

Practical No: 4

Title: Enterprise Architecture using - IDEF, ARIS using Architecture Description Languages like SysML/piADL

Problem Statement:

Develop an enterprise architecture using IDEF, ARIS using Architecture Description Languages like SysML/piADL

Software Requirements: Sparx Systems Enterprise Architect

Theory:

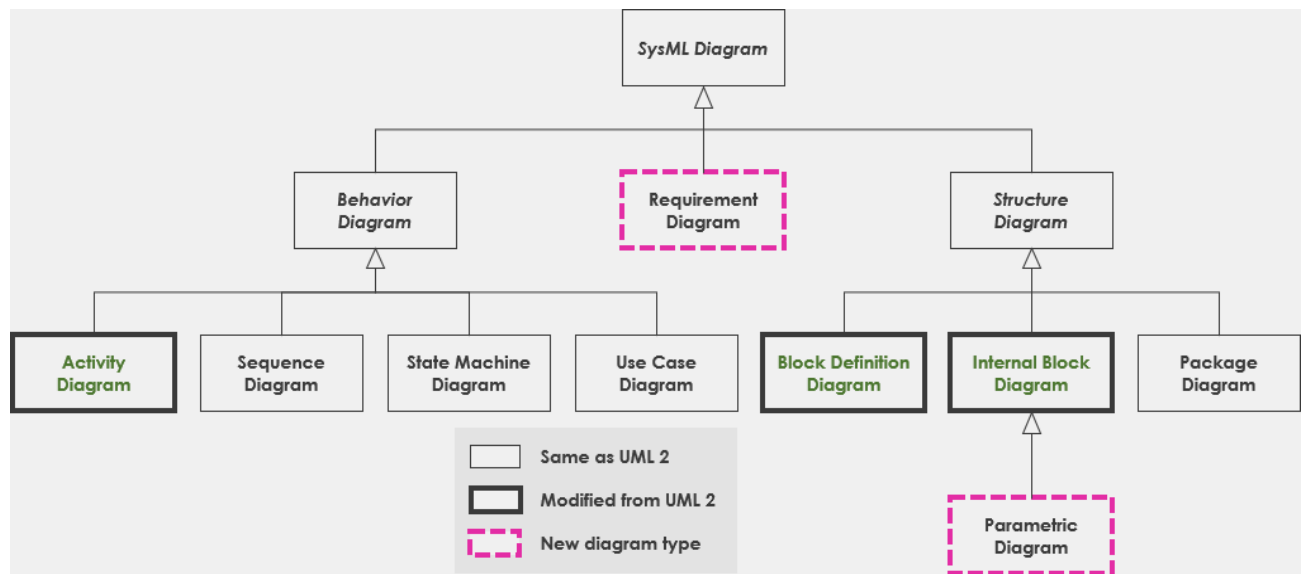
SysML

SysML (Systems Modeling Language) is a modeling language that extends Unified Modeling Language (UML) to enable the specification, analysis, design, and verification of complex systems, including hardware, software, information, processes, personnel, and facilities. SysML is particularly useful for system engineering and system architecture modelling.

Types of SysML Diagram

SysML is a powerful modeling language used in Model-Based Systems Engineering (MBSE) applications. It provides a standardized notation and vocabulary for capturing system requirements, structure, behavior, and interactions between system components. SysML diagrams are used to model different aspects of a system, including its physical and functional aspects, requirements, and constraints.

There are nine types of SysML diagrams, each with a specific purpose



The Three Categories of SysML Diagrams

SysML is a modeling language used for system engineering design and analysis, and it provides a range of diagram types to help model and represent different aspects of a system. SysML diagrams can be broadly divided into three categories: structure diagrams, requirement diagrams, and behavior diagrams.

Structure Diagrams:

Structure diagrams are used to represent the physical or logical architecture of a system. The two main types of structure diagrams in SysML are block definition diagrams (BDDs) and internal block diagrams (IBDs). BDDs are used to show the hierarchy and composition of the system's components, while IBDs show the internal structure of a block and the connections between its parts. The package diagram is another type of structure diagram that shows the organization of the model's components into packages and their dependencies.

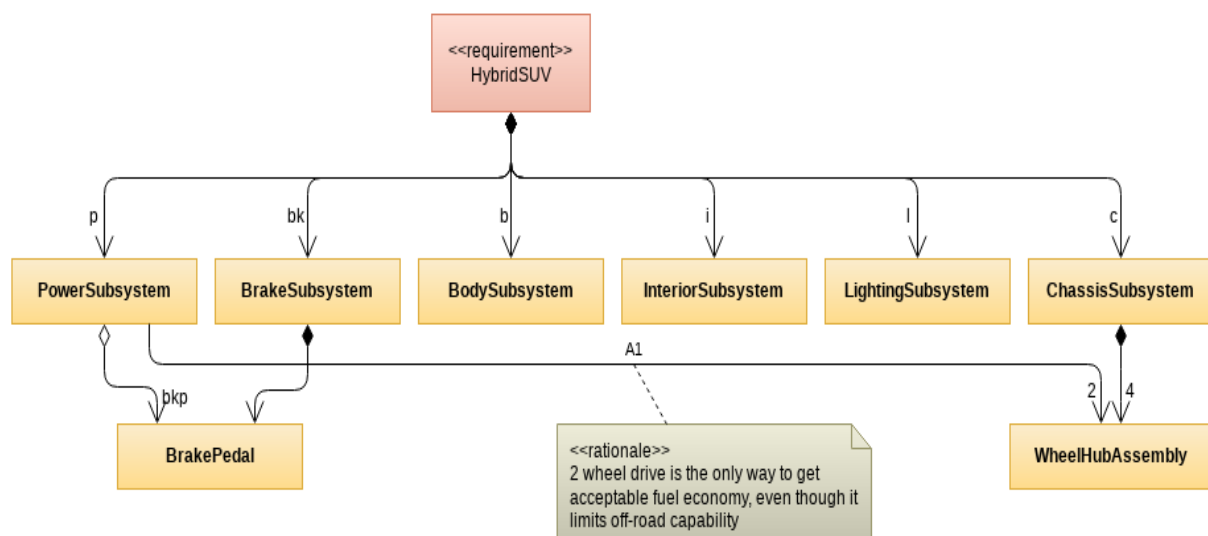
Requirement Diagram: Requirement diagram is used to define and manage the requirements of a system. The requirements diagram is used to capture and organize the requirements for a system. It helps to define the scope of the system, identify the stakeholders, and trace requirements to specific components or parts of the system.

Behavior Diagrams: Behavior diagrams are used to represent the dynamic behavior of a system, including its activities, states, and interactions. There are several types of behavior

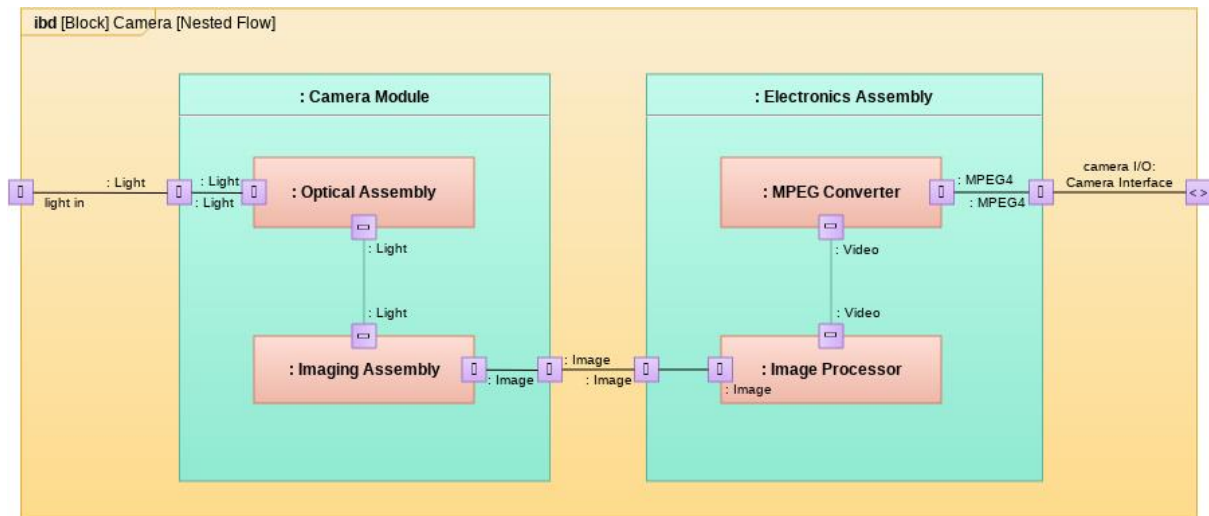
diagrams in SysML, including activity diagrams, state machine diagrams, sequence diagrams, and use case diagrams. Activity diagrams show the flow of activities in a system, state machine diagrams show the behavior of a system in response to events and changes in state, sequence diagrams show the interactions between components or parts of a system, and use case diagrams show the interaction between the system and its users or external entities.

In short, SysML has nine diagram types that are divided into three major categories: structure diagrams, requirement diagrams, and behavior diagrams. These diagrams help to model and represent different aspects of a system, such as its physical and logical architecture, requirements, and dynamic behavior.

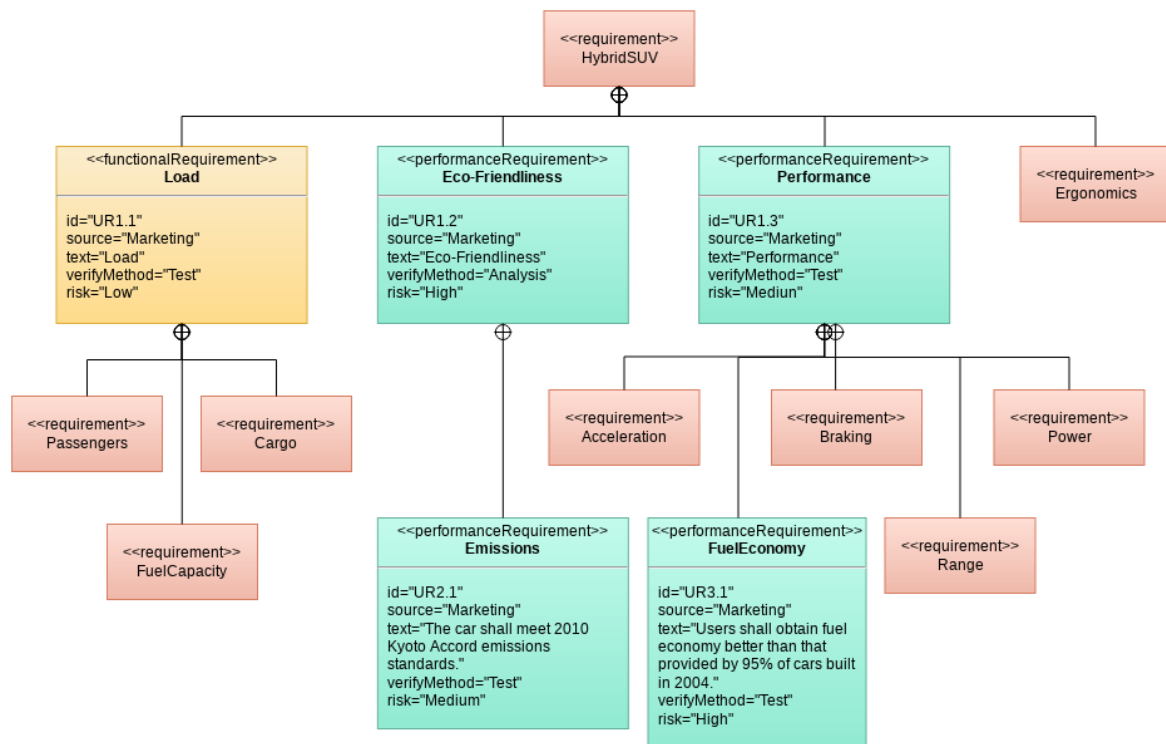
1. Block Definition Diagrams (BDDs): BDDs are used to define the blocks that make up a system and their relationships. Blocks represent the components of a system and their interactions, and can be hierarchical.



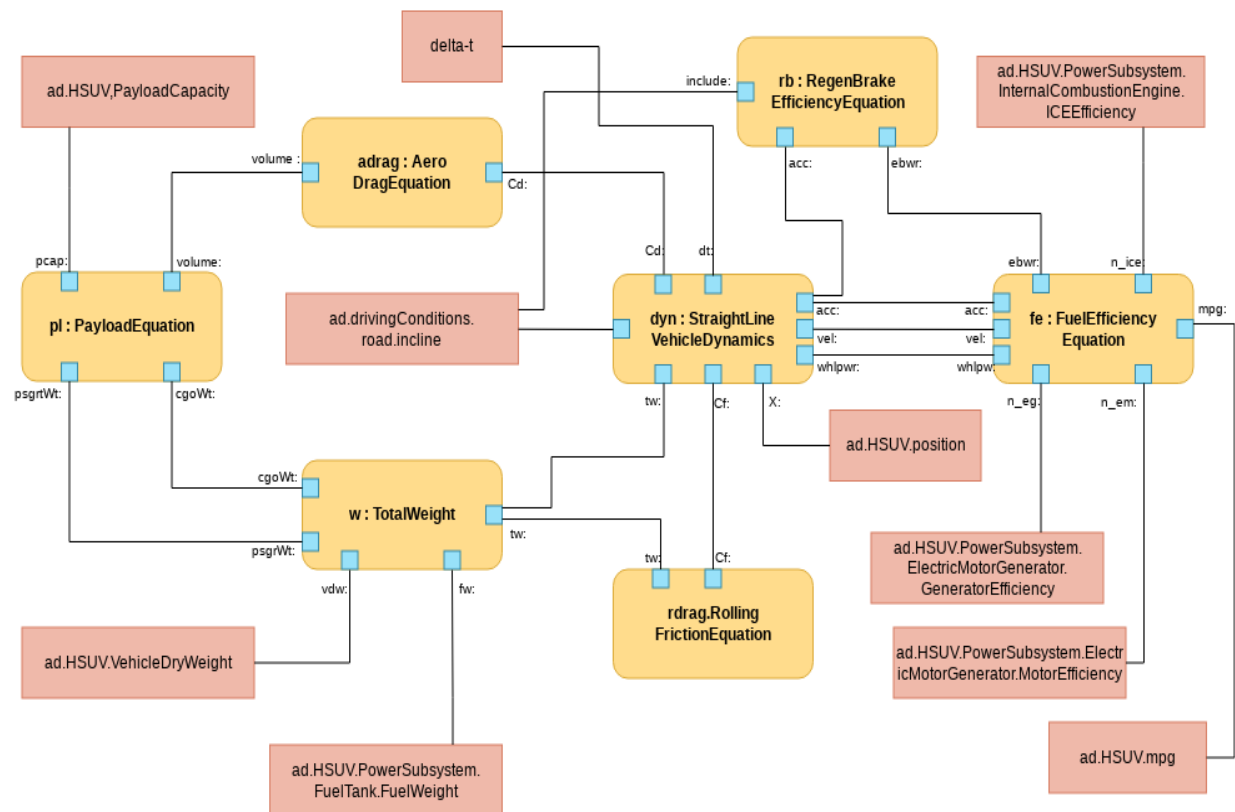
2. Internal Block Diagrams (IBDs): IBDs depict the internal structure of a block, showing the parts that make up the block and their relationships.



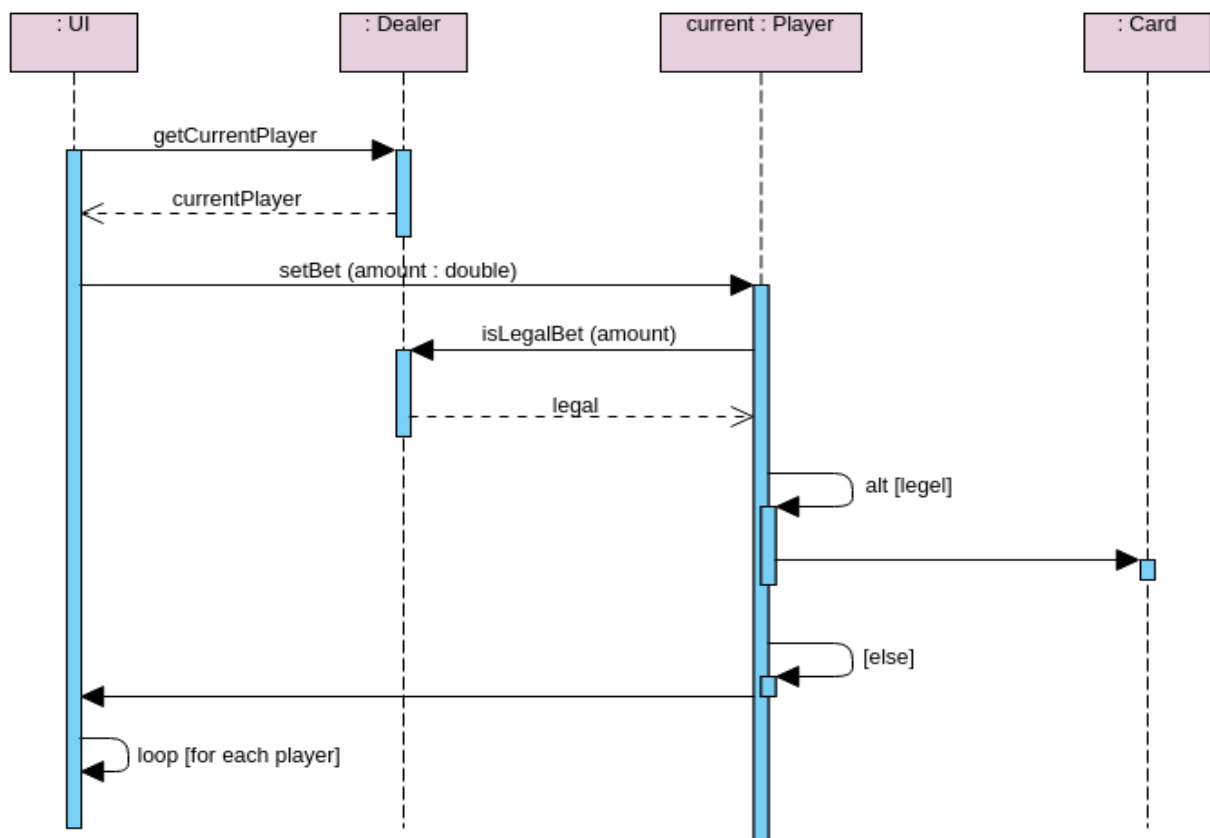
3. Requirements Diagrams: Requirements diagrams are used to capture system requirements, including functional, performance, and interface requirements. They provide a way to track requirements and ensure they are being met.



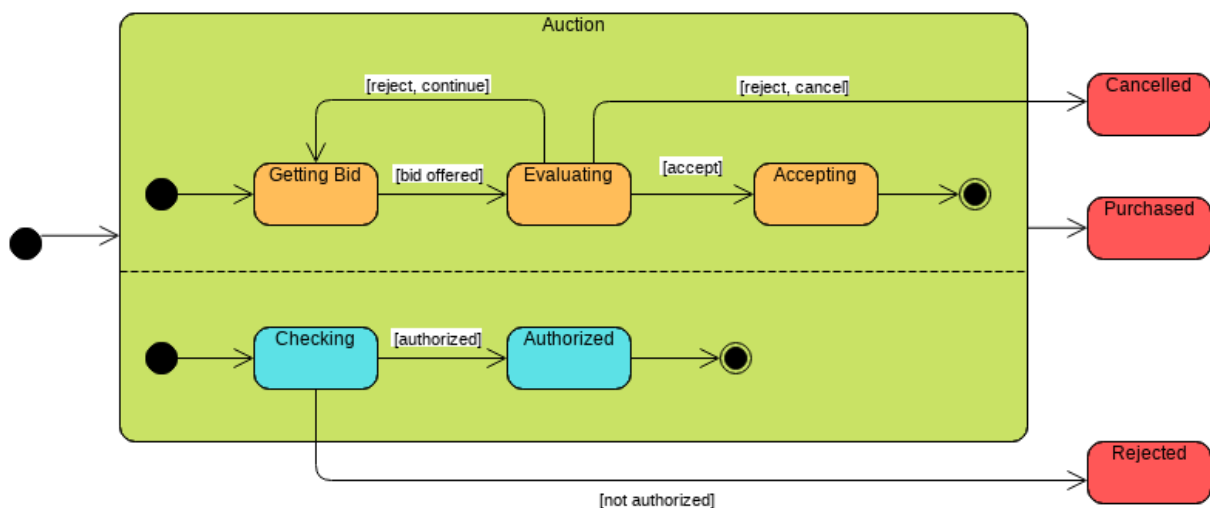
4. Parametric Diagrams: Parametric diagrams are used to model the behavior of a system by showing how the system responds to different inputs and environmental conditions. They show the relationships between system parameters and their values.



5.Sequence Diagrams: Sequence diagrams are used to model the interactions between system components over time. They show the order of messages between components and can be used to verify system behavior.

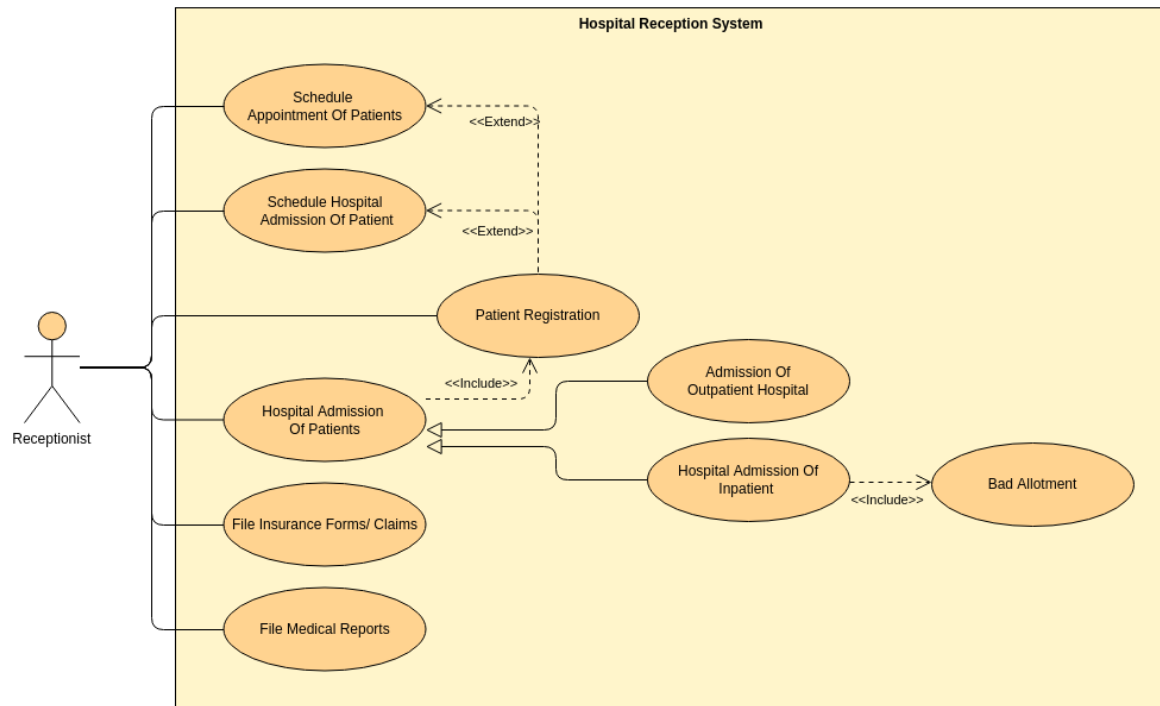


6. State Machine Diagrams: State machine diagrams are used to model the behavior of a system over time, showing the different states a system can be in and how it transitions between states.

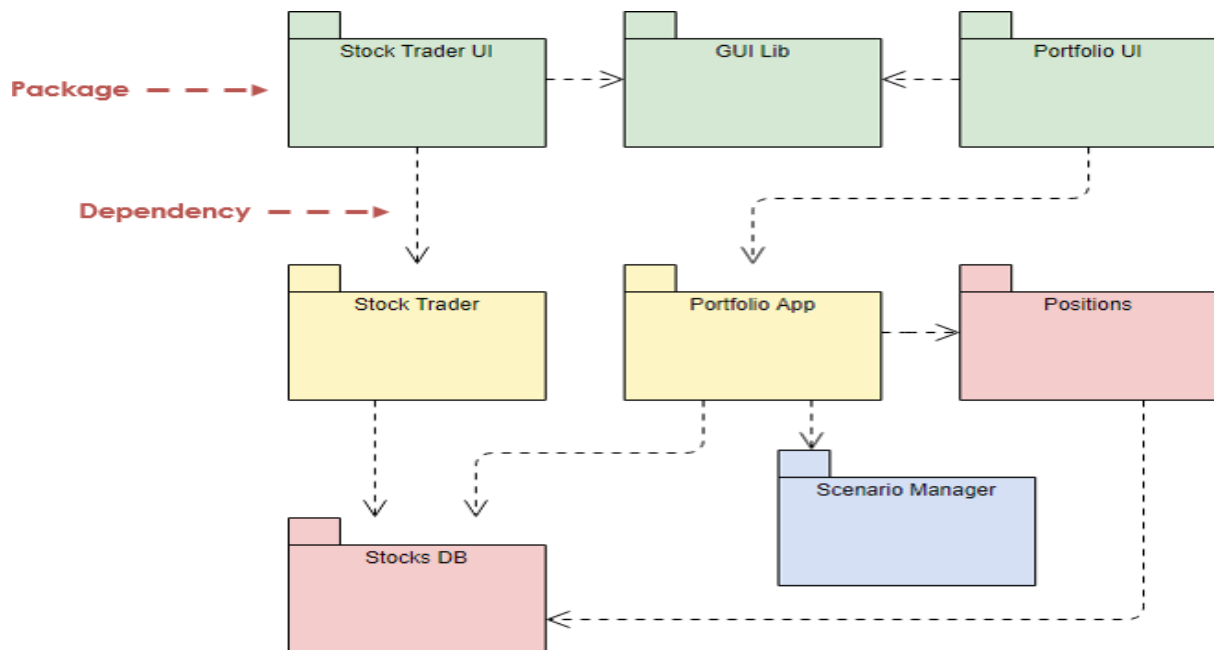


7. Activity Diagrams: Activity diagrams are used to model the flow of activities in a system, showing the steps involved in a process and their relationships.

8. Use Case Diagrams: Use case diagrams are used to model the interactions between a system and its users, showing the different use cases and actors involved in a system.



9. Package Diagrams: Package diagrams are used to organize the different elements of a system, including blocks, requirements, and diagrams.



In addition to these diagrams, SysML also includes Allocation Tables, which provide a way to allocate system requirements to specific system components and track their implementation.

Steps to Develop EAC using SysML:

Step 1: Define the Scope and Objectives

Before diving into architecture development, clearly define the scope and objectives of your enterprise architecture project. Understand what you want to achieve and the problems you want to address. This is a critical step for a successful outcome.

Step 2: Gather Requirements and Stakeholder Input

Collect and analyze requirements from various stakeholders, including business owners, IT experts, and end-users. Their input will inform your architecture design.

Step 3: Choose the Architecture Description Language

For this project, we will combine IDEF and ARIS with SysML to provide a comprehensive view of the enterprise architecture. IDEF will help with process modeling, while ARIS will assist in integrating information systems. SysML will be used for systems engineering and structural modeling.

Step 4: Create Process Models using IDEF

IDEF is particularly useful for process modeling. Create IDEF diagrams to visualize the current and desired processes within your organization. This can include Data Flow Diagrams (DFD), Process Structure Diagrams (PSD), and more. These diagrams will provide a clear understanding of how different processes interrelate.

Step 5: Design Information Systems with ARIS

ARIS is well-suited for modeling information systems. Use it to map out your organization's data and information flows, information systems architecture, and data models. This will help in understanding how data is managed, shared, and utilized within the organization.

Step 6: Develop System Models with SysML

SysML provides a structured approach to system modeling. Create block diagrams, activity diagrams, and sequence diagrams to illustrate how different system components and processes interact. This is especially important for large and complex enterprises with intricate IT systems.

Step 7: Integration of IDEF, ARIS, and SysML

Integrate the models created using IDEF, ARIS, and SysML to develop a comprehensive view of your enterprise architecture. Ensure that your process models align with your information systems and overall system design.

Step 8: Document and Annotate

Document the architecture description using appropriate notations and annotations. Provide clear explanations and details to make the architecture understandable for a wide range of stakeholders.

Step 9: Validation and Review

Engage with stakeholders to validate the architecture description. Address any feedback or concerns, and make necessary revisions.

Conclusion: In this way we have successfully designed different SysML Diagrams using Enterprise Architect visual modelling and design tool