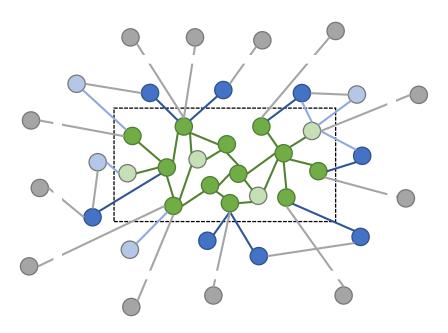


## **Systems Engineering Transformation:** Accelerating transformation to a model-based discipline

Troy A. Peterson
Assistant Director
SE Transformation
troy.peterson@incose.org

## The Pervasive Systems Phenomenon



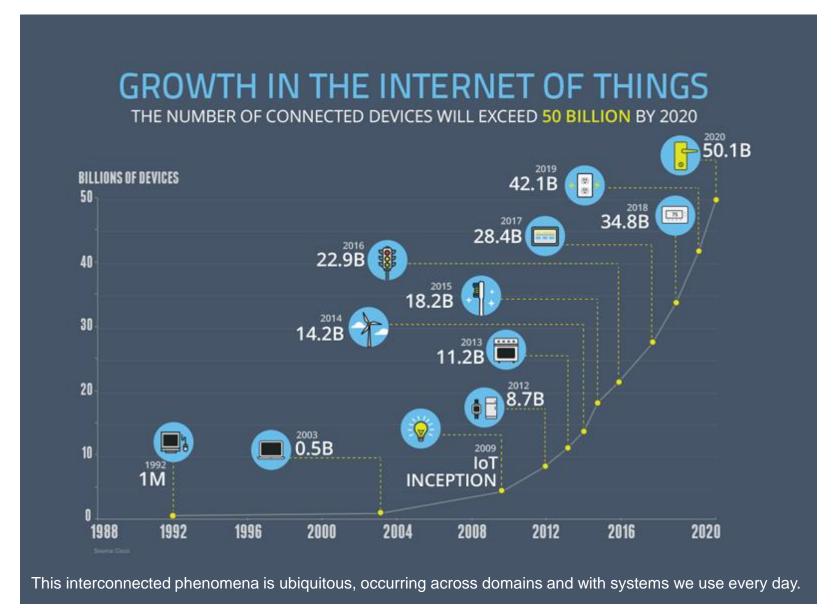


System Elements & Interactions External Elements & Interactions

Increased Density of System Elements & Interactions
Increased Density of System External Elements & Interactions
Increased Interactions Between External Elements
Expanding System Domain Boundary Increasing Interactions

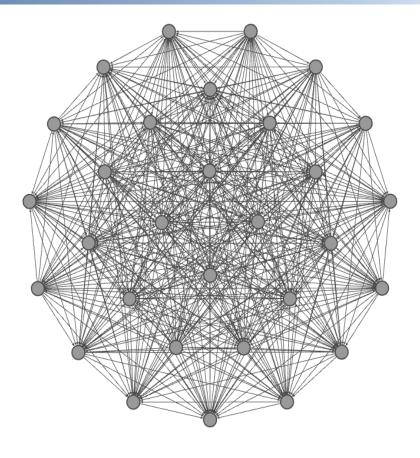
## Internet of Things





## Why Transformation





Nodes = 30, potential links = 435, unique configurations =  $2^{435}$ 

Number of known atoms in the universe estimated between 2<sup>158 and</sup> 2<sup>246</sup>

#### The Context – Is this all new?



"Today more and more design problems are reaching insoluble levels of complexity."

"At the same time that problems increase in quantity, complexity and difficulty, they also change faster than before."

"Trial-and-error design is an admirable method. But it is just real world trial and error which we are trying to replace by a symbolic method. Because trial and error is too expensive and too slow."

Christopher Alexander,
Notes on the Synthesis of Form<sup>1</sup>,

## SE Transformation Overview



#### **Objective:**

INCOSE <u>accelerates</u> the <u>transformation</u> of systems engineering to a <u>model-based discipline</u>.

#### Accelerates:

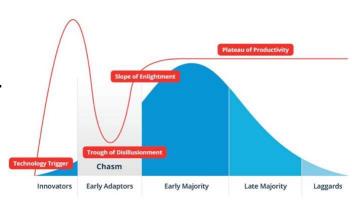
- Understand the hype cycle<sup>1</sup> and bridge the chasm<sup>2</sup>...
- Empower others to enlighten and influence adoption

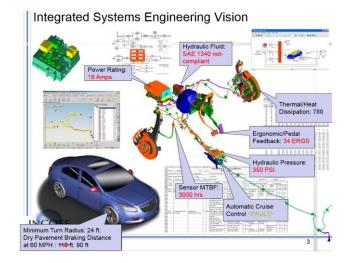
#### Transformation:

- A marked change, as in appearance or character, usually for the better<sup>3</sup>. e.g. documents to models
- Lead and support the community in crossing the chasm

#### Model Based Discipline

- System models of all types
- Modeler Collaboration and Model Integration





<sup>1.</sup> Hype Cycle is a branded graphical presentation developed and used by IT research and advisory firm Gartner

<sup>2.</sup> Moore, Geoffrey A. "Crossing the Chasm - and Beyond" Strategic Management of Technology and Innovation Third Edition 1996

<sup>3.</sup> Excerpted from The American Heritage Dictionary of the English Language, Third Edition 1996 by Houghton Mifflin Company

<sup>4.</sup> Friedenthal, Sandy and Sampson, Mark - MBSE Initiative Overview - http://www.omgwiki.org/MBSE/doku.php

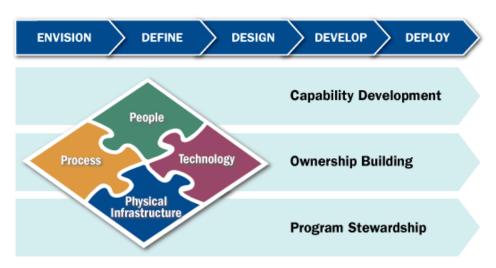
## Model Based Discipline: The Next Evolutionary Step



- Model Based Discipline
  - Models are not new to us
  - Transformation is not a wholesale change
  - Model based is the next evolutionary step
  - In some ways we're going "back to the future"
- Understand the Current State
  - Take inventory of current state of transition and progress toward becoming a model based discipline
- Envision and define the future state of SE:
  - Vision 2025, what are the business objectives, associated metrics, stakeholders, technology and transition needs, typical what if questions, priorities etc.
- Leverage Transformation and Change Management methods and frameworks

## Transformation: Change Management and Leadership





Transformation Life Cycle™ (TLC): Booz Allen Hamilton

#### Consider key dimensions of change

- People, Process, Technology, and Physical Infrastructure
  - Integrate dimensions of change
  - Addresses dimensions in parallel
  - Leverage concurrency to encourage cross dimension trades
  - Build ownership at the grass-root level

#### Consider:

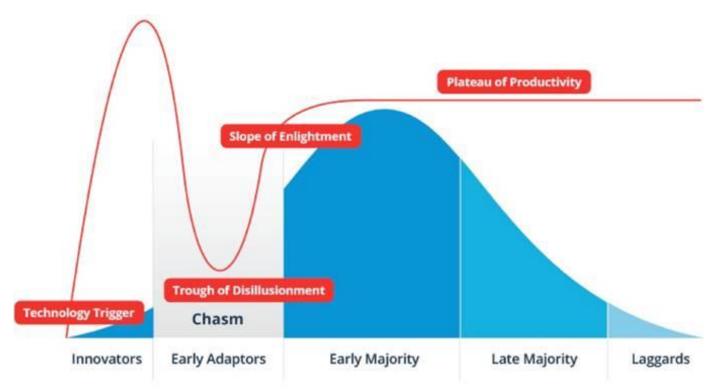
ABP = CM(OE + BPR + IT)

- ABP = Achieving Breakthrough Performance
- OE = Organizational Environment
- BPR = Business Process Reengineering
- IT = Information Technology
- CM = Change Management

Transformation is very much a people focused endeavor.

## Accelerates: Hype Cycle and Chasm





Acceleration is very much about sharing, communicating and learning

Where would you plot your organization today?

<sup>1.</sup> Hype Cycle is a branded graphical presentation developed and used by IT research and advisory firm Gartner

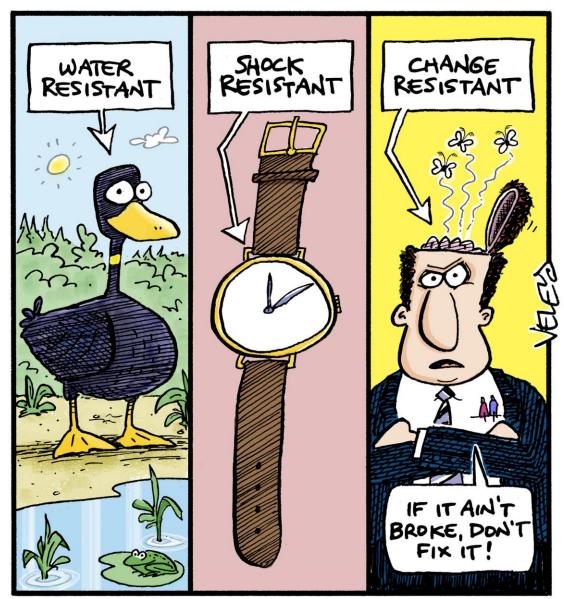
<sup>2.</sup> Hype Cycle Graphic: <a href="https://en.wikipedia.org/wiki/Hype\_cycle">https://en.wikipedia.org/wiki/Hype\_cycle</a>

<sup>3.</sup> Moore, Geoffrey A. "Crossing the Chasm – and Beyond" Strategic Management of Technology and Innovation Third Edition 1996

<sup>4.</sup> Hype Cycle, Chasm Combind Graphic: http://www.datameer.com/blog/big-data-analytics-perspectives/big-data-crossing-the-chasm-in-2013.html INCOSE: Systems Engineering Transformation: Troy Peterson

## Change Management





https://redapplemom.files.wordpress.com/2011/06/change-cartoon1.jpg

## Change Encouragement



# If you want to truly understand something – try to change it.

**Kurt Lewin** 

The best way to mange change is to create it.

**Peter Drucker** 

## MBSE Future in Vision 2025



#### From:

Model-based systems engineering has grown in popularity as a way to deal with the limitations of document-based approaches, but is still in an early stage of maturity similar to the early days of CAD/CAE.

#### To:

Formal systems modeling is standard practice for specifying, analyzing, designing, and verifying systems, and is fully integrated with other engineering models. System models are adapted to the application domain, and include a broad spectrum of models for representing all aspects of systems. The use of internet-driven knowledge representation and immersive technologies enable highly efficient and shared human understanding of systems in a virtual environment that span the full life cycle from concept through development, manufacturing, operations, and support.

## Transformation to a Model-Based Discipline



#### Objective: Accelerate the transformation to a model-based discipline

- Advance and mature the MBSE Practice
- Mainstream Model Based Systems Engineering
- Evolve to a cohesive MBSE language, applicable to multiple domains
- Promote and advance the role of MBSE in global Model Based Engineering (MBE)
- Connect to other MBE cross domain standards like Building Information Modeling (BIM)
- Get authoritative information on MBSE out to practitioners and the broader community
- Align with SE Vision 2025 (see page 38-39)



## SWOT Analysis – Early Draft



Strengths (current)	Weaknesses (current)		
<ul> <li>Strong interest in current MBSE initiative. Momentum created</li> <li>SysML Standard and Development</li> <li>High attendance at IW workshop</li> <li>Part of Vision 2025</li> </ul>	<ul> <li>Perception that SysML ≡ MBSE</li> <li>Not fully integrated or accepted</li> <li>Limited spread to other WG activities</li> <li>Limited set of examples available</li> <li>Ad hoc application</li> <li>Building the theoretical foundation</li> </ul>		
Opportunities (future)	Threats (future)		
<ul> <li>Mainstream Systems Engineering as a Model Based Discipline</li> <li>Connect to other MBE disciplines and take lead in integration</li> <li>Application across domains e.g. BIM</li> <li>Improve the overall business case for systems engineering</li> </ul>	<ul> <li>Stove piping of MBSE</li> <li>Miss the larger community – stuck in the chasm / trough</li> <li>Other modelling communities pick up the lead for MBSE</li> <li>MBSE viewed as applicable only to large projects</li> </ul>		



#### Assistant Director for Transforming SE to a Model Based Discipline

Troy Peterson

Core team of experts supporting the effort – Meet one or two times a month...

- Jeff Bergenthal
- Sandy Friedenthal
- Joachim Fuchs
- John Gill
- Mark Sampson
- Bill Schindel

Adding stakeholder representatives to obtain diverse perspectives

- INCOSE CAB, IOB, Working Groups etc.
- Strong connection to the INCOSE MBSE Initiative
- Representatives from targeted MBE applications (NAFEMS, BIM, ....)
- Domain representatives

#### Please let me know if you are interested

#### **Products & Interactions**



- Strategy and Plan for Transformation
  - Vision, mission, goals, objectives, tasks and associated metrics
- Transformation Business Case / ROI Briefing
  - Collection of works to help make the case for transformation
  - Compelling Storylines and Case Studies
  - SE Transformation Principles (heuristics, lessons learned, best practices)
- Strategic Collaboration and Communication
  - Who all should INCOSE collaboration from a Transformation perspective
  - How do we better reach and communicate with stakeholders
- Invigorate and Integrate Working Groups
  - Help with modeling foundations Ontology, Model Types/Taxonomy
  - Bring together our collective strength

#### What do we consider a successful outcome



#### What Success looks like at IW 2016 and/or IS 2016

- New AD for transformation selected
- Strategy defined for implementing the Transformation
- First steps taken to mainstream MBSE
  - Partial MBSE workshop @ IW + MBSE topics addressed during (WG) meetings
  - Explicit have MBSE activities displayed during ongoing WG activities
- Work on explicit connecting products between MBSE and NAFEMS as well as the Building Information Modeling

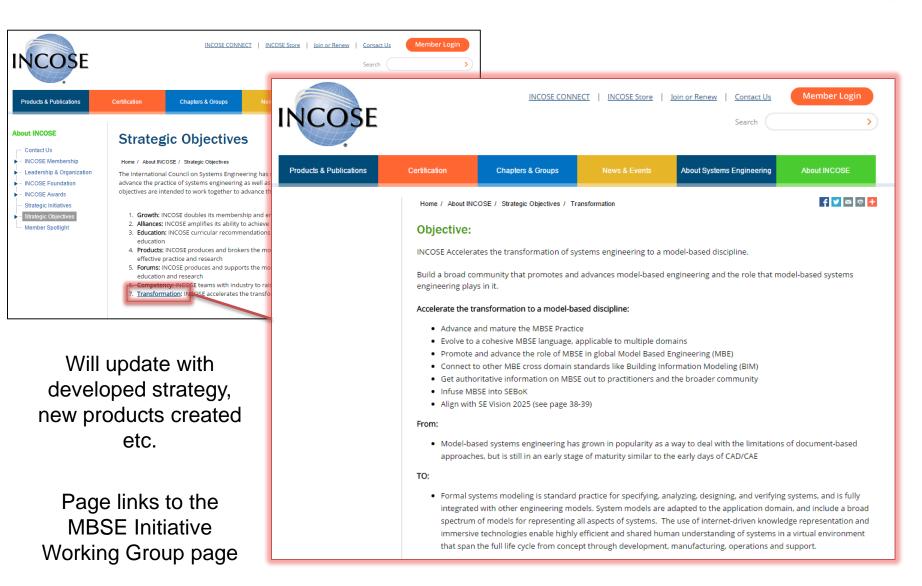
#### What Success looks like at the end of 2019 (5 years)

- Decision makers ask for models rather than documents
- MBSE is not a separate track at IS and IW but integrated in all WG activities
- Systems Engineering is a Model Based discipline, explicitly connected to X# of MBE applications

#### I think we can do more!

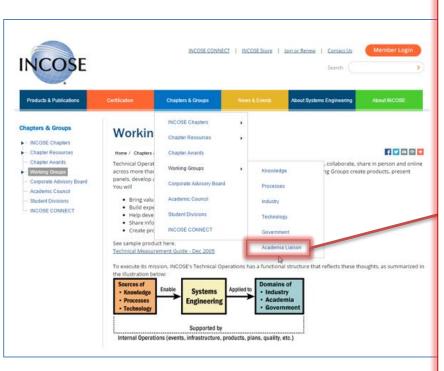
## Accomplishments: Transformation Page





## Accomplishments: MBSE Initiative Page





Links take users to INCOSE / OMG MBSE Initiative Wiki. Page also points to the SE Transformation INCOSE page as well.

Model Based Systems Engineering (MBSE) Initiative						
Home / Chapters & Groups / Working Groups / MBSE Initiative  MBSE Initiative - Sandy Friedenthal and Mark Sampson						
Click Link to view project site						
Challenge Teams						
FILE	DESCRIPTION	DATE	WEBSIT			
Modeling and Simulation Interoperability	Russell Peak	01 Jul, 2015	Link			
Space Systems Modeling	Louise Anderson	01 Jul, 2015	Link			
Telescope Modeling	Robert Karban	01 Jul, 2015	Link			
Biomedical Device Modeling	Ajay <mark>Thukral</mark>	01 Jul, 2015	Link			
GEOSS Modeling	Lawrence McGovern	01 Jul, 2015	Link			
Patterns	Bill Schindel	01 Jul, 2015	<u>Link</u>			
Activity Teams	DESCRIPTION	DATE	WEBSIT			
MBSE Usability	Bjorn Cole	01 Jul, 2015	Link			
Methodology and Metrics	John Watson	01 Jul, 2015	<u>Link</u>			
Model Management	Amit Fisher	01 Jul, 2015	<u>Link</u>			
Modeling Standards	Roger Burkhart	01 Jul, 2015	Link			
Ontology	Henson Graves	01 Jul, 2015	Link			
System of Systems/Enterprise Modeling	Ron Williamson/Matthew Hause	01 Jul, 2015	Link			
Model Based Test	Frank Alvidrez	01 Jul, 2015	<u>Link</u>			
Affiliated INCOSE Groups						
		DATE	WEBSIT			
FILE						
		01 Jul, 2015	Link			
Tool Integration and Interoperability		01 Jul, 2015 01 Jul, 2015	<u>Link</u> <u>Link</u>			
Tool Integration and Interoperability Tools Database	Simulation Working Group (SMSWG)	-				
Tool Integration and Interoperability Tools Database NAFEMS-INCOSE Systems Modeling &	•	01 Jul, 2015	Link			
FILE Tool Integration and Interoperability Tools Database NAFEMS-INCOSE Systems Modeling & Association Française d'Ingeletie System MBSE SIG of INCOSE The Netherlands	e.	01 Jul, 2015 01 Jul, 2015	Link Link			
Tool Integration and Interoperability Tools Database NAFEMS-INCOSE Systems Modeling & Association Française d'Ingeletie System	e.	01 Jul, 2015 01 Jul, 2015 01 Jul, 2015	Link Link Link			

INCOSE: Systems Engineering Transformation: Troy Peterson

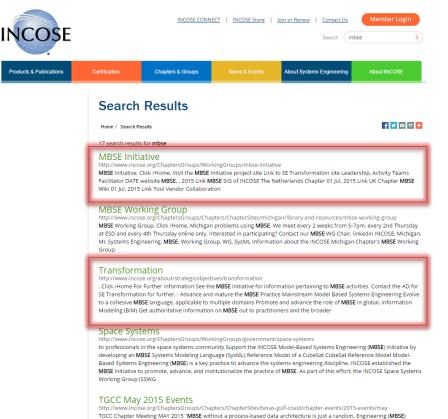
## Accomplishments: MBSE Search Results



Search of MBSE on the INCOSE site...

#### **BEFORE** INCOSE CONNECT | INCOSE Store | Join or Renew | Contact Us Chapters & Groups About Systems Engineering Products & Publications Search Results f 💆 🔤 🖯 🛨 Home / Search Results 15 search results for MBSE MBSE Working Group http://www.incose.org/ChaptersGroups/Chapters/ChapterSites/michigan/library-and-resources/mbse-working-group MBSE Working Group, Click /Home, Michigan problems using MBSE. We meet every 2 weeks from 5-7pm, every 2nd Thursday at ESD and every 4th Thursday online only. Interested in participating? Contact our MBSE WG Chair, linkedin INCOSE, Michigan, MI, Systems Engineering, MBSE, Working Group, WG, SysML Information about the INCOSE Michigan Chapter's MBSE Working Group. Space Systems http://www.incose.org/ChaptersGroups/WorkingGroups/government/space-systems to professionals in the space systems community Support the INCOSE Model-Based Systems Engineering (MBSE) Initiative by developing an MBSE Systems Modeling Language (SysML) Reference Model of a CubeSat CubeSat Reference Model Model-Based Systems Engineering (MBSE) is a key practice to advance the systems engineering discipline. INCOSE established the MBSE Initiative to promote, advance, and institutionalize the practice of MBSE. As part of this effort, the INCOSE Space Systems Working Group (SSWG TGCC May 2015 Events http://www.incose.org/ChaptersGroups/Chapters/ChapterSites/texas-gulf-coast/chapter-events/2015-events/may TGCC Chapter Meeting MAY 2015 "MBSE without a process-based data architecture is just a random, Engineering (MBSE) approach, focusing on the definition of the Data Architecture, A Process-based Data, (MBSE) approach, A well-defined processbased data architecture will facilitate: standardization, for Space Achievement (RNASA) Stellar Award for MBSE methodology development. Mr. Crain was awarded Library and Resources http://www.incose.org/ChaptersGroups/Chapters/ChapterSites/texas-gulf-coast/library-and-resources M\_Hause\_How\_to\_Fail\_at\_MBSE PDF, 1.44 MB lean\_se\_paper PDF, 219.64 KB LE, , 253.00 KB

## AFTER



approach, focusing on the definition of the Data Architecture. A Process-based Data, (MBSE) approach. A well-defined process-INCOSE: Systems Engineering iransormation. iroy िक्सिकियों Architecture will farilitate standardization for Space Achievement (RNASA) Stellar Award for MRSE methodology

## Accomplishments: Stakeholders & Voice



#### **Understanding our Stakeholders**

- Who are they, internal and external
- Many enablers and roadblocks discussed and captured

#### 2015 IS CAB Breakout Sessions Topics:

- Process/Method
- Value / ROI
- Documents to Models

#### 2016 IW: Infusing MBSE Panel and MBSE 101

- Funding MBSE
- Interchange formats
- Intellectual property issues
- Human interaction with models across the lifecycle

## MBSE Workshop Agenda & Logistics



	Start 7:00	End 8:00	MBSE Workshop: MBSE & Transformation	MBSE Workshop: Joint Sessions	MBSE Workshop: Model Lifecycle Mgmt (MLM)	MBSE Workshop: Healthcare, Critical Infra. Protection and Recovery, OPM	MBSE Workshop: Model Based Conceptual Design and Sys. Sci WGs
	7:00 8:00	9:00					
	9:00	10:00		Opening	Plenary		
	10:00	10:30	Break				
			MBSE Initiative: Overview				
			& Status			Healthcare Working Group (HWG) Workshop Kickoff &	
	10:30	11:00	Salon E Invited Speaker Steve			(HWG) Workshop Kickoff & Introduction	
	1		Jenkins from JPL			Suite 4	
	11:00	12:00	Salon E				
			Lunch				
	12:00	13:00	MBSE Context and SE	Γ			
~			Transformation				
<del>-8</del>	13:00	13:30	Salon E				Systems Science WG:
Saturday	13:30	14:00		Joint Workshop: Patterns		Healthcare WG: MBSE for	Modeling of Systems
Ħ			MBSE 101	In System of Systems by	Model Ufecycle Management (MUM):	Emergency Dept	Processes Suite 10
Š	1		Salon E	SoS and Patterns WG	Team Kickoff	Stakeholders	State 10
	14:00	15:00		Salon F	Exec Suite 1734	Suite 4	
	15:00	15:30	Bresk				
			MBSE 101	Joint Workshop: Patterns	MLM: Team Kickoff	HWG: MBSE for Emergency	Systems Science WG: Modeling of Systems
		16:00	Salon E	In System of Systems by	Exec Sulte 1734	Dept. – Stakeholders	Processes
						Suite 4	
	15:30 16:00	17:00		SoS and Patterns WG			Suite 10
	16:00 17:00	17:00 17:30		SoS and Patterns WG Salon F			Suite 10
	16:00 17:00 17:30	17:00 17:30 18:00	<u> </u>				Suite 10
	16:00 17:00	17:00 17:30		Salon F			Suite 10
	16:00 17:00 17:30	17:00 17:30 18:00		Salon F	e Solrée sponsored by the O		Suite 10
	16:00 17:00 17:30 18:00	17:00 17:30 18:00 19:00		Salon F	e Soirée aponsored by the C		Suite 10
	16:00 17:00 17:30 18:00 16:00	17:00 17:30 18:00 19:00		Salon F  INCOSE Foundation Win		Corporate Advisory Soard	Suite 10
	16:00 17:00 17:30 18:00	17:00 17:30 18:00 19:00		Salon F  INCOSE Foundation Win	e Solvie sponsored by the O	Corporate Advisory Scard	Suite 10
	16:00 17:00 17:30 18:00 16:00	17:00 17:30 18:00 19:00	SE Transformation  Boundtable influsion Model	Salon F  INCOSE Foundation Win		Corporate Advisory Board  Lete  HWG: MBSE for Emergency	Suite 10
	16:00 17:00 17:30 18:00 16:00	17:00 17:30 18:00 19:00	SE Transformation Roundtable infusing Model- Based Methods	Salon F  INCOSE Foundation Win		Corporate Advisory Scard	Suite 10
	16:00 17:00 17:30 18:00 16:00 7:00 8:00	17:00 17:30 18:00 19:00 24:00 8:00 9:00	Roundtable Infusing Model- Based Methods Salon E	Salon F  INCOSE Foundation Win		Orporate Advisory Scand  Late HWG: MISSE for Emergency Dept.—Reference	Suite 10
	16:00 17:00 17:30 18:00 17:50 17:50 17:50	17:00 17:30 18:00 19:00 21:00 8:00 2:00 10:00	Roundtable Infusing Model- Based Methods Salon E Break	Salon F  INCOSE Foundation Win		Corporate Advisory Board  HWG: MBSE for Emergency  Dept Reference  Architecture	Suite 10
	16:00 17:00 17:30 18:00 16:00 7:00 8:00	17:00 17:30 18:00 19:00 24:00 8:00 9:00	Roundtable Infusing Model- Based Methods Salon E Break SEBOK MBSE Update	Salon F  INCOSE Foundation Win		Orporate Advisory Board  HWG: MBSE for Emergency Dept.—Reference Architecture Salon C	Suite 10
	16:00 17:00 17:30 18:00 10:00 10:00	17:00 17:30 18:00 19:00 21:00 8:00 2:00 10:00	Roundtable Infusing Model- Based Methods Salon E Break SEBOK MBSE Update Salon E	Salon F  INCOSE Foundation Win		Opposite Advisory Econol HWG: MBSE for Emergency Dept.—Reference Architecture Salon C  HWG: MBSE for Emergency Dept.—Reference	Suite 10
	16:00 17:00 17:30 18:00 7:00 (550 9:00 10:00 10:30	17:00 17:30 18:00 19:00 21:00 20:00 10:30 11:00	Roundtable Infusing Model- Based Methods Salon E Break SEBOK MBSE Update Salon E Space Systems WG:	Salon F  INCOSE Foundation Win		HING: MBSE for Emergency Dept. – Reference Architecture Salon C  HWG: MBSE for Emergency Dept. – Reference Architecture	Suite 10
	16:00 17:00 17:30 18:00 10:00 10:00 10:00 11:00	17:00 17:30 18:00 19:00 2150 250 10:00 10:30 11:00 11:15	Roundtable Infusing Model- Based Methods Salon E Break SEBOK MBSE Update Salon E Space Systems WG: CubeSat Model Review	Salon F  INCOSE Foundation Win		Opposite Advisory Econol HWG: MBSE for Emergency Dept.—Reference Architecture Salon C  HWG: MBSE for Emergency Dept.—Reference	Suite 10
_	16:00 17:00 17:30 18:00 7:00 (550 9:00 10:00 10:30	17:00 17:30 18:00 19:00 21:00 20:00 10:30 11:00	Roundtable infusing Model- Based Methods Salon E Break SEBOK MBSE Update Salon E Spec Systems WG: CubsSat Model Review Salon E	Salon F  INCOSE Foundation Win		HING: MBSE for Emergency Dept. – Reference Architecture Salon C  HWG: MBSE for Emergency Dept. – Reference Architecture	Suite 10
ay	16:00 17:30 17:30 18:00 18:00 18:00 18:00 10:00 10:00 10:00 11:15 12:00 13:00	17:00 17:30 18:00 19:00 215:00 20:00 10:30 11:00 11:15 12:00 13:30	Roundtable Infusing Model- Based Methods Salon E Break SEBOK MBSE Update Salon E Space Systems WG: CubeSat Model Review	Salon F  INCOSE Foundation Win		HING: MBSE for Emergency Dept. – Reference Architecture Salon C  HWG: MBSE for Emergency Dept. – Reference Architecture	Suite 10
nday	16:00 17:00 17:30 18:00 18:00 18:00 10:00 10:00 10:00 11:00	17:00 17:30 18:00 19:00 21:00 20:00 10:30 11:00 11:15	Roundtable infusing Model- Based Methods Salon E Break SEBOK MBSE Update Salon E Spec Systems WG: CubsSat Model Review Salon E	Salon F  INCOSE Foundation Win	em Hell: BIICASE Project upd	HWG: MBSE for Emergency Dept.—Reference Architecture Salon C  HWG: MBSE for Emergency Dept.—Reference Architecture Salon C	Suite 10
unday	16:00 17:30 17:30 18:00 18:00 18:00 18:00 10:00 10:00 10:00 11:15 12:00 13:00	17:00 17:30 18:00 19:00 215:00 20:00 10:30 11:00 11:15 12:00 13:30	Roundtable infusing Model- Based Methods Salon E Break SEBOK MBSE Update Salon E Spec Systems WG: CubsSat Model Review Salon E	Salon F  INCOSE Foundation Win	m Half LividASE Project upon	Corporate Advisory Scend  Lete HWG: MBSE for Emergency Dept.—Reference Architecture Salon C  HWG: MBSE for Emergency Dept.—Reference Architecture Salon C	Model Based Conceptual
Sunday	16:00 17:30 17:30 18:00 18:00 18:00 18:00 10:00 10:00 10:00 11:15 12:00 13:00	17:00 17:30 18:00 19:00 215:00 20:00 10:30 11:00 11:15 12:00 13:30	Roundtable infusing Model- Based Methods Salon E Break SEBOK MBSE Update Salon E Spec Systems WG: CubsSat Model Review Salon E	Salon F  INCOST Foundation Win  To	MLM Activity Team (52026 Panel Working Session	HWG: MBSE for Emergency Dept Reference Architecture Salon C  HWG: MBSE for Emergency Dept Reference Architecture Salon C  HWG: MBSE for Emergency Dept MBSE for Emergency Dept MBSE for Emergency Dept MBSE for Emergency	Model Based Conceptual Design Working Meeting
Sunday	16:00 17:30 17:30 18:00 18:00 18:00 18:00 10:00 10:00 10:00 11:15 12:00 13:00	17:00 17:30 18:00 19:00 215:00 20:00 10:30 11:00 11:15 12:00 13:30	Roundtable infusing Model- Based Methods Salon E Break SEBOK MBSE Update Salon E Spec Systems WG: CubsSat Model Review Salon E	Salon F  INCOST Foundation Win  To  Joint Workshop: Product Line Engineering - Patterns	m Half LividASE Project upon	Corporate Advisory Scend  Lete HWG: MBSE for Emergency Dept.—Reference Architecture Salon C  HWG: MBSE for Emergency Dept.—Reference Architecture Salon C	Model Based Conceptual
Sunday	16:00 17:30 17:30 18:00 18:00 10:00 10:00 10:00 11:00 11:15 12:00 13:00 13:30	17:00 17:30 18:00 19:00 21:00 200 10:00 10:30 11:00 11:15 12:00 13:30 14:00	Roundtable infusing Model- Based Methods Salon E Break SEBOK MBSE Update Salon E Spec Systems WG: CubsSat Model Review Salon E	Salon F  INCOSE Foundation Win  To  Joint Workshop: Product Line Engineering - Patterns Salon G	MLM Activity Team (52026 Panel Working Session	HWG: MBSE for Emergency Dept Reference Architecture Salon C  HWG: MBSE for Emergency Dept Reference Architecture Salon C  HWG: MBSE for Emergency Dept MBSE for Emergency Dept MBSE for Emergency Dept MBSE for Emergency	Model Based Conceptual Design Working Meeting
Sunday	16:00 17:00 17:30 18:00 16:00 7:00 600 10:00 10:30 11:00 11:15 12:00 13:00 13:00	17:00 17:30 18:00 19:00 21:00 21:00 10:00 10:30 11:00 11:15 12:00 13:30 14:00	Roundtable infusing Model Based Methods Salon E Event SEBOK MBSE Update Salon E Space Systems WG: CubeSat Model Review Salon E Lunch	Joint Workshop: Product Une Engineering - Patterns Salon G	MLM Activity Team (52026 Panel Working Session	HWG: MBSE for Emergency Dept Reference Architecture Salon C  HWG: MBSE for Emergency Dept Reference Architecture Salon C  HWG: MBSE for Emergency Dept MBSE for Emergency Dept MBSE for Emergency Dept MBSE for Emergency	Model Based Conceptual Design Working Meeting
Sunday	16:00 17:00 17:30 18:00 18:00 18:00 10:00 10:00 11:15 12:00 13:00 13:00 14:00 14:00	17:00 17:30 18:00 19:00 19:00 10:00 10:00 11:00 11:15 12:00 13:30 14:00 15:30	Roundtable infusing Model Based Methods Salon E Event SEBOK MBSE Update Salon E Space Systems WG: CubeSat Model Review Salon E Lunch	Joint Workshop: Product Line Engineering - Patterns Salon G	MLM Activity Team (52026 Panel Working Session Exec Suite 1634	HWG: MBSE for Emergency Dept Reference Architecture Salon C  HWG: MBSE for Emergency Dept Reference Architecture Salon C  HWG: MBSE for Emergency Dept MBSE for Emergency Dept MBSE for Emergency Dept MBSE & Simulation Salon C	Model Based Conceptual Design Working Meeting State 244  Model Based Conceptual Design Working Meeting
Sunday	16:00 17:30 17:30 18:00 10:50 2:00 10:00 10:30 11:00 11:00 13:30 13:30 14:00 15:30 15:30 16:00	17:00 17:30 18:00 19:00 19:00 10:00 10:30 11:15 12:00 13:30 14:00 15:00 15:00 16:00 16:30	Roundtable infusing Model Based Methods Salon E Event SEBOK MBSE Update Salon E Space Systems WG: CubeSat Model Review Salon E Lunch	Joint Workshop: Product Line Engineering - Patterns Salon G  Joint Workshop: Review of Agile SC Life Cycle Pattern Model	MLM Activity Team (52026 Panel Working Session	HWG: MBSE for Emergency Dept. – Reference Architecture Salon C  HWG: MBSE for Emergency Dept. – Reference Architecture Salon C  HWG: MBSE for Emergency Dept. – MBSE & Simulation Salon C	Model Based Conceptual Design Working Meeting Suite 2+4 Model Based Conceptual
Sunday	16:00 17:30 17:30 18:00 18:00 10:00 10:00 10:00 11:00 11:15 12:00 13:30 14:00 15:30	17:00 17:30 18:00 19:00 215:00 10:00 10:30 11:15 12:00 13:30 14:00 15:30 16:00	Roundtable infusing Model Based Methods Salon E Event SEBOK MBSE Update Salon E Space Systems WG: CubeSat Model Review Salon E Lunch	Joint Workshop: Product Line Engineering - Patterns Salon G	MLM Activity Team IS2016 Panel Working Session Exec Suite 1634  MLM: IS2016 Panel	INVIG. MISSE for Emergency Dept Reference Architecture Salon C  HWG: MISSE for Emergency Dept Reference Architecture Salon C  HWG: MISSE for Emergency Dept MISSE & Simulation Salon C  HWG: MISSE for Emergency Dept MISSE & Simulation Salon C	Model Based Conceptual Design Working Meeting Suits 2+4  Model Based Conceptual Design Working Meeting
Sunday	16:00 17:30 17:30 18:00 16:50 7:00 65:0 10:00 10:30 11:00 11:00 13:30 14:00 15:30 16:30	17:00 17:30 18:00 19:00 19:00 10:00 10:30 11:00 11:15 12:00 13:30 14:00 15:00 16:30 16:30 17:00	Roundtable infusing Model Based Methods Salon E Event SEBOK MBSE Update Salon E Space Systems WG: CubeSat Model Review Salon E Lunch	Joint Workshop: Product Line Engineering - Petterns Salon G  Joint Workshop: Review of Agile St Life Cycle Pettern Model Salon G  Patterns: Discussion of 2016 Projects	MLM Activity Team (52016) Panel Working Session Exec Suite 1654  MLM: 152016 Panel Working Session	INVIG. MISSE for Emergency Dept Reference Architecture Salon C  HWG: MISSE for Emergency Dept Reference Architecture Salon C  HWG: MISSE for Emergency Dept MISSE & Simulation Salon C  HWG: MISSE for Emergency Dept MISSE & Simulation Salon C	Model Based Conceptual Design Working Meeting Suits 2+4  Model Based Conceptual Design Working Meeting
Sunday	16:00 17:00 17:30 18:00 16:00 10:00 10:00 10:30 11:00 11:15 12:00 13:00 13:30 14:00 15:30 16:30 16:30	17:00 17:30 18:00 19:00 19:00 10:00 10:30 11:00 11:15 12:00 13:30 14:00 15:30 16:30 16:30 17:30	Roundtable infusing Model Based Methods Salon E Event SEBOK MBSE Update Salon E Space Systems WG: CubeSat Model Review Salon E Lunch	Joint Workshop: Product Line Engineering - Patterns Salon G Joint Workshop: Review of Agile SE Life Cycle Pattern Model Salon G Patterns of Pattern	MLM Activity Team (52016) Panel Working Session Exec Suite 1654  MLM: 152016 Panel Working Session	INVIG. MISSE for Emergency Dept Reference Architecture Salon C  HWG: MISSE for Emergency Dept Reference Architecture Salon C  HWG: MISSE for Emergency Dept MISSE & Simulation Salon C  HWG: MISSE for Emergency Dept MISSE & Simulation Salon C	Model Based Conceptual Design Working Meeting State 244  Model Based Conceptual Design Working Meeting
Sunday	16:00 17:30 17:30 18:00 10:50 10:50 10:50 10:50 10:30 11:00 11:00 13:30 13:30 14:00 15:30 16:30 17:00	17:00 17:30 18:00 19:00 19:00 10:00 10:30 11:15 12:00 13:30 14:00 15:30 16:00 16:30 17:30 17:30	Roundtable infusing Model Based Methods Salon E Break SEROK MESE Update Salon E Space Systems WS: CubeSet Model Review Salon E Lunch Break	Joint Workshop: Product Line Engineering - Petterns Salon G  Joint Workshop: Review of Agile St Life Cycle Pettern Model Salon G  Patterns: Discussion of 2016 Projects	MLM Activity Team (52016 Panel Working Section Exec Suite 1634  MLM: 152016 Panel Working Section Exec Suite 1634	INVIG. MISSE for Emergency Dept Reference Architecture Salon C  HWG: MISSE for Emergency Dept Reference Architecture Salon C  HWG: MISSE for Emergency Dept MISSE & Simulation Salon C  HWG: MISSE for Emergency Dept MISSE & Simulation Salon C	Model Based Conceptual Design Working Meeting Suits 2+4  Model Based Conceptual Design Working Meeting
Sunday	16:00 17:00 17:30 18:00 16:00 10:00 10:00 10:30 11:00 11:15 12:00 13:00 13:30 14:00 15:30 16:30 16:30	17:00 17:30 18:00 19:00 19:00 10:00 10:30 11:00 11:15 12:00 13:30 14:00 15:30 16:30 16:30 17:30	Roundtable infusing Model Based Methods Salon E Event SEBOK MBSE Update Salon E Space Systems WG: CubeSat Model Review Salon E Lunch	Joint Workshop: Product Line Engineering - Petterns Salon G  Joint Workshop: Review of Agile St Life Cycle Pettern Model Salon G  Patterns: Discussion of 2016 Projects	MLM Activity Team (52016 Panel Working Section Exec Suite 1634  MLM: 152016 Panel Working Section Exec Suite 1634	HWG: MBSE for Emergency Dept Reference Architecture Salon C  HWG: MBSE for Emergency Dept Reference Architecture Salon C  HWG: MBSE for Emergency Dept MBSE & Simulation Salon C  HWG: MBSE for Emergency Dept MBSE & Simulation Salon C	Model Based Conceptual Design Working Meeting State 244  Model Based Conceptual Design Working Meeting

	Start	End	MBSE Workshop: MBSE & Transformation	MBSE Workshop: Joint Sessions	MBSE Workshop: Model Lifecycle Mgmt (MLM)	MBSE Workshop: Healthcare, Critical Infra. Protection and Recovery, OPM	MBSE Workshop: Model Based Conceptual Design and Sys. Sci WGs
	7:00	8:00					
	8:00	9:00		Town Hall: INCOSE 5-yea	r Objectives: Transformation	n and impactful products	
	9:00	9:15	Model-based System	Joint NAFEMS-INCOSE			
	9:15	9:30	Management in the	Systems Modeling &			
			Autonomy Era	Simulation WG Salon C			
	9:30	10:00	Exec Suite 1619	Seion C			
	10:00	10:30	Bresk				
	10:30	11:00	SE Transformation Working Session (Closed)	Joint NAFEMS-INCOSE Systems Modeling &	MLM Activity Team To-Be ConOps Working Session		
	11:00	12:00	Exec Suite 1619	Simulation WG Salon C	Salon G		
	12:00	13:00	Lunch				
i ≽							Systems Science WG: Is
9		l					This System Still Fit For
Monday	13:00	13:30			MLM Activity Team To-Be		Purpose Suite 10
Š	13:30	14:00	t		ConOps Working Session		Systems Science WG:
_	13:30	14300	t		Salon G		Systems
							Thinking/Modeling for
	14:00	15:00					Conceptual Design Suite 10
	15:00	15:30	Bresk				
	15:30	16:00			MLM Session Cont. Salon G	Critical Infra. Protection &	Architecture WG:
	15:30	16:00	t		3800 G	Recovery WG: Value of MBSE to Critical	Architecture Framework
						Infrastructure Protection &	Development/Updates
						Recovery	Suite 4
	16:00	16:30				Salon F	Architecture WG:
							Architecture and Human
	16:30	17:30					Fectors
	7:00	8:00					Suite 4
	8:00	9:00	ł				
			İ				Systems Science WG:
						Object-Process Methodology: Automation	Warfield's Science of Generic Design and
						systems and integration,	Structural Modeling
						ISO/PAS 19450:2015(en)	Suite 10
l	9:00	10:00				Suite 2	
l	10:00	10:30	Bresk				
_							Warfield's Science of
ē	10:30	11:00	SE Transformation Working Session (Closed)		MLM Activity Team To-Be ConOps Working Session		Generic Design and Structural Modeling Cont.
S			Suite 2		Exec Suite 1734		Suite 10
Fuesday	11:00 11:30	11:30 12:00					
F	12:00	13:00	Lunch				
1					Model Lifecycle		
		l	MBSE Initiative Outbriefs		Management Activity		
		l	Salon E		Team IS2016 Paper and Planning Session		
	13:00	14:00			Exec Suite 1734		
	14:00	14:30					
	14:30	15:00	Bresk		Closing Plenary		
1	15:00 16:00	16:00 18:30		Cloring Records	Closing Plenery on and Working Group Bases	r / Market Place	
	10.00			and the last of the	The second second		

Competency/Professional Developm
 Others TBD

#### Model Based Related Content at the 2016 IW



## **Metrics on the new MBSE Workshop format**

- 30+ model based related sessions in MBSE Workshop
- 4 joint sessions (Patterns, SoS, PLE, Agile and NAFEMS)
- Almost half the present WGs have model content (15/34)
- Half of those with model content are new to the workshop
- Receive an additional 8 commitments for next year

## Models reflecting reality...





# MOTORSPORT: Nissan picks 'gamers' for Le Mans

February 13, 2015

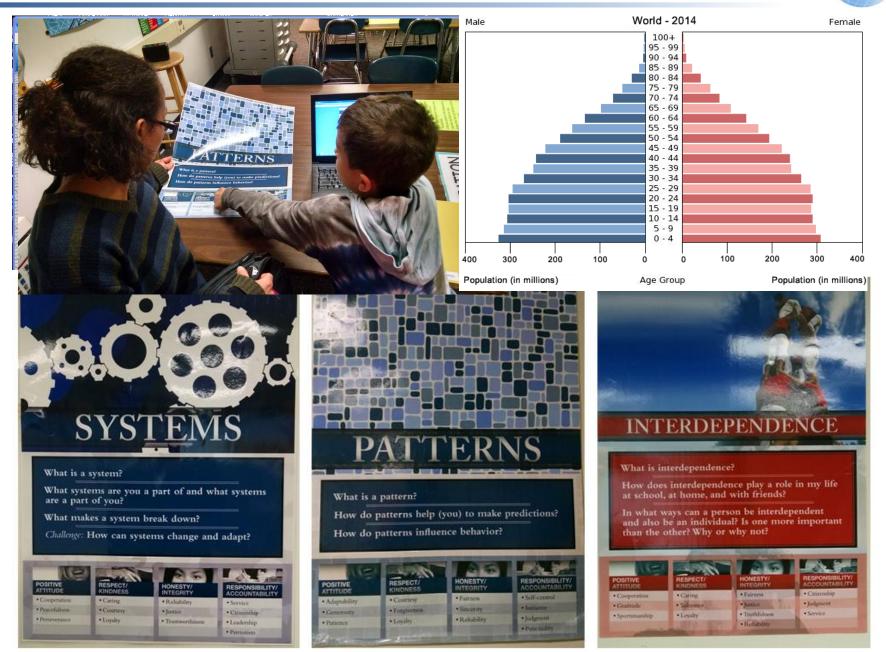
story photos





## MBSE - 2007 to present...





#### Motivation for Transformation



"When the rate of external change exceeds the rate of internal change, the end of your business is in sight."

**Jack Welch** 

"It is not necessary to change. Survival is not mandatory."

W. Edwards Deming

