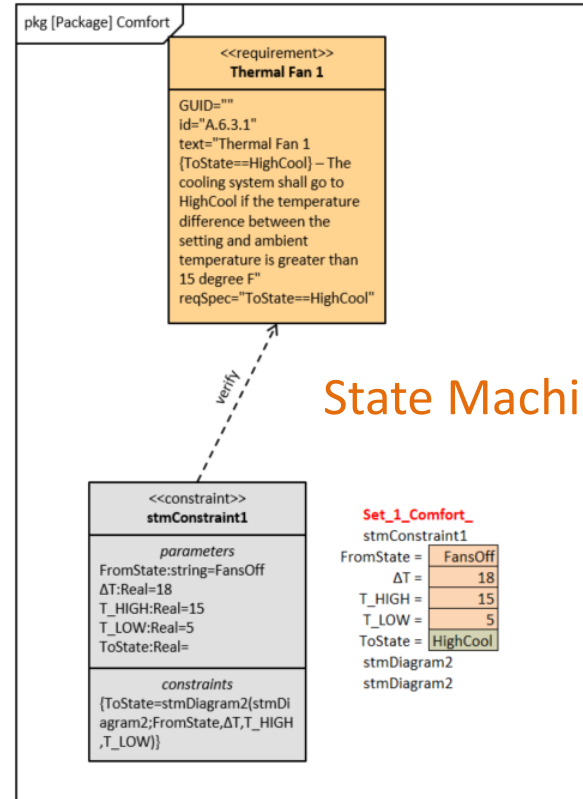

Linking System Requirements with Product Performance

Thomas Tecco
XLDyn

Topics

- XLDyn, LLC
- Systems Engineering Vision
- XLSE Key Features
 - Overview
 - Model Creation
 - Requirements and Verification
 - Use Cases
 - Activity Diagrams
 - State Machine Diagrams and Simulation
 - Domain Maps and DFMEA
 - Schematic Diagrams and Reliability
- XL1D Features
- Design Balance Video
- Summary



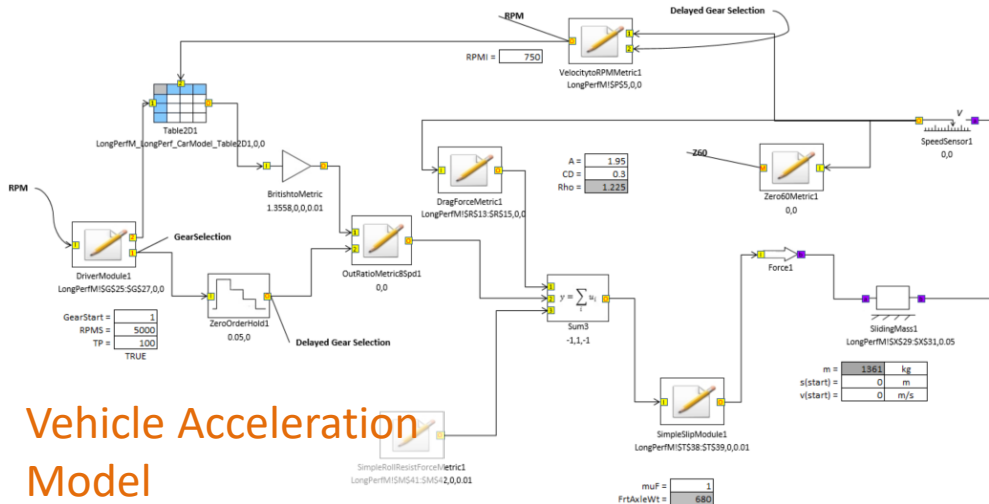
State Machine Verifier

XLDyn, LLC

- Founded in 2010, our mission is to develop enterprise system engineering tools that are fully integrated with an intuitive and easy to use graphical interface
- Innovations are covered by four U.S. Patents, plus one pending

XLDyn = XLSE + XL1D

XL1D - For authoring/simulating detailed 1D multi-physics systems models



Vehicle Acceleration
Model



XLDyn, LLC

XLDyn = XLSE + XL1D

Requirements w/Simulation Verification

The screenshot displays the XLDyn software interface. On the left, a project tree shows a hierarchy of components including 'Mass Global', 'NVH', 'HMI', 'ORD', 'Capacity', 'Cargo', 'Passengers', 'Vehicle Dynamics', and 'Structure Global'. The central workspace shows a SysML diagram for a 'Frontal Crash' package. It contains three requirements and one constraint:

- Head Injury Criterion** (Requirement): GUID="A.1.1.1", text="Head injury Criterion[HIC<1000] - Head Injury Criterion calculated using NHTSA approved method shall not exceed 1000 in frontal crash against fixed barrier at vehicle speed of 30 mph", reqSpec="HIC<1000"
- Thoracic Chest Acceleration** (Requirement): GUID="A.1.1.2", text="Thoracic Chest Acceleration[TCA<60] - Thoracic chest acceleration shall not exceed 60 g based on FMVSS 208 for frontal crash against fixed barrier at vehicle speed of 30mph", reqSpec="TCA<60"
- Femur Load** (Requirement): GUID="A.1.1.3", text="Femur Load[FL<7560] - Femur load shall not exceed 7560 N in frontal crash against fixed barrier at vehicle speed of 30mph", reqSpec="FL<7560"
- 5 Mass Crash Model** (Constraint): Contains parameters for various components and constraints for HIC, TCA, and FL.

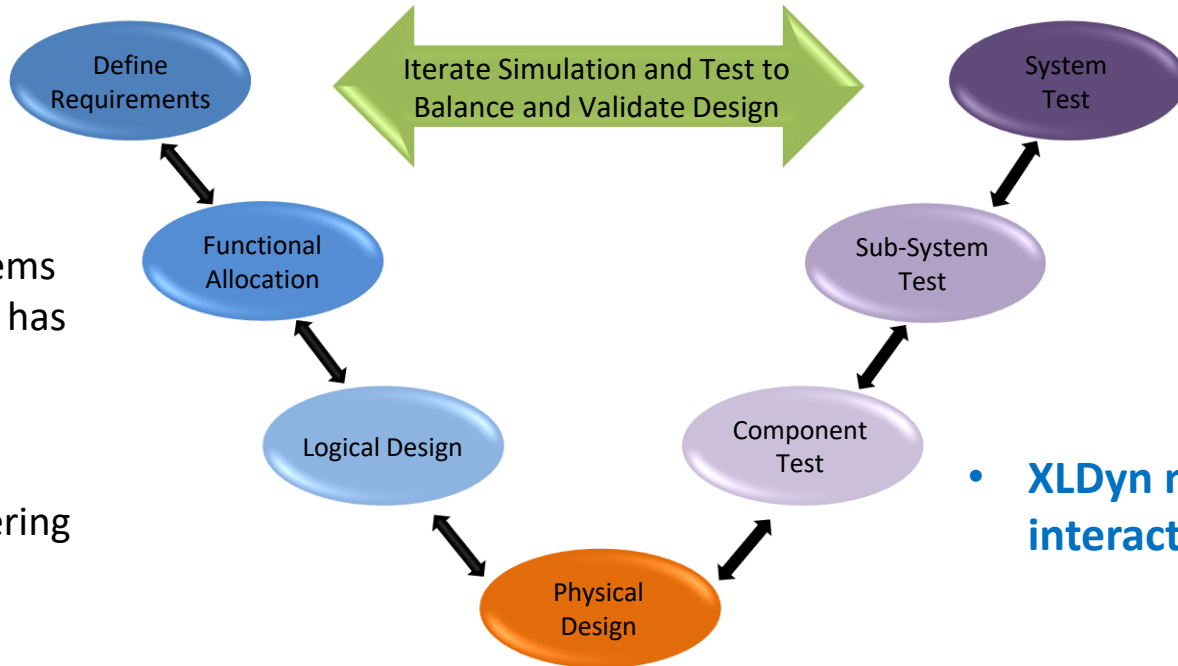
Verification arrows point from the constraint to each requirement. On the right, a table titled 'Set_1_Frontal_Crash_5 Mass Crash Model' provides simulation results:

Parameter	Value
Occupant_m	80
Occupant_v[start]	15.65
Damper7_d	33114.2
Damper5_d	6764
SuspensionRails_m	128.551
EngineRadiator_m	321.378
CradleShotgun_m	160.689
VehicleBody_m	749.882
HIC	277.0
TCA	40.1
FL	4009
StarRating	5.00
%DamperEngy3	
CrashSMass	

XLSE – For authoring
OMG SysML compliant
system models

What is Systems Engineering?

- Often described with the “System V”, some key elements are:



- Historically Systems Engineering (SE) has been document based
- Model Based Systems Engineering (MBSE) is more visual, but static

- **XLDyn makes MBSE interactive**

XLDyn = Enterprise Solution to MBSE



XLDyn Closes the Gap



Enterprise
Data

- XLDyn is an actionable tool for engineers to develop, balance, and track designs
- XLDyn supports all verification methods
- Program status is easily available to everyone
- Documentation is byproduct of the development process
- Documentation is critical for team communication
- XLDyn is easy to use: Systems Engineering for everyone

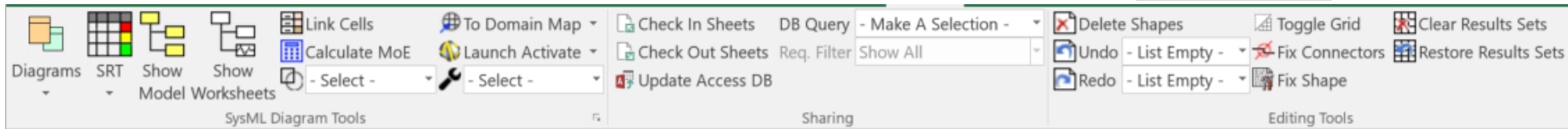


Simulation
And
Test

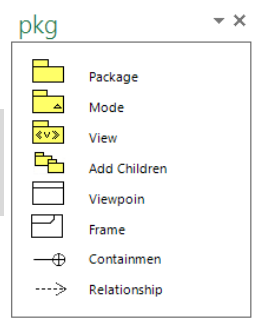
XLSE Overview

- XLSE uses Microsoft Excel[®] as the Graphical User Interface
- Diagrams can be moved and copied/pasted anywhere in the workbook. Utility functions simplify the modeling process making tasks intuitive and simple
- Extensive model navigation tools

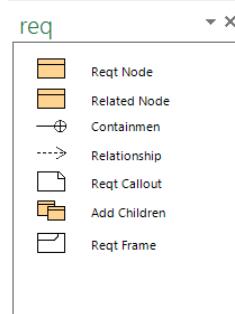
XLSE Tool Bar



Package Diagram Pallet

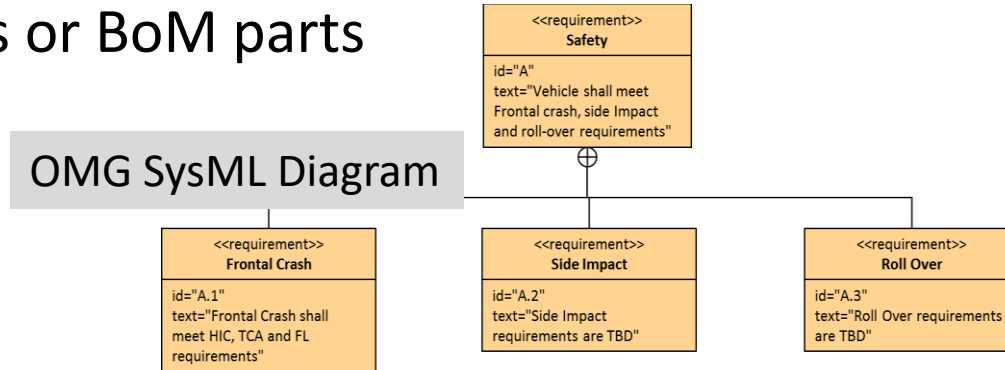


Requirement Diagram Pallet

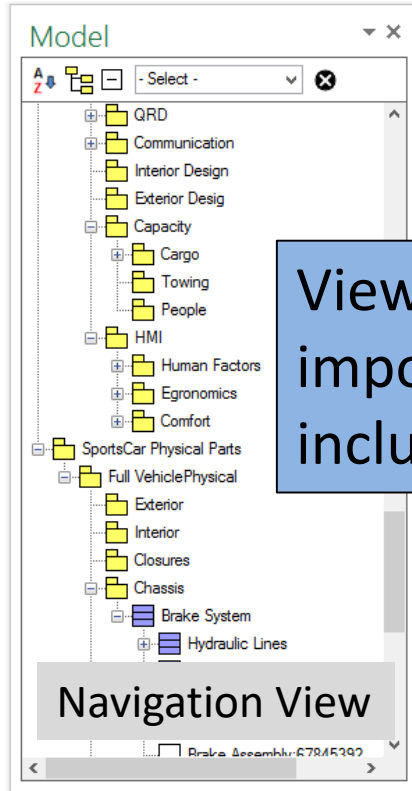


XLSE Overview

- XLSE is a Model Based Systems Engineering Tool
 - Manages requirements status throughout the design cycle
 - Provides design balance tools to create optimal designs
 - Can be used at system, subsystem, or component level
 - Model is fully synchronized when adding or editing requirements or BoM parts



XLSE Overview



Views are created automatically from imported Microsoft Word® documents, including IBM DOORS®

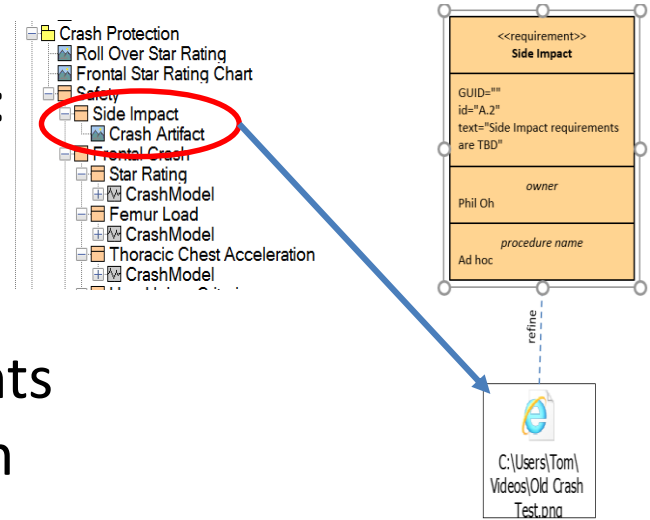
ID	Name	Text	Procedure Name	Target	Actual	Method
A	Safety	Vehicle shall meet Frontal crash, side	Ad hoc			
A.1	Frontal Crash	Frontal Crash shall meet HIC, TCA ar	Ad hoc			
A.1.1	Head Injury Criterion	Head Injury Criterion(HIC<1000) - F	Ad hoc	HIC<1000	342.8	
A.1.2	Thoracic Chest Acceleration	Thoracic Chest Acceleration(TCA<6G	Ad hoc	TCA<60	45.1	
A.1.3	Femur Load	Femur Load(FL<7560) - Femur load	Ad hoc	FL<7560	4513	
A.1.4	Star Rating	Star Rating (Star=5) – The NHTSA fr	Ad hoc	4.75<Star<5	5.00	
A.2	Side Impact	Side Impact requirements are TBD	Ad hoc			
					1.198	
					42.0	
					31.09	
					35.2	
					423	
						Quality requirements while
C.1	Acceleration	The vehicle shall meet all acceleratic	Ad hoc			
C.1.1	0-60 Time	0-60 Time (Z60<6) - The time for the	Ad hoc	Z60<6	7.96	
C.2	Deceleration	The vehicle shall meet all deceleratic	Ad hoc			
C.2.1	Stopping Distance	Stopping Distance(Distance<60) – TI	Ad hoc	Distance<60	55.2	
C.3	Handling	The vehicle shall meet all of the follo	Ad hoc			
C.3.1	Turning Radius	Turning Radius(TurnRad<8.6) – The	Ad hoc	TurnRad<8.6	8.69	
C.3.2	Axle Weight Balance	Axle Weight Balance (FrtAxle=50) – 1	ad hoc	47.5<FrtAxle	50.0	CAT/CAE
D	Capacity	Capacity is c				, cargo both weight and volume, and towing.
D.1	Passengers	Passengers (able to carry 4.75<NumPass<5.25
D.2	Cargo	Cargo capac				volume measures
D.3	Towing	Vehicle towing capacity is comprised of trailer weight and tongue weight.				
E	QRD					

Table View



XLSE Overview

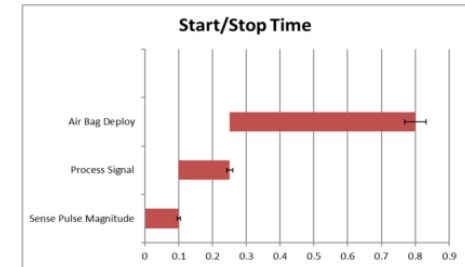
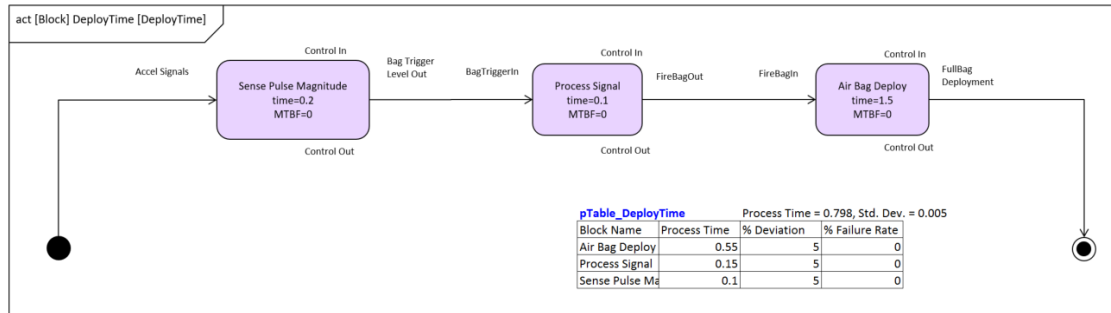
- Document your work by attaching objects to the diagram blocks including:
 - *Word Documents, PowerPoint,*
 - *Excel, Visio, Video, PDF, etc.*
- XLSE automatically updates requirements status with verifier results in the System Requirement Table (SRT)



ID	Name	Text	Procedure N Target	Actual	Target Wt	Actual Wt	Change Hist	Comments	Method	Owner	Assigned To	Notified	Due Date	Last Updated
A.3.2	Deceleration	Deceleration – The vehicle shall meet all deceleration requirements												
A.3.2.1	Stopping Distance	Stopping Distance(Distance<60) – The vehicle shal Distance<60		56.4										
A.3.3	Handling	Handling – The vehicle shall meet all of the following handling criteria.												
A.3.3.1	Turning Radius	Turning Radius(TurnRad<8.6) – The vehicle turning TurnRad<8.6		8.25										
A.3.3.2	Axle Weight Balance	Axle Weight Balance (FrtAxle=50) – TICA 50	47.5<FrtAxle	49.0					CAT/CAE Request		thomas.tecc	Jul 21, 2017	Jul 31, 2017	21-Jul-17
A.3.4	Ride Quality	Ride Quality – Vehicle shall be best in class for smooth and rough road ride metrics												
A.4	Capacity	Capacity – Capacity is comprised of number of passengers, cargo both weight and volume, and towing.												
A.4.1	Passengers	Passengers (NumPass==5) – The vehicle must be a NumPass==5												
A.4.2	Cargo	Cargo – Cargo capacity is comprised of both weight and volume measures												
A.4.2.1	Cargo Volume	Cargo Volume (CargoVol>1.0) – Avail:ad hoc	CargoVol>1.0	1.100					CAT/CAE Request		thomas.tecc	Jul 20, 2017	Jul 30, 2017	20-Jul-17

XLSE Overview

- XLSE includes the following SysML diagrams:
 - Package (*pkg*)
 - Block Definition (*bdd*)
 - Internal Block (*ibd*)
 - Parametric (*par*)
 - Activity (*act*)
 - Requirement (*req*)
 - State Machine (*stm*)
 - Use Case (*uc*)
- XLSE's Parametric, Activity, and State Machine diagrams are actionable. Change parameters and run simulations from the diagrams



Model Creation: 'One Click'

- SysML requirements diagrams can be created with 'One Click'
- The Systems Requirement Document(SRD) can be imported from enterprise data sources
- The SRD contains requirements and if desired BoM data (assembly/parts with cost, weight, and MTBF), and activities
- Including parts data allows cost rollup and automates the creation of the Domain Map and DFMEA diagrams and charts.

Human Powered Vehicle Requirements and Assemblies

A Functional Requirements – What the HPV must do or be

A.1 Load/ Unload- The vehicle shall accommodate 1 rider and cargo

- A.1.1 **Rider** – Accommodate students from 1.4 meters to 2.2 meters tall and between 40 kg and 130kg in mass
 - A.1.1.1 **Student Height**($1.4 < \text{riderheight} < 2.2$) – Accommodate passengers between 1.4 meters and 2.2 meters in height.
 - A.1.1.2 **Student Weight**($40 < \text{riderweight} < 130$) – Accommodate passengers between 40 kg and 130 kg
- A.1.2 **Ingress** – Students within the size/ mass range shall be able to open the door and sit down on the seat confidently while the vehicle is stationary
 - A.1.2.1 **Open Effort**($\text{OpenEft} < 4$) - Energy to open the door shall not exceed 4 joules

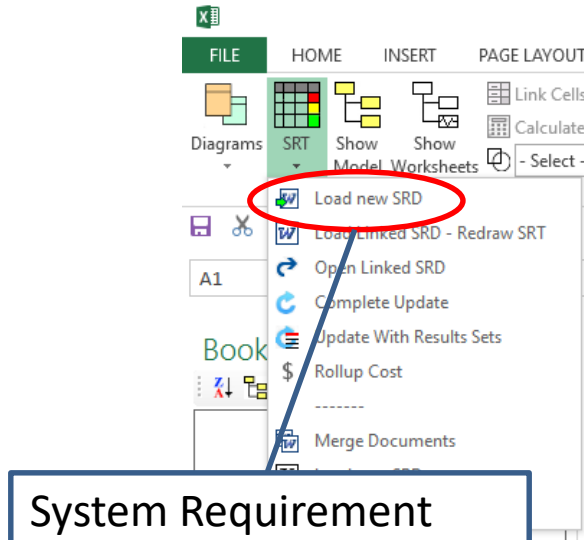
B Physical Decomposition – Parts required to build the HPV

B.1 Body & Structure – Includes frame, body, door and parts attached thereto

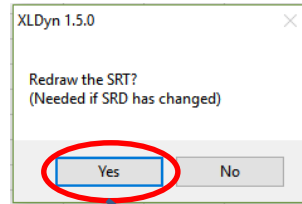
- B.1.1 Frame Assembly (1-0100-A) - \$0
- B.1.2 Body Assembly (1-0200-A) - \$0
- B.1.3 Door Assembly (1-0300-A) - \$0
- B.1.4 Headlamp Assembly (1-0400-A) - \$0
- B.1.5 Headlamp Switch Cable Assembly (1-0500-A) - \$0
- B.1.6 Taillamp Assembly (1-0600-A) - \$0
- B.1.7 Front Indicator Assembly (1-0700-A) - \$0
- B.1.8 Rear Indicator Assembly (1-0800-A) - \$0
- B.1.9 Rear View Mirror Assembly (1-0900-A) - \$0

Model Creation: 'One Click'

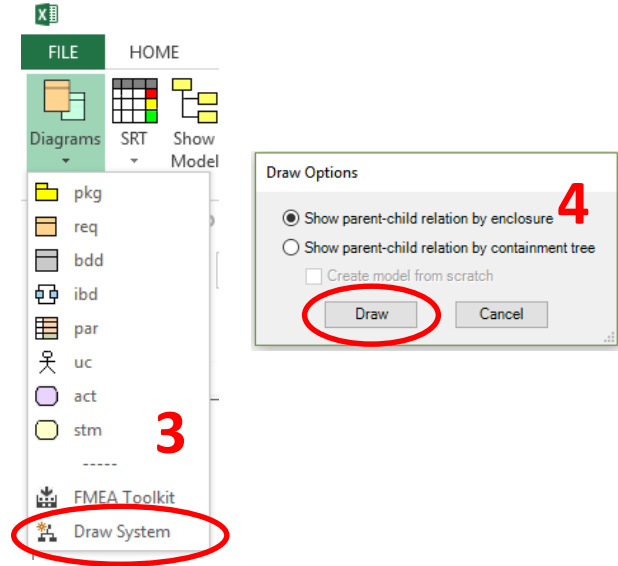
- Model Creation Steps



System Requirement Document (SRD) **1** includes Requirements and BoM

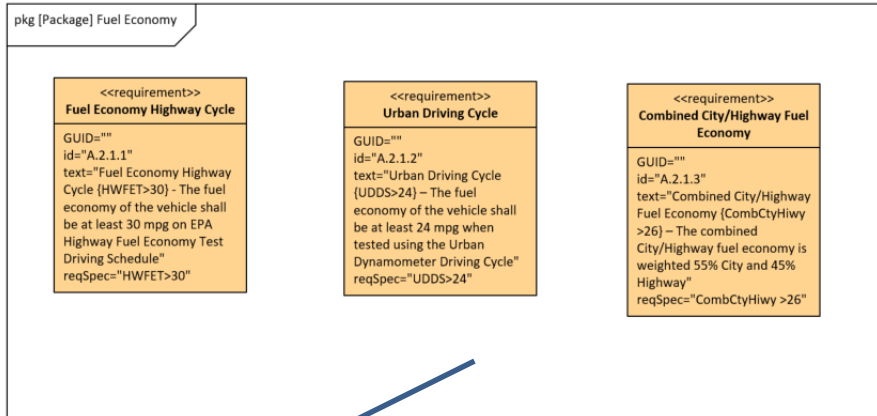


Yes to create the System Requirements Table (SRT). SRT provides a summary of **2** requirements status



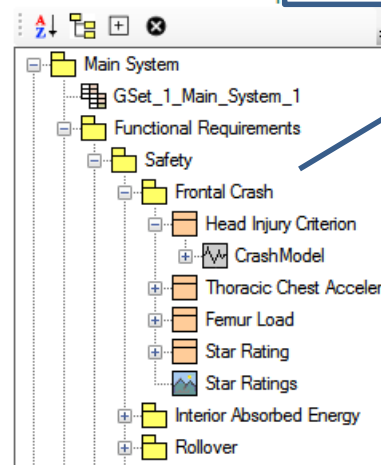
Model Creation: 'One Click'

- XLDyn[®] 's patented method creates SysML requirement, BoM, and Activity diagrams for the *entire* system



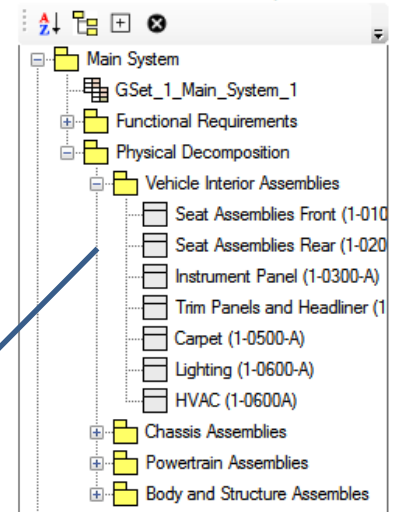
SysML Requirement nodes created

Vehicle v1.4 Compl...



Functional Tree Structure: Packages and Requirements

Vehicle v1.4 Compl...



Physical Tree Structure: BoM Assemblies and Parts

Requirements Verification

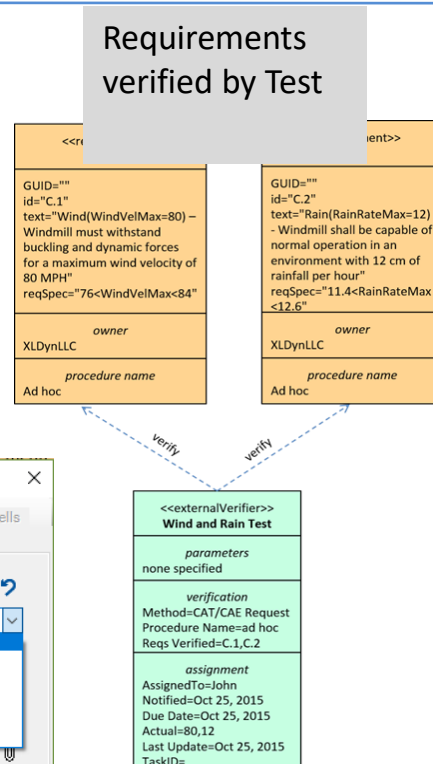
- Verification checks if requirements are met for a given set of design parameters and operating conditions
- XLSE has two classes of verifiers:
 - Internal: Perform simulation or retrieve test data directly from the diagram. *3rd Party simulation tools can be easily added.*
 - External: Generate and track work request for test or large scale simulation
- Multiple verifiers for a requirement:
 - Verification methods can change over the life of a product program
 - Simple models, design rules followed by detailed simulation and test
 - XLSE allows engineers to change verifiers and track the history of the methods and values

XLDyn[®] Verification Methods

Verification methods supported by XLDyn[®]

- *Cell Equations* – Simple equations or Macros
- *Worksheets* – Link the input/output cells of a worksheet to the results set
- *CAT/CAE Request*¹ – Automated e-mail request for a test or simulation. Automatic updated to SRT when work is completed
- *Observation*¹ – Automated e-mail request to make a simple observation, e.g. verify label is installed

¹ Requires Microsoft Outlook



Create Verifier

Configuration Parameters

Node Name: externalVerifier2

Verification Method: CAT/CAE Request

Node Location: CAT/CAE Request

Procedure Name: Observation, Cell Equation, Activate Model, Modelica Model, Worksheets, act Diagram

Owner: XLDynLLC

Attachment:

Due Date: May 29, 2017

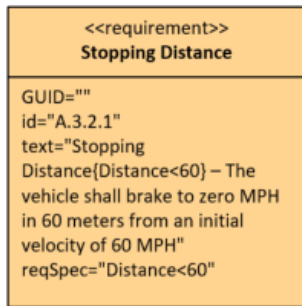
Actual Value: TBD

XLDyn[®] Verification Methods

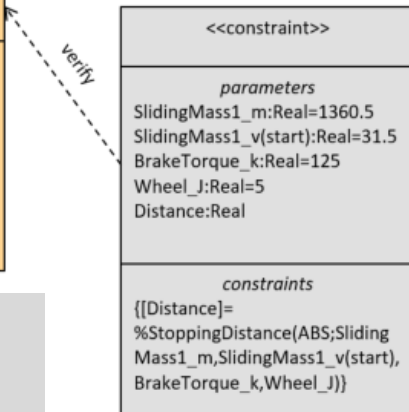
Verification methods supported by XLDyn[®]

- *XL1D Model*² – Use a XL1D model including reliability
- *Activate Model*³ – Use a *solidThinking Activate* model.
- *Modelica Model*⁴ – Use a Modelica model
- *act Diagram*⁵ – Calculate process time using an activity diagram
- *stm Diagram*⁶ – Determine system state for parameters and conditions

- Radius
 - Force
 - Friction
- $T > 90 \text{ Nm}$



Requirement verified
by XL1D simulation



```
Set_1_Deceleration_
Brake Model ABS
SlidingMass1_m = 1360.5
SlidingMass1_v(start) = 31.5
BrakeTorque_k = 125
Wheel_J = 5
Distance = 56.4
%StoppingDistance
ABS
```

Simulation run from
Diagram View

- ² Requires XL1D model in workbook
- ³ Requires Activate models in Activate model library
- ⁴ Requires OpenModelica solver and Modelica models in Modelica model library
- ⁵ Requires Activity diagram in workbook
- ⁶ Requires State diagram and XL1D mode.

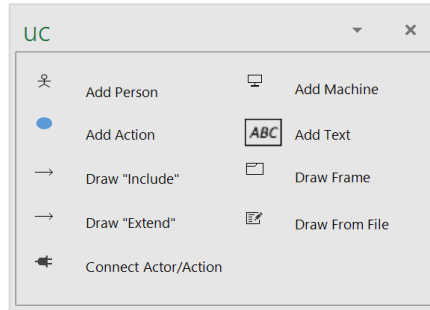
XLSE Use Case Diagrams

- Use Cases can be imported from a Word document or created directly in XLDyn
- Use Cases can be associated with other diagrams such as requirements

Word Document

HPV

- A Enter Vehicle
- A.1 Description – Enter vehicle and prepare for riding
- A.2 Pre-conditions
- A.2.1 Proper vehicle has been located
 - A.2.2 Vehicle is not currently being used by someone else
 - A.2.3 Visual vehicle inspection indicates it is suitable for use
- A.3 Post-conditions
- A.3.1 Gear is stowed and secured
 - A.3.2 Passenger is ready to begin trip
- A.4 Trigger
- A.4.1 Passenger needs transportation
- A.5 Actors
- A.5.1 Passenger
 - A.5.2 +Door Assembly
 - A.5.3 +Rear Mirror Assembly
 - A.5.4 +Seat Assembly
 - A.5.5 +Cargo Compartment
- A.6 Activities
- A.6.1 Stow cargo
 - A.6.2 Open door
 - A.6.3 Adjust seat
 - A.6.4 Close door
 - A.6.5 Adjust mirror

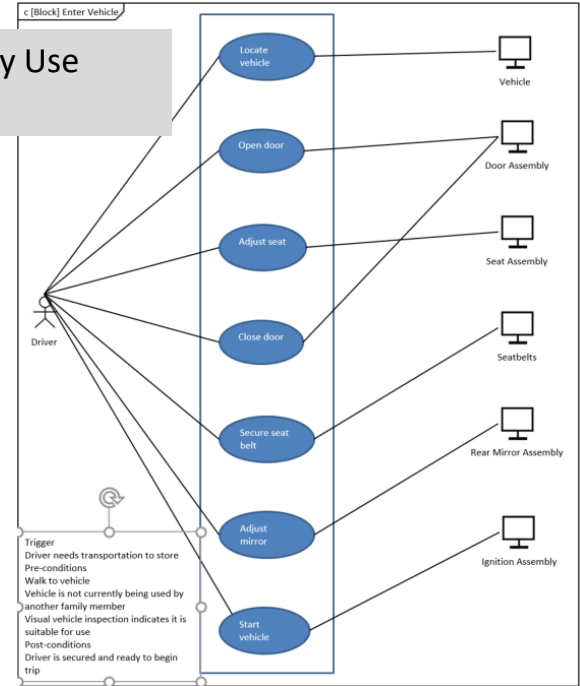
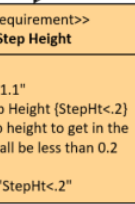


Use Case to Refine Requirement

Vehicle Entry Use Case

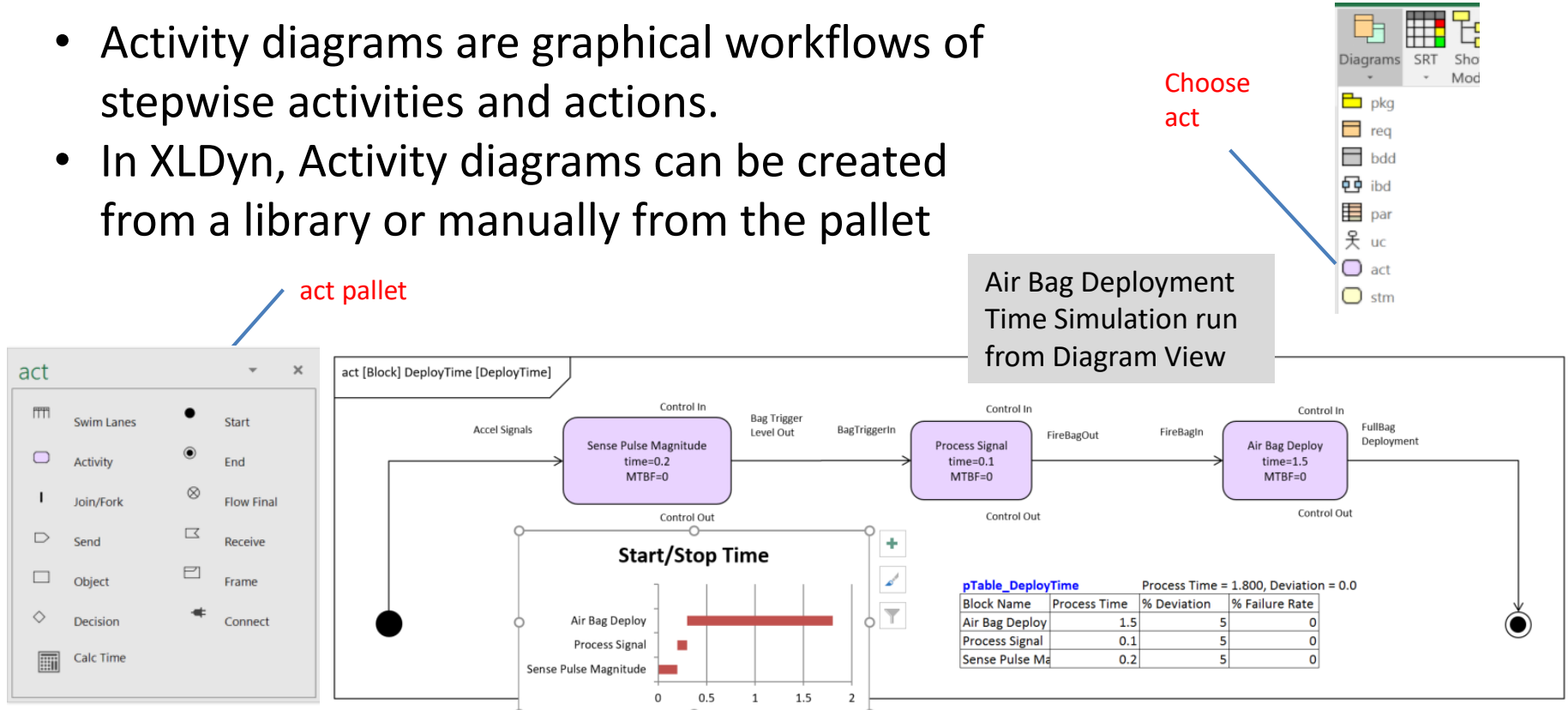
<<UC>>
Enter Vehicle

refine



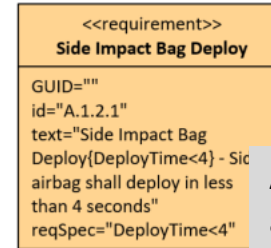
XLSE Activity Diagram

- Activity diagrams are graphical workflows of stepwise activities and actions.
- In XLDyn, Activity diagrams can be created from a library or manually from the pallet

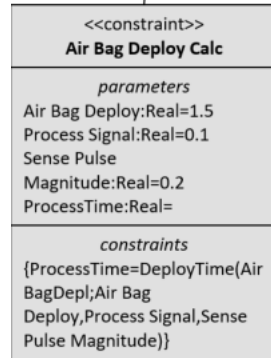


XLSE Activity Diagram

- Activity diagrams can be used as a verifier, design parameters can be varied and simulations performed
- Monte Carlo or Reliability simulations can also be performed



Activity Diagram as Verifier



verify

Set_1_Interior_Absorbed

Air Bag Deploy Calc

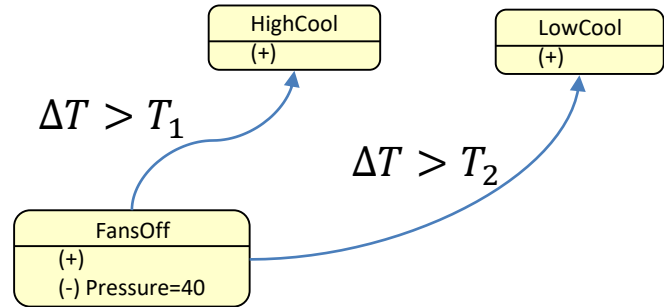
Air Bag Deploy =	1.5
Process Signal =	0.1
Sense Pulse Magnitude =	0.2
ProcessTime =	1.8

DeploymentTime
AirBagDepl

Simulation run from Diagram View

XLDyn State Diagram

- A state transition machine diagram, or *state diagram* for short, is used in dynamic system models as well as SysML models
- A state diagram shows the conditions that causes a system to change its state
- In this example, a simple cooling system has three states, and the system will shift from *FansOff* to *HighCool* or *LowCool* depending on the temperature difference ΔT



XLDyn State Diagram

```

State FansOff
  OnEntry
  End OnEntry

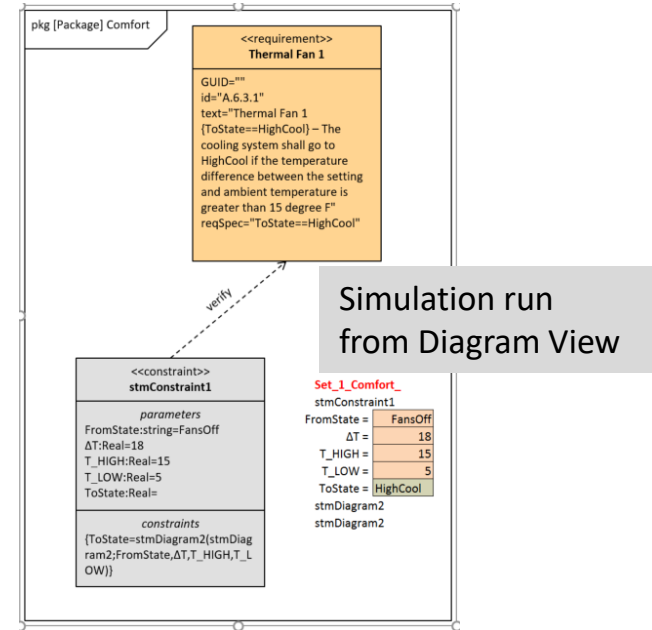
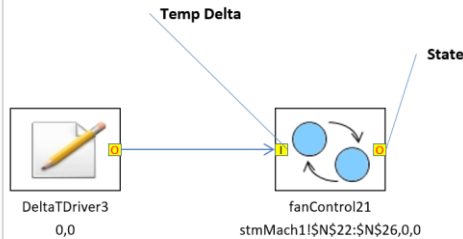
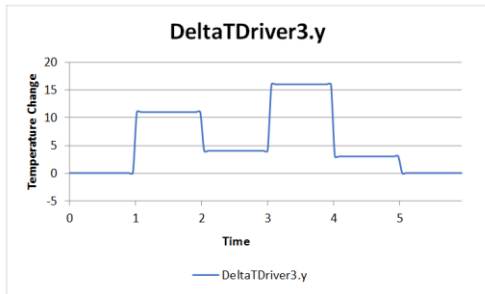
  Active
  y1 = 1
  if DeltaT > T_high then goto highcool
  if DeltaT > T_Low then goto lowcool
  end Active

  OnExit
  Pressure=40
  End OnExit
end State

State LowCool
  OnEntry
  end OnEntry
  Active
  y1 = 2
  if DeltaT > T_high then goto 3
  if DeltaT < T_Low then goto 1
  end Active
end state
    
```

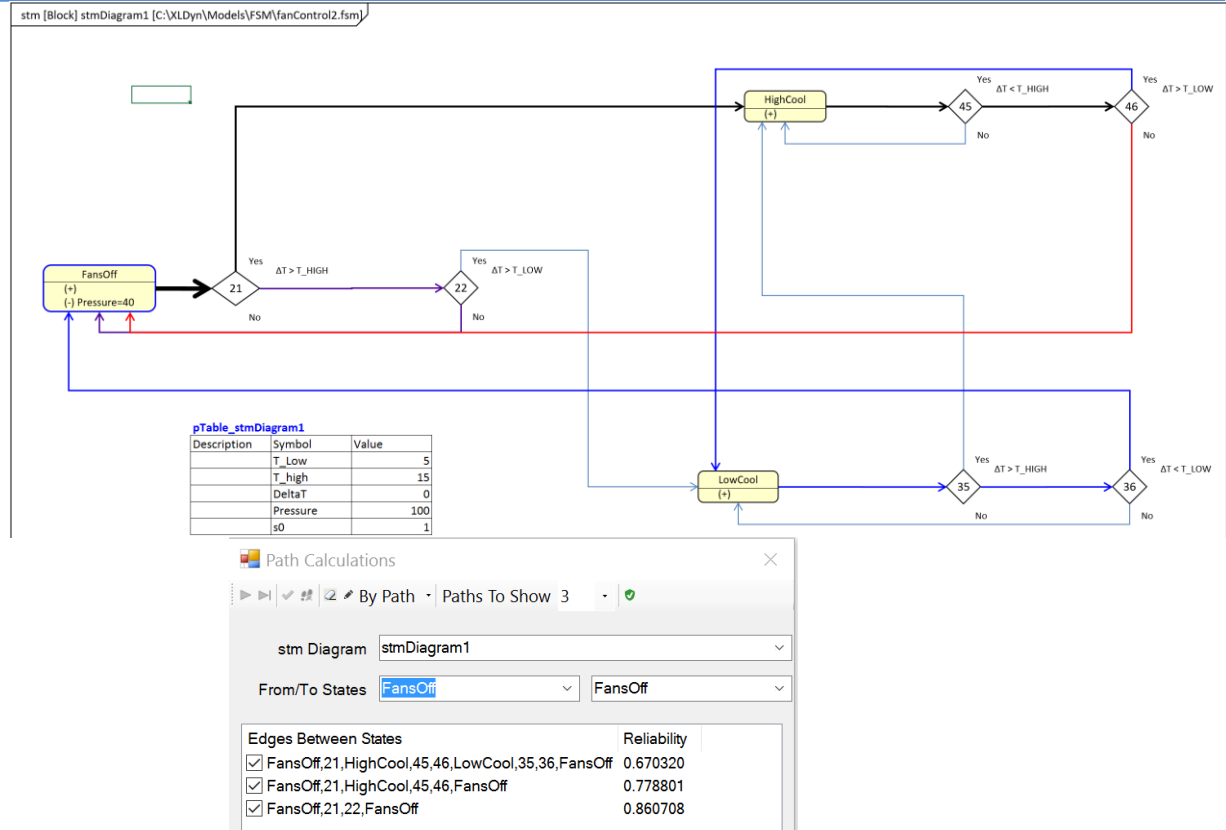
- Start with easy to write script
 - Use script to create the XL1D state machine
 - Determine states based on inputs

- State Machine used to verify requirement



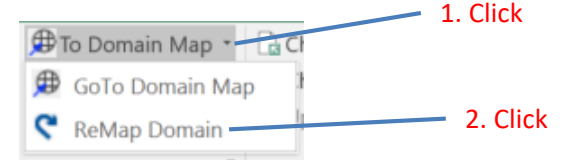
XLDyn State Diagram

- Use same script to create SysML diagram
- Find possible transition paths
- Animate transition during simulation
- Determine reliability



Domain Mapping

- XLDyn automatically maps the requirements to the parts using the tree structure of the model
- Add relationship strength directly to table
- Use for peer reviews and to create DFMEA



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	
		B Physical Dec...	B.1 Vehicle Interior Assembl	B.1.1 Seat Assemblies Fro	B.1.2 Seat Assemblies Rez	B.1.3 Instrument Panel (1	B.1.4 Trim Panels and Hei	B.1.5 Carpet (1-0500-A)	B.1.6 Lighting (1-0600-A)	B.1.7 HVAC (1-0600A)	B.2 Chassis Assemblies	B.2.1 Brake Assemblies (2	B.2.2 Rear Axle Assembly	B.2.3 Front half shafts As	B.2.4 Drive Shaft Assembl	B.2.5 Chassis Control Moc	B.2.6 Tires and Wheels (2	B.2.7 Front Suspension As	B.2.8 Rear Suspension As	B.3 Powertrain Assemblies	B.3.1 Engine Assembly (3	B.3.2 Fuel System (3-020K	B.3.3 Air Intake (3-0300-A	
1																								
56	A.6.1.3	Vehicle Operation Controls																						
57	A.6.1.4	Vehicle Operation Transaction Times																						
58	A.6.2	Ergonomics																						
59	A.6.2.1	Entry Egress																						
60	A.6.2.1.1	Step Height																	5	4	4			
61	A.6.2.1.2	Door Close Force																						
62	A.6.2.1.3	Door Open Force																						
63	A.6.2.2	Cargo Access																						
64	A.6.3	Comfort																						
65	A.6.3.1	Thermal									5													
66	A.7	NVH																						

4. Add Relationships

	A	B	C	N	AF	AG	AH	AI	AJ	AK	AL	AM	A
		0. Physical Decomposition	1. Body & Structure	1. Chassis & Power Transfer	1. Interior, Electrical & Clim:	2. Seat Assembly (3-0100-	2. Upper Steering Assem	2. Headlamp Harness Assr	2. Taillamp Harness Assen	2. Handlebar Turn Indicat	2. Front Indicator Harness	2. Rear Indicator Harness	
1													
2	0.	Functional Requirements											
3	1.	Load/ Unload											
19	1.	Move											
31	1.	Steer											
34	1.	Brake											
37	1.	Signal											
40	1.	Safetv											

3. Domain Map created with empty cells

DFMEA Process

- DFMEA is a representation of:
 - What can go wrong in a part or subassembly
 - Its cause(s) and effects
 - Importance or ranked priority

Select Toolkit

1

FMEA

- Create BoM Part
- Create req Node
- Relate
- Make Diagram
- Use Domain Map

Optional Diagram

2

2

Create from Domain Map

Add Failure Mode and Causes

FMEA Input

Part Name: Headlamp Switch Cable Assembly (1-0500-A)

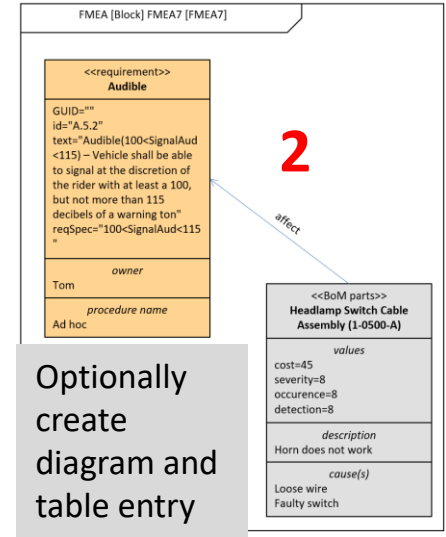
Severity: 8 Occurrence: 8 Detection: 8

Failure Mode (Description): Horn does not work

Cause(s): Loose wire, Faulty switch

3

OK Cancel



Item	Potential Failure Mode	Requirements Impacted	Potential Cause(s)	Symtoms/Detection	SEV	OCC	DET	RPN	Recommended actions	Assigned To	Target Date
Headlamp Switch Cable Assembly (1-0500-A)	Horn does not work	Audible[100<SignalAud<115) - Vehicle shall be able to signal at the discretion of the rider with at least a 100, but not more than 115 decibels of a warning ton	Loose wire Faulty switch		8	8	8	512			

4

Table Entry Generated

Schematic Diagrams with Reliability

- Create schematic diagrams from part list with defined connector types
- Show connectivity and flow
- Select components then calculate reliability

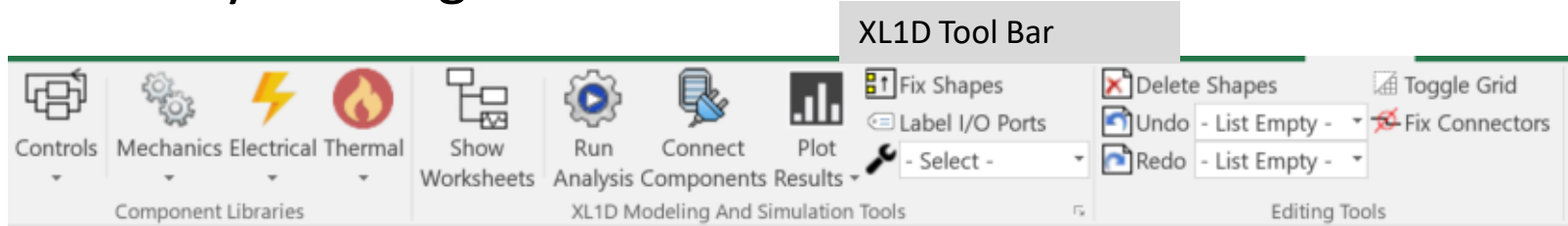
The image displays a software interface for creating and calculating reliability for schematic diagrams. It is divided into three main sections:

- Draw Parts:** A tree view on the left lists various components such as Transmission Assembly, Hybrid Drive, Generator, Drive Motor, Inverter, Li Ion Battery, Heat Exchanger, Sensors, Pressure Sensors, Speed, Temperature Sensors, Position Sensors, and Controllers. The Engine Control Module is highlighted.
- Schematic Diagram Menu:** A central menu with options: Select, Connect Parts, Draw Parts, Add Legend, and Calculate Reliability.
- Drag Parts to Pallet and Connect:** A 'Pin Connector' dialog box shows the 'Transmission Speed Sensor' selected with 'Pin 1' checked. The 'Trans Control Module' has 'Pin 3' checked.
- Schematic Diagram:** A central diagram showing the Engine Control Module connected to various sensors (Transmission Speed, Transmission Oil Temp, Engine Oil Temp, Throttle Position) and other components (Li Ion Battery, Drive Motor, Heat Exchanger). A legend indicates High Voltage (red), High Speed LAN (green), Fluid (blue), and Low Voltage (white).
- Calculate Reliability:** A window showing the calculated reliability for the system. The 'Sys. Reliability' is 0.847831766. The 'Paths Definition' is 'MTBF Data'. The 'Chains' table shows the following data:

Chains	Reliability
<input type="checkbox"/> Engine Oil Temp Sensor Engine Control Module Li Ion Battery	0.47575...
<input checked="" type="checkbox"/> Trans Control Module Engine Control Module Drive Motor	0.70973...

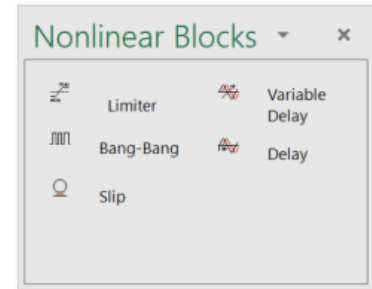
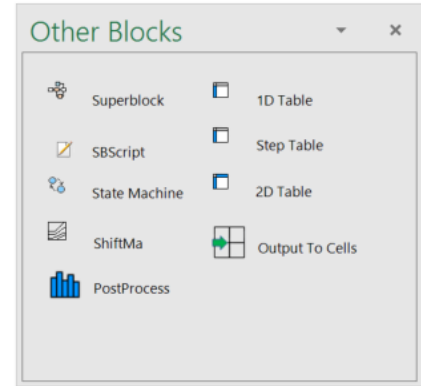
What Is XL1D?

- A multi-physics lumped parameter simulation tool similar to Mathworks Simulink®
- Completely integrated with XLSE for requirements verification and parametric studies
- Includes mechanical, thermal, electrical, control systems, and reliability building blocks



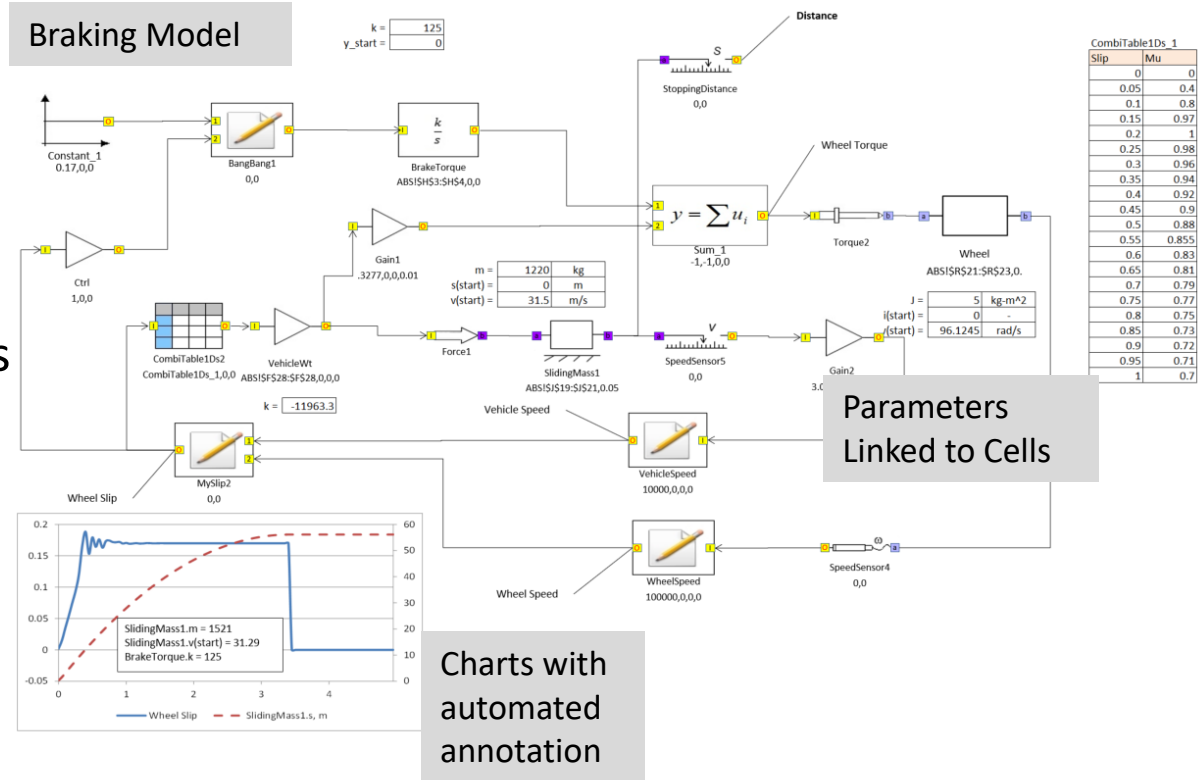
XL1D Features

- Static, transient, and frequency domain analyses
- Supports continuous and discrete time simulation
- Powerful scripting language (without 3rd party compiler)
- Finite state machines using scripts
- Transfer Function blocks with custom labels



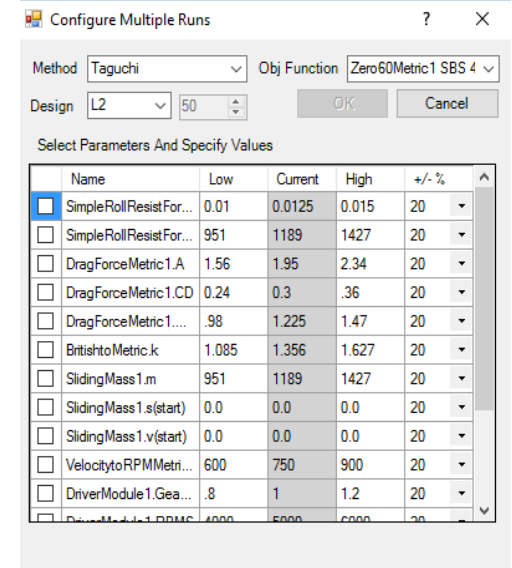
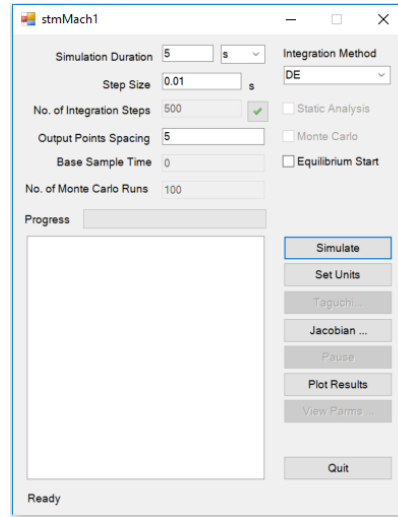
XL1D Features

- Automated chart creation with Excel functionality
- Built-in Units Management
- Links system parameters to Excel cells
- Run Monte Carlo to calculate performance variations, component properties have built in variation specification

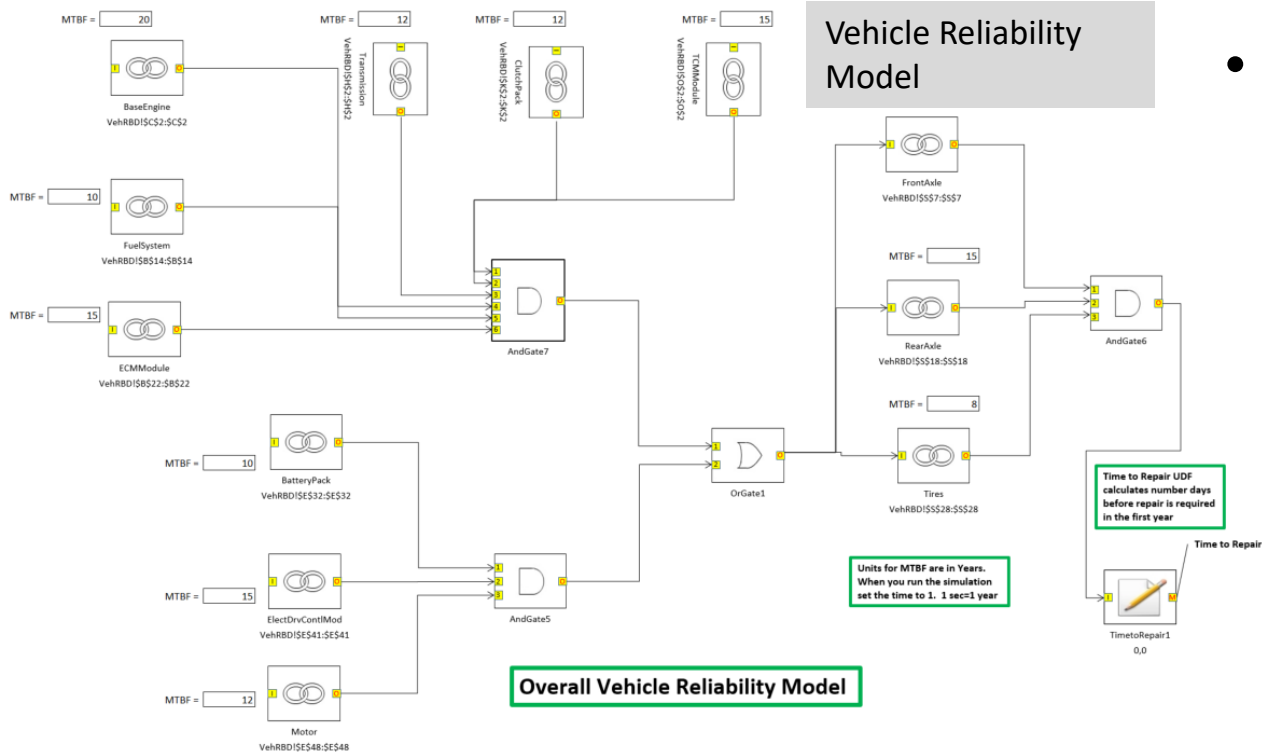


XL1D Features

- Easily configures DoE studies
- Automatically connects components across worksheets (superblocks)
- Completely integrated with XLSE for requirements verification and parametric studies













XL1D Features



Vehicle Reliability Model

- Fault Tree and Reliability Block Diagrams

Reliability Blocks

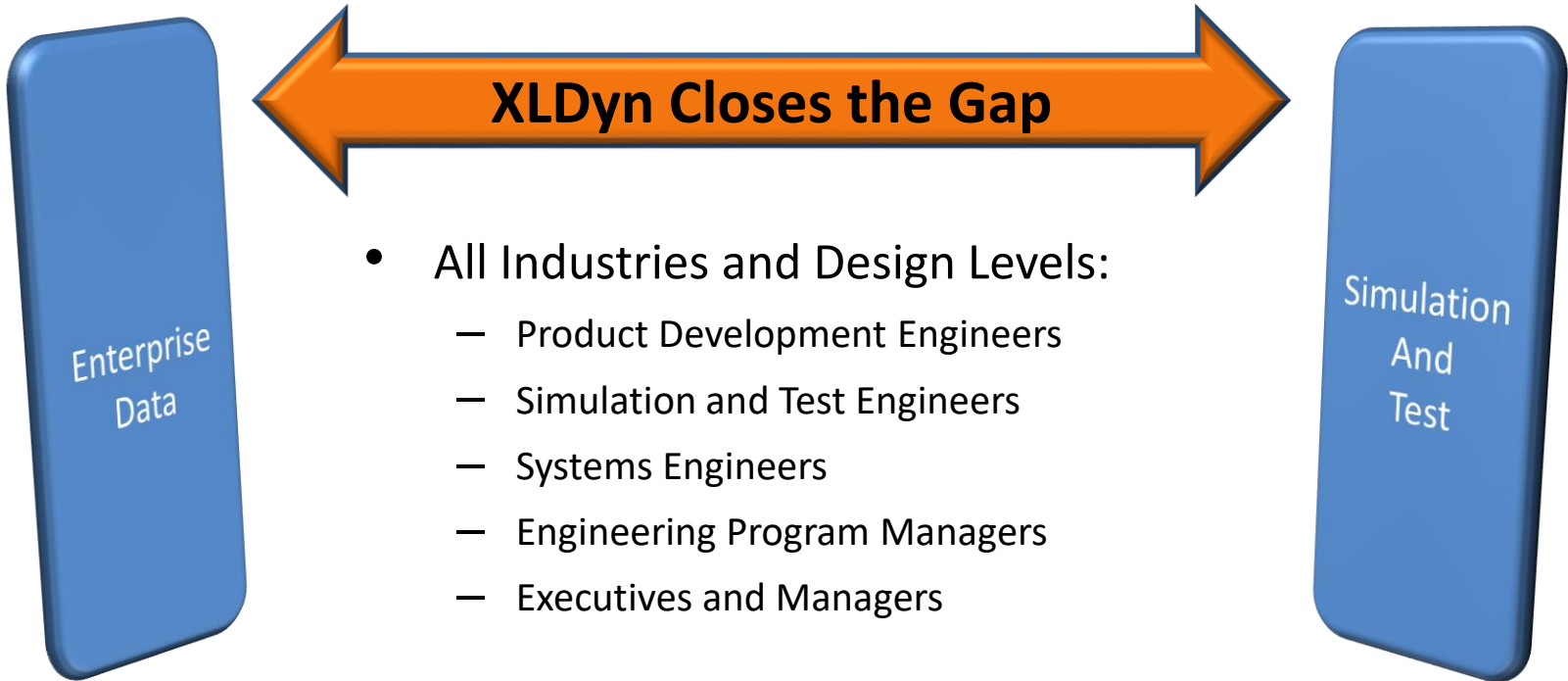
 Start	 OrGate
 Maintai	 AndGate
 Repair	 FaultTree Node
 Failure Link	 KofN
 Unertainty Link	 Exponential Event

Summary

- Balance designs at the system, subsystem and component level
- Import requirements from and export updates to enterprise systems
- All requirements and verifiers managed in a single application
- XLDyn's SysML diagrams are actionable
- Easy access "project status view" including on mobile devices
- XLDyn's ease of use and integration makes MBSE a way to do your work, not document what you did
- XLDyn requires minimal training so *ALL* engineers can use it

Backup Slides

Summary: XLDyn Users



Adding Requirements and Parts

- Requirements and BoM parts are added directly to diagrams and synchronized in all views and added to the SRD

Requirement Node

Specifications GUID & Names

*Node Name

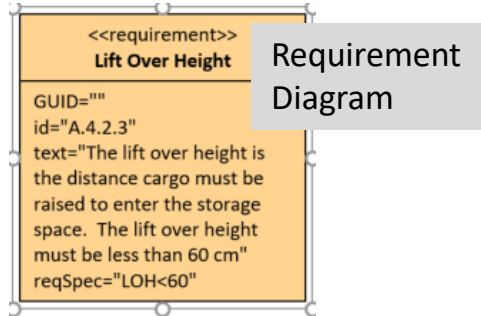
Target Spec

Req ID

Edit Requirement Text

The lift over height is the distance cargo must be raised to enter the storage space. The lift over height must be less than 60 cm

Define Requirement

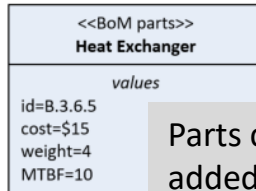


- A.4.2 **Cargo** – Cargo capacity is comprised of both weight and volume measures
- A.4.2.1 **Cargo Volume** {CargoVol>1.0} – Available volume for passenger cargo shall be at least 1 square meter
- A.4.2.2 **Cargo Weight** {CargoWt>50} – Cargo compartments must be able to carry at least 50 kg
- A.4.2.3 **Lift Over Height**{LOH<60} - The lift over height is the distance cargo must be raised to enter the storage space. The lift over height must be less than 60 cm

Added to System Requirement Document (SRD)

A.4.2	Cargo	Cargo – Cargo capacity is comprised of both weight and volume measures		
A.4.2.1	Cargo Volume	Cargo Volume {CargoVol>1.0} – Available volume for passenger cargo shall be at least 1 square meter	CargoVol>1.0	1.100
A.4.2.2	Cargo Weight	Cargo Weight {CargoWt>50} – Cargo compartments must be able to carry at least 50 kg	CargoWt>50	
A.4.2.3	Lift Over Height	The lift over height is the distance cargo must be raised to enter the storage space. The lift over height must be less than 60 cm	LOH<60	

Added to System Requirement Table (SRT)



Parts can be added also