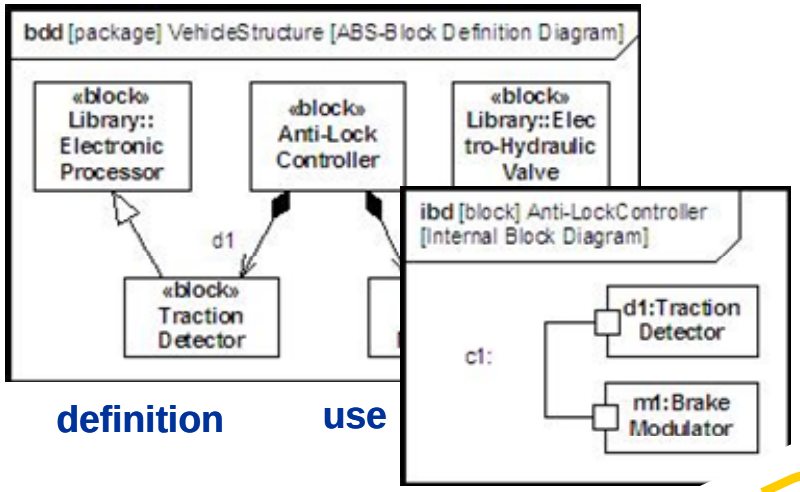
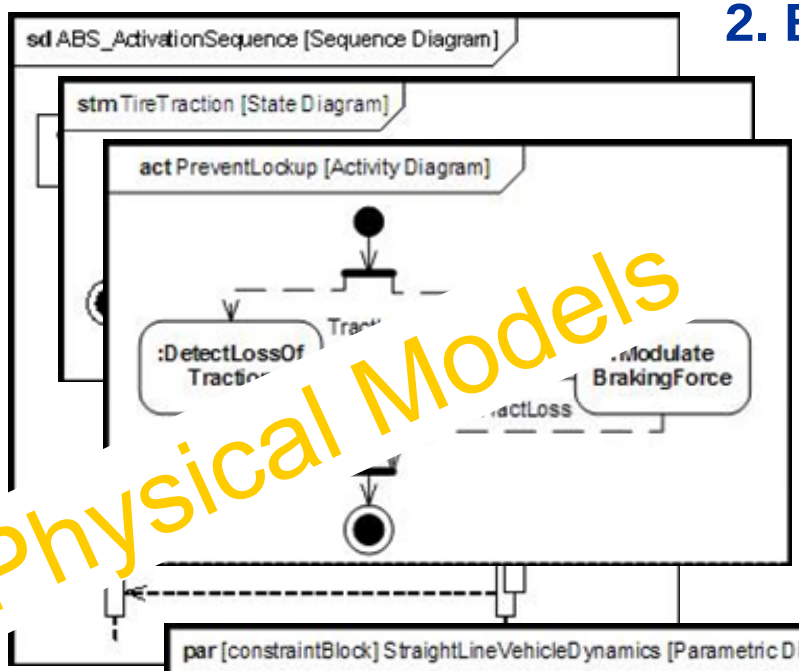
1. Structure



definition use

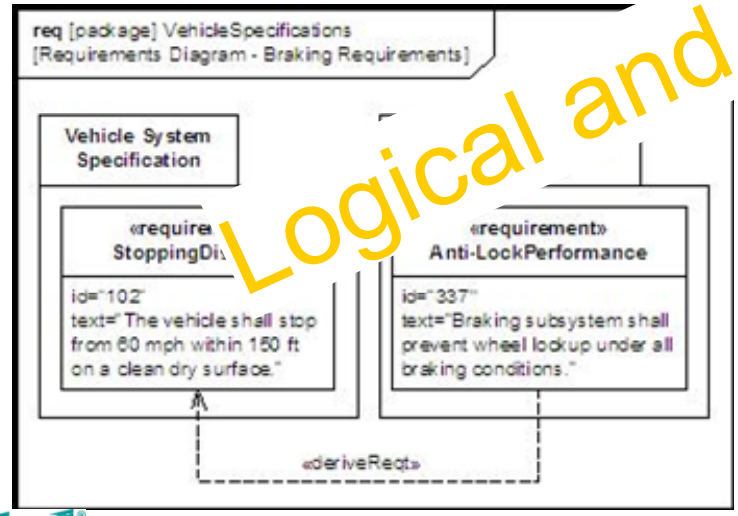
2. Behavior

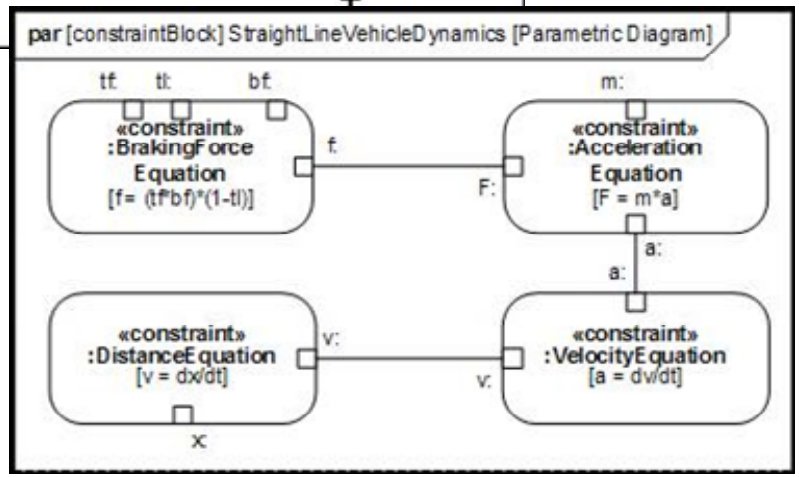


interaction

state machine

activity/ function





3. Requirements

4. Parametrics

Logical and Physical Models

Source: INCOSE, OMG (OMG SysML™ Tutorial

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Background

SysML as an Enterprise Modeling Language

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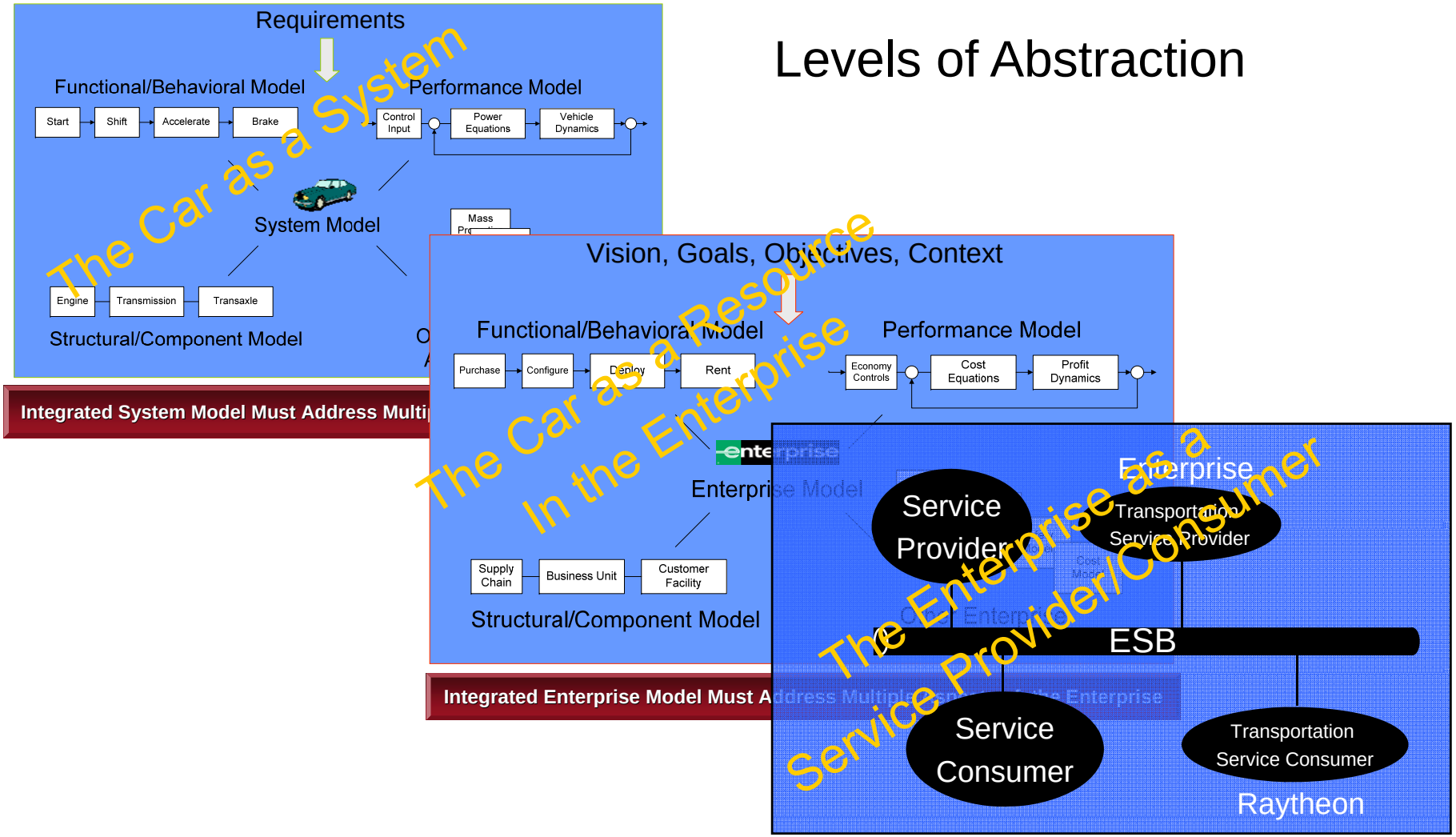

Levels of Abstraction

Source: www.omgsysml.org

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SysML/MODAF Case Study Perspectives

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- Strategic Context
  - Model Elements: Vision, Goals, Capabilities, Stakeholders, Viewpoint, Views
- Structural
  - Model Elements: Nodes, Organizations, Systems, Components, Interfaces
- Behavioral
  - Model Elements: Scenarios, Processes, Activities, Functions, Tasks, States, Flows
- Parametric
  - Model Elements: Constraints
  - Model Elements: Properties (effectiveness measures, metrics, quality attributes)
- Programmatic
  - Model Elements: Program, Milestones, Phases, Increments, Deliverables

Note:

The OMG UPDM (UML Profile for DoDAF/MODAF) status will be presented later in these sessions.

This briefing provides rationale for the simplified core model of the Compliance Level 1 in the UPDM Specification

SysML/MODAF Case Study
Enterprise Contextual Model

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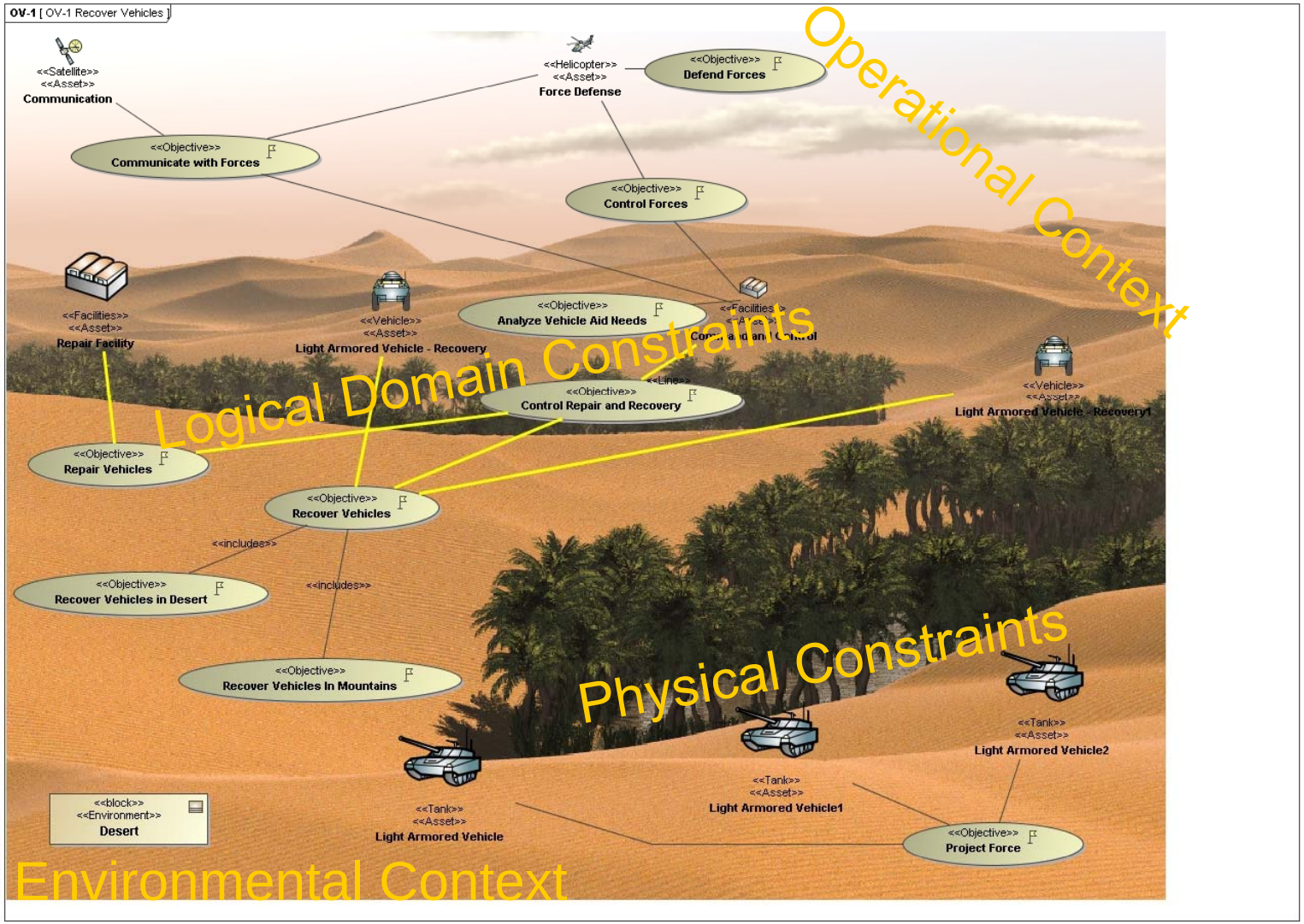

Source: OMG UPDM FTF Specification Section 10

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SysML/MODAF Case Study
Enterprise Structural Models

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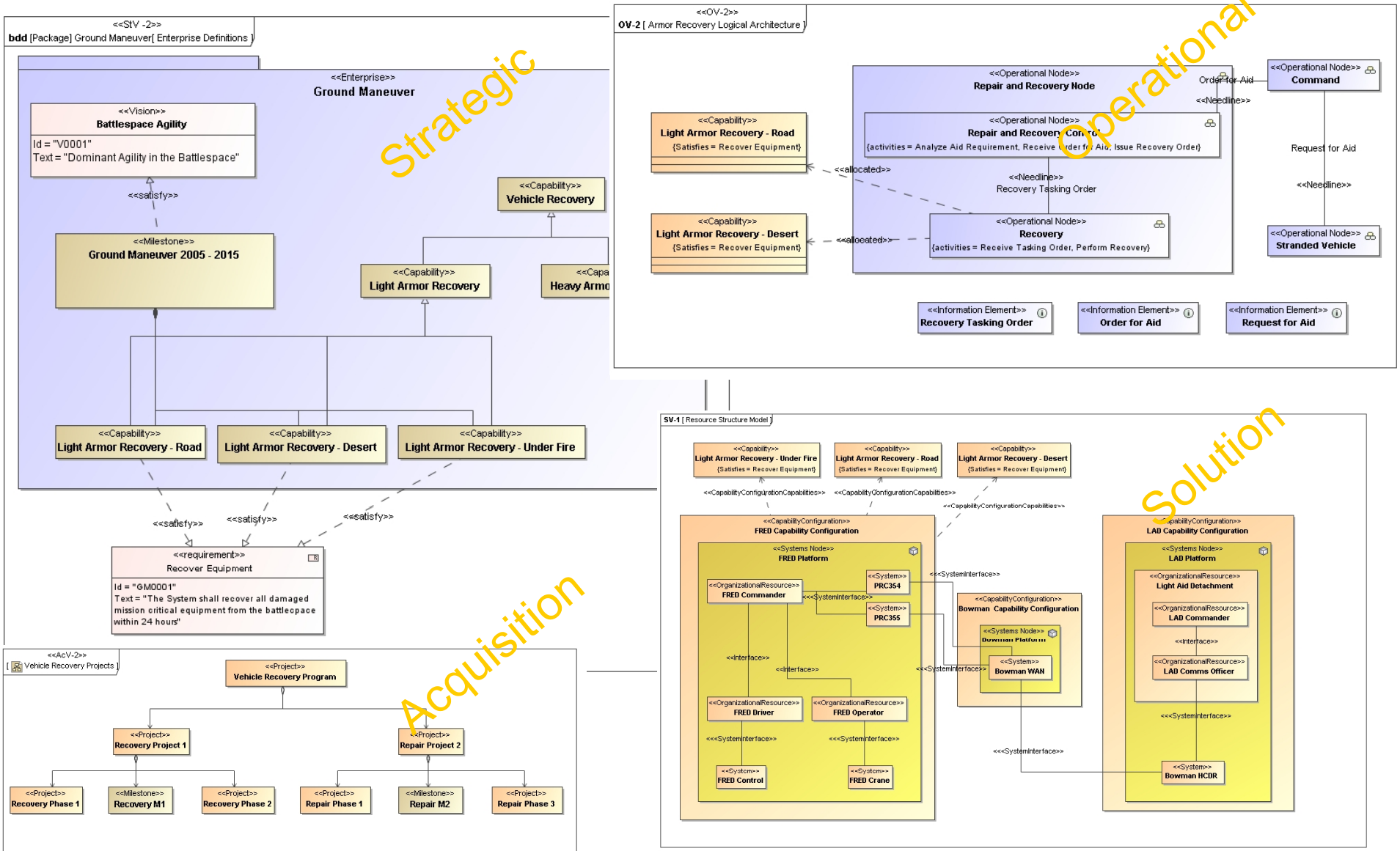

Source: OMG UPDM FTF Specification Section 10

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SysML/MODAF Case Study
Enterprise Behavioral Model

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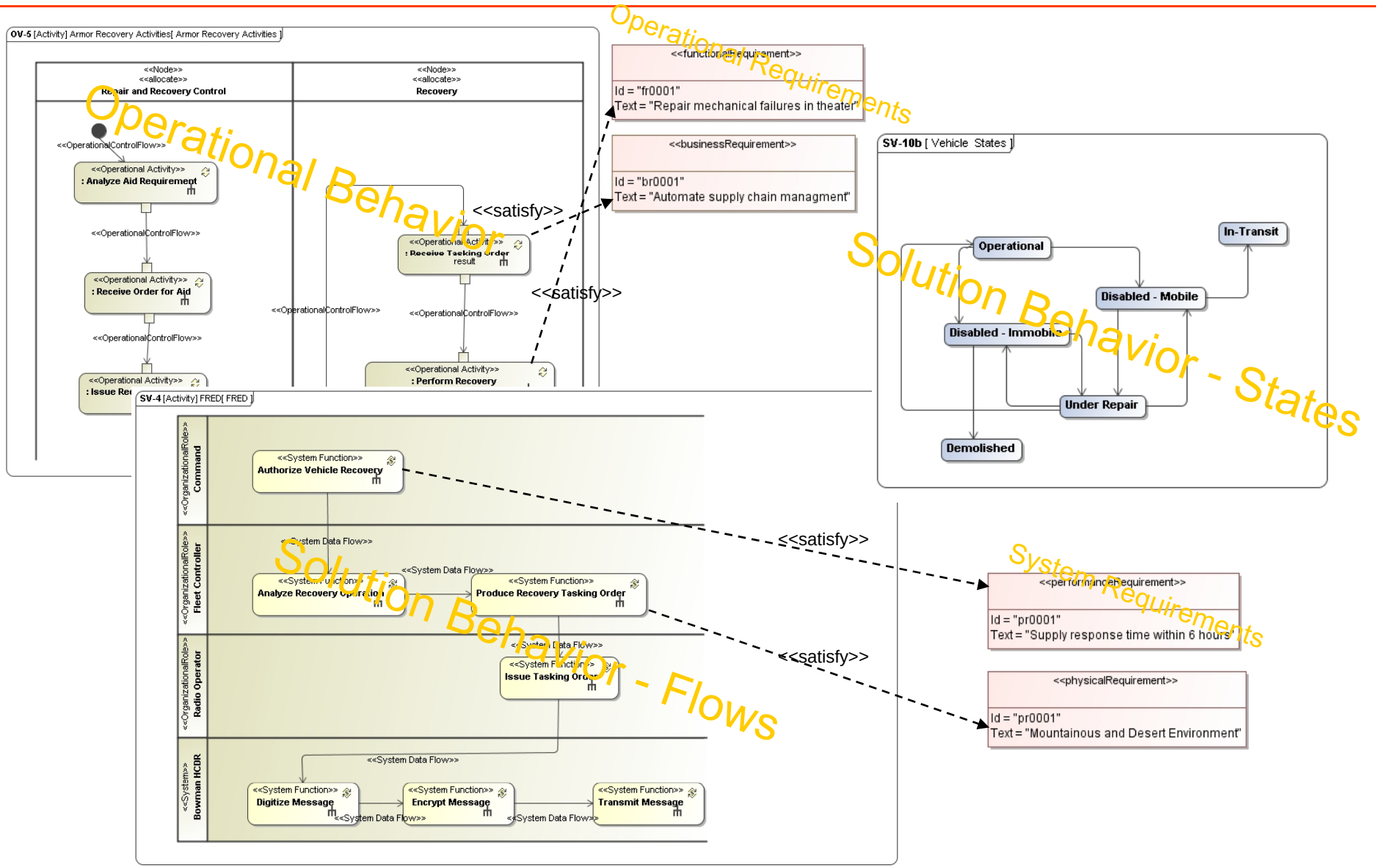

Source: OMG UPDM FTF Specification Section 10

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SysML/MODAF Case Study
Enterprise Parametric Model

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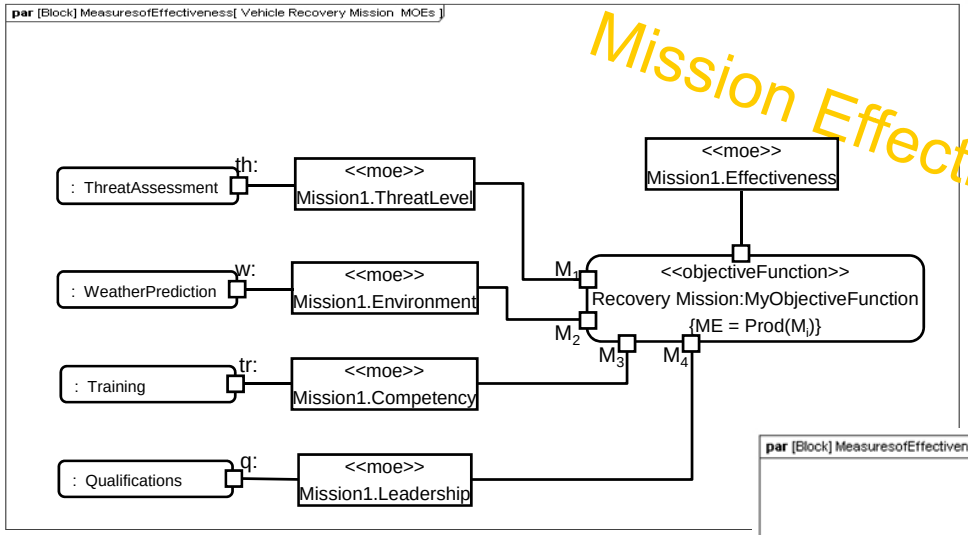
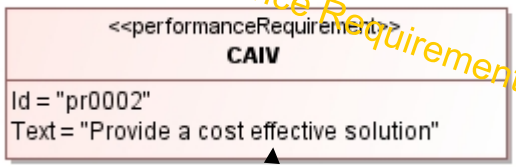


Mission Effectiveness

Performance Requirements



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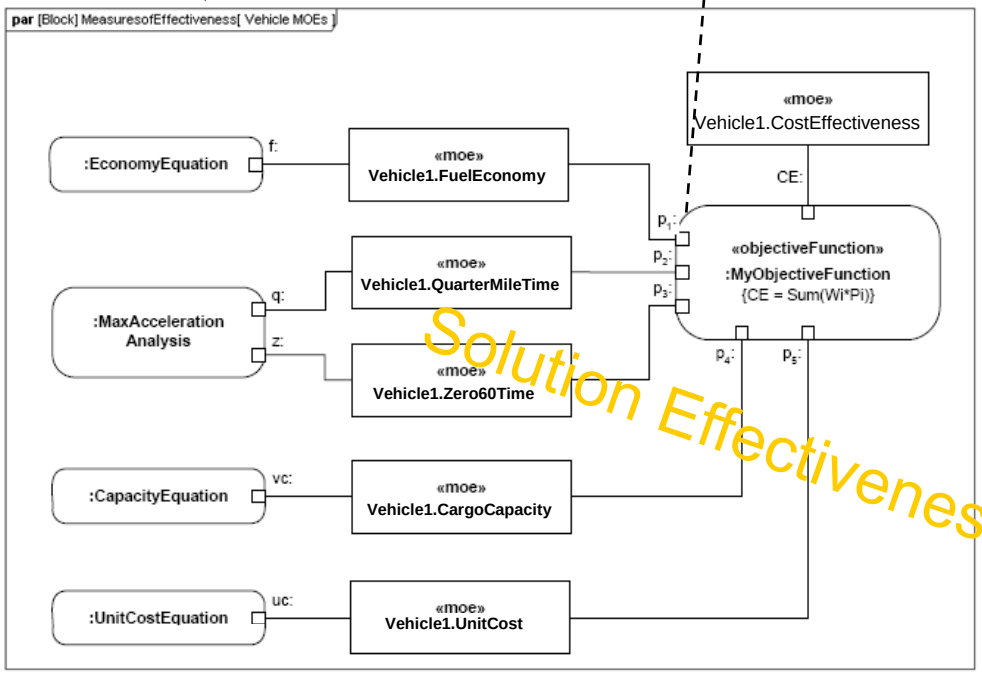

Solution Effectiveness

- Quality Attribute Driven
  - Strategic
    - Extensibility
    - Affordability
    - Mission Capable
  - Operational
    - Maintainability
    - Mobility
    - Ease of Use
    - Safety and Security
  - Solution
    - Technical Performance
    - Net Enabled

Source: OMG Systems Modeling Language (SysML™) Specification

SysML/MODAF Case Study Conclusions

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- Enterprise Architecture Concepts Mapped Effectively to SysML language constructs
  - Capability, Node, System → SysML Block
  - OperationalActivity, SystemFunction → SysML Activities
  - Operational and System States → SysML States
  - Objective, Goal, Policy, Doctrine → SysML Requirement
  - Measures of Effectiveness and Performance → SysML Parametrics
- Enterprise Context based on SysML Viewpoint/View model
  - IEEE 1471 interpretation used for Enterprise Context
  - Extended SysML model with the OMG Business Motivation Metamodel
- Contractual Requirements Modeled
  - SysML Requirements framework used to map Enterprise Capabilities and Solutions to Contractual Specifications
- Enterprise Phase and Project Sequencing Visualization was SysML Tool limited
  - Exported model to visualization and project management tools