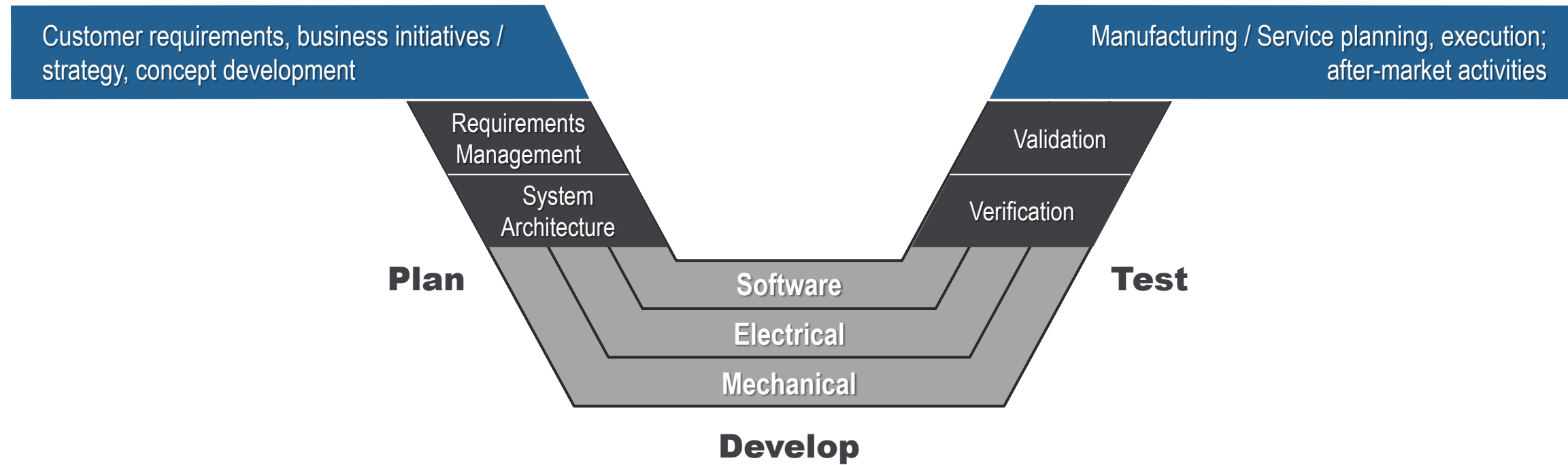


- PTC Vision of Smart Connected Systems
- Software/Systems Modeling (UML/SysML)
- Model transformation
- Product Line Engineering
- ThingWorx
- Demo Smart Connected System
- Coldlight Neuron







Customer requirements, business initiatives / strategy, concept development

Manufacturing / Service planning, execution; after-market activities



Requirements Management

System Architecture

Plan

Software

Electrical

Mechanical

Manufacturing

Service

Develop

Validation

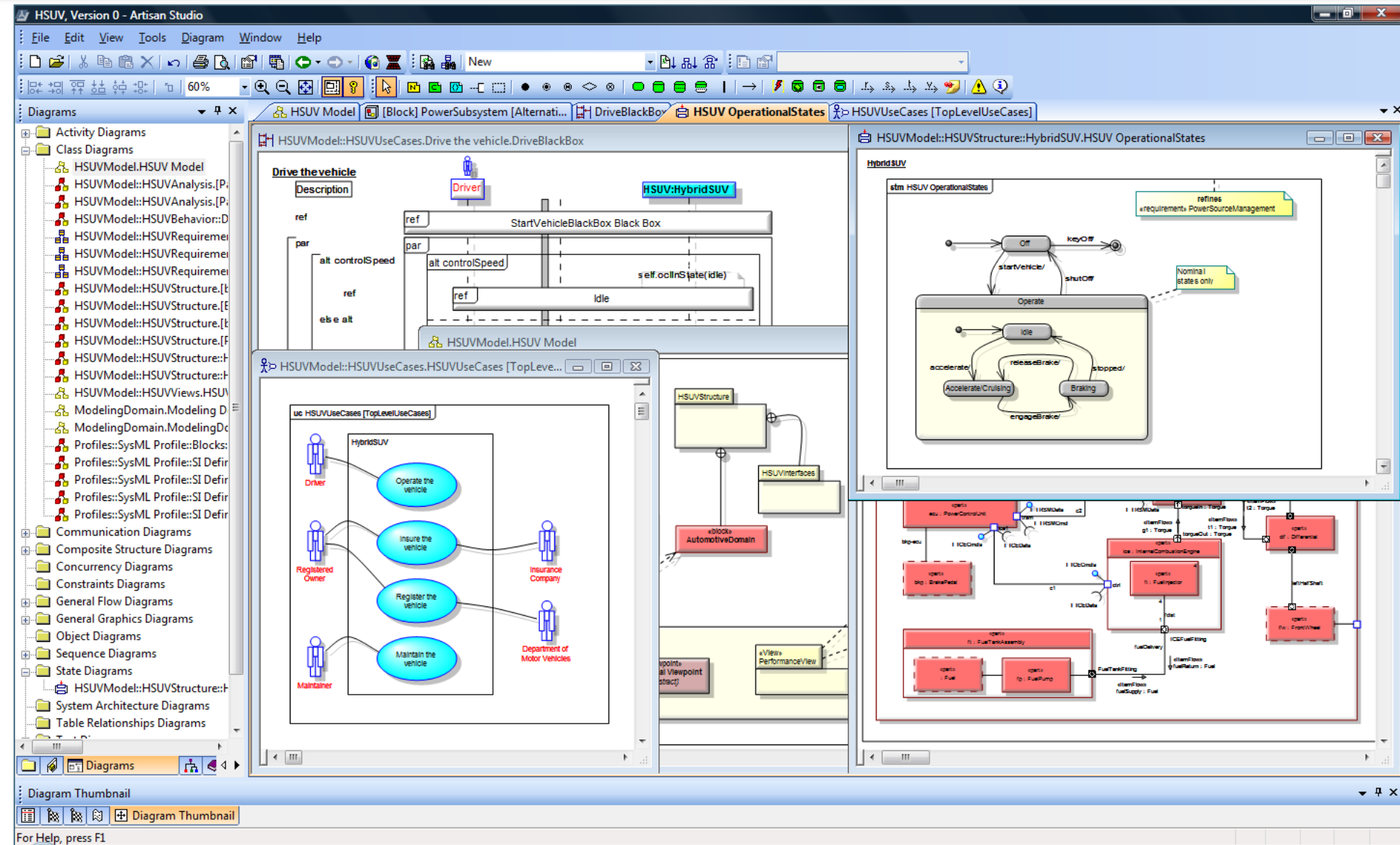
Verification

Test



CAPABILITIES

- Scalable UML, SysML, UPDM
- Repository Collaboration
- Built-In Traceability
- Document Generation
- Automated Design Review
- System Simulation
- Code Generation & Sync



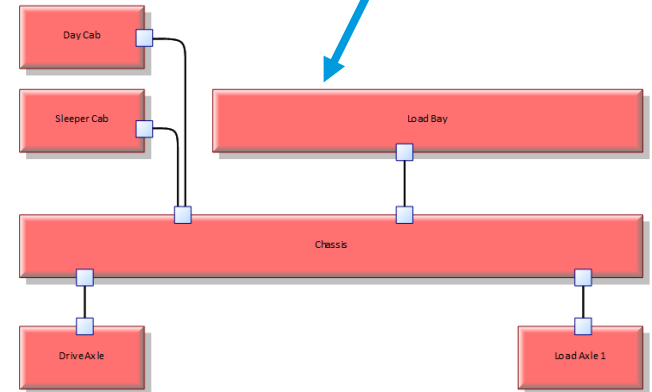
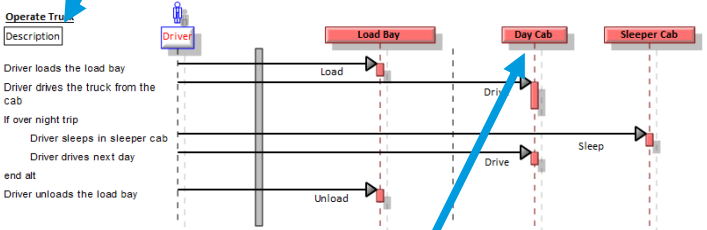
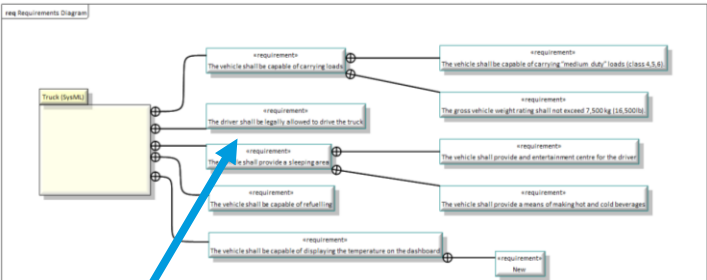
BENEFITS

Improved Quality through Early Design Review and Consistency

Bring Systems to Market Faster with Parallel Design Effort

Cost Reductions from Design and Development Automation

PTC Integrity™ Modeler™



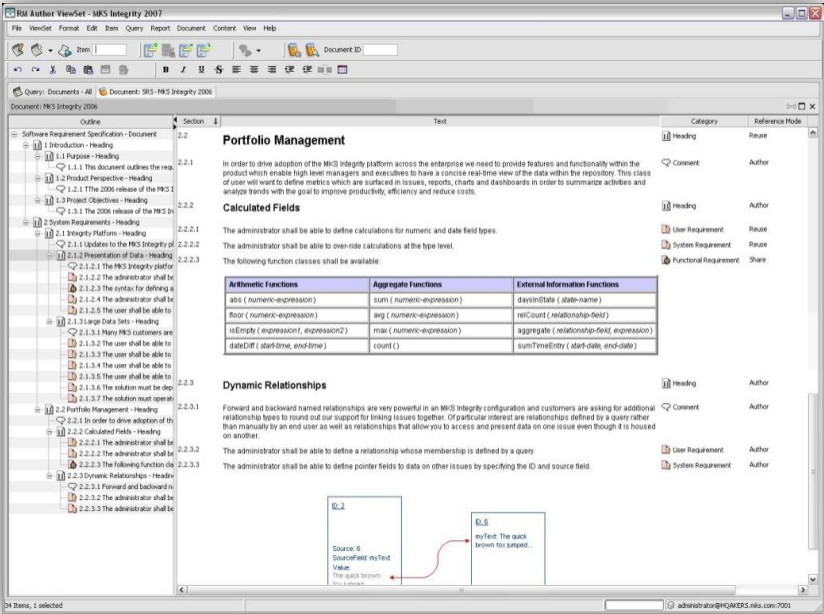
PTC Integrity Lifecycle Manager Synchronizer

Requirements

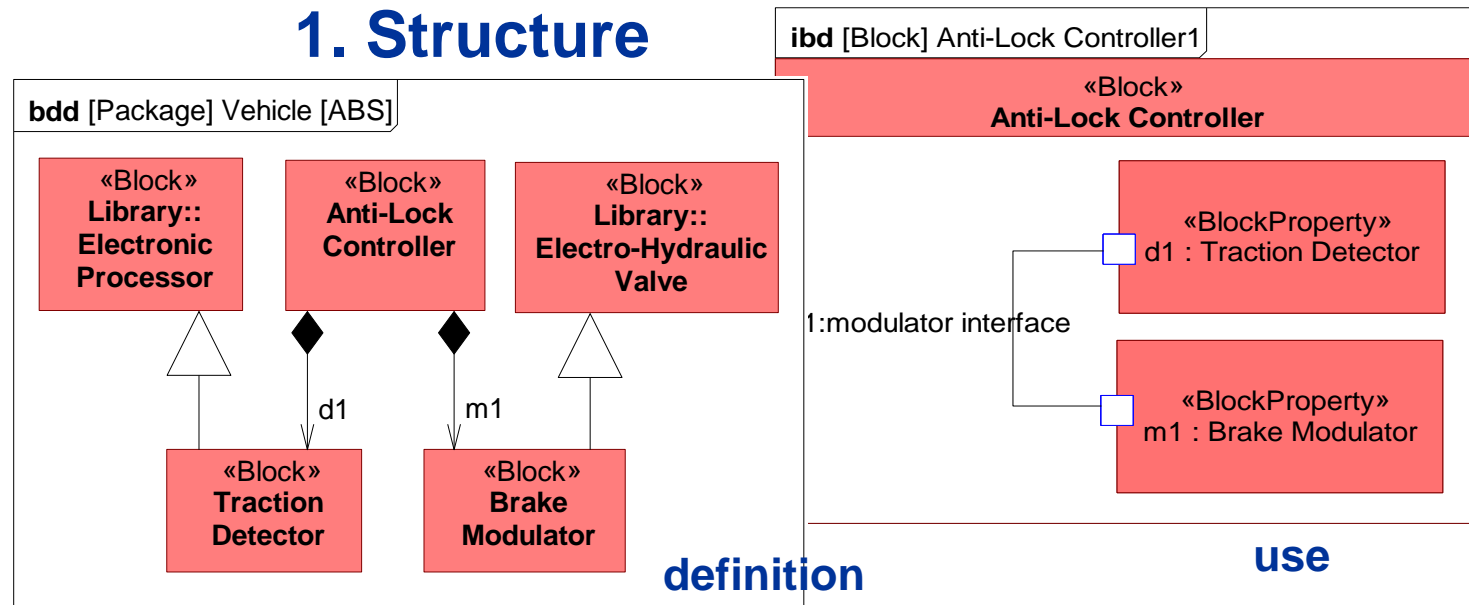
Additional Model Elements

Model Trace Links

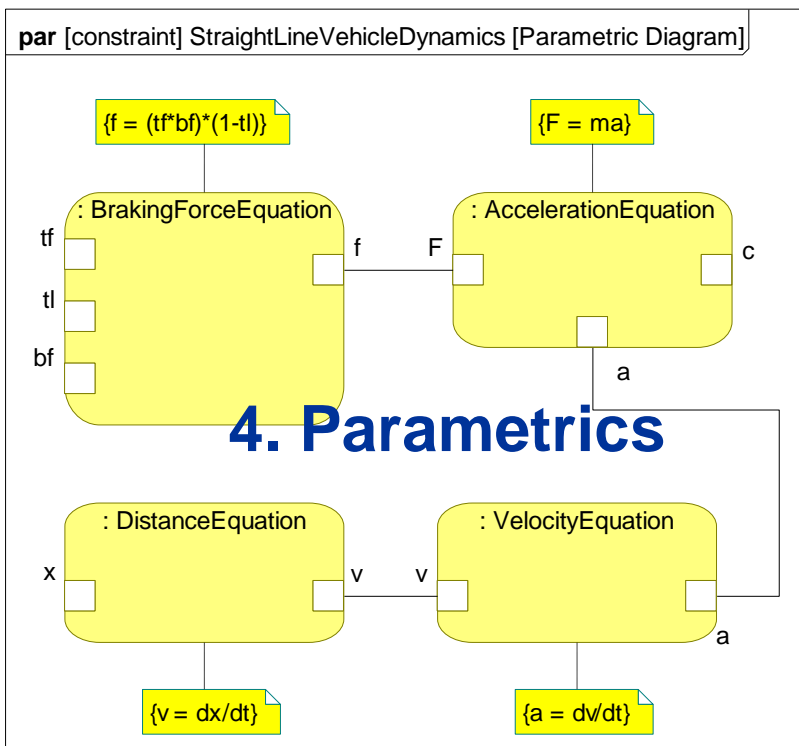
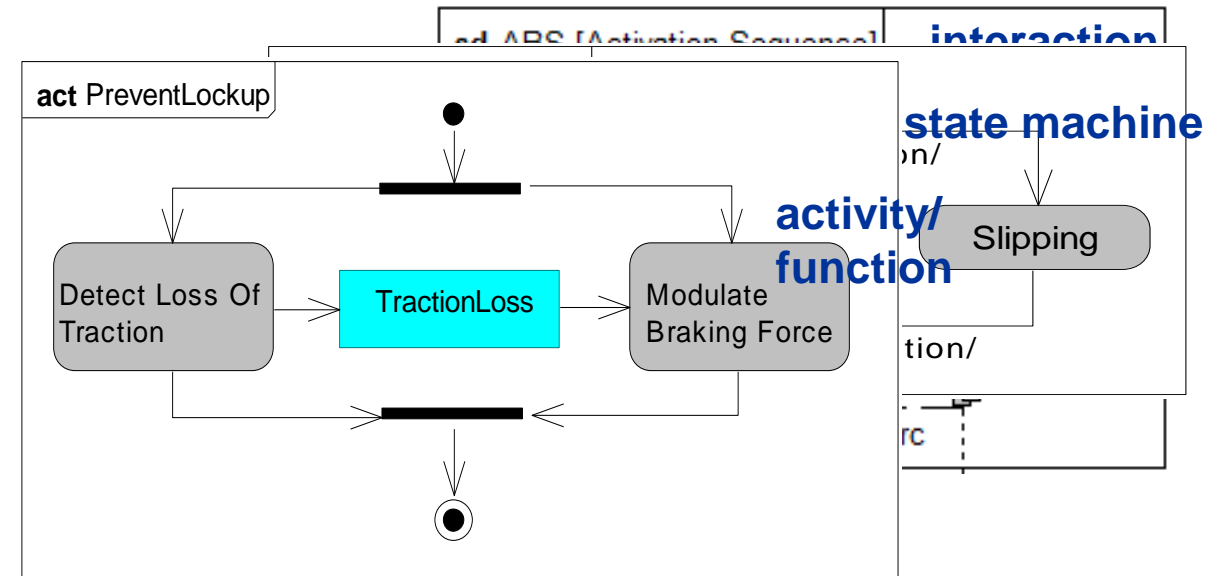
PTC Integrity Lifecycle Manager



1. Structure

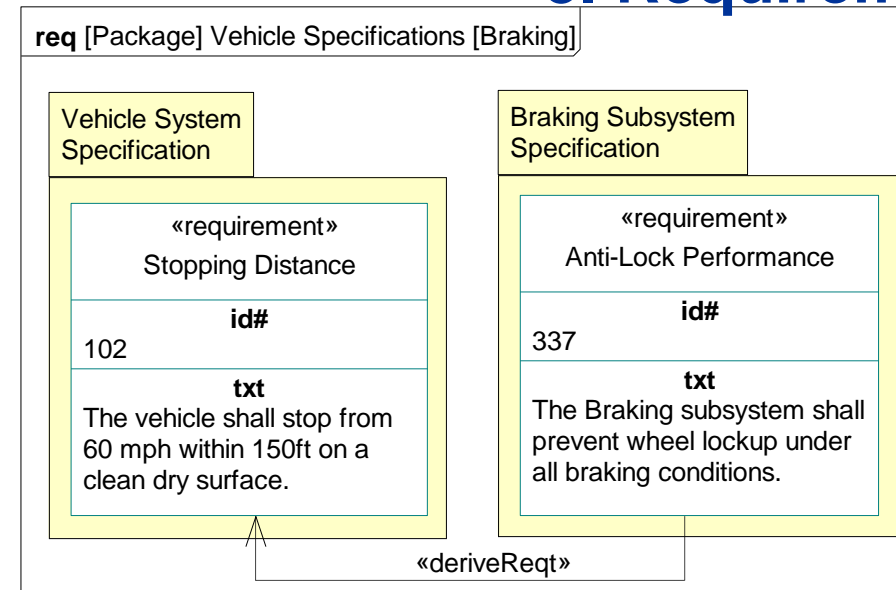


2. Behavior

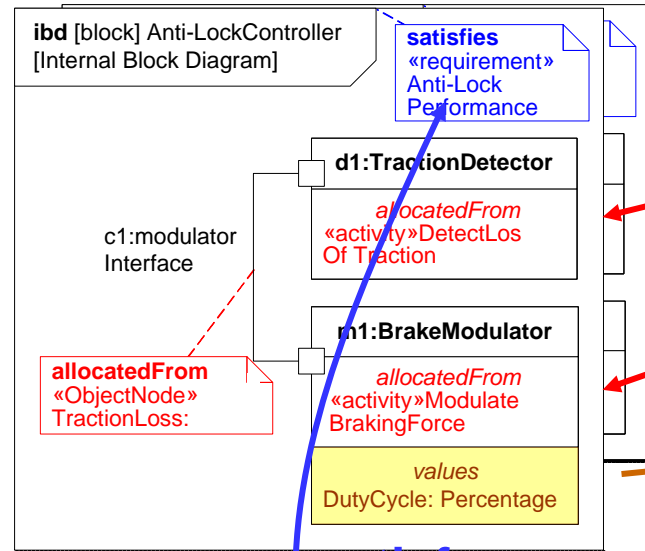


4. Parametrics

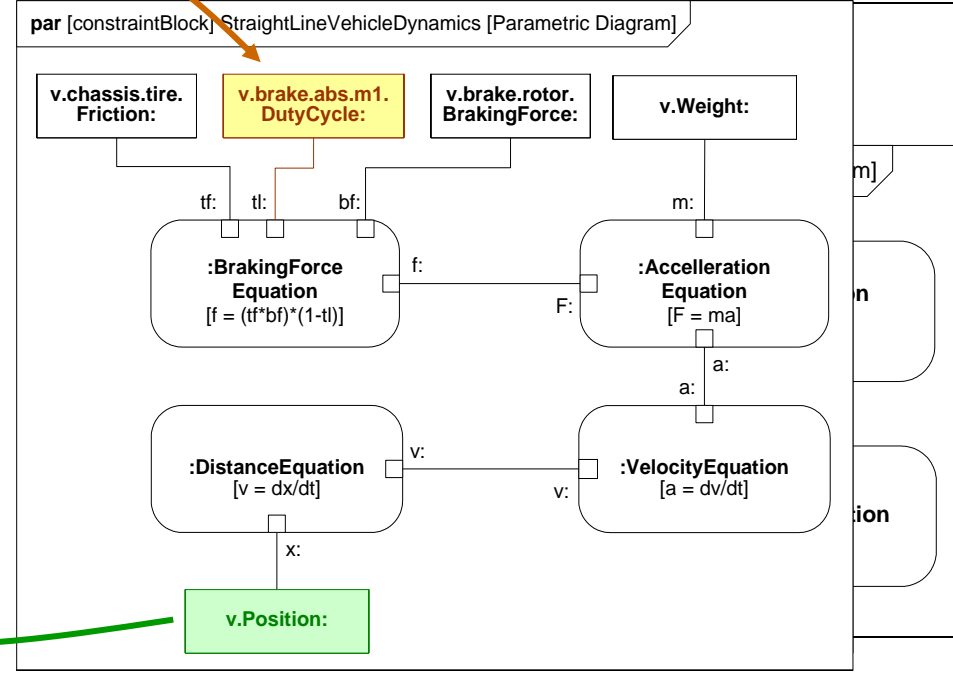
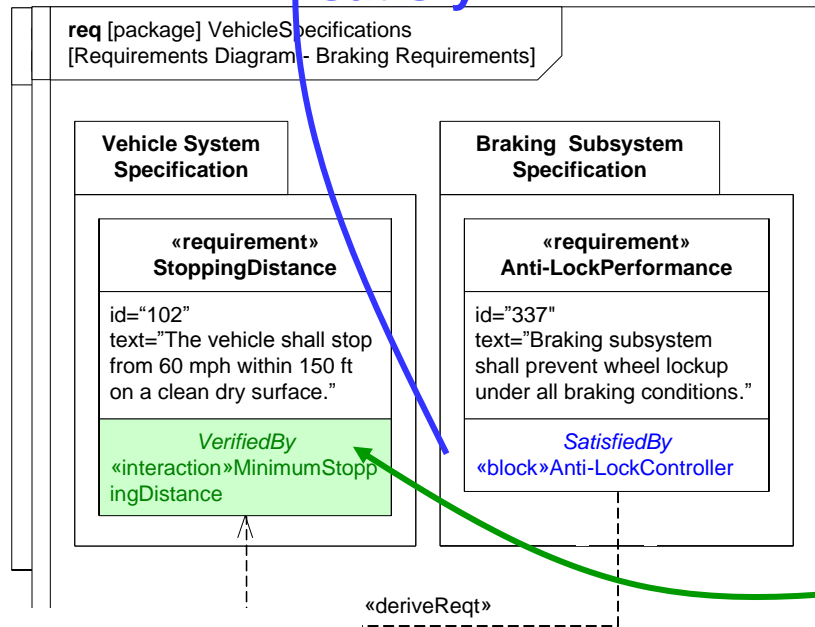
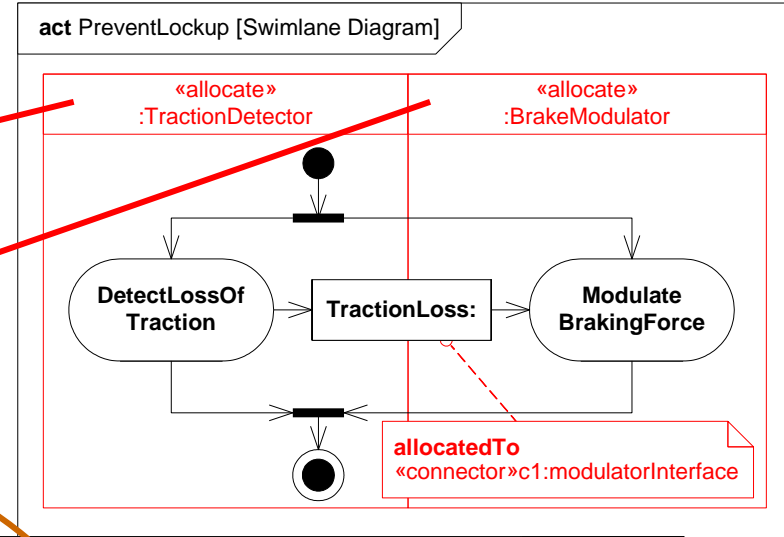
3. Requirements



1. Structure

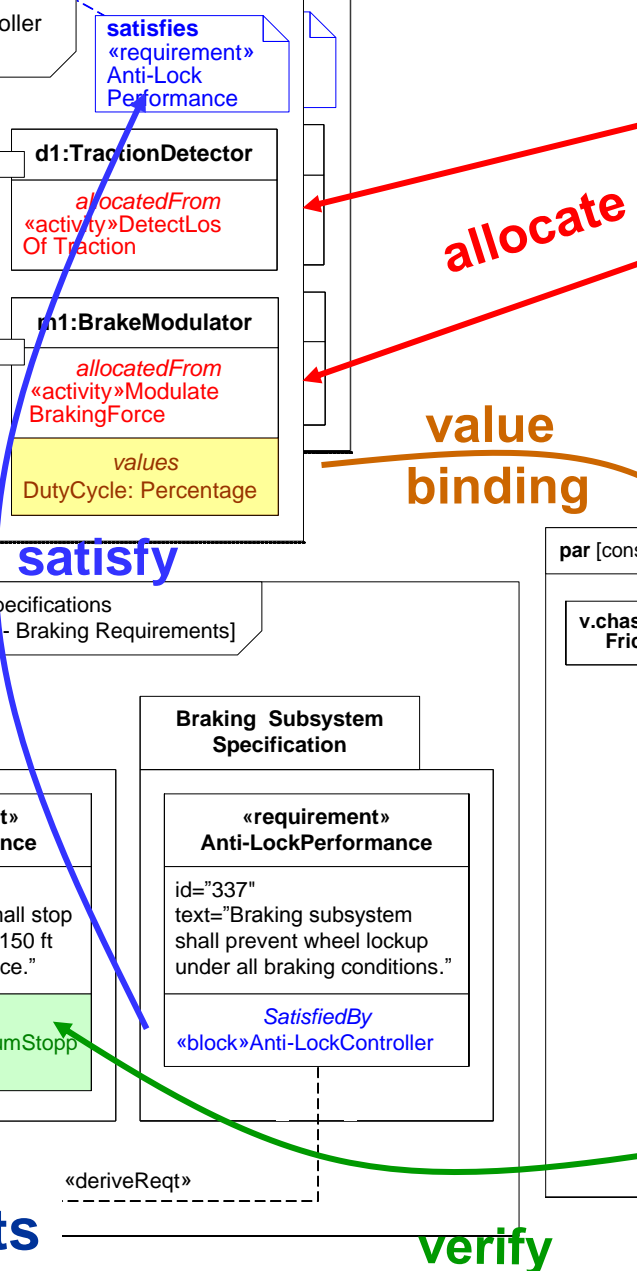


2. Behavior



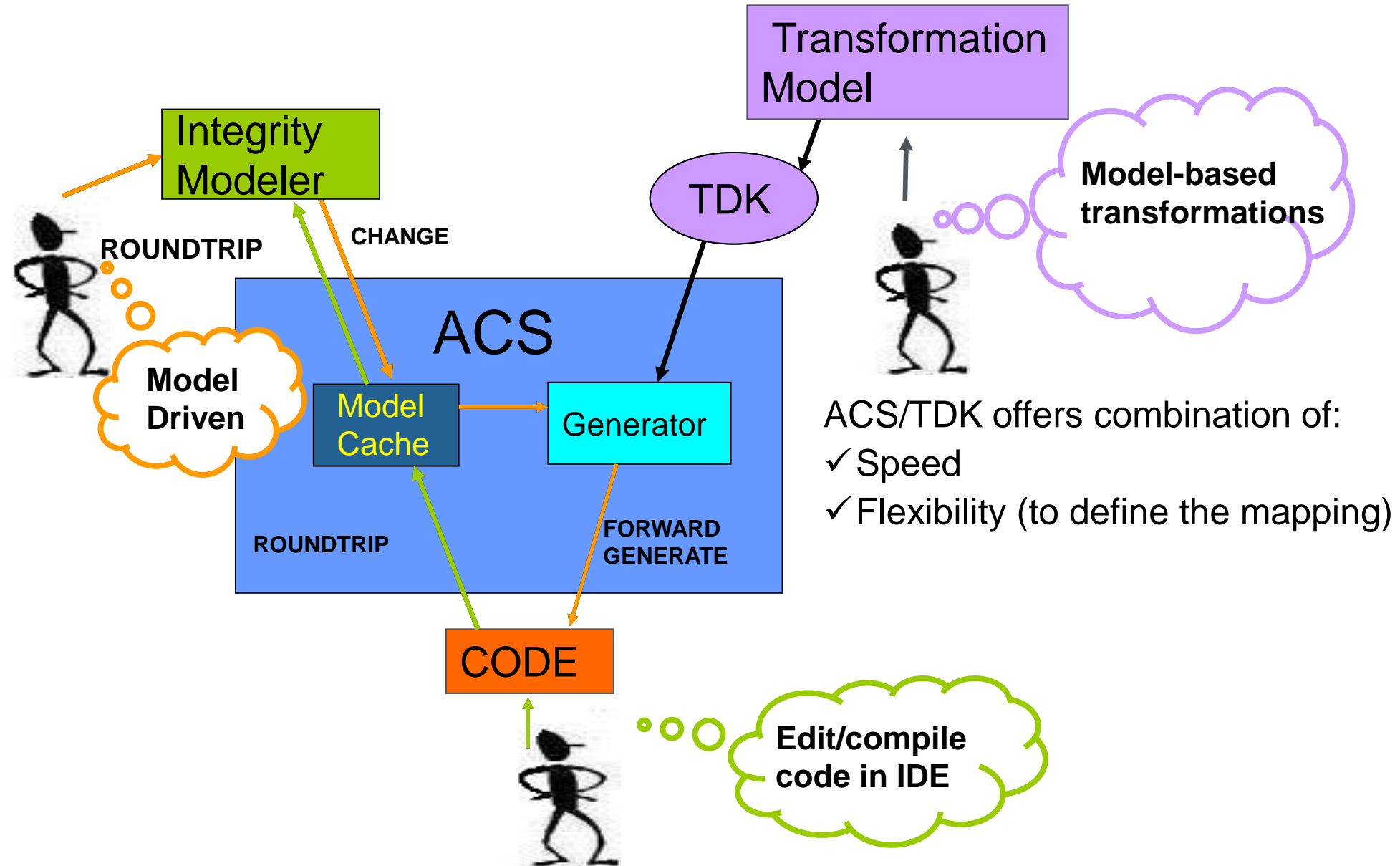
3. Requirements

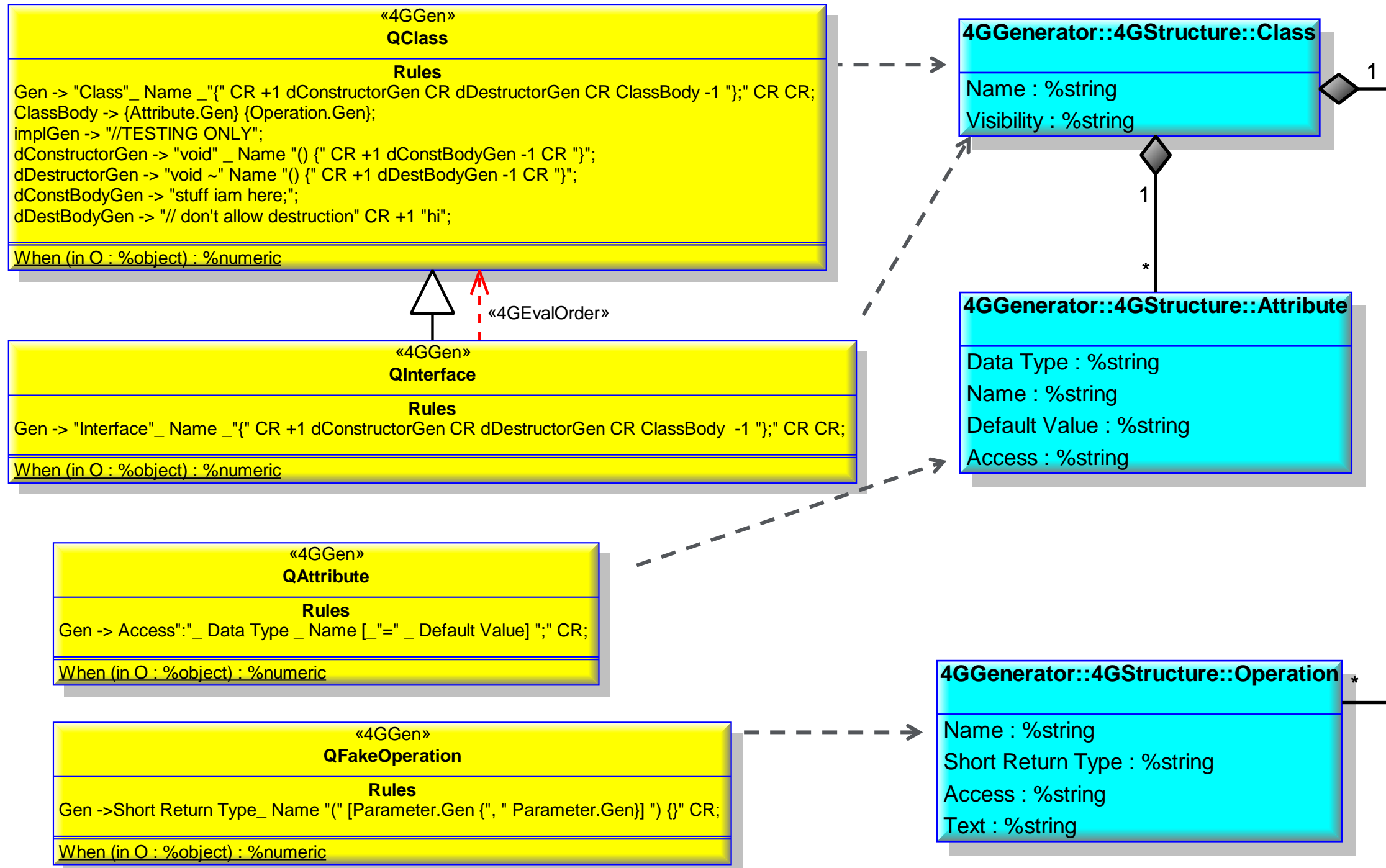
4. Parametrics



- Support the automatic generation of “things” from the model

- Ada
- Java
- C/C++
- C#
- Visual Basic
- IDL/ IDL3+



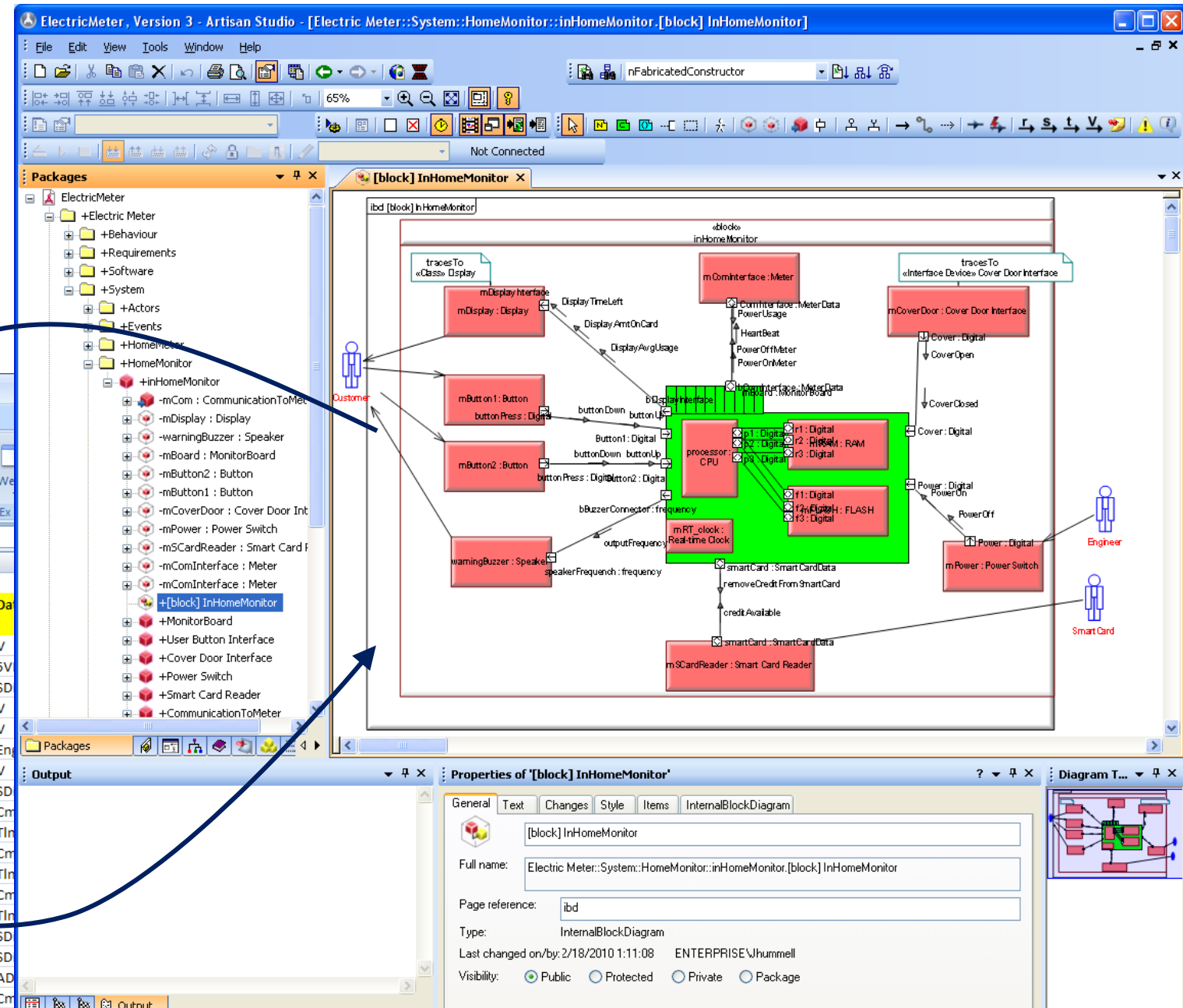


VBA/VB scripting engine inside Modeler

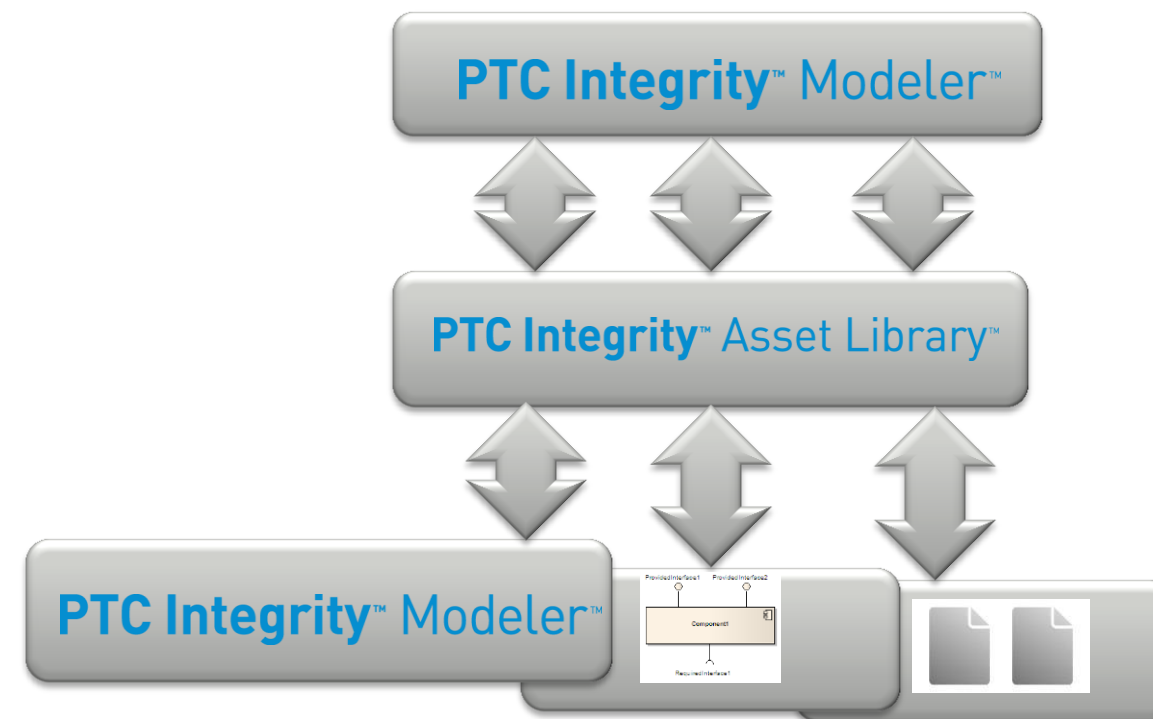
- Generate traditional Systems documentation from modeling information

Book1 - Microsoft Excel

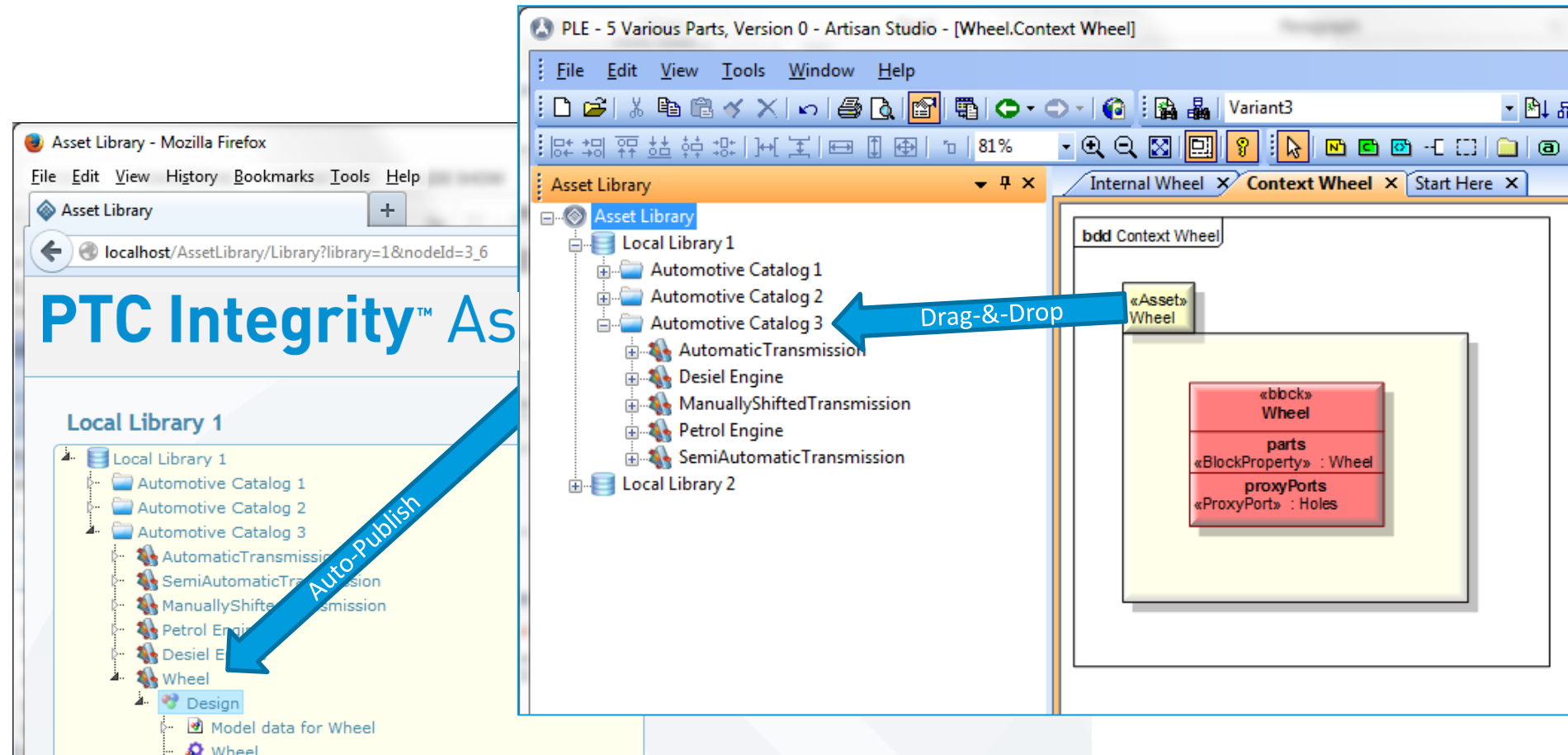
	A	B	C	D	E	F
1						
2		Interface Name	Source	Destination	Interface Type	Da
3						
4		PowerOutput	APU	Controller	24	V
5		PowerOutput	APU	Controller	testFlow	5V
6		PowerOutput	Controller	APU	wrongDirectionTest	SD
7		FlowPort1	AirFrameWiring	Controller	testV	V
8		PowerOutput	APU	AvonicsDisplay	24	V
9		ARINC	Controller	AvonicsDisplay	FADEC1Status	En
10		VoltageAngle	PLA	Controller	0-24	V
11		MissionData	C&DH	Comms	DownlinkData	SD
12		C2	C&DH	ElectricalPowerSystem	PSCmd	Cm
13		C2	ElectricalPowerSystem	C&DH	PSTlm	Tln
14		C2	C&DH	Comms	CommsCmd	Cm
15		C2	Comms	C&DH	CommsTlm	Tln
16		TT&C_Internal	Comms	C&DH	CmdInternal	Cm
17		TT&C_Internal	C&DH	Comms	TlmInternal	Tln
18		C2	C&DH	Sensor	SensorCmd	SD
19		C2	Sensor	C&DH	SensorTlm	SD
20		TT&C_Internal	C&DH	ThermalControl	ItemFlow1	AD
21		TT&C_External	Spacecraft11	Comms	CmdExternal	Cm
22		TT&C_External	Comms	Spacecraft11	TlmExternal	TlmMsg
23		C2	C&DH	GNC	GNCCmd	SDigital
24		C2	C&DH	GNC	GNCTlm	SDigital

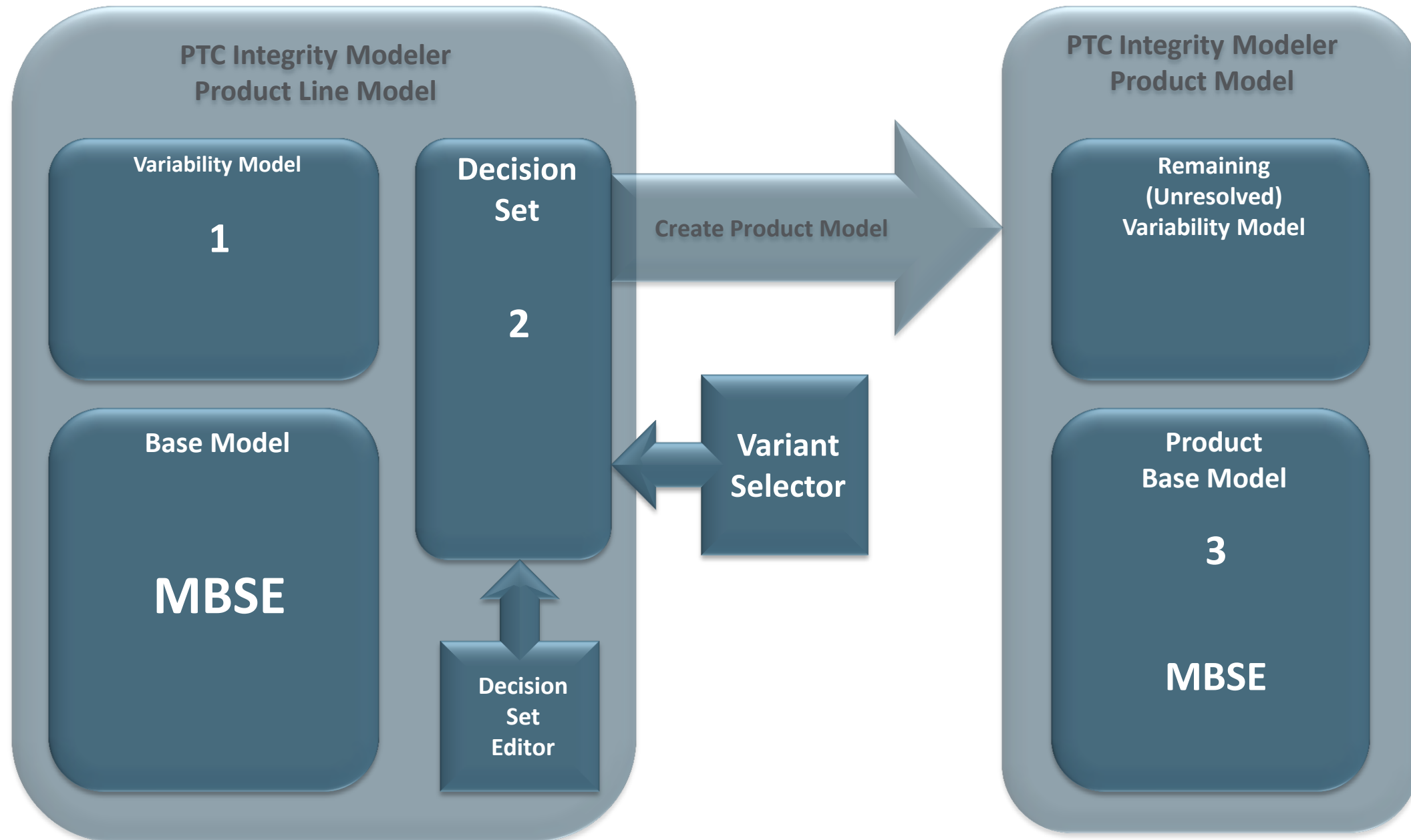


- Design the same way you Build
 - Construct Systems of Sub-Systems (SoS)
 - Use Services to build your Application (SOA)
 - Plug Components together (CBD)
- Modular Design
 - Top-Down, Architected
 - Specification (& Requirements) Driven
 - Parallel Working
 - Separation of Concerns
 - Bottom-Up, Asset Mining
 - Un-modeled Assets
 - Other Modeling Tools
 - Legacy Integration
 - Published Interfaces (e.g. IDL)

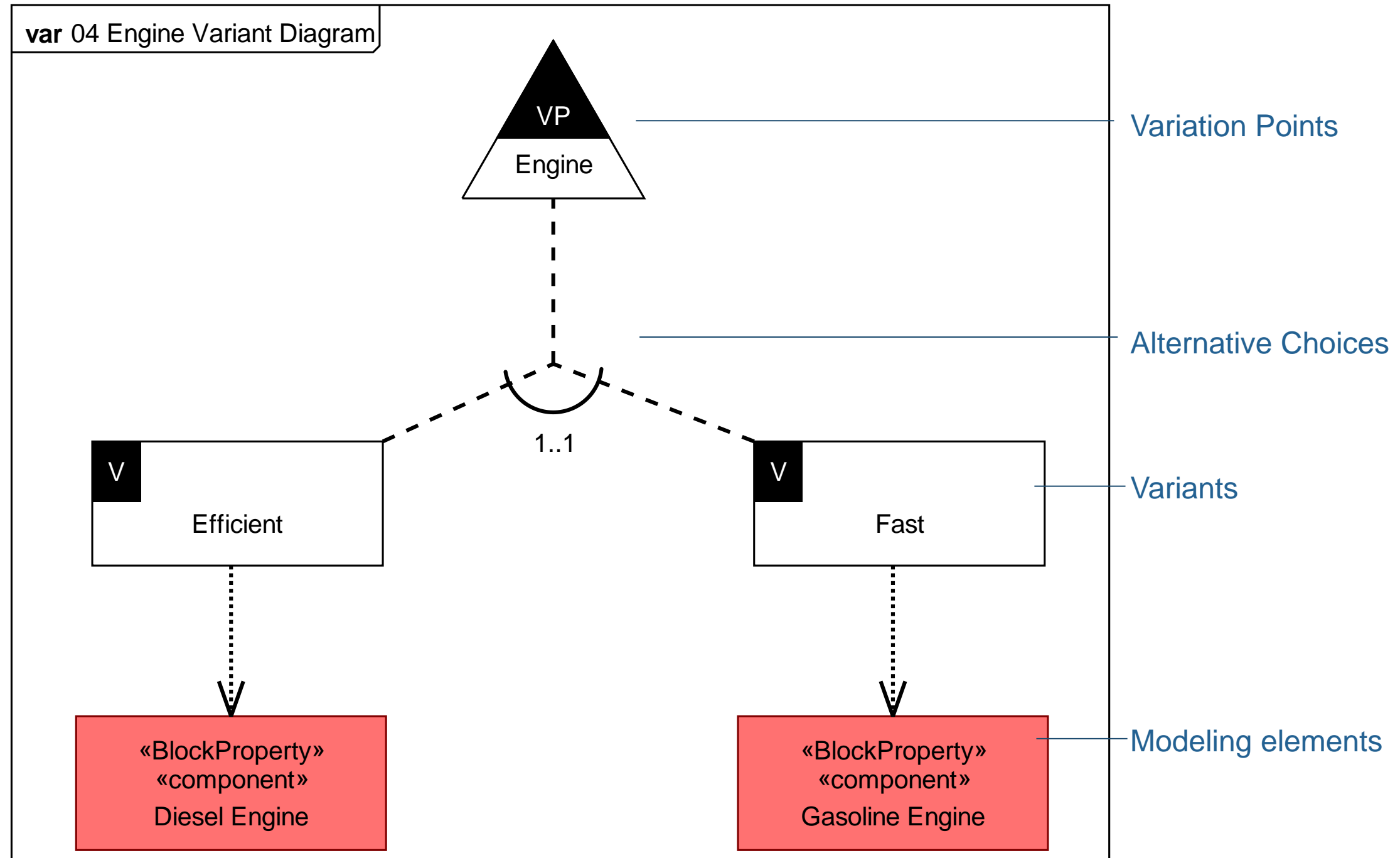


- Publish from Sub-system model into PTC Integrity Asset Library
 - Auto-creates Trace Links





- Engine variability along with model dependencies



Decision Set Editor Variant Selector Examples

Name	Decision	Status	Included By	Excluded By	Reason
+ <input type="checkbox"/> Dynamic	?	Excluded			
+ <input type="checkbox"/> Luxus	?	Excluded			
+ <input type="checkbox"/> Keyless Entry Option	?	Excluded			
M E <input type="checkbox"/> Line		Included	Variable		
+ <input type="checkbox"/> Base	Include	Included			
+ <input type="checkbox"/> Dynamic	?	Excluded			
+ <input type="checkbox"/> Luxus	?	Excluded			
M <input type="checkbox"/> Multimedia Supplier		Included	Variable	cheape	
+ <input type="checkbox"/> The well-known, expensive Brand	?	Excluded			
+ <input type="checkbox"/> The cheaper, better, but quite unknown Brand	Include	Included			
M <input type="checkbox"/> Battery Size		Included	Variable		
+ <input type="checkbox"/> 65Ah	?	Excluded			
+ <input type="checkbox"/> 44Ah	?	Included	Variable	Size.Alt	

Variants: 16/3: Variation Points: 8/21 Inconsistent: 0 Undecided Mandatory Variation Points: 9
--

Variant Selector

Example Model for Atego Perspective, Version 4

Make it Cheap

- Car Types for the city
- Motor Type
- Air Conditioning
- Route Directives
- Car Colour
- Connectivity USB
- Bluetooth version
- Data Input Keyboard
- Screenlock
- External and Optional
- External and Mandatory
- Routing Options Voice
- Comfort Options
- Keyless Entry
- Line Base

Line

There are three main car equipment lines, from which one is to be chosen: 1. Base for the price-sensitive customer 2. Dynamic for the more sporty customer 3. Luxus for the customer who wants to equip the car with all the luxury possible

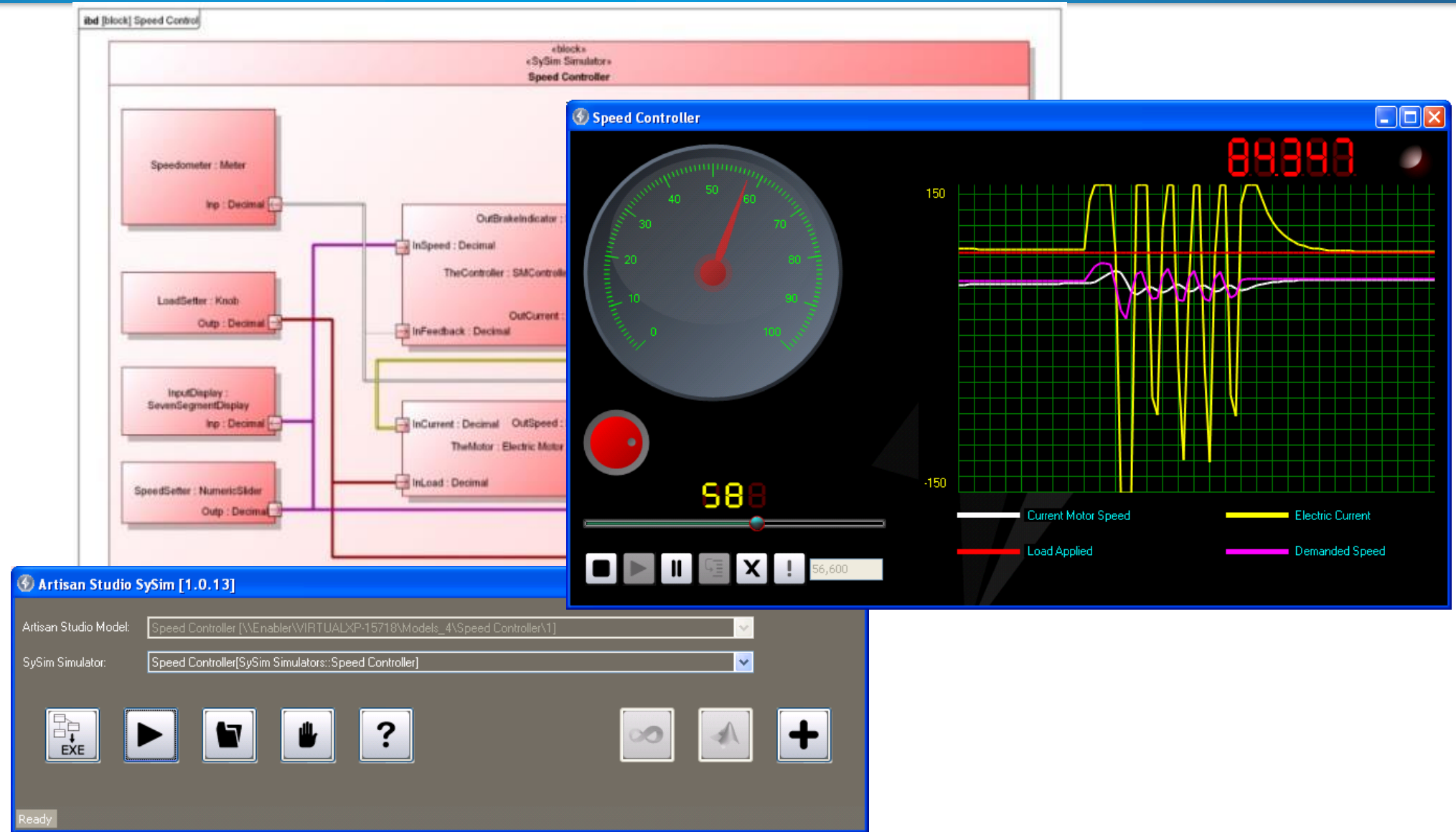
Base
 Dynamic
 Luxus

(8/21)

→ ←

CAPABILITIES

- Early Complex Behavior Validation
- Block Level Reuse
- Drop-&-Play Simulation
- Connect to External Simulators
 - MATLAB Simulink™, etc.



BENEFITS

Typical 20% reduction in model 'Design Walkthrough' effort

Up to 30% reduction in design errors

Significant reduction in overall project costs

INTERNET

Digital World

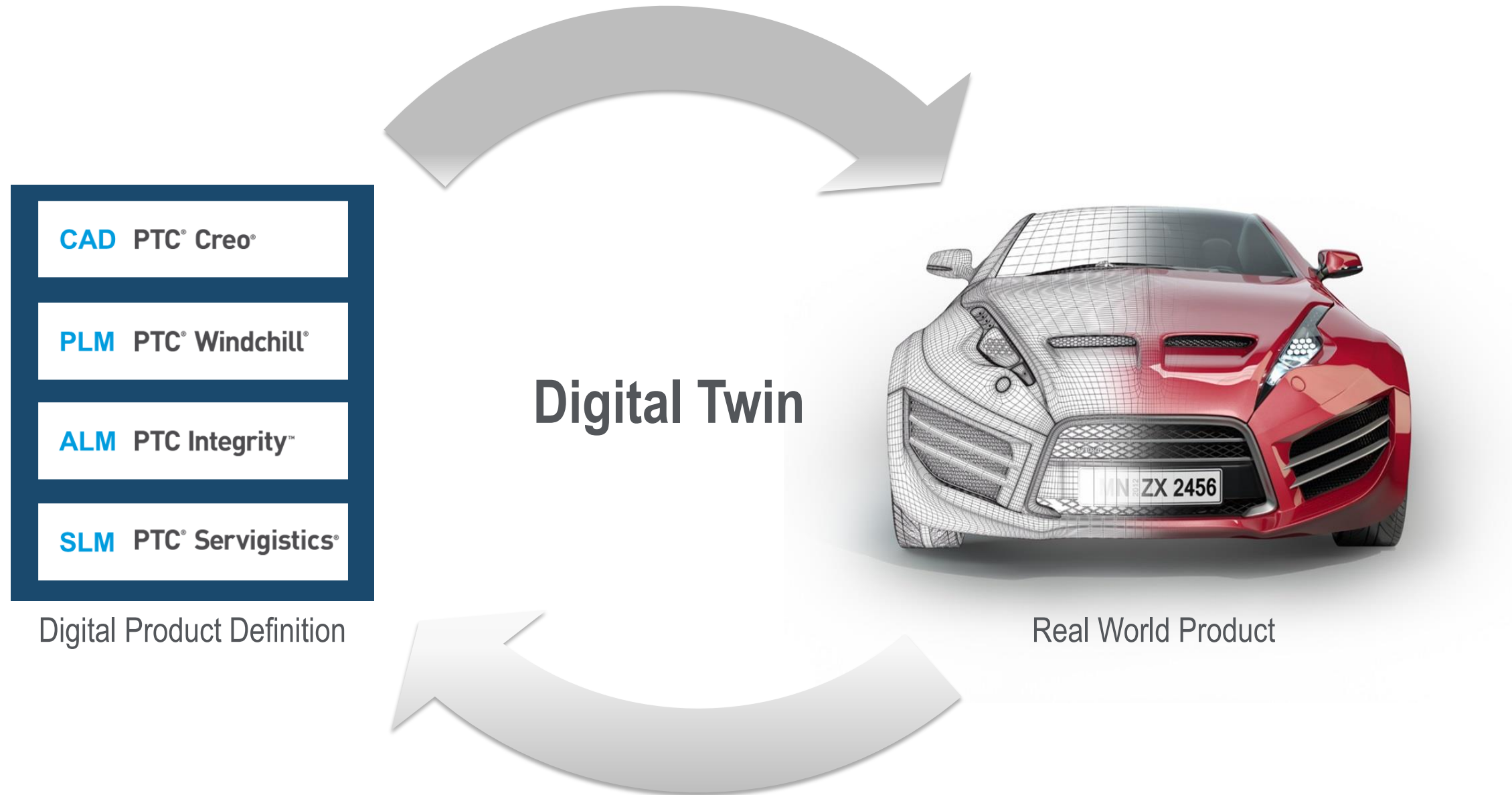
OF

THINGS

Real World



Produce and manage Smart, Connected Products



Leverage Smart, Connected Product data to improve products

With Augmented Reality (Software Configuration)



With Augmented Reality (Software Configuration)

User toggles between hardware, fluid, electrical and software views of the product

Alerts are presented in the context of the system or subsystem

Relevant details about the software configuration are obtained from the product and the cloud

Drill down into a number of connected Apps to get details on specific content

PTC® Search... Johnny Hockey +

GENERAC-007898873

GENERAC-0020394432

Warning 002334: Software recall on ECU3445. Update

Software Configuration

- SEN9833 – firmware v7.2.33.2
- SEN7430 – firmware v4.54.3.221
- ECU3445 – firmware v1.23.54.506**
- DRV1011 – v0.9.89.322

Known Software Issues

- 78988 – infinite loop logging war...
- 98723 – memory not released wh...

Security Vulnerability

- VU#577193 Vulnerability in SSL 3.0

Details

Demo

Creation of a smart connected system



Neuron is an advanced learning technology that simplifies and democratizes the once complex and time consuming science of **advanced and predictive analytics.**



+



Neuron™

ThingWorx

- Explanatory Analysis
- Actionable Insights
- Operationalized Predictions

Predictive Signals

Show/Hide Log
Show/Hide Debug Info
Reload
Default
Fullscreen

Choose Prediction: Soil Moisture 16in (weather only)

Choose Filter: All Data

Learn

Predict

PREDICTIVE SIGNALS

Category View

- Time and Location
- Soil Temperature
- Weather Solar Radiation
- Weather Potential Evapotranspiration
- Weather Air Temperature
- Weather Apparent Temperature
- Weather Wind Chill
- Weather Wind Chill AVG 0 to 1 DAY prior
- Weather Wet Bulb Temperature
- Weather Diffuse Radiation
- Weather Direct Radiation
- Weather Air Pressure


Weather Wind Chill AVG 0 to 1 DAY prior

PROFILES

Feature	Value	Avg. Goal	Population	Z Score
Weather Diffuse Radiation AVG 4 to 5 DAY prior	[17.26 - 36.71]	33.66	10,061	33.17
Weather Relative Humidity AVG 8 to 9 DAY prior	[8.75 - 62.76]	31.76	6,170	35.32
Weather Relative Humidity AVG 10 to 11 DAY prior	[8.75 - 73.56]	31.22	5,405	35.49
Weather Wind Direction AVG 0 to 1 DAY prior	[115.37 - 235.3]	30.17	4,365	36.23

Predictive Analyzer

Show/Hide Log
Show/Hide Debug Info
Reload
Default
Fullscreen

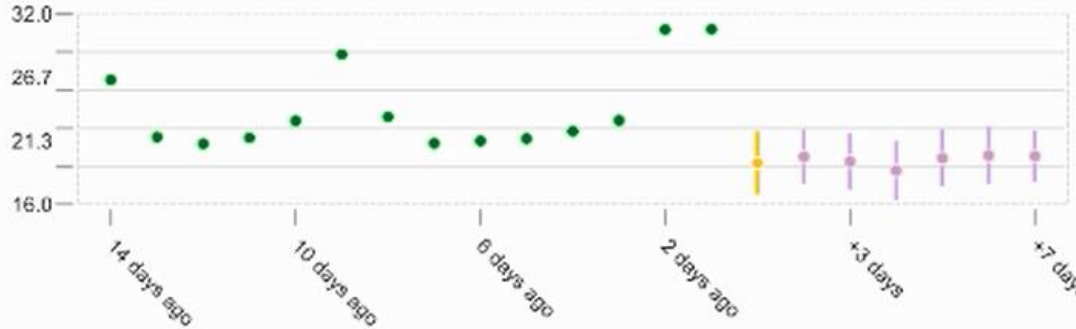


Choose Prediction: Soil Moisture 16in (weather only)

Choose Filter: All Data

PREDICTED PERFORMANCE

Soil Moisture Prediction Next Week @ 16in



ESTIMATED MODEL ACCURACY

94.37%

RMSE

0.06

PEARSON CORRELATION

0.98

VALIDATION RECORDS

14827

ENSEMBLE METHODS

Enabled	Learning Technique
<input checked="" type="checkbox"/>	BACKPROP
<input checked="" type="checkbox"/>	DECISION TREE
<input checked="" type="checkbox"/>	LINEAR REGRESSION
<input checked="" type="checkbox"/>	GRADIENT BOOST

FACTORS INFLUENCING PREDICTION FOR +1 DAY

Feature Name	Feature Value	Influence
Location Name	Location 5	
Weather Wind Chill AVG 0 to 1 DAY prior	69.5	
Weather Apparent Temperature AVG 0 to 1 DAY prior	69.58	
Weather Air Temperature AVG 0 to 1 DAY prior	69.5	
timestamp_month_of_year	4 April	

- Your feedback is valuable
- Don't miss out on the chance to provide your feedback
- Gain a chance to win an instant prize!
- Complete your session evaluation now

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