



INCOSE UK MBSE IG 20/3/2018

Subgroups Status:

MBSE Adoption Guide; MBSE-MDA

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Subgroup Adoption Guide – progress

Subgroup primary objective

- produce a 'practical adoption guide for MBSE'

Biggest Challenge

- Active participation by sub-group vs day job / access at work

Subgroup Adoption Guide – progress



Last version

- Kipling's 6 W's framework adopted + How much?
- V0.4 produced (Wiki and paper pdf format)

V0.4 Reviewed Dec 2017/Jan 2018

- Over 70 comments, thanks to team + Powley, Silman
- 47 addressed and closed; many of remaining relate to 6W versus People / Process / Tools framework etc.
- V0.5 now on Wiki



MBSE Adoption Guide - v0.5

Contents [hide]

- 1 Overview
- 2 Why should I adopt MBSE?
- 3 What does MBSE mean for my role?
- 4 Where do I employ MBSE?
- 5 When should MBSE be employed?
- 6 Who needs to participate in, or will be impacted by the use of, MBSE activities?
- 7 How do I make use of MBSE on my project?
- 8 How much will adoption of MBSE cost?
- 9 People, Process, Tools, Infrastructure
- 10 Common pitfalls
 - 10.1 Failure within your organisation or project
 - 10.2 Failure with interaction with other organisations or external stakeholders.
- 11 Footnotes

Overview

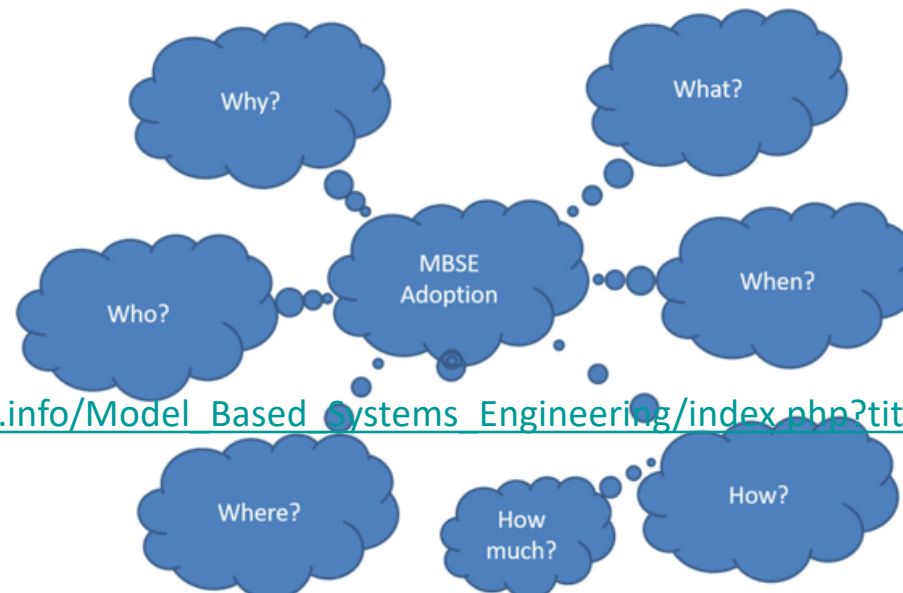
Model-Based Systems Engineering (MBSE) is the formalised application of modelling to support:

- System requirements
- Analysis
- Design
- Verification & Validation

An MBSE approach begins, or can be applied, in the conceptual design phase and continues throughout development and later lifecycle phases. (INCOSE). It contrasts with Document Centric Systems Engineering (DCSE) where the primary artefacts of system engineering activities are documents.

Adopting MBSE in a mature SE organisation is a non-trivial challenge because it requires a fundamental change to the way Systems Engineers, teams, and organisations think. Adopting MBSE can be organisation- and project-wide. However it can also be adopted incrementally, for instance selectively replacing 'drawings' of designs, by views generated from models of designs.

This is an introductory Guide intended to assist individual Systems Engineers and organisations contemplating or travelling along the path of MBSE adoption.



<http://www.incosewiki.info/Model Based Systems Engineering/index.php?title=MBSE Adoption Guide - v0.5>

Next steps

- Encourage use and INCOSE UK community involvement in refining / updating / adding to
- Consider for draft publication ahead of ASEC 2018?
- Consider sub-stream future – dormant for trial use

Subgroup MBSE/MDA - status

Subgroup primary objective

- produce a succinct explanation of the relationship between MBSE and MDA

No significant progress from last status (Sept 2016)...

- Achievements to date (reflected on Wiki)
 - MBSE & MDA subgroup Objectives captured, 15/4/2016;
 - Definitive Sources identified;
 - succinct MBSE-MDA view produced; (some) Use Cases collected
 - Ongoing
 - Thales: MDA metamodeling (method / tool) experience; feedback on JJ metamodels
 - MBDA: Ongoing MDA for MBSE in “Model Driven Engineering”
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MBSE/MDA wiki



Emerging Outputs

1 Definitive sources for a definition of MBSE

INCOSE Systems Engineering Vision 2020, INCOSE-TP-2004-004-02, September, 2007:

"Model-based systems engineering (MBSE) is the formalized application of modeling to support system requirements, design, analysis, verification and validation activities beginning in the conceptual design phase and continuing throughout development and later life cycle phases."

Note the above definition is also cited by "A practical Guide to SysML The Systems Modelling Language", Friendenthal, Moore and Steiner, MK / OMG, second edition, 2012.

Final Report, Model-Based Engineering Subcommittee, NDIA, Feb. 2011:

"Model-Based Engineering (MBE): An approach to engineering that uses models as an integral part of the technical baseline that includes the requirements, analysis, design, implementation, and verification of a capability, system, and/or product throughout the acquisition life cycle."

(This definition located in Slide 8 of file Model-based-Systems-Engineering-MBSE-101.ppt, Model-based Systems Engineering (MBSE) 101, presented at INCOSE International Workshop, 25-26/1/2014, Torrance, CA, USA.)

[Wikipedia Entry](#)

Model-based systems engineering (MBSE) is a systems engineering methodology that focuses on creating and exploiting domain models as the primary means of information exchange between engineers, rather than on document-based information exchange.

2 Definitive sources for a definition of MDA

[OMG MDA site](#)

The current version of the OMG MDA Guide 2.0 is available via that site as below:

[MDA 2.0 Word format](#)

[MDA 2.0 pdf format](#)

A subset of the Executive Summary from the above guide is:

"MDA provides an approach for deriving value from models and architecture in support of the full life cycle of physical, organizational and I.T. systems."

The Executive summary goes onto elaborate what it means by 'models' and how such models can be used:

"The MDA approach represents and supports everything from requirements to business modeling to technology implementations. The primary feature of MDA which enables us to deal with complexity and derive value from models and modeling is defining the *structure, semantics, and notations* of models using industry standards – models conforming to these standards are "MDA Models". MDA models can then be used ... *(sentences removed-JJ)*. MDA models can represent systems at any level of abstraction or from different viewpoints, ranging from enterprise architectures to technology implementations. MDA "connects the dots" between these different viewpoints and abstractions."

<http://www.incosewiki.info/Model Based Systems Engineering/index.php?title=MBSE %26 MDA>

Latest update

20170915.4 **All** To look to open sources on the MBSE and MDA topic; send links to any material to JJ, who will collate.

JJ: Did trawl through INCOSE IW 2018 materials, on OMG

http://www.omgwiki.org/MBSE/doku.php?id=mbse:incose_mbse_iw_2018

Found nothing. Asked Sandy Friedenthal...

Latest update

From Sandy:

“The primary OMG efforts that have the most visibility within the INCOSE MBSE effort are the effort to develop the next generation of SysML (v2), the ongoing efforts to evolve and use the Unified Architecture Framework (UAF), and the draft RFP for the CubeSat Reference Model (CRM). I view all of these modeling standards under the general theme of MDA, but that is not explicitly stated.”

Next Steps

- Collate MBSE/MDA metamodeling / examples
- MBDA: report outcome from MDA for MBSE in “Model Driven Engineering”
- Collate publishable aspects from Thales / MBDA
- Revisit / collate external sources for MBSE/MDA

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MBSE/MDA succinct view

MBSE and MDA - single page visualisation v1

All disciplines increasing use models (formal representations) to represent, define, analyse emerging products, services, systems... (JJ)

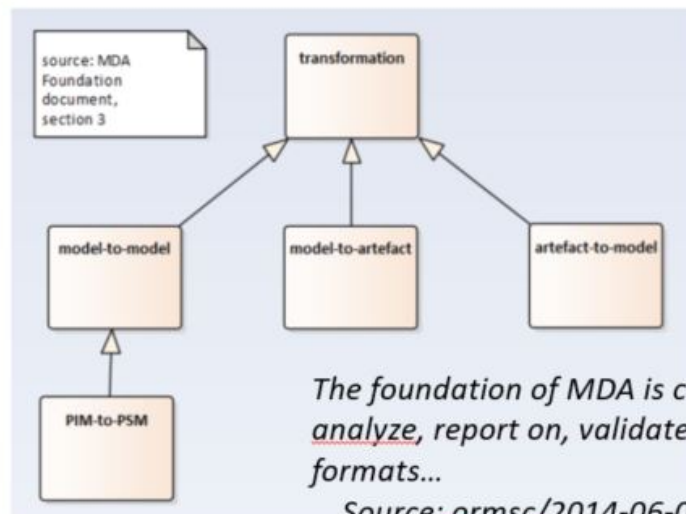
Model-based systems engineering (MBSE) is the formalized application of modeling to support system requirements, design, analysis, verification and validation activities beginning in the conceptual design phase and continuing throughout development and later life cycle phases

INCOSE SE Vision 2020 (INCOSE-TP-2004-004-02), Sept 2007

"All models are wrong; some models are useful"

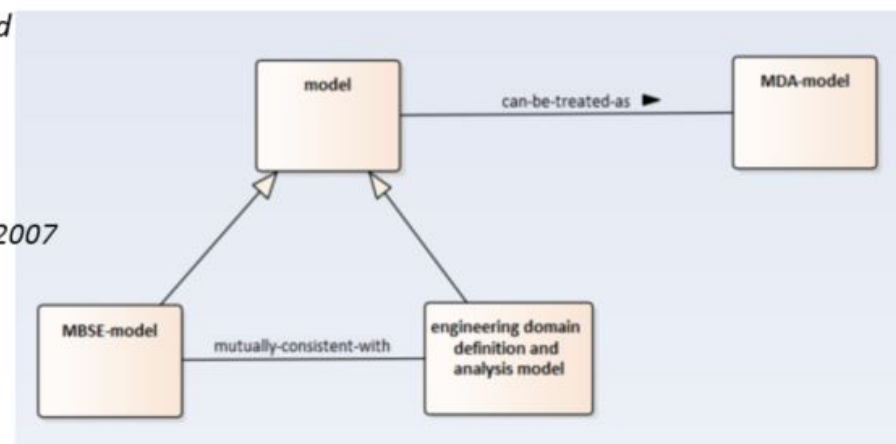
George E. P. Box, mathematician , prof of statistics, 1919-2013,

https://en.wikiquote.org/wiki/George_E._P._Box



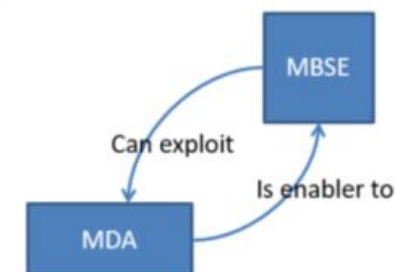
The foundation of MDA is capturing models as data so that we can query, analyze, report on, validate, simulate, and transform into other useful formats...

Source: [ormsc/2014-06-01](#), OMG MDA Guide Rev 2.0



Models are represented using appropriate formalisms...which are conventionally defined with languages with define abstract, and concrete syntax, and associated semantics... (jj)

MBSE and MDA are both 'approaches' making use of models; MBSE can exploit MDA to aid the automation of operations on SE and related models; MDA can be viewed as an enabler to more effective MBSE... (jj)



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