



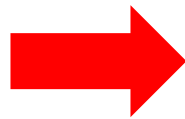
PHOENIX

INTEGRATION

INTEGRATE**EXPLORE**ORGANIZE

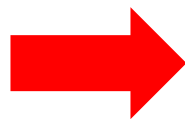


1950
67 Seconds Pit stop





1950
67 Seconds Pit stop



2013
2 Seconds Pit stop

MBE, MBSE and MaaS to Unleash Your Supply Chain

Phoenix Integration

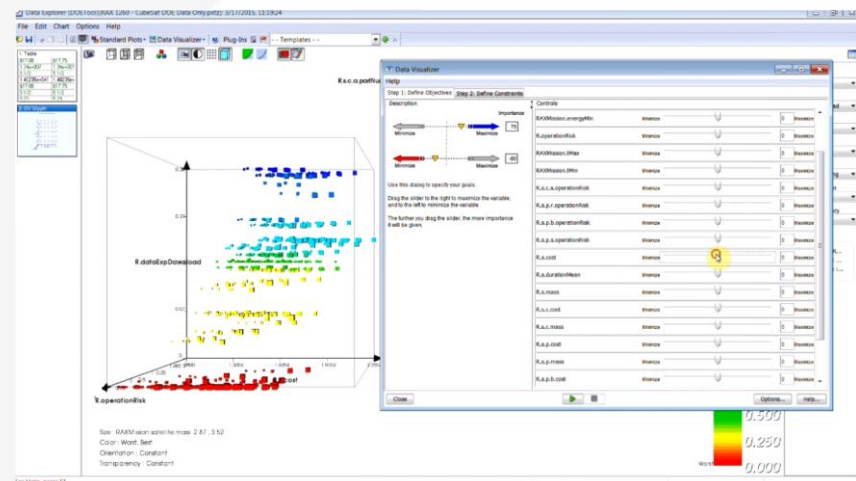
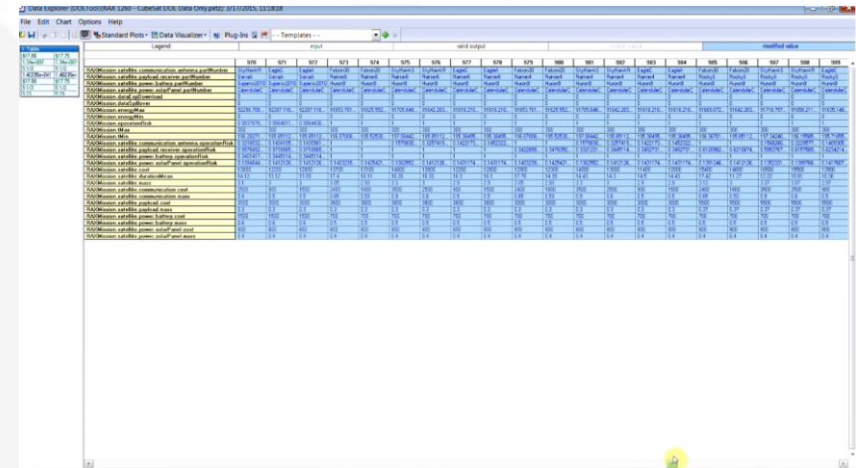
Dr. J Simmons, PhD
jsimmons@phoenix-int.com

Tony Davenport, BSME, MBA
tdavenport@phoenix-int.com

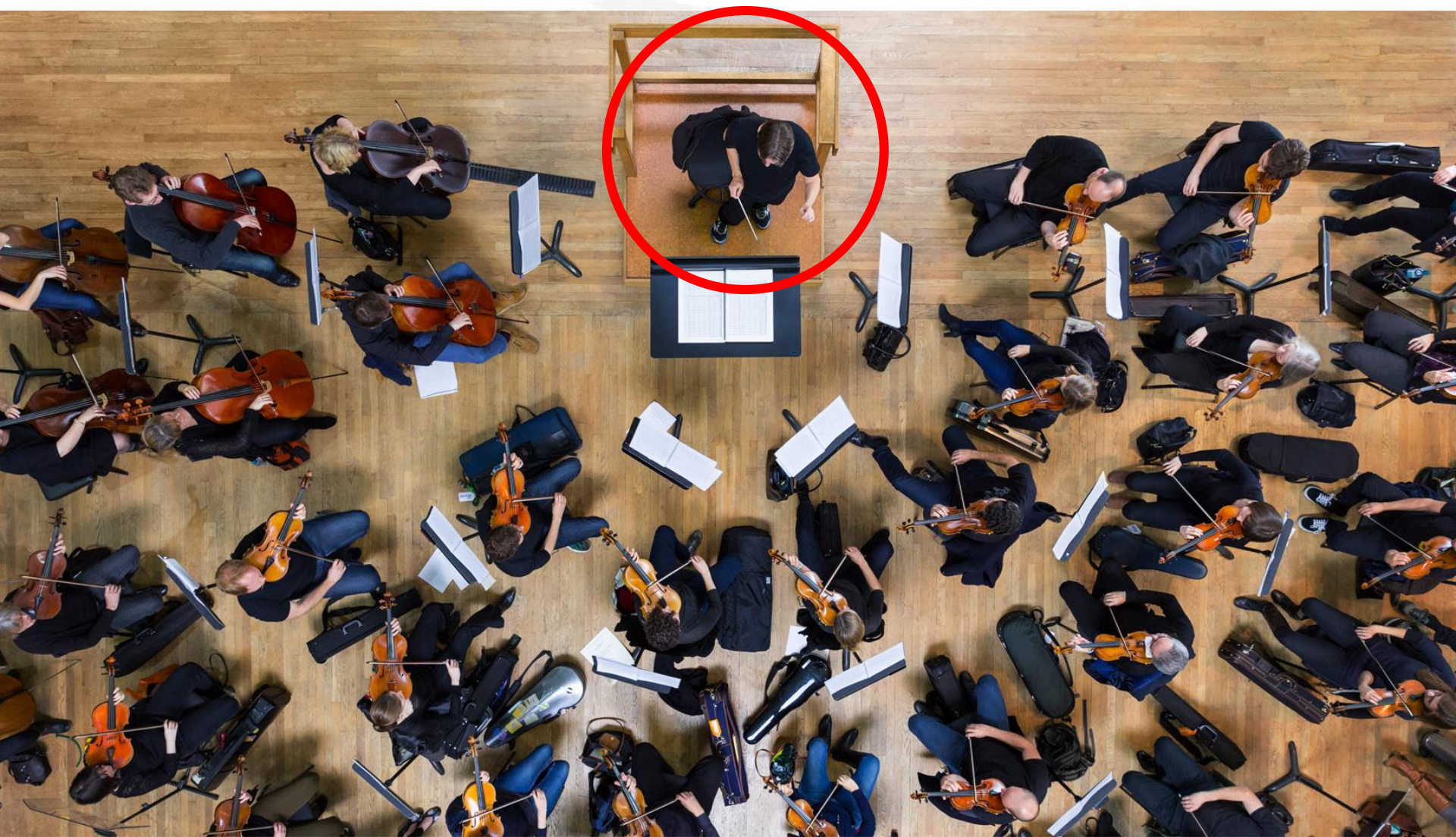
INTEGRATE**EXPLORE**ORGANIZE

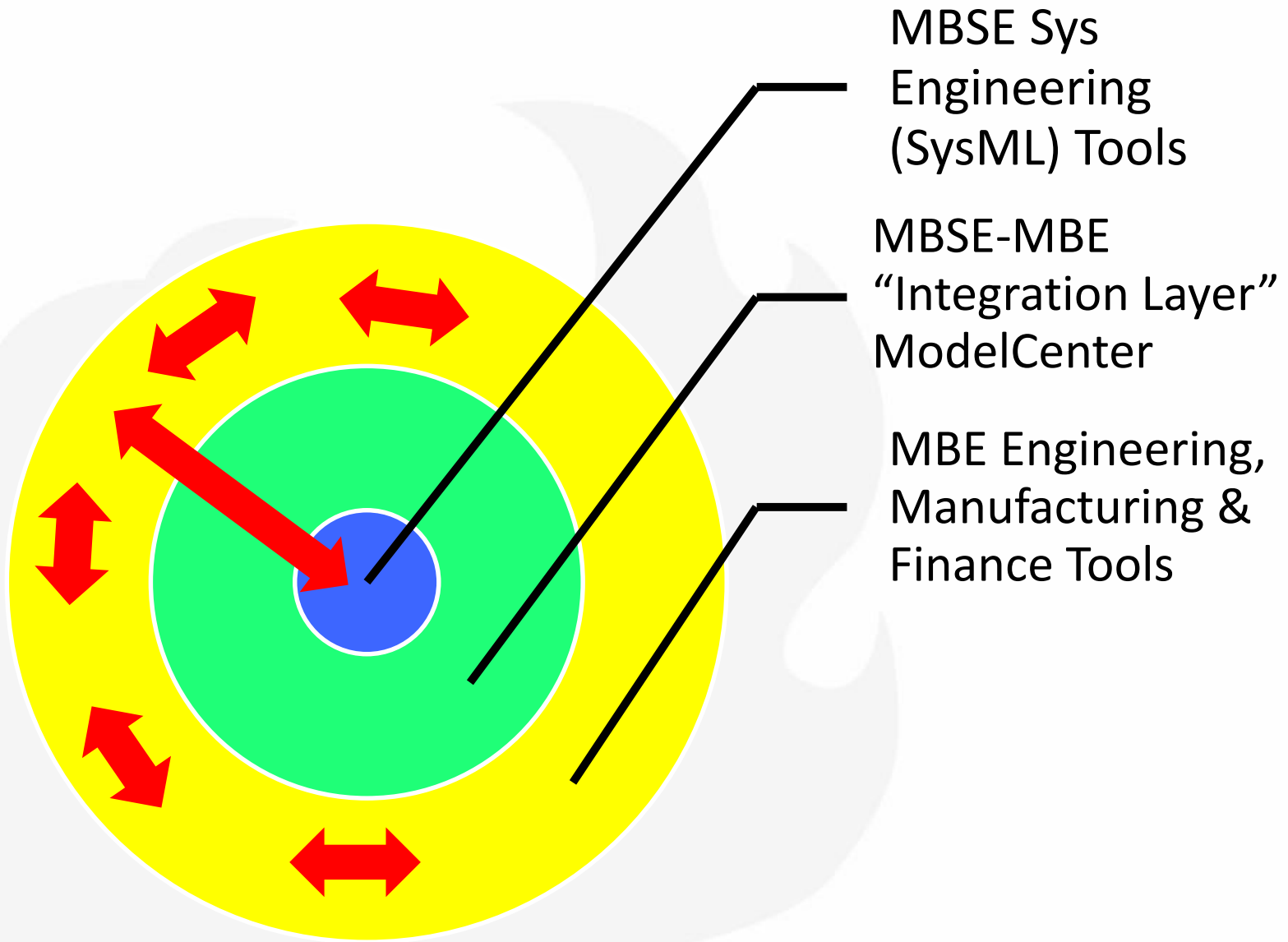
Shopping by Performance

- Practically unlimited data records can be captured from variation of inputs in the Workflow
- The Trade Space Visualization Tool allows the User to quickly slice through the data to find the most relative data points to find the best performance.

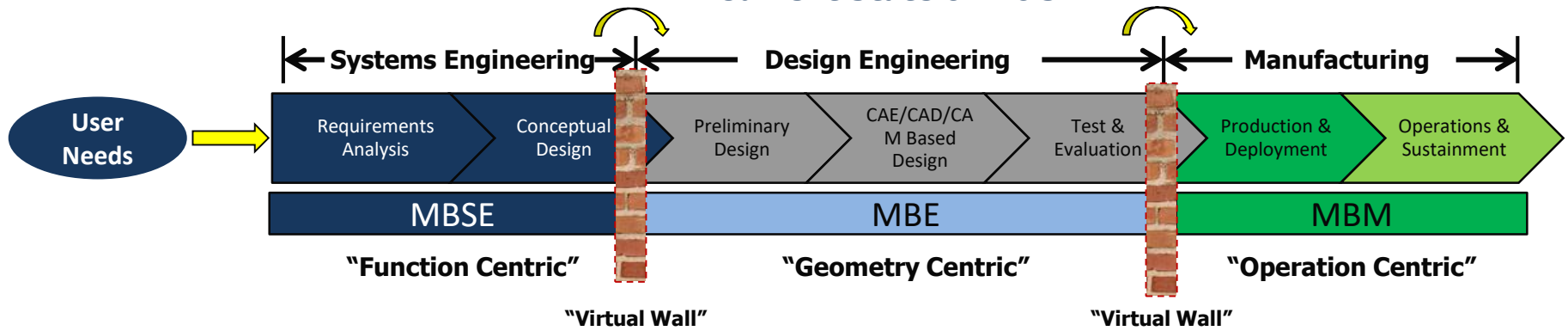


ModelCenter is an Integration Conductor for both MBE and MBSE

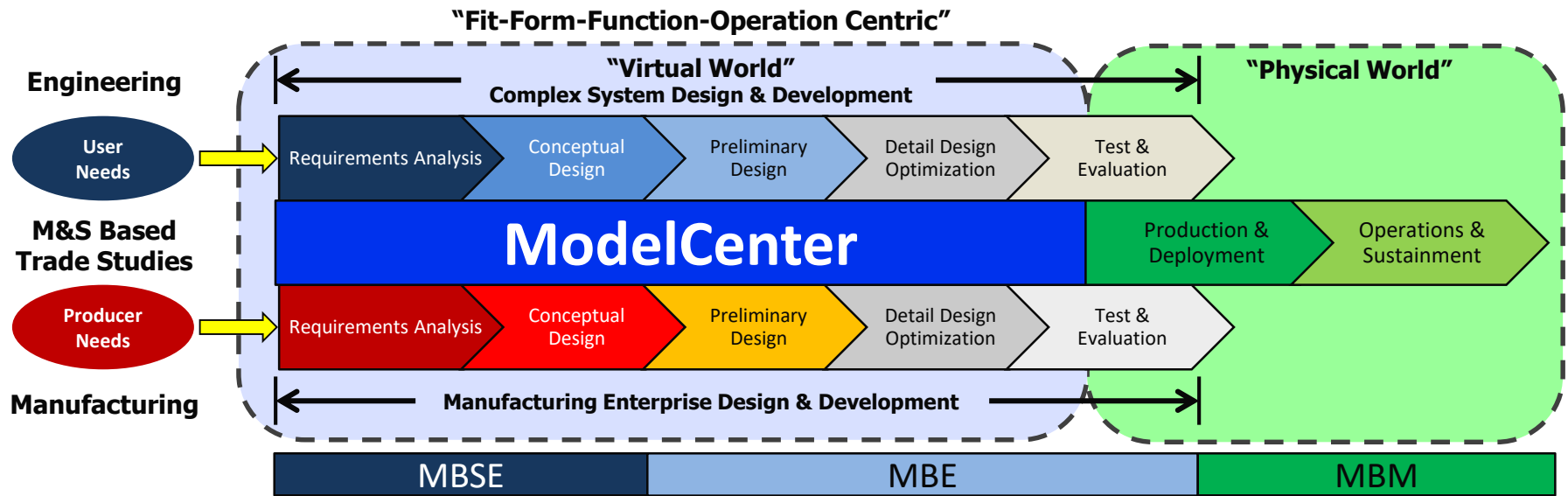




Current State of M&S



Transforming the Design Space



"Re-Engineering" Design and Manufacturing"

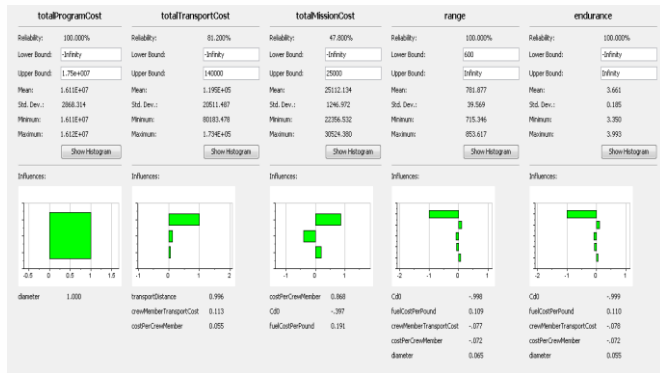
Adapted from NDIA presentation "21st Century Aerospace and Defense M&S Needs and the Virtual Manufacturing Frontier" by Dr. Al Sanders Presented to NDIA SE M&S Committee, Washington, DC, June 19, 2012

Integrate Any Software Tool

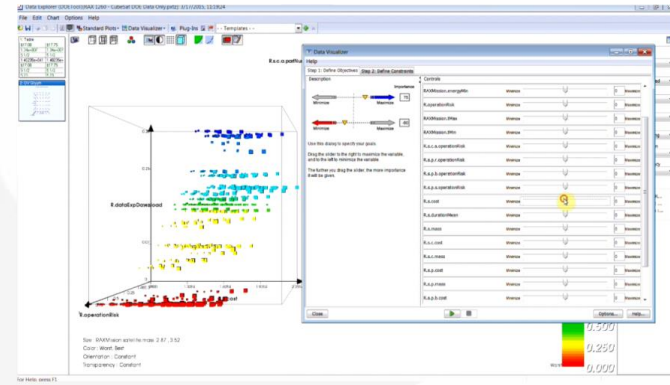


- Integrate and Automate any software tool
- Outputs from Tool A, become Inputs for Tool B
- Vendor neutral

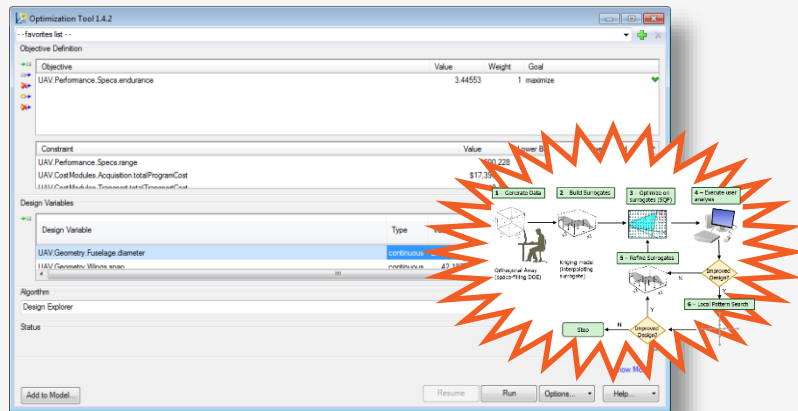
What Can MBE Do for You?



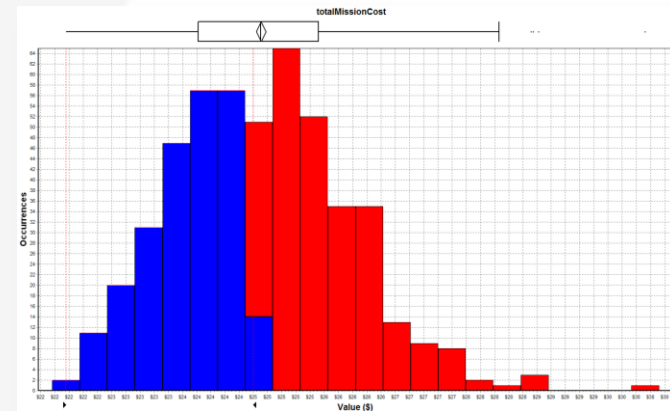
Sensitivity Analysis



Trade Space Visualization

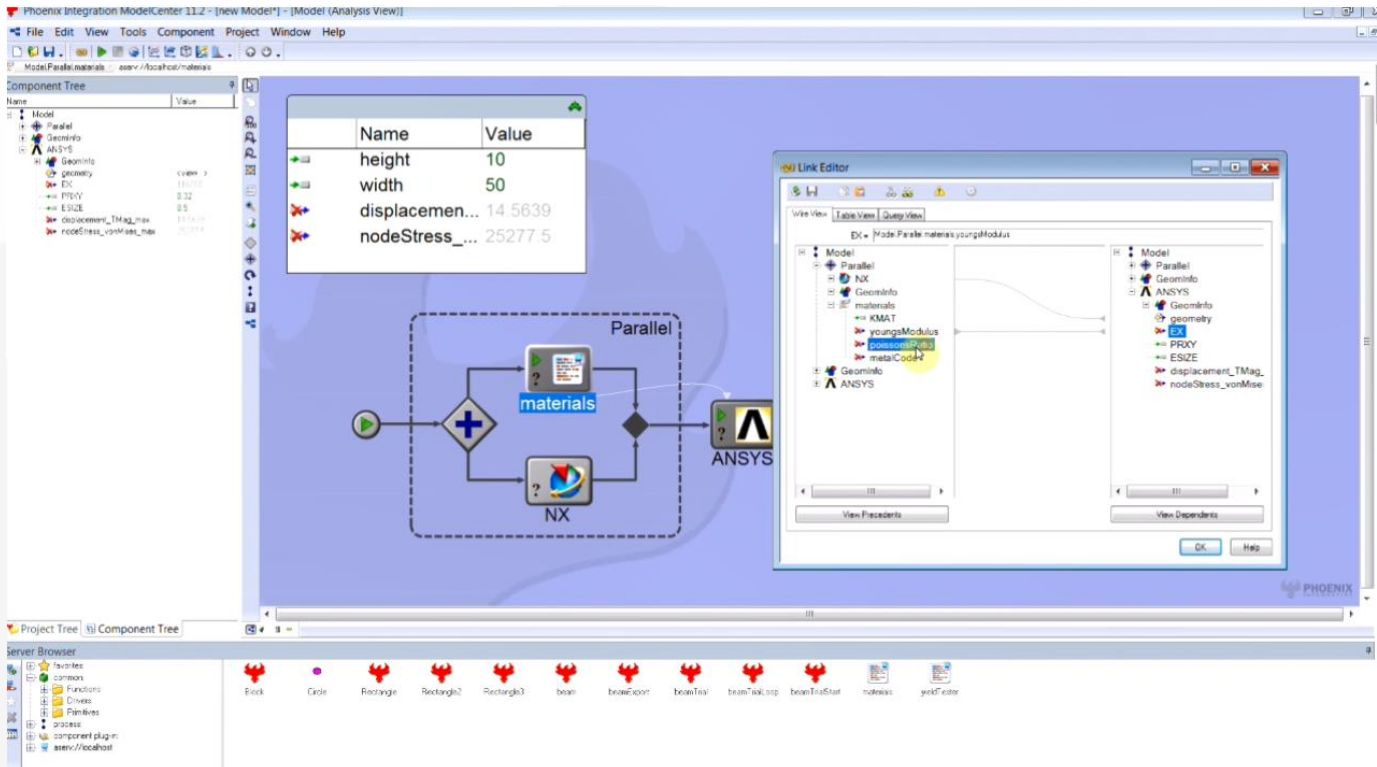


Optimization



Probabilistic Analysis

How Does MBE Integration Work?



The screenshot displays the Phoenix Integration ModelCenter 11.2 interface. A central workflow diagram shows a 'Parallel' block containing 'materials' and 'NX' components, which then feeds into an 'ANSYS' component. A 'Link Editor' window is open, showing a dependency graph between 'NX' and 'ANSYS'. A data table is also visible, listing parameters and their values.

Name	Value
height	10
width	50
displacemen...	14.5639
nodeStress_...	25277.5

- Integrated Workflows are created through the ModelCenter graphical environment.
- Models and Workflows can be integrated from any location world-wide.
- Inputs and Outputs of a Software Solution are easily stitched together.
- Workflows can then be “Played” with new inputs through the click of a button.



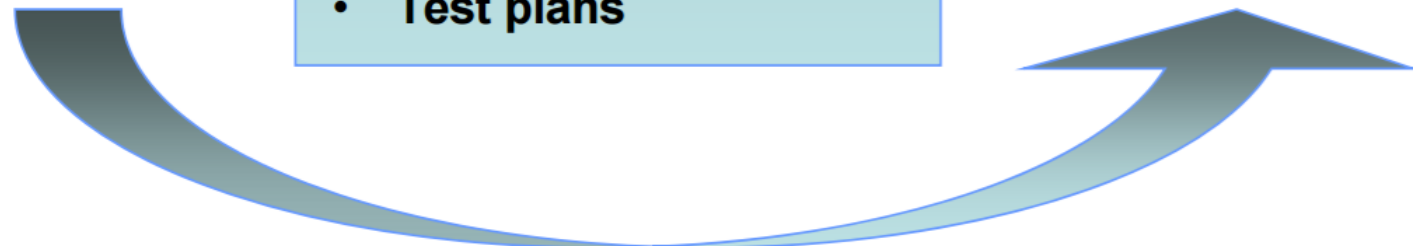
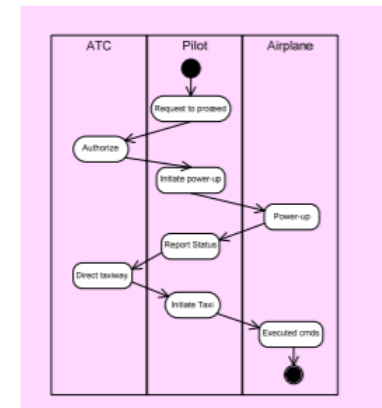
SE Practices for Describing Systems

Past



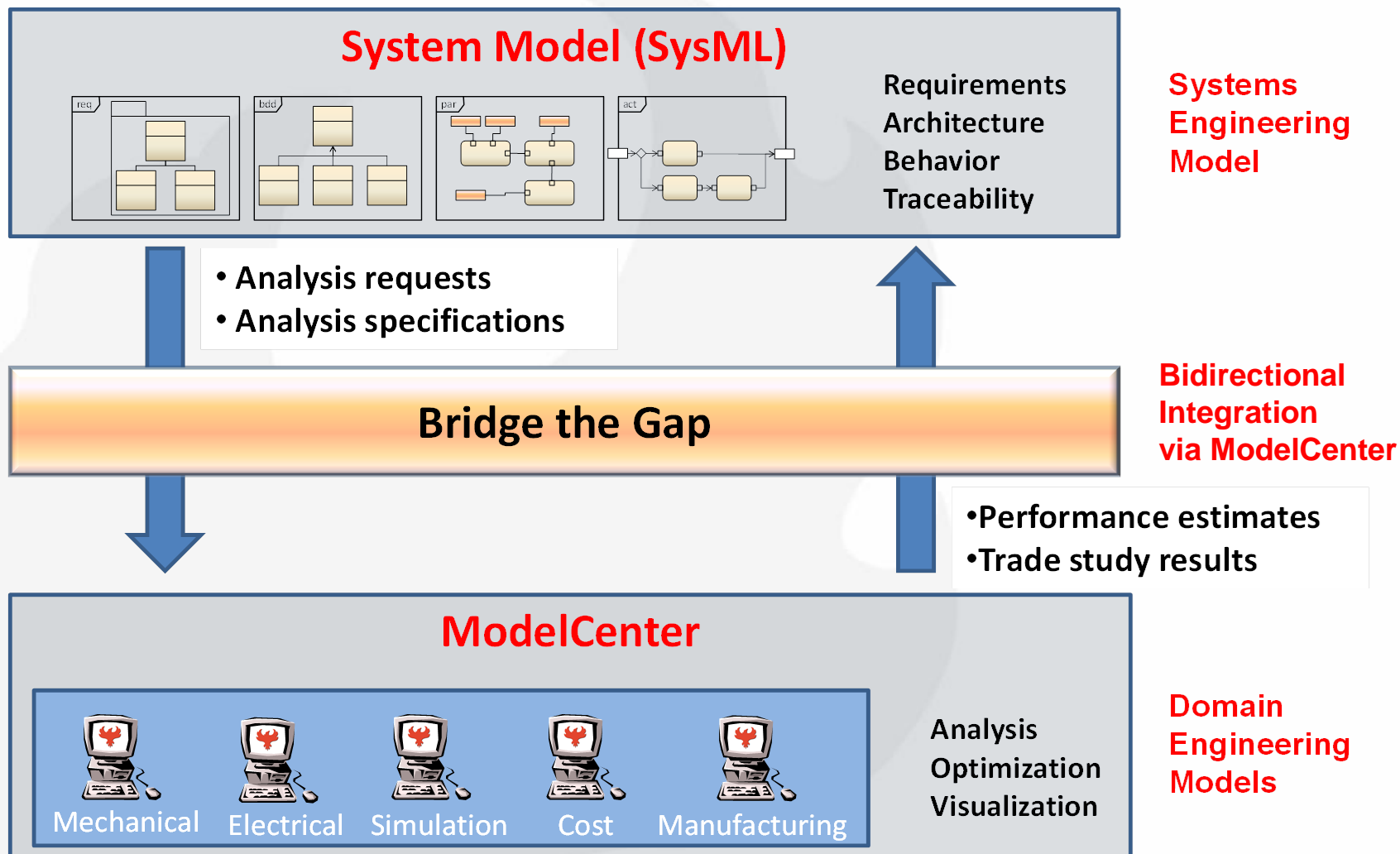
- Specifications
- Interface requirements
- System design
- Analysis & Trade-off
- Test plans

Future

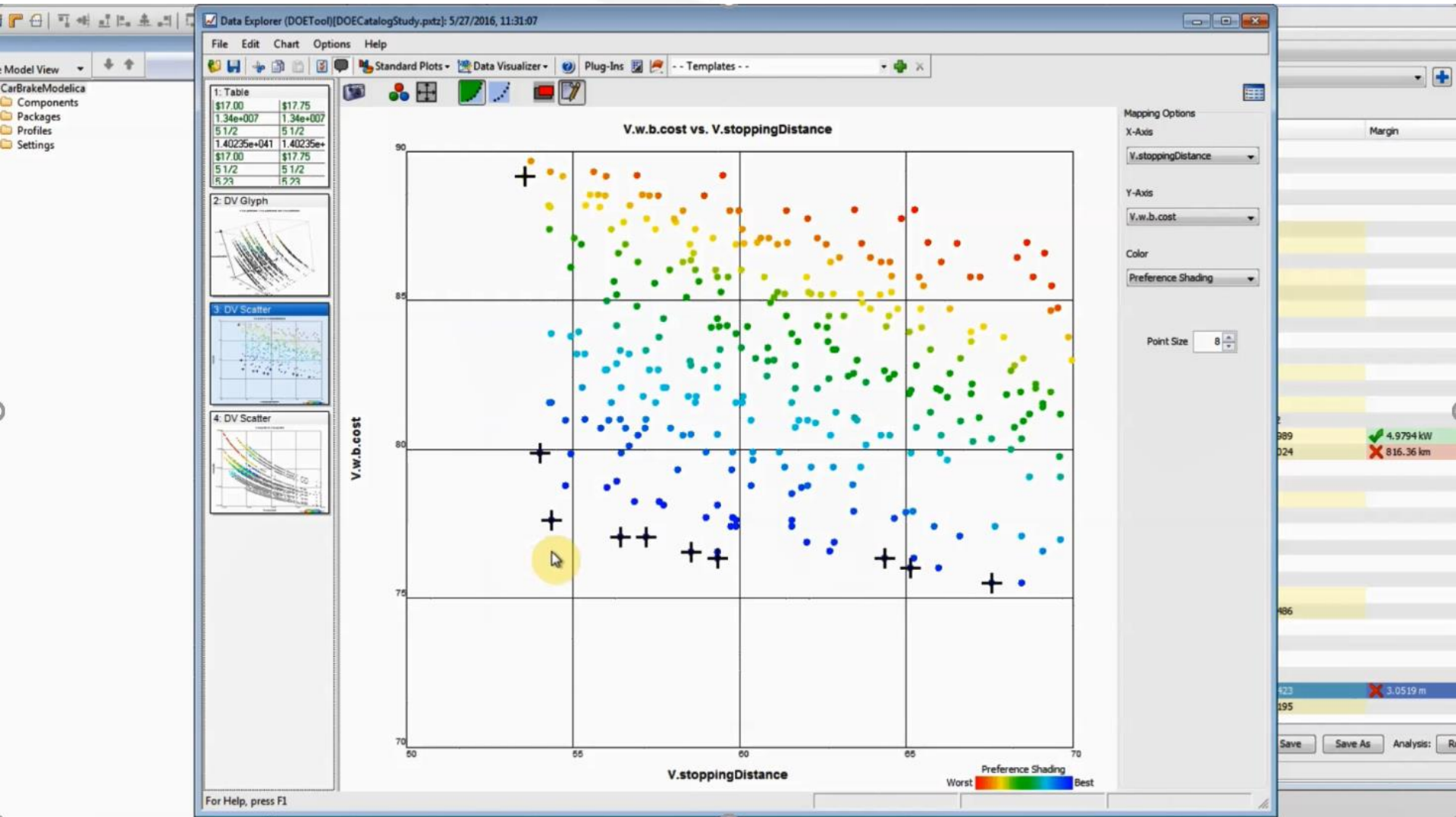


Moving from Document centric to Model centric

Today: Connect SysML with Engineering Analysis

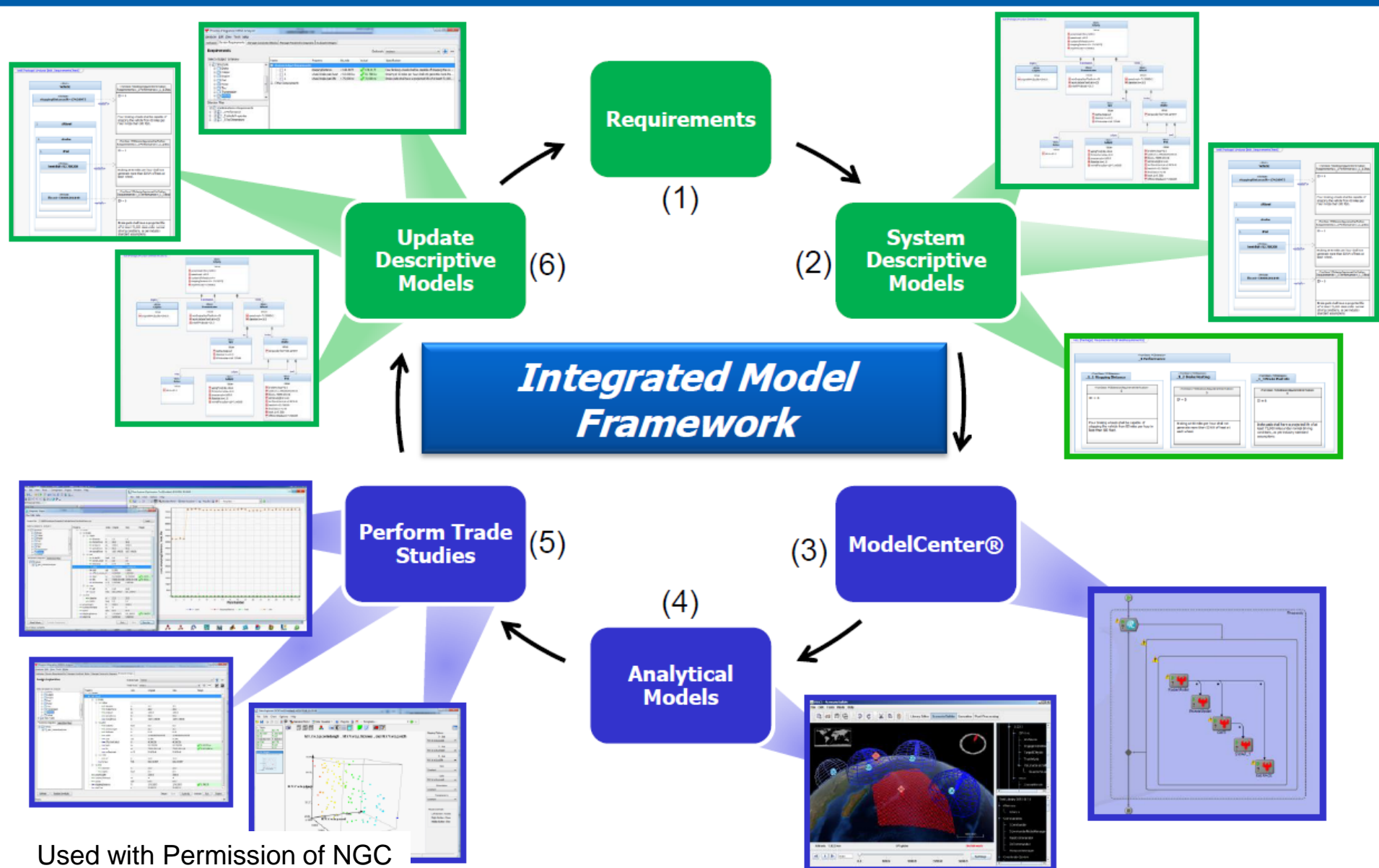


Design Exploration in MBSE



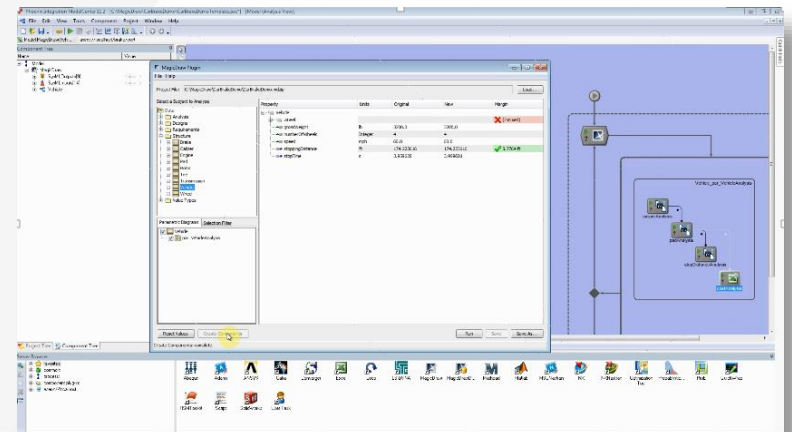
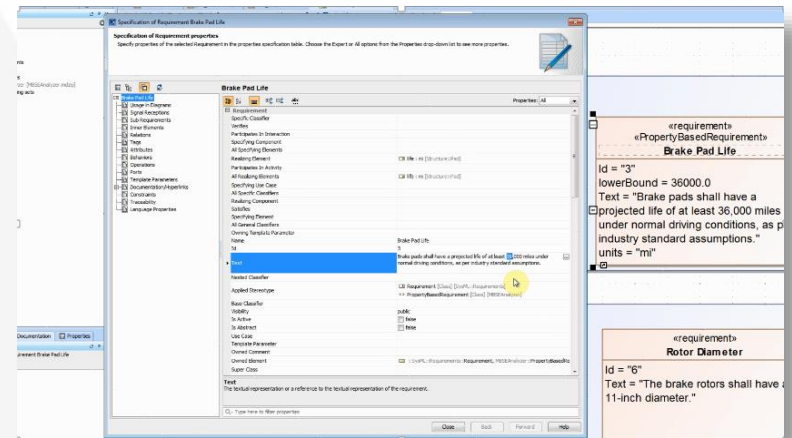
Integrated Model Framework Example

Descriptive to Analytical and Back



Responding to a Requirement Change

- Share performance requirements from SysML models with domain experts through SysML integration.
- Automatically generate workflows from SysML models to rapidly respond to requirements changes.



Responding to a Requirement Change

Phoenix Integration ModelCenter 11.2 - [C:\MagicDraw\CarBrakeDemo\CarBrakeDemoTemplate.pxc] - [Model (Analysis View)]

File Edit View Tools Component Project Window Help

Model MagicDraw Vehi... aserv://localhost/brake/cost

Component Tree

Name	Value
Model	
MagicDraw	
SysMLOutputs[3]	<view...>
SysMLInputs[14]	<view...>
Vehicle	

Project File: C:\MagicDraw\CarBrakeDemo\CarBrakeDemo.mdzp

Select a Subject to Analyze

- Data
 - Analysis
 - Designs
 - Requirements
 - Structure
 - Brake
 - Caliper
 - Engine
 - Pad
 - Rotor
 - Tire
 - Transmission
 - Vehicle**
 - Wheel
 - Value Types

Property

Property	Units	Original	New	Margin
Vehicle				
wheel				✖ (2 mixed)
grossWeight	lb	3200.0	3200.0	
numberOfWheels	Integer	4	4	
speed	mph	60.0	60.0	
stoppingDistance	ft	174.223616	174.223616	✔ 5.7764 ft
stopTime	s	3.959628	3.959628	

Parametric Diagrams

- Vehicle
 - par_VehicleAnalysis

Reset Values Create Components Run Save Save As...

Create Components: complete.

Server Browser

- favorites:
 - common:
 - process:
 - component plug-in:
 - aserv://localhost

Taskbar: Abaqus, Adams, ANSYS, Catia, Converger, Excel, Loop, LS-DYNA, MagicDraw, MagicDraw..., Matricad, Matlab, MSCNastran, NX, N/Nastran, Optimization Tool, Probabilistic..., ProE, QuickWrap, RSMTlookit, Script, SolidWorks, User Task.

Diagram: Vehicle_par_VehiclesAnalysis

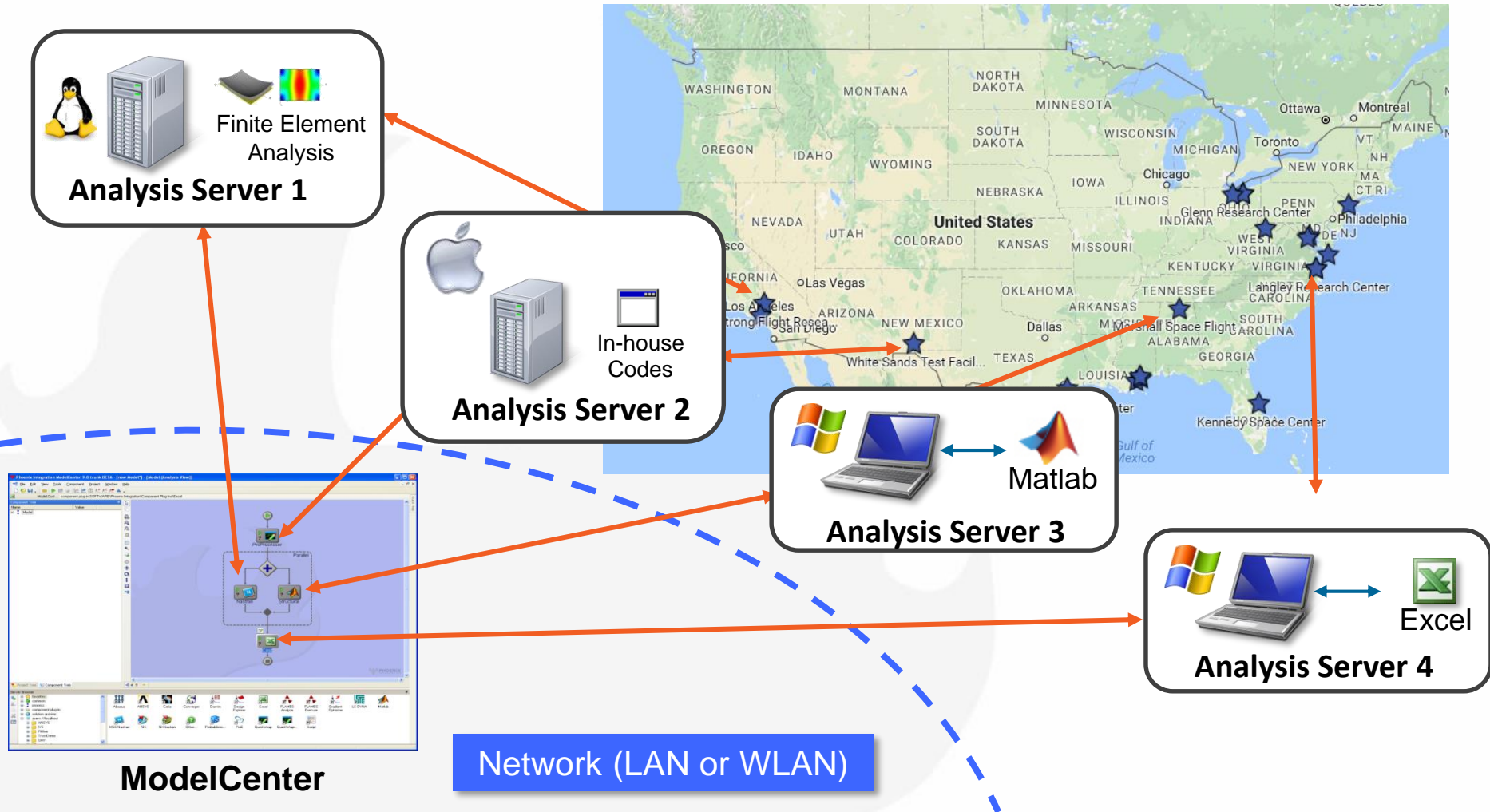
```

graph TD
    Start(( )) --> Caliper[caliperAnalysis]
    Caliper --> Pad[padAnalysis]
    Pad --> Stop[stopDistanceAnalysis]
    Stop --> Cost[costAnalysis]
  
```

One more thing...



Model as a Service (MaaS)



Utilize MaaS to share your models your Organization & Supply Chain.

MaaS: Model as a Service

- ***Same Company, Different Computer.*** Utilize MaaS to serve models from one computer to another. This occurs when a user who is looking at the whole picture, needs to tap the discipline experts. MaaS can make their models accessible to the workflow.
- ***Different Company, Different Computer.*** Utilize this method of MaaS to run your supplier's models without exposing their IP. Parameters are passed through the firewall to the vendor's model. The model runs on the vendors computer (never leaves their network). Once complete, only key parameters are passed back via MaaS to complete your ModelCenter run.

Working with Phoenix Integration We...

- “Reduced a proposed three-month study to two weeks.”
— **Computer Science Corporation (CSC)**
- “Design point runs were conducted in a 20-hour period whereas using conventional methods, these trades would have taken weeks. The end result was a vehicle whose size was reduced by 33%”.
— **Lockheed Martin Aeronautics**
- “Completed 100s of UAV trade studies in the time it took to do 10.”
— **United States Air Force Research Laboratory**



Phoenix Integration Brings A Team of 20+ Years Of MBE Experience With Defense Customers





PHOENIX
INTEGRATION

Tony Davenport, Manager East US
tdavenport@phoenix-int.com

Dr. J. Simmons, Lead AE
jsimmons@phoenix-int.com

INTEGRATE**EXPLORE**ORGANIZE