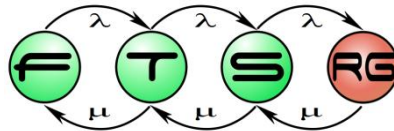


UML & SysML Overview

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UML

Modeling Language (not only) for Software Engineers

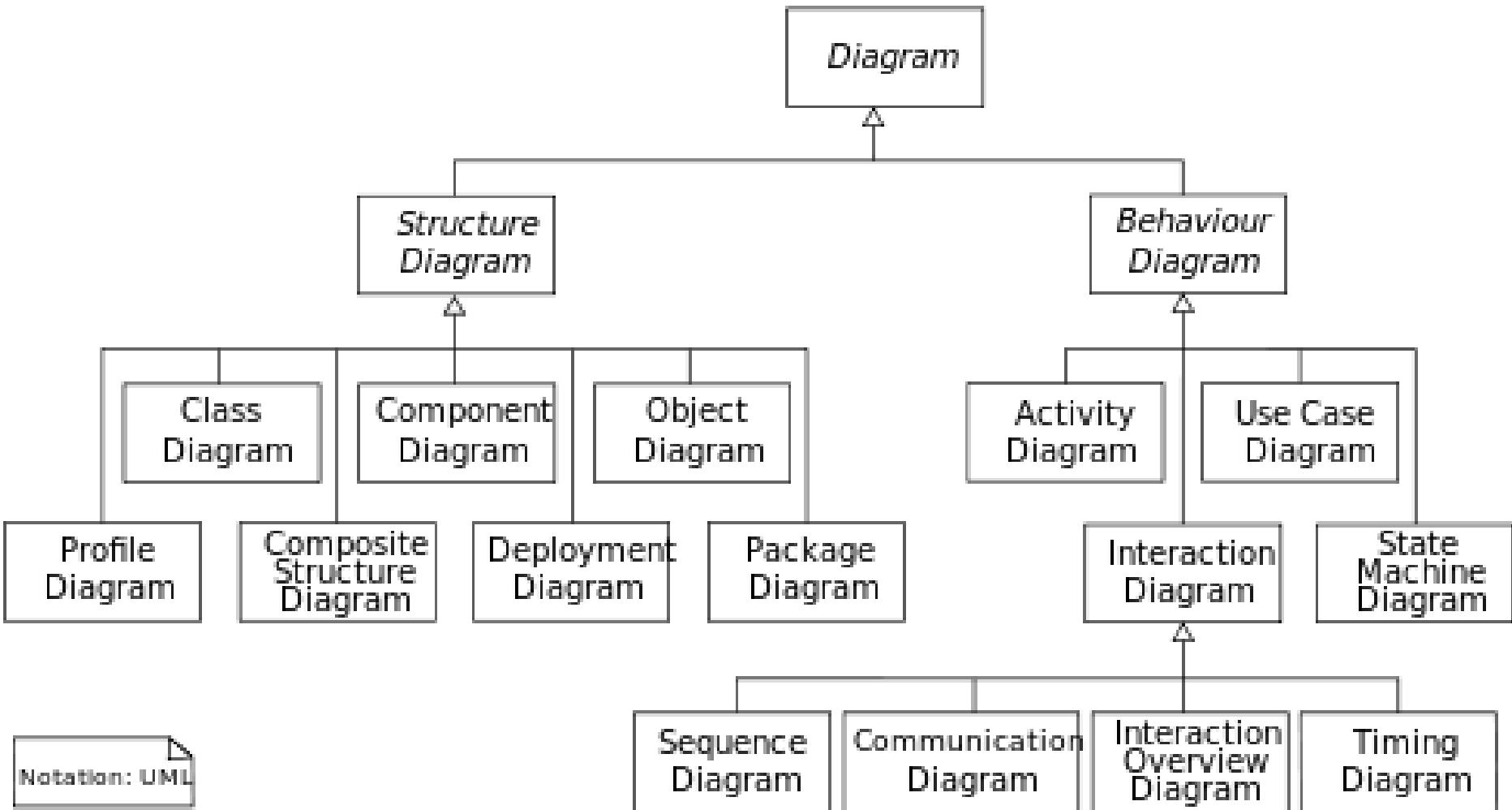
UML Overview

- Unified Modeling Language
 - An OMG (Object Management Group) standard
- 1.x series
 - 1997 – Initial version (v1.1 – first adopted version)
 - by James Rumbaugh, Grady Booch, Ivar Jacobson at Rational
 - 2000 – v1.3, v1.4
 - 2003 – v1.5
- 2.x series
 - 2005 – v2.0
 - 2007 – v2.1.2
 - 2009 – v2.2
 - 2010 – v2.3
 - 2011 – v2.4.1
 - 2012 – v2.5 – „In Process”

Related Standards

- MOF – Meta Object Facility Core
 - 2011 – v2.4.1
 - Modeling language for defining modeling languages
- OCL – Object Constraint Language
 - 2012 – v2.3.1
 - Textual language for formulating constraints and queries over models
- fUML – Foundational UML
 - 2013 – v1.1
 - Semantics of a Foundational Subset for Executable UML Models
- ALF – Action Language for Foundational UML
 - 2012 – v1.0.1 Beta3
 - Concrete Syntax for a UML Action Language
- XMI – XML Metadata Interchange
 - 2011 – v2.4.1
 - XML representation of models
- DD – Diagram Definition
 - 2012 – v1.0
 - for modeling and interchanging graphical notations

UML Diagram Taxonomy

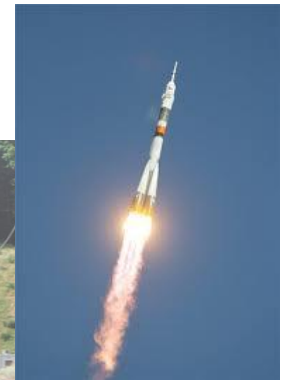
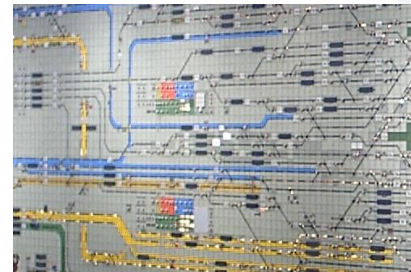
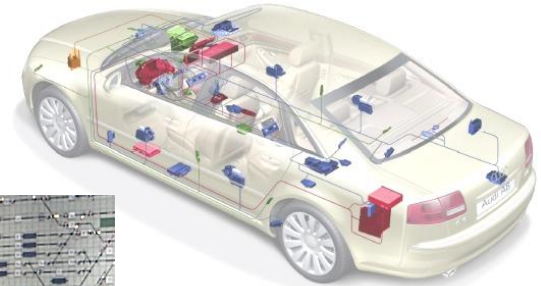


SysML

Modeling Language (not only) for Systems Engineers

Systems Engineering

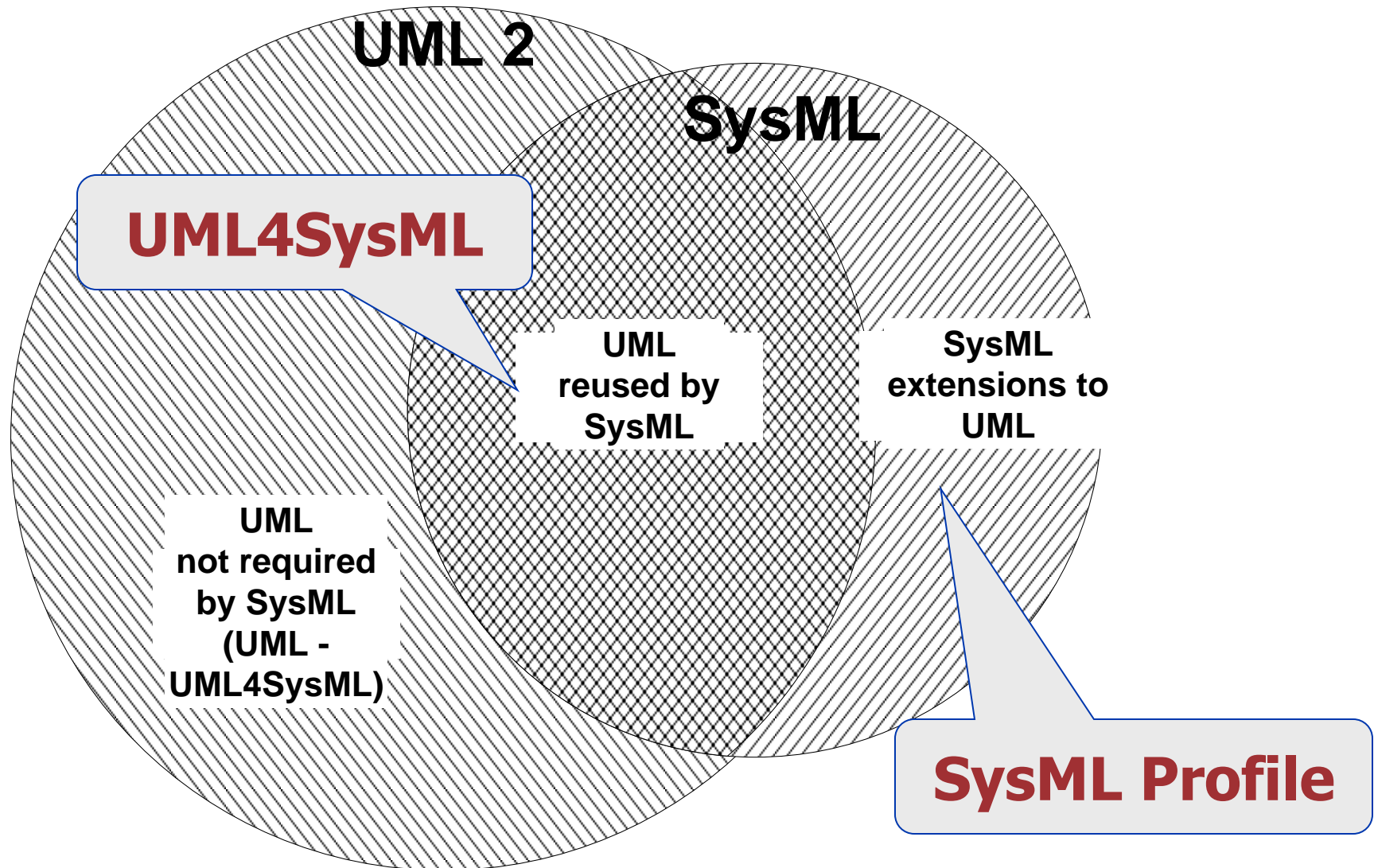
- Systems Engineering is a multidisciplinary approach to develop balanced system solutions in response to diverse stakeholder needs
- ~ Integration Engineering
 - Software engineering
 - Hardware engineering
 - Mechanical engineering
 - Safety engineering
 - Security engineering
 - ...
- ~ Process Engineering
- System
 - Military, airplane, car, aviation, railway interlocking, notebook, etc.



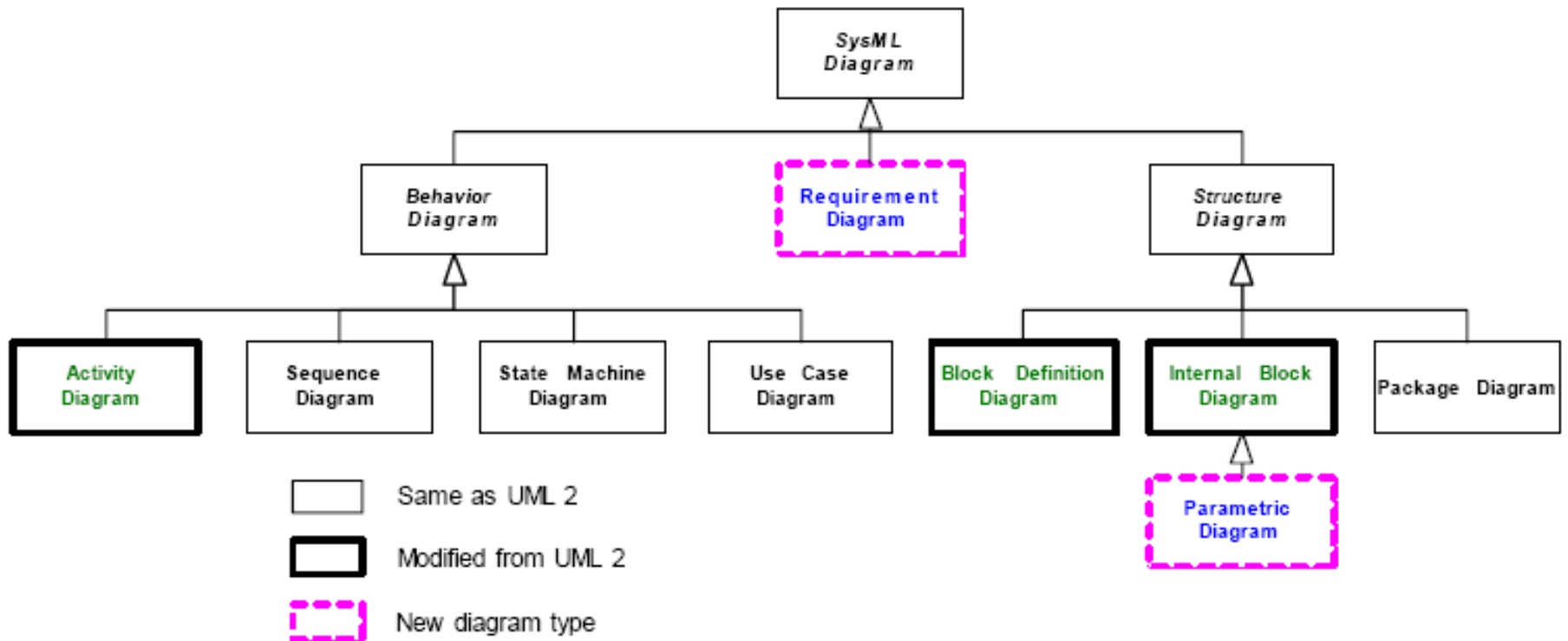
SysML overview

- „UML for Systems Engineering”
 - Supports the specification, analysis, design, verification and validation of systems that include hardware, software, data, personnel, procedures, and facilities
- Developed by OMG and International Council on Systems Engineering (INCOSE)
- OMG SysML™ (<http://www.omgsysml.org>)
 - RFP – March 2003
 - Version 1.0 – September 2007
 - Version 1.1 – November 2008
 - Version 1.2 – June 2010
 - Version 1.3 – June 2012

Relationship Between SysML and UML



SysML Diagram Taxonomy



Aspects of SysML

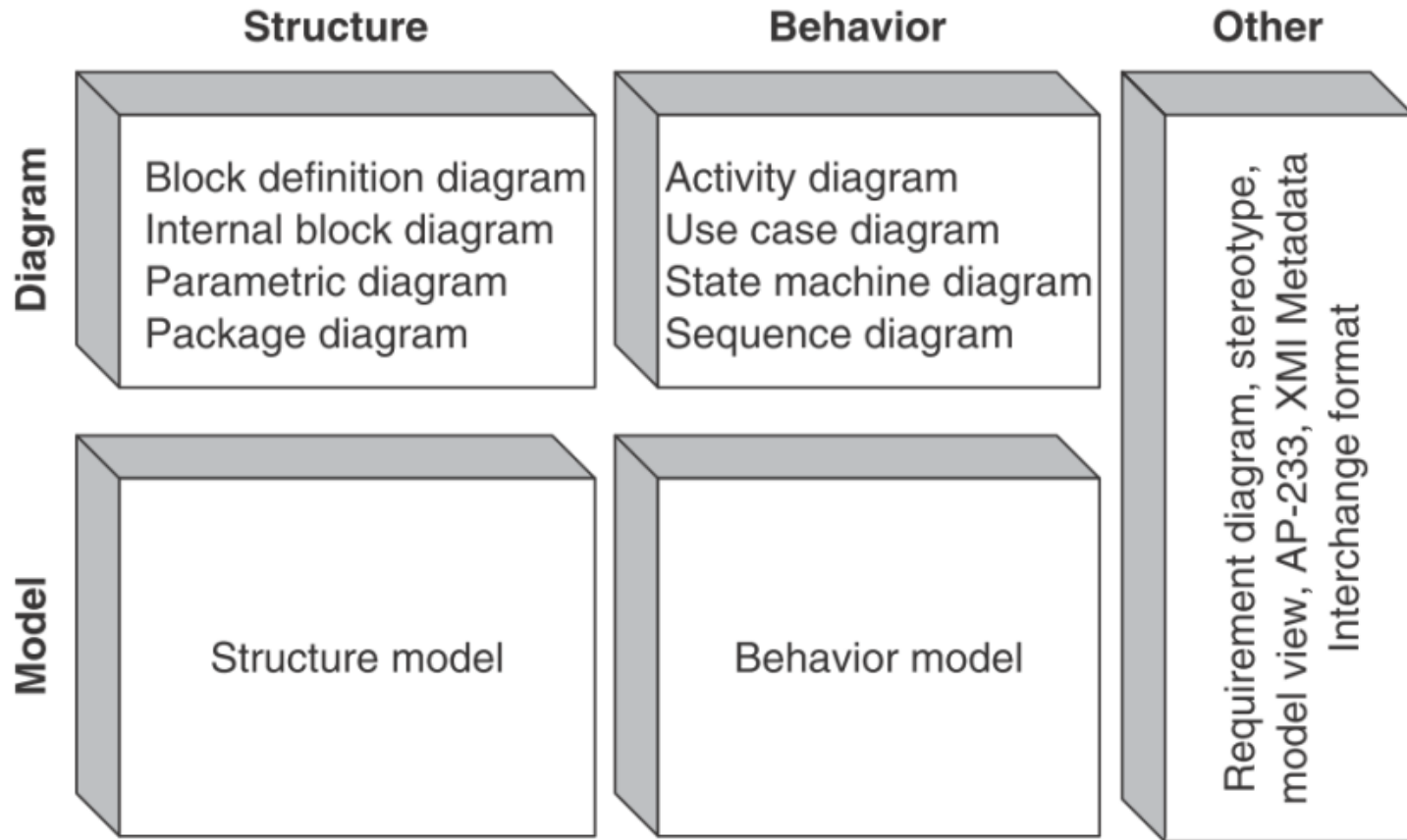


Diagram Frames in SysML

- Each SysML diagram represents a model element
- Each SysML diagram must have a diagram frame
- Diagram context is indicated in the header
 - Diagram kind
 - e.g. *act* for Activity Diagrams
 - Model element type
 - e.g. Package, Block, Activity
 - Model element name
 - the represented model element
 - Diagram description
 - e.g. „*Context model for Cyber-Physical Agricultural System*”

pkg [Model] CPAS [Overview]

bdd [Package] Structure [Logical Architecture of CPAS]

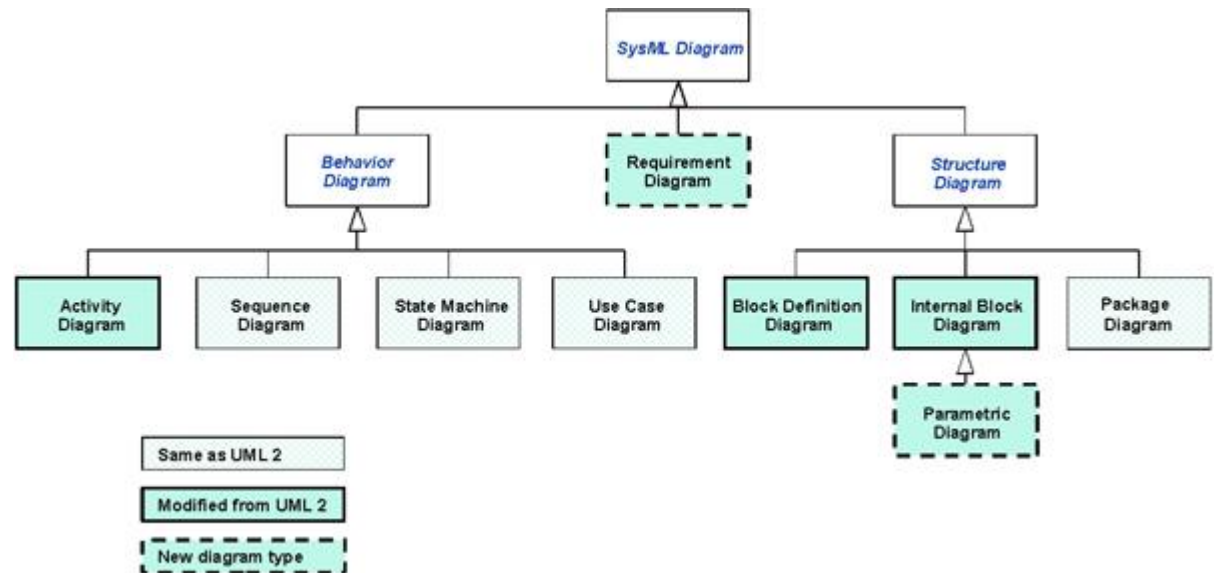
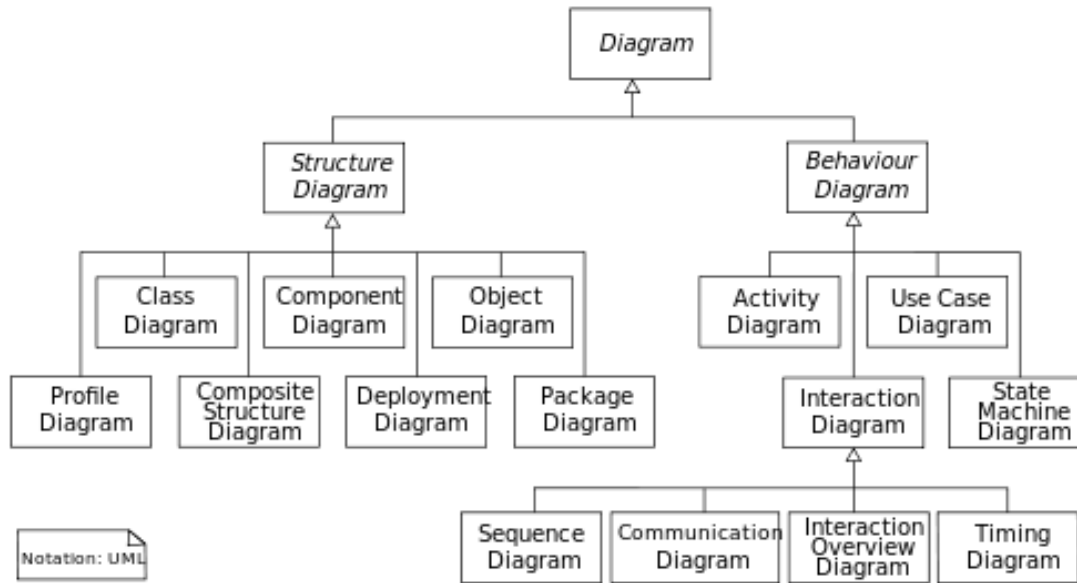
act [Activity] Measure environment [Measure environment with allocation]

SysML Diagram Kinds

- **pkg** – Package Diagram
- **bdd** – Block Definition Diagram
- **ibd** – Internal Block Diagram
- **par** – Parametric Diagram
- **uc** – Use Case Diagram
- **act** – Activity Diagram
- **sd** – Sequence Diagram
- **stm** – State Machine Diagram

Summary

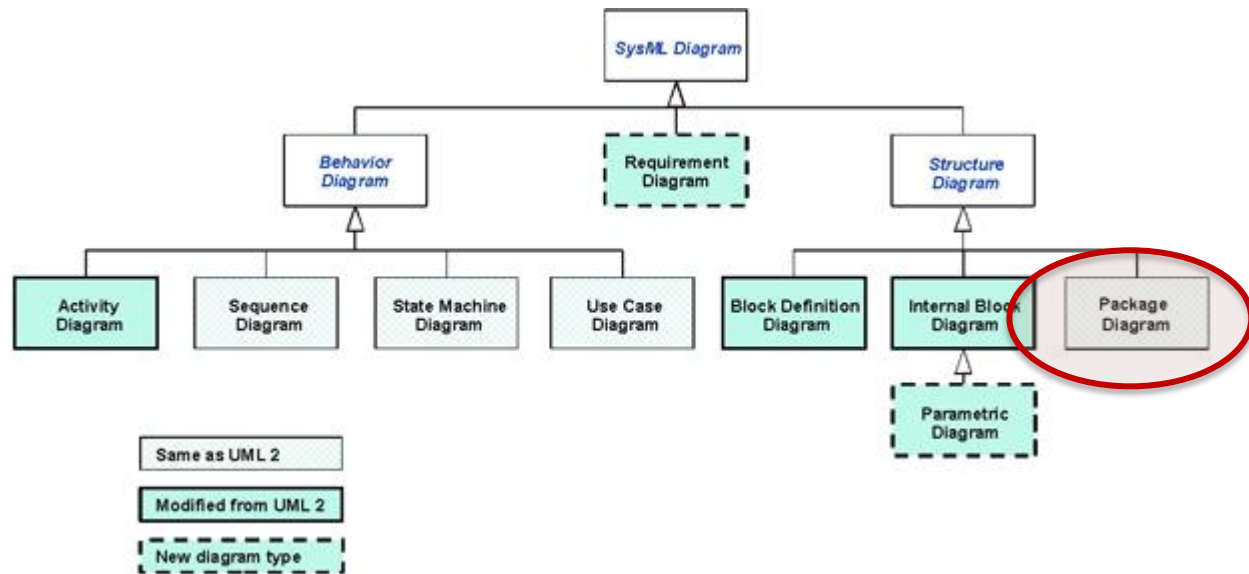
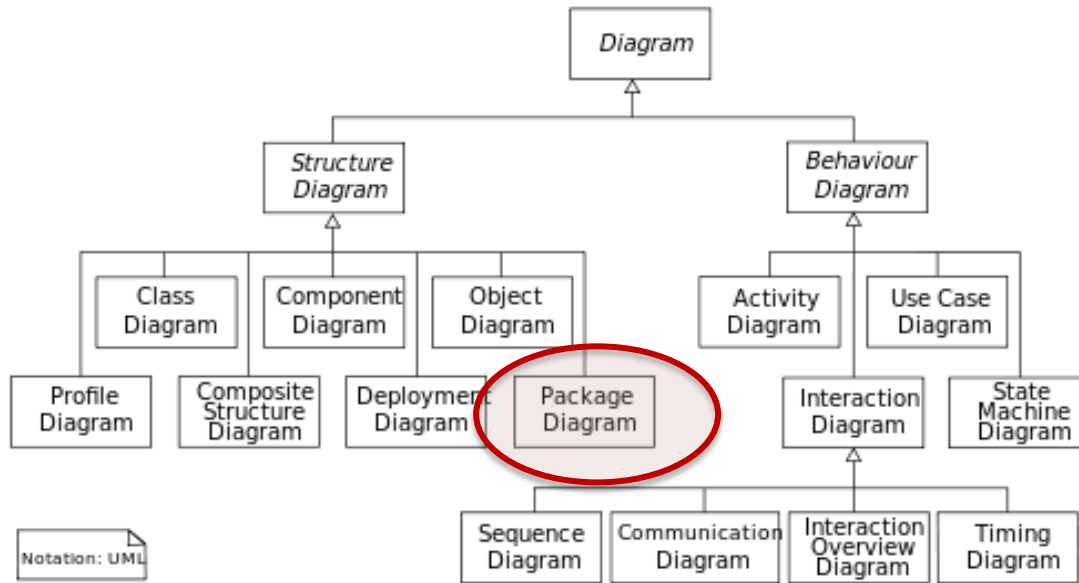
UML & SysML Diagrams



Organizing Models with Packages

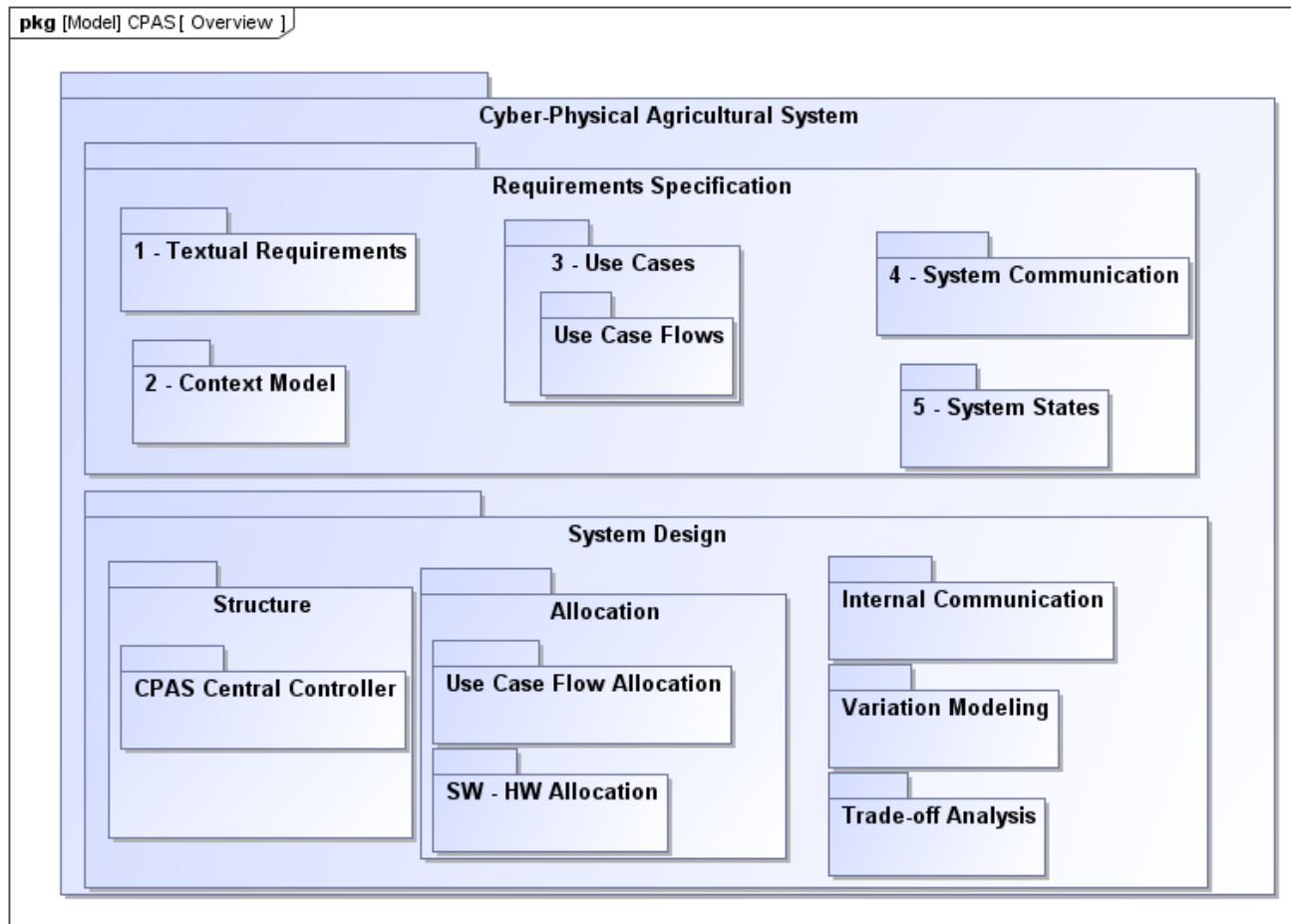
Package Diagrams

Package Diagrams



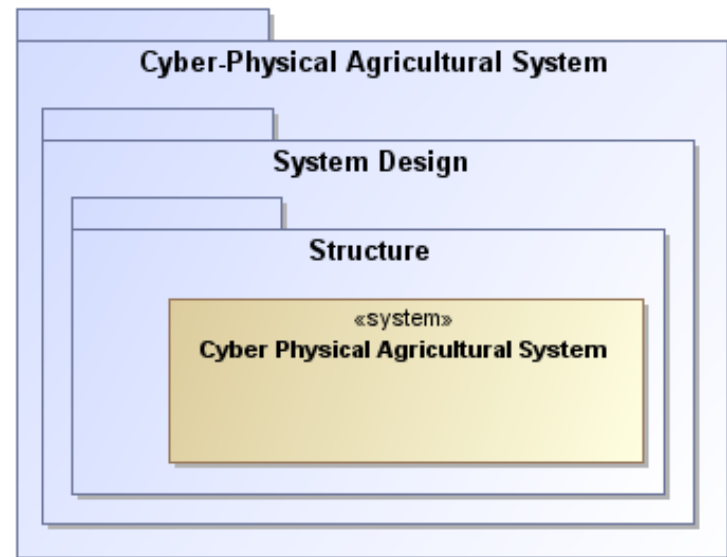
Modeling Aspect

How to organize the model?



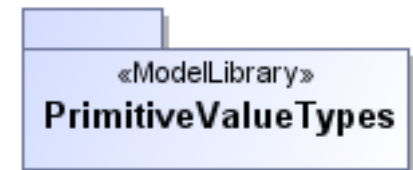
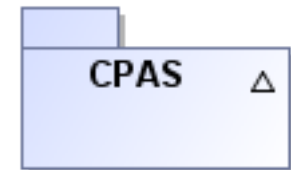
Objectives

- Packages are used to group elements
 - Provides a containment hierarchy for model elements
 - Similar to directories for files
- Provides a namespace for the grouped elements
 - Modeling elements are identified by their qualified name
 - E.g. Cyber-Physical Agricultural System::System Design::Structure::Cyber Physical Agricultural System
- Not for modeling real world entities



Special packages

- **Profile (UML)**
 - extends metamodel
- **Model (UML)**
 - contains set of elements that describe the domain of interest
- **Model library (SysML)**
 - contains reusable elements



Package relationships

- Containment
 - Packageable elements
 - Other packages
- Package import
 - Import all elements from another package to the namespace
- Element import
 - Import one element from another package to the namespace

Package example

Pkg [package type] package name [diagram name]

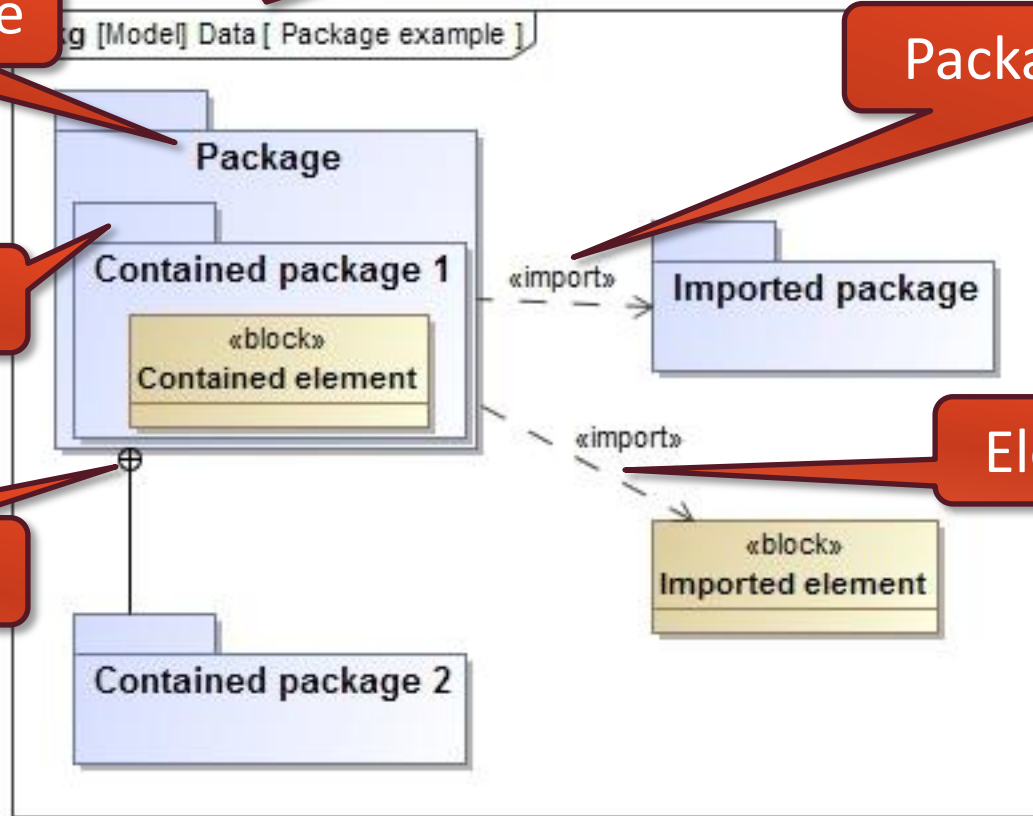
Package name

Containment

Containment

Package import

Element import



Summary

- Goal
 - Group model elements hierarchically
 - Provide namespace for model elements
- Modeling aspect
 - *How to organize the model?*
 - Not real modeling