Massachusetts Institute of Technology

Model-Based Systems Engineering: Documentation and Analysis

Key Takeaways

WEEK 2: BUILDING AN MBSE MODEL

MBSE Benefits

In traditional systems approaches, documents are the highest source of information concerning the requirements, constraints, architecture, designs, decisions, and other information about the system. But documents can become outdated, disconnected, or even contradictory. Model-based systems engineering (MBSE) provides several advantages over document-based engineering, including:

- Streamlined communication and sharing of information
- Simpler change management
- Increased traceability

Data modeling is an important aspect of MBSE that captures the requirement text, parent child relationships, and related information such as owner, validity status, and other factors. The data constructs are:

- **Objects**: Objects represent concrete and conceptual things important to a business.
- **Attributes (Properties)**: Attributes are aspects of an object that define or describe an object.
- **Relationships**: Establishes the relationship between entities (Composition, Aggregation, Directed Association, Generalization).
- **Cardinality**: This is another important aspect of data modeling. Cardinality quantifies the relationships between entities by measuring how many instances of one entity are connected to a single instance of another.

SysML

The Systems Modeling Language (SysML) is general purpose architecture modeling language for Systems Engineering applications.

- SysML supports the specification, analysis, design, verification, and validation of a broad. range of systems and systems-of-systems. These systems may include hardware, software, information, processes, personnel, and facilities.
- SysML is a dialect of UML and is defined as a UML 2 Profile. (Profile = UML customization that uses Stereotypes, Tagged Values, and Constraints.)
- SysML is an enabling technology for Model-Based Systems Engineering (MBSE).

SysML language includes the following nine diagram types that are used to model system concepts and architectures:

SysML as an Example Language for MBSE > SysML Diagram Overview >

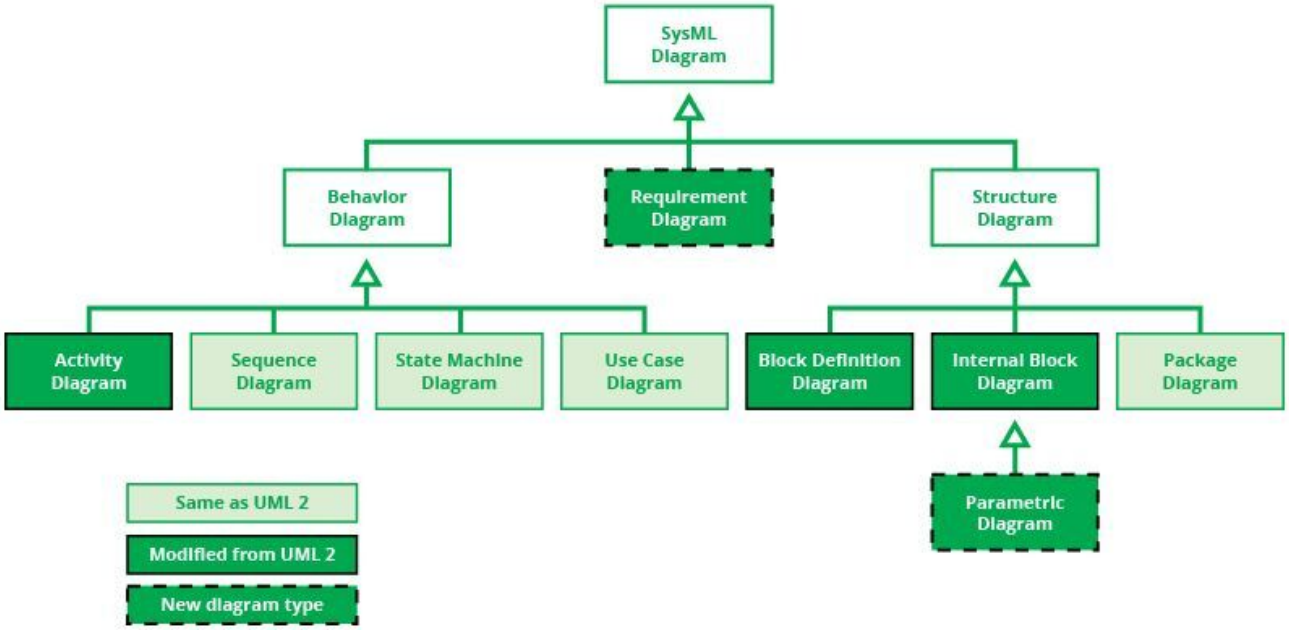
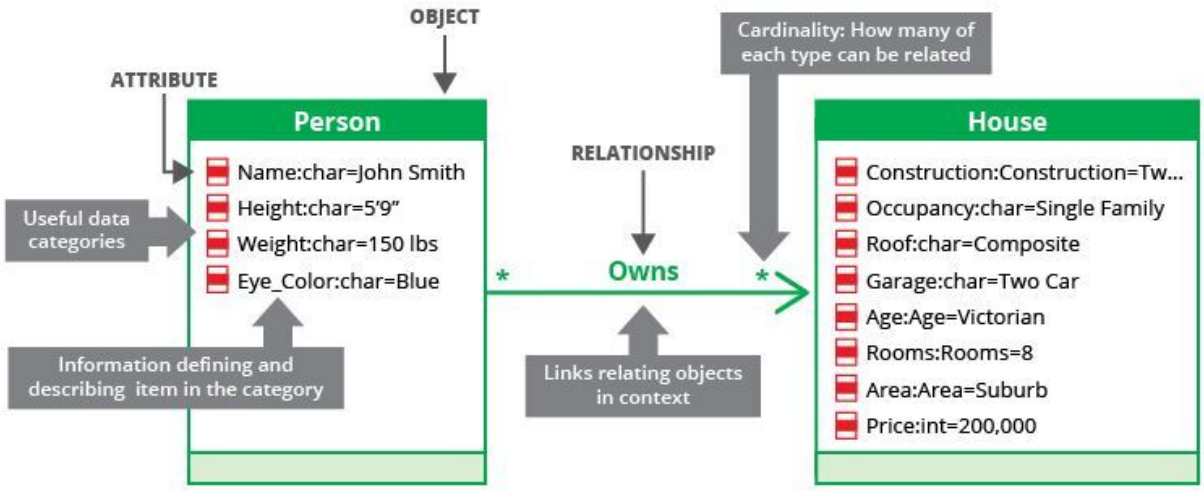


Image credit to http://omgsysml.org



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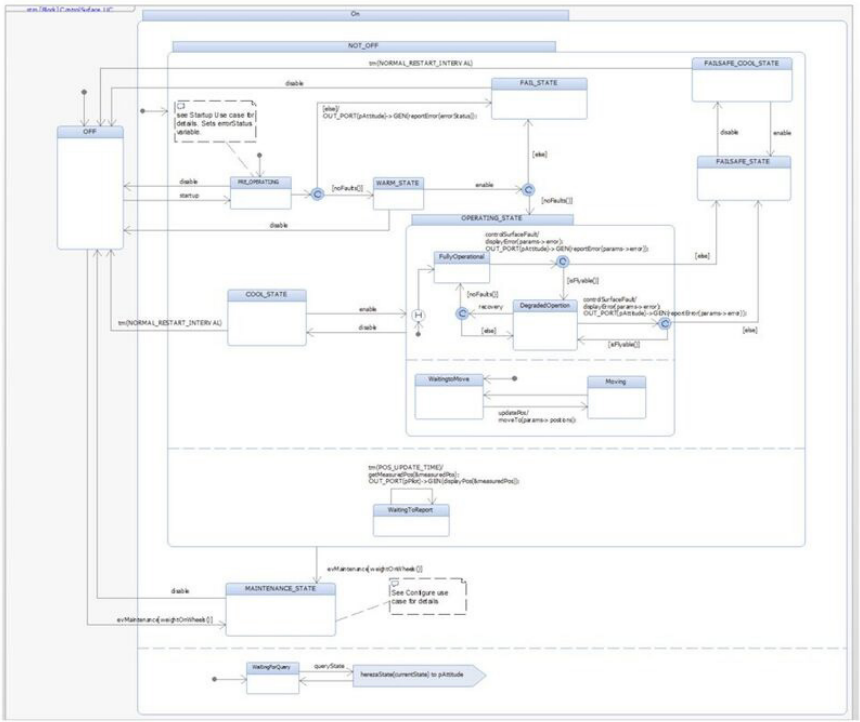
SysML DIAGRAM



Air Surface Control Enactment System (ACES) Use Cases