Powering Innovation That Drives Human Advancement

Real-time collaborative system modelling with Ansys System Architecture Modeler (SAM)

Michael Soden / Senior Product Manager

2024-11-23

Agenda

- MBSE and Digital Engineering at Ansys
- System Architecture Modeler (SAM)
- Q&A

Challenge: Model-based Integration across multiple Disciplines

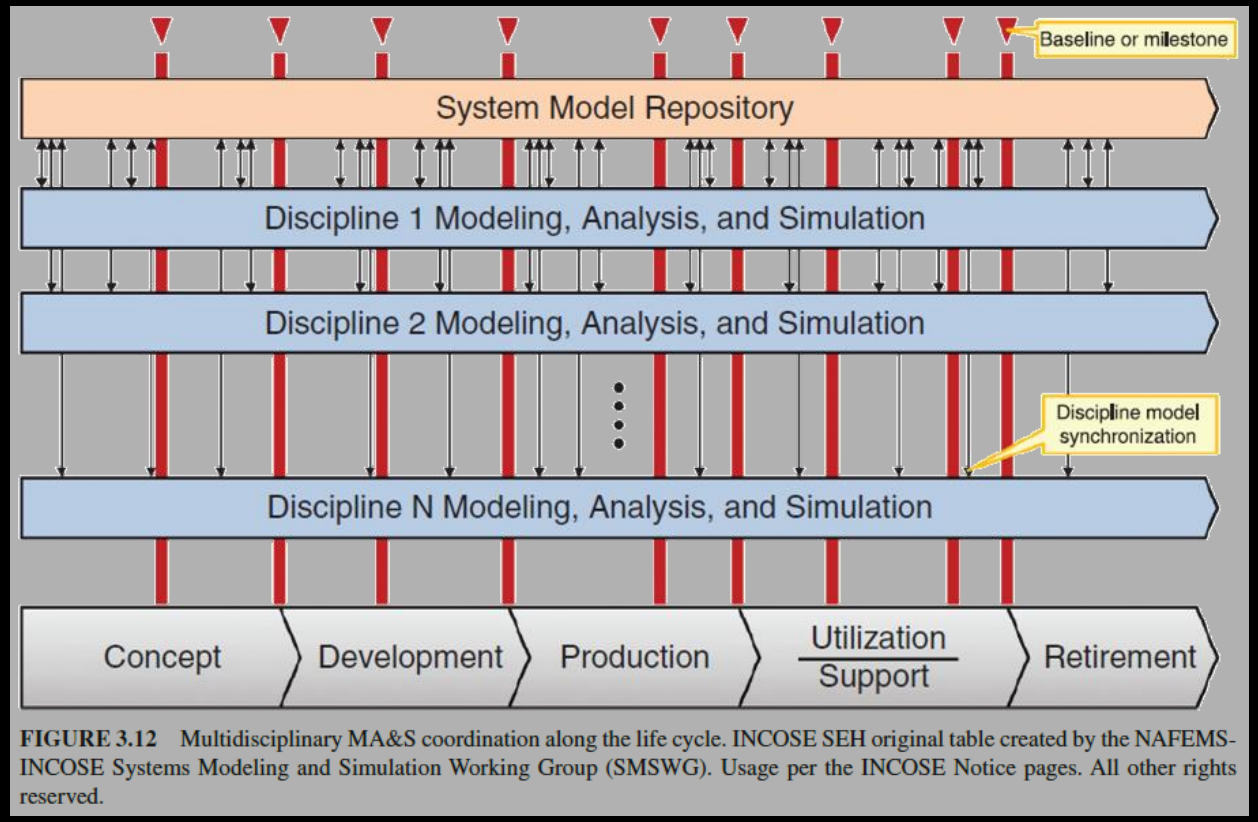
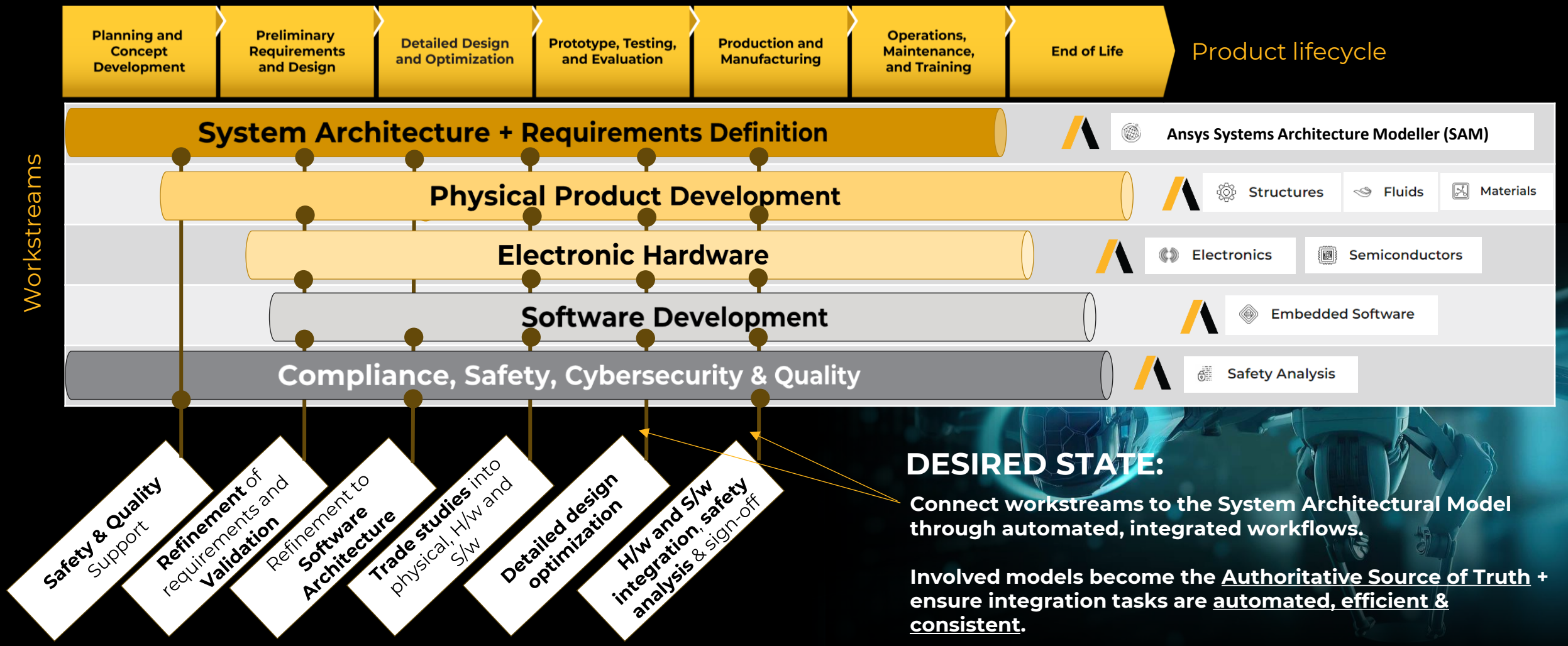


FIGURE 3.12 Multidisciplinary MA&S coordination along the life cycle. INCOSE SEH original table created by the NAFEMS-INCOSE Systems Modeling and Simulation Working Group (SMSWG). Usage per the INCOSE Notice pages. All other rights reserved.

=> We see a broad range of system engineers that need to collaborate in a digital/model-based environment

Shift from Traditional to Digital Systems Engineering



DESIRED STATE:

Connect workstreams to the System Architectural Model through automated, integrated workflows.

Involved models become the Authoritative Source of Truth + ensure integration tasks are automated, efficient & consistent.

Digital Engineering Capabilities / Supporting MBSE

Integration with **Requirements Management Systems**

Interface with **System Architecture Modeling Tools**

Safety and Cybersecurity Analysis for System Architectural Models

Ansys System Model Analysis

Requirement verification & trade studies based on system architecture

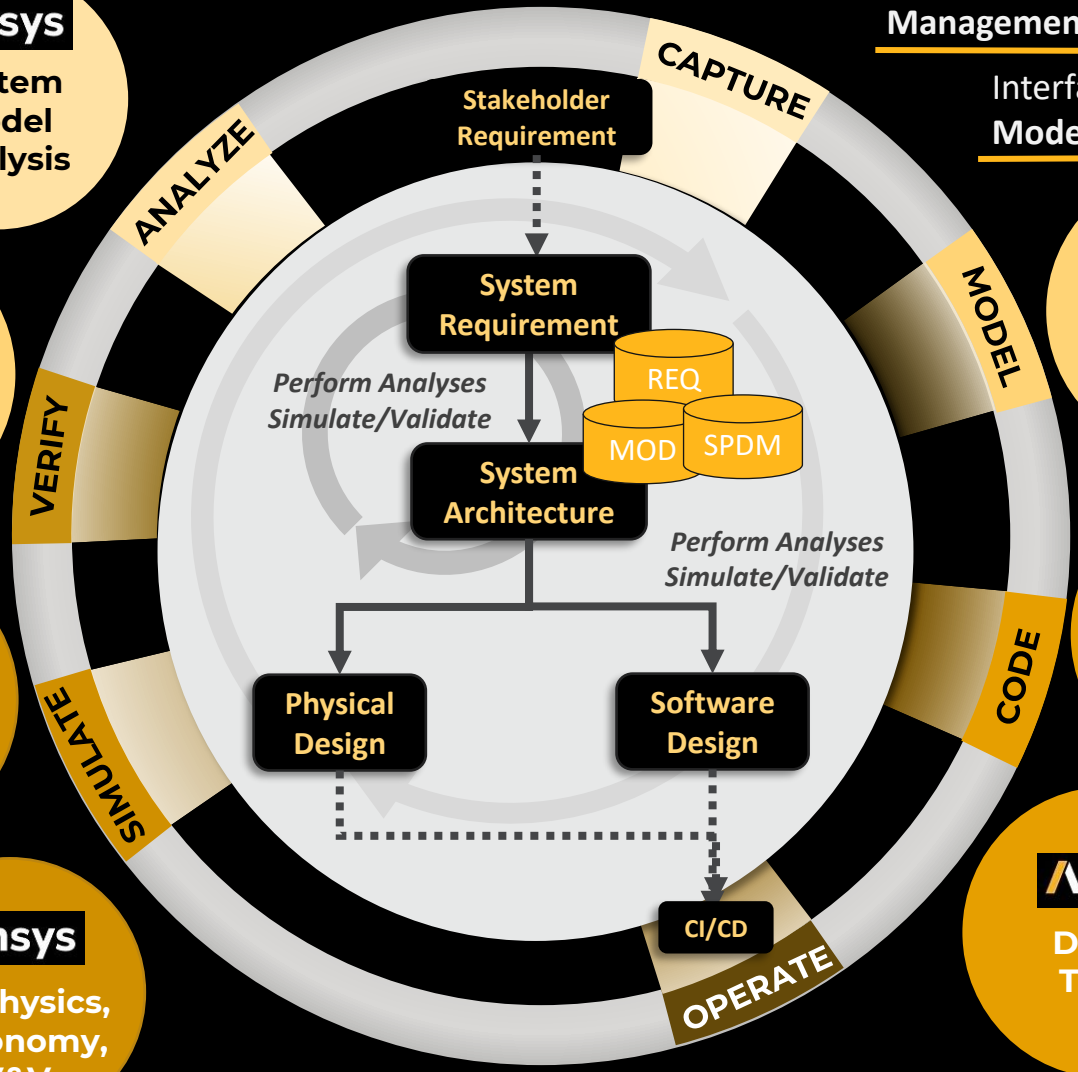
Ansys Interface to Engineering Analysis

Physics Simulation, Analysis & Optimization

Ansys Optimization Digital Twins System Simulation

Ansys 3D Physics, Autonomy, V&V

Guided by Ansys DE Methodology



Ansys System Architecture Modeling

System Architecture Modeling
Structure, Behavior, Requirements

Ansys Embedded Software Flow

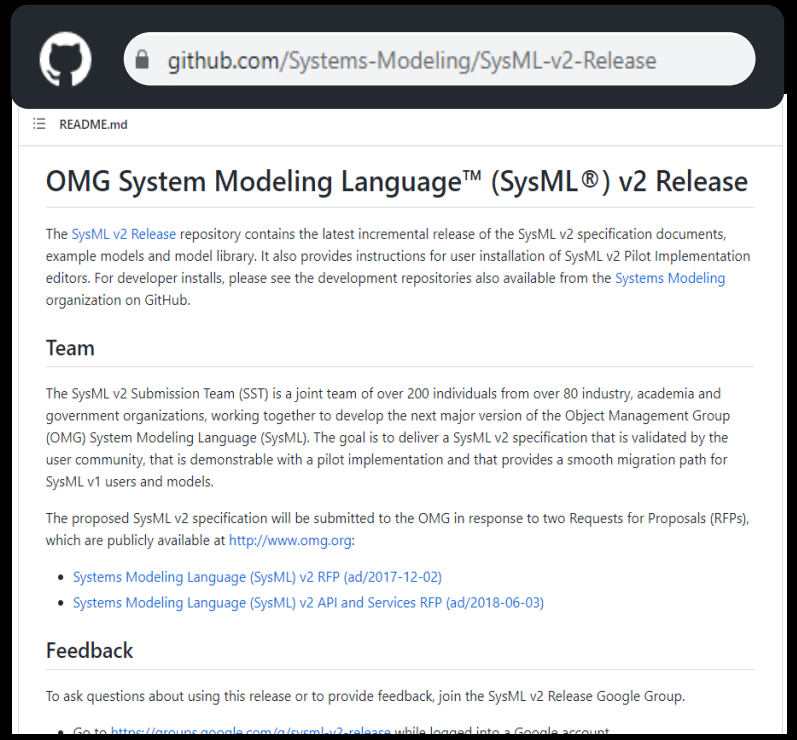
Model Based Design & Verification of Safety Critical Embedded Software

Ansys Digital Twins

Predictive maintenance & operational feedback into product design

SysML v2 – Standardization Roadmap

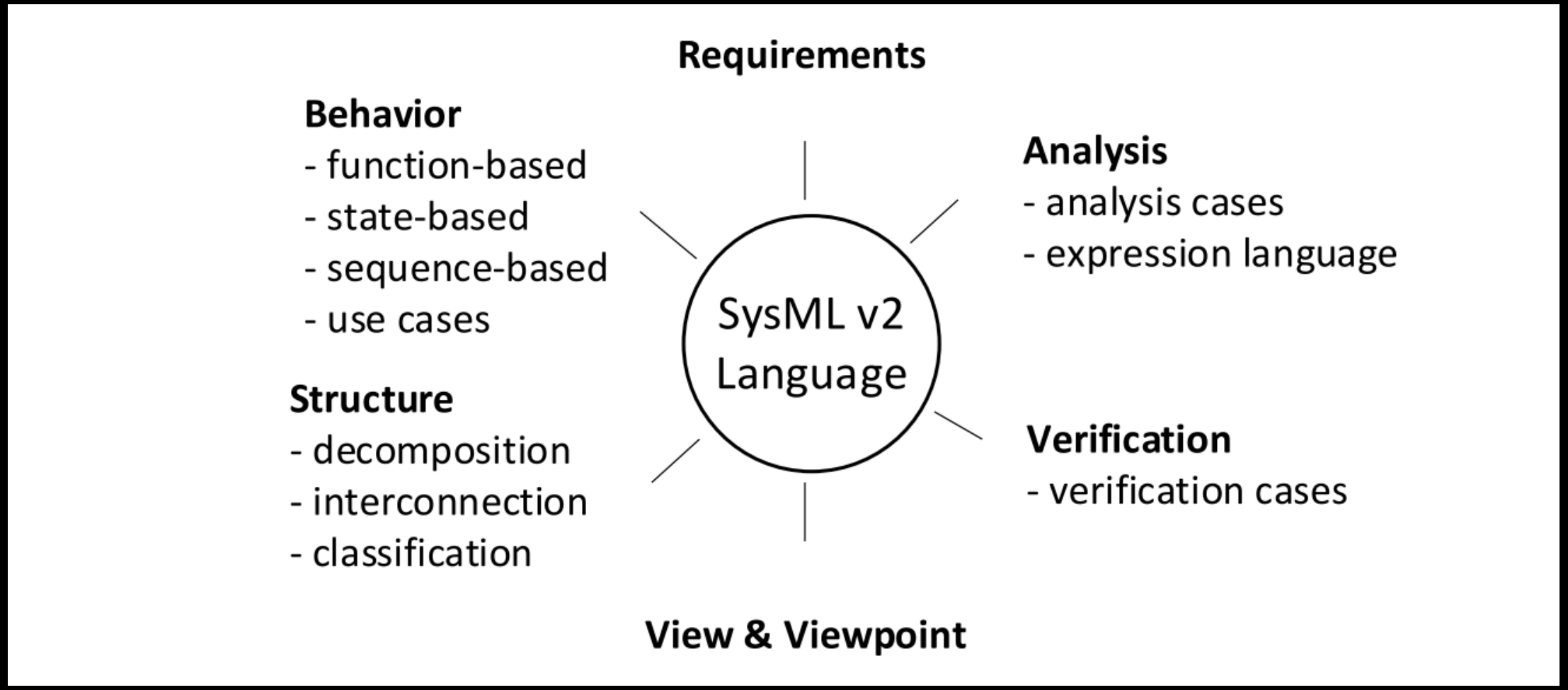
- SysML v2 Finalization ongoing
  - Request For Proposal (RFP) issued to overcome limitations introduced by UML
  - Single specification from the *SysML v2 Submission Team* (SST)
  - Broad MBSE community is contributing and supporting initiative
  - Ansys is part of the SST and OMG FTF leading the group for execution semantics
- Latest SysML v2 specifications available on github



SysML2 Standardization

1st Public Release (Sept 2019) → Initial Submission (August 2020) → Revised Submission (Sept 2021) → Final Submission (OMG Adoption: March 2023) **>> FTF@OMG >>** **Official Standard (2024?)**

SysML v2: Language Capabilities



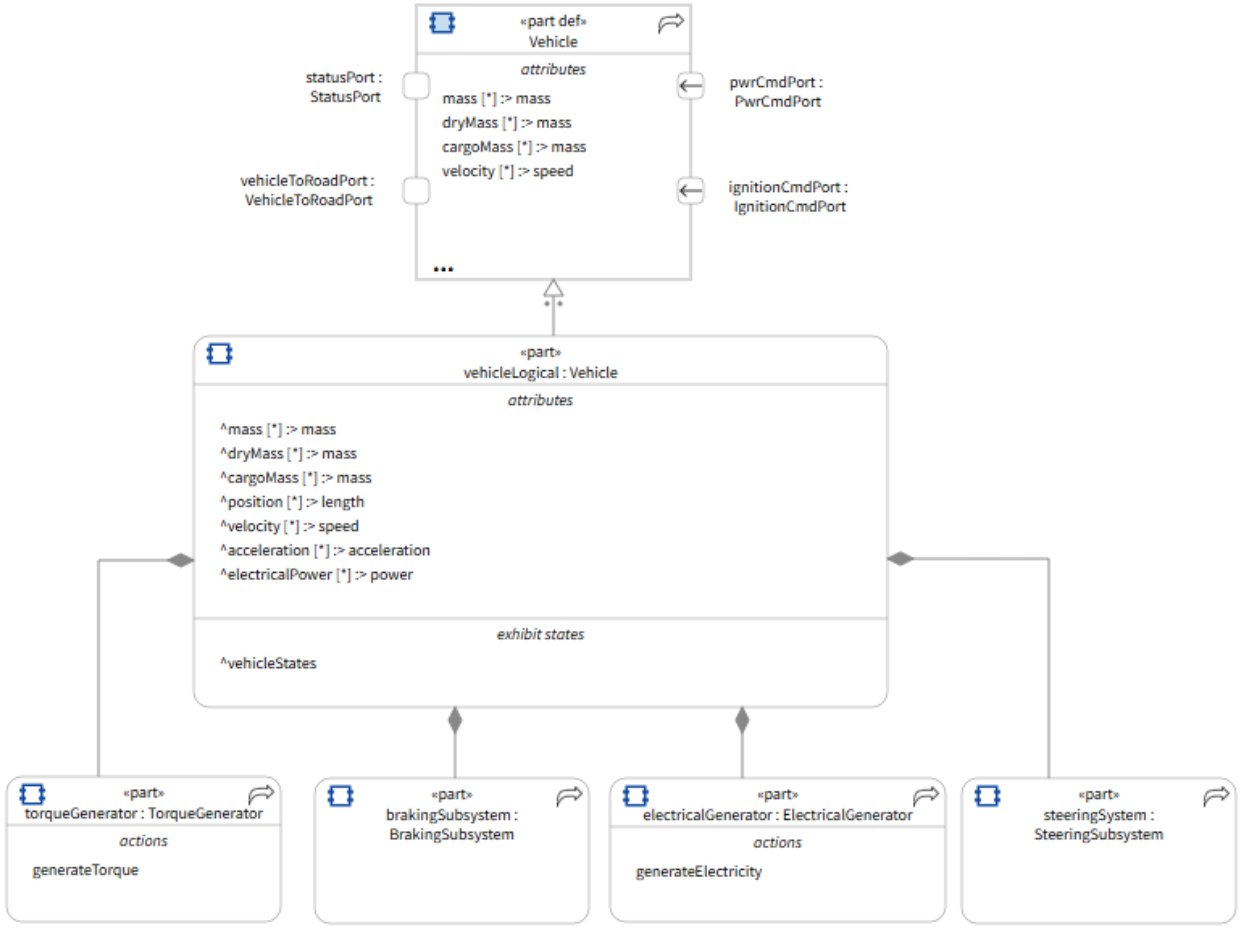
Source: Introduction to the SysML v2 Language (SST Presentations)

13 Dec 2021

SysML v2 Textual and Graphical Syntax

```
part def Vehicle {
    attribute mass :> ISQ::mass;
    attribute dryMass:>ISQ::mass;
    attribute cargoMass:>ISQ::mass;
    attribute position:>ISQ::length;
    attribute velocity:>ISQ::speed;
    attribute acceleration:>ISQ::acceleration;
    attribute electricalPower:>ISQ::power;
    attribute Tmax:>ISQ::temperature;
    attribute maintenanceTime: Time::DateTime;
    attribute brakePedalDepressed: Boolean;
    port ignitionCmdPort:IgnitionCmdPort;
    port pwrCmdPort:PwrCmdPort;
    port vehicleToRoadPort:VehicleToRoadPort;
    port statusPort:StatusPort;
    perform action providePower;
    perform action provideBraking;
    perform action controlDirection;
    perform action performSelfTest;
    perform action applyParkingBrake;
    perform action senseTemperature;
```

```
package VehicleLogicalConfiguration{
    package PartsTree{
        #logical part vehicleLogical:Vehicle{
            part torqueGenerator:TorqueGenerator{
                action generateTorque;
            }
            part electricalGenerator:ElectricalGenerator{
                action generateElectricity;
            }
            part steeringSystem:SteeringSubsystem;
            part brakingSubsystem:BrakingSubsystem;
        }
    }
}
```



Digital Engineering / SAM

Ansys System Architecture Modeler

- **Cloud-ready SysML v2** modeling solution
- **Collaboration** and ease-of-use are key drivers
- **Connected** to the digital thread

DEMO

Digital Engineering / Ansys Driving Principles

No lock-in	**Open solution** and built on a solid partner framework - openness in terms of models, data, APIs
Future-proof	Based on **most up-to-date standard SysML V2 & state of the art**
Collaborative	Truly easy-to-use & easy-to-access using **components in web & cloud with enterprise scale real-time collaboration**
Scalable & consistent	Managed source of truth for models and data - holistic approach in terms of **consistent interoperability** with other Enterprise Systems
Connected	**Connect to the digital thread** and integrate with Ansys multi-physics and system modeling solutions

Summary & Outlook

- SAM implements SysML V2, objectives:
  - Graphical Syntax, textual syntax, and tabular editing
  - 100% complete & standard compliant
  - Seamless integration with digital thread (Ansys and 3rd parties)

- Outlook into 2025
  - Focus on language and API completion (graphical and textual)
  - Increased connectivity to requirements management
  - Improved model and config management (e.g. branches, review support)

Thank You for Listening!

Ansys