SIEMENS
Ingenuity for life

System Modeling Workbench for Teamcenter

An integrated MBSE approach to improving multi-domain product development

Benefits

- Achieve right-to-market – by ensuring that your products meet customer value perceptions, time-to-market windows of opportunities and quality related objectives

- Accelerate time-to-market – by enabling your development teams to collaborate and understand the total impact of their design decisions as early in the product lifecycle as possible, thereby minimizing unnecessary rework and expense

- Meet customer expectations – by making certain that every aspect of your product complies with its related performance targets, customer expectations and regulatory requirements

- Ensure compliance – by enabling program managers to continuously measure and track design items that must comply with specific requirements by closing the loop between downstream implementation with upstream plans, and flagging instances when a requirement is in danger of being violated

Summary
Teamcenter® System Modeling Workbench solution provides a first-of-its-kind integrated systems engineering environment that companies can use to apply standard model-based systems engineering (MBSE) concepts to the entire product development process. This is different than existing stand-alone Unified Modeling Language/Systems Modeling Language (UML/SysML) modeling tools which create disconnected product architectures. Teamcenter links requirements management and model-driven systems design with the rest of your company's product and process knowledge, enabling you to understand your products and systems in their entirety and optimize the trade-offs that must be made throughout a decision-intensive product lifecycle using standard design notations in an integrated product lifecycle management (PLM) solution.

Define system/subsystem
Companies can use System Modeling Workbench for Teamcenter standard modeling notations (SysML, Capella) to create multiple high-level system abstractions. You can define system architectures and create system models to represent various functional, logical and physical needs as well as capture and analyze performance targets. During the modeling process you can also capture and share the interface definitions and system relationships. Once captured, these needs can be interrelated, giving you whole product visibility for cross-product and cross-domain optimization. For example, automotive companies can create/capture architecture choices as models that represent product structures for cars, trucks and other kinds of vehicles that are comprised of many systems, subsystems, configurations, assemblies, parts, components, test cases and more. The system architecture connects the vehicle's parts to each other and links customer requirements, attributes, targets and program constraints to each system, subsystem, domain, assembly and part. Other considerations, such as safety, reliability, supplier, materials, function, cost, manufacturing and service can also be connected to one another, as well as to the product structure – thereby allowing you to see how a requirements analysis and other changes ripple across engineering and enable you to prepare for verification and validation.
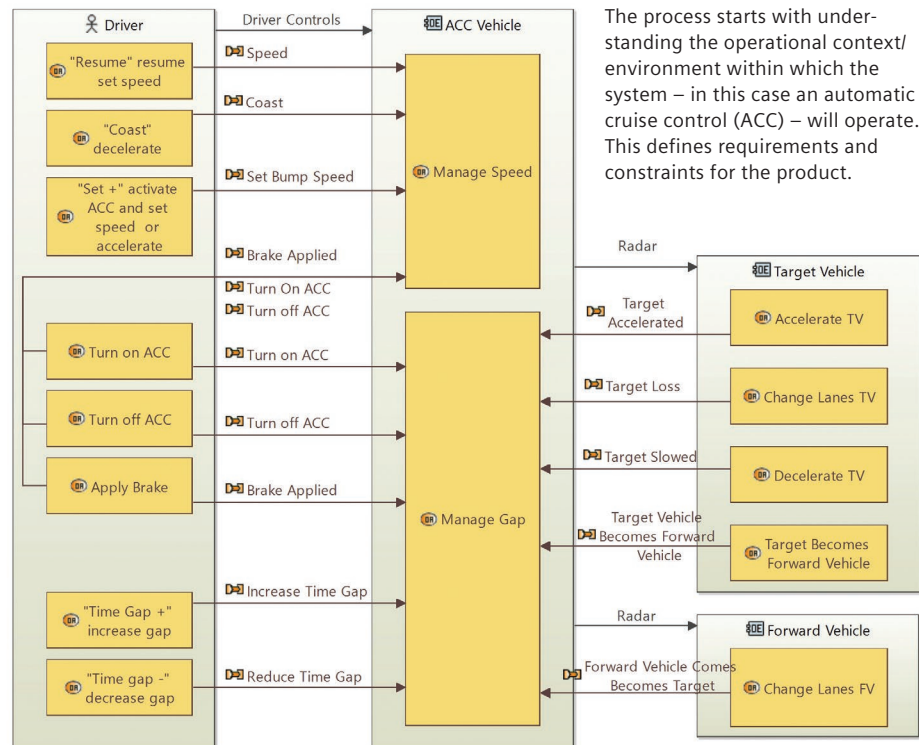
System design and optimization
The integrated Teamcenter Systems Modeling Workbench solution creates a multi-domain representation/environment that you can use to fully understand your products, improve crucial processes in your product

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System Modeling Workbench
for Teamcenter

Benefits *continued*

- Master product change – by enabling development teams to see the impact that design changes and product decisions will have across all aspects of a system and by enabling managers to monitor product development as it takes place

- Optimize the whole product – by using high-level product abstractions to interrelate and optimize complex, interdependent product targets, attributes and constraints and subject them to trade-off analysis before detailed design begins

- Start where you are with existing processes – top-down, bottom-up, iterative/agile, while supporting standard systems engineering notations with built-in best-practice guidance with user queues for shorter learning curves and rapid model development

The process starts with understanding the operational context/environment within which the system – in this case an automatic cruise control (ACC) – will operate. This defines requirements and constraints for the product.

development cycle, and drive your company's systems engineering/cross-product improvement initiatives. By facilitating whole-product understanding, Teamcenter enables you to optimize the trade-offs/take-to-market decisions by maintaining/keeping the cross-product digital thread/big picture needed for globally optimized decisions.

Integrated systems engineering
Teamcenter supports a variety of these strategic objectives:

- The systems modeling capabilities in Teamcenter enable development teams to quickly describe complex products from a systems-oriented perspective – as well as to break down these high-level product hierarchies into fine-grain design elements, program constraints and design notes. Linked design elements enable downstream developers to align design content with customer requirements creating the big picture

needed for holistic, balanced product development. Program performance targets and constraints enable development teams to manage the product's cost, performance and other related variables. Design notes enable developers to explain their design intent, record their concerns and raise appropriate issues of interest

- With seamlessly integrated requirements management, your enterprise can capture requirements documents from multiple sources, parse these documents for individual requirements and retain those requirements in the same environment you use for managing the other parts of the product. In turn, this enables you to incorporate these requirements into the workflow-driven processes you use to drive your engineering, sourcing, manufacturing planning, total quality and change-related decisions
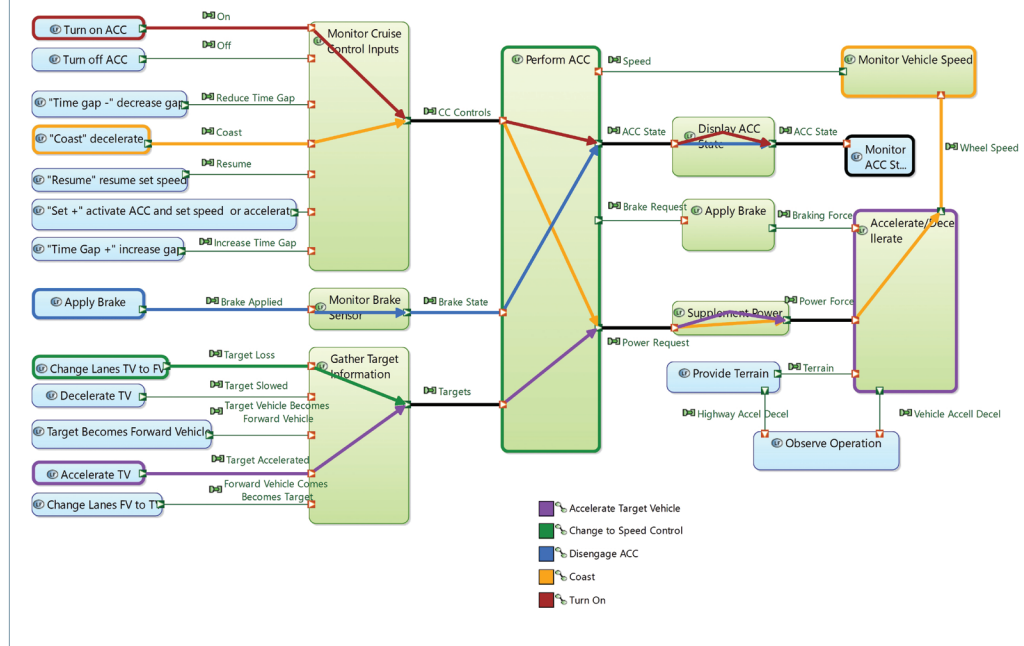
- Teamcenter enables you to capture, manage and re-use product requirements and system models as a living by-product of your development process
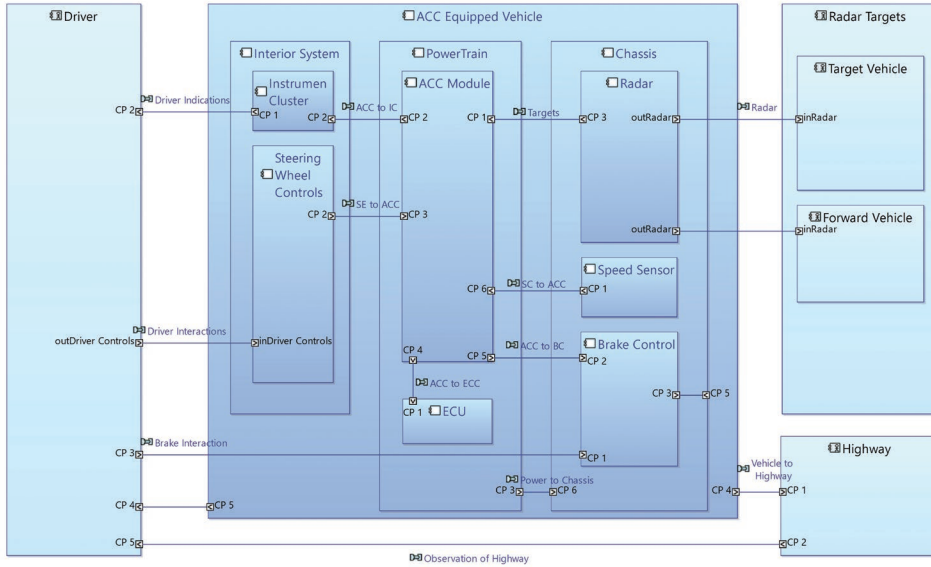
Features

- A proven modeling solution with intuitive user interface that enables engineers to graphically represent complex products and their related systems with best-practice guidance

- Open-community support for modeling add-ons and customizations

- Support for standard modeling notations including SysML (free add-on)

- Full impact analysis across multiple domains to quickly find and navigate engineering artifacts

- System Modeling Workbench, when joined with Teamcenter, enables you to see product decompositions from a variety of perspectives – such as systems, domains, functions, safety and maintenance – and address their interrelated concerns for cross-domain optimization

- System model diagrams are shared across the product lifecycle for continuous big-picture collaboration/decision making

- Tracing mechanism links requirements to other model elements

- All system models and requirements elements participate in program planning, schedule, resource, configuration, workflow and change processes

- Security protections control user access, information access, modification privileges, and enable you to monitor change histories and perform baseline comparisons

- Standard integration framework leveraging open modeling management gateway for communicating with external tools and managing lifecycle of system models
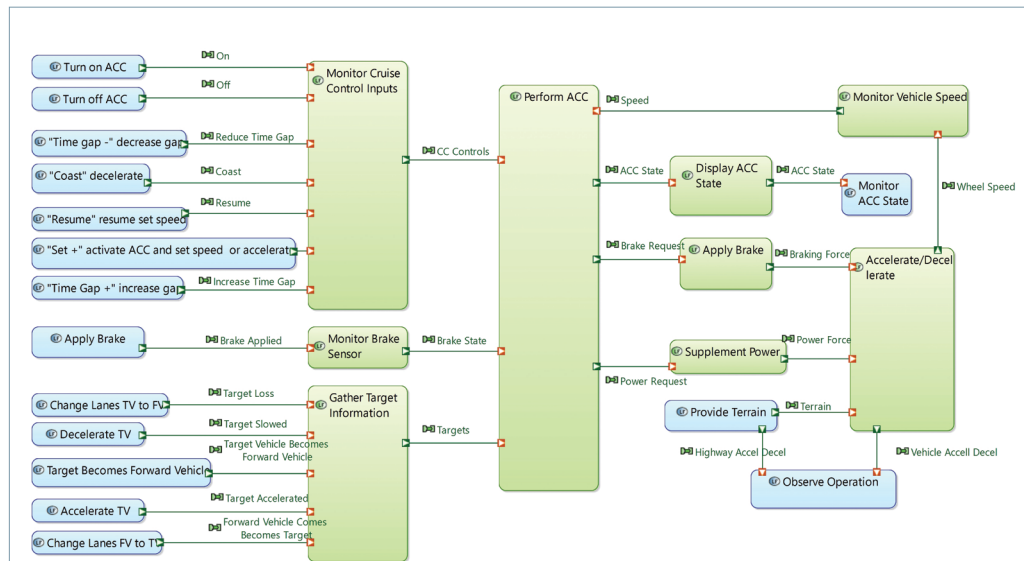
With the context understood, the functional design process produces a functional architecture that develops the product logic that will eventually drive the downstream logical design, providing traceable functional scenarios for product architecture optimization.
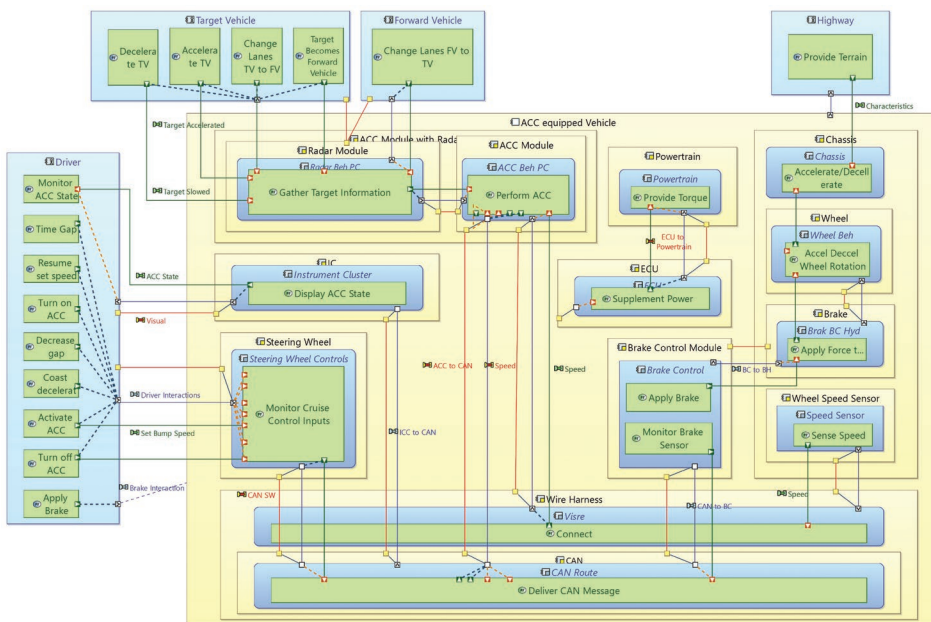
Functional allocation decisions about how/where the functions are accomplished create a logical architecture that drives physical architecture decisions, all of which culminates in a physical system architecture that documents/understands allocation decisions and system interfaces/exchanges in context of the operating environment that is able to drive the downstream development environments to an integrated solution.

Document decision support knowledge

Development teams can create a graphical representation of the overall system and attach notes to objects to document their design decisions, explain their rationale, express supplier concerns and/or record other issues of interest.

This integrated approach to systems engineering and requirements management enables you to more effectively monitor project status, support design decisions, assess the impact of a change, verify performance and validate compliance to customer or contract requirements.

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