



EMEA Workshop 2019

*Utrecht, the Netherlands  
10-11 October 2019*

# Configuration Management Working Group



Adriana D'Souza (CSEP)  
*Airbus*



Paul Nelson (CSEP)  
*Northrop Grumman Corporation*



Dale Brown  
*HATCH*



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# Workshop Agenda

- Icebreaker & expectations – 15 min
- Introduction WG goals and status – 25 min
- Split into areas of focus and brainstorm on the contributions to date and further outcomes – 30 min
- Change areas of focus – 30 min
- Consolidation of results – 30 min
- Conclusion – 20 min

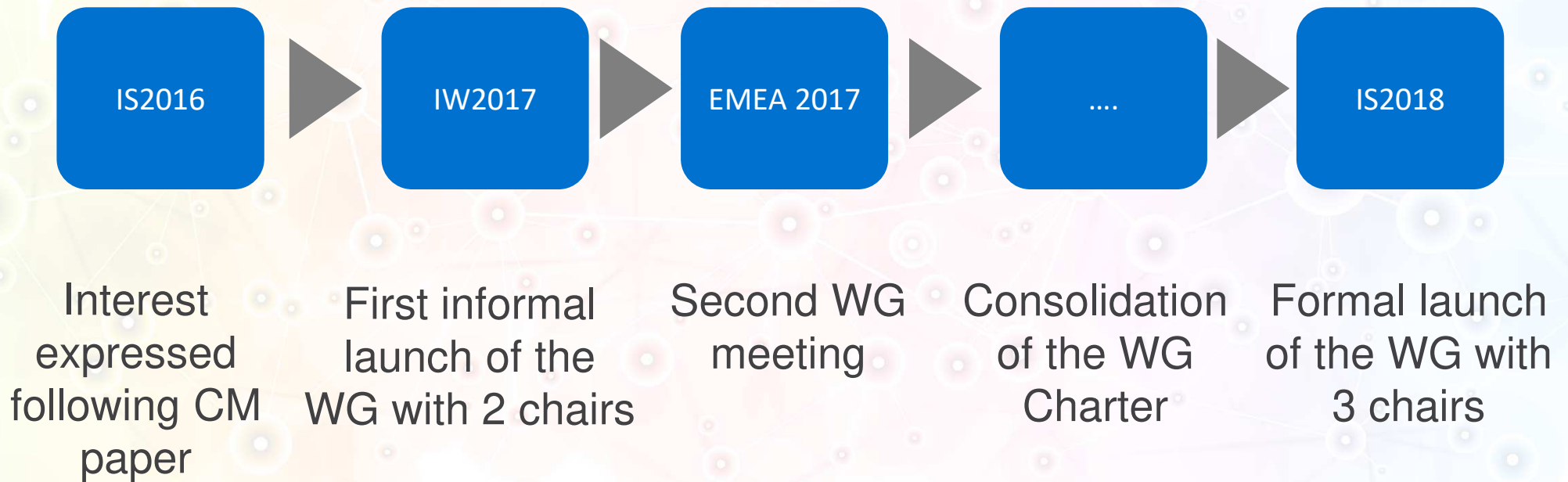


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## Icebreaker

- 1) How much time did you spend to travel to Utrecht?
- 2) Are you from Academia or Industry?
- 3) How knowledgeable you are on the topic
- 4) What was your intention for this workshop more on the receiving end or more on the giving end or anything inbetween?

# History of the CM WG to date





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# CM WG Charter & addendum - signed Dec 18



INCOSE Charter  
Configuration Management Working Group

## 10 APPROVAL

1<sup>st</sup> Level of Approval  
Technical Director, INCOSE

Date 12/10/2018

## Revision History

Date	Revision	Description	Author
10 Dec 2018	1.0	Initial version.	Various WG CM members.



Adobe Acrobat  
Document



INCOSE Configuration Management Working Group  
Leadership Addendum

## 1 MEMBERS, ROLES AND RESPONSIBILITIES

List the names of members and briefly describe their responsibilities.

**Leadership (if possible 1 per INCOSE Region)**

Name	Organization	Role*	Region
Adriana D'Souza	Airbus	Co-Chair	EMEA
Paul Nelson	NGC	2019 Chair	Americas
Dale Brown	Marta	Co-Chair	Americas
	To be filled	Secretary	
	To be filled	Communication Chair	

\*Chair will rotate annually

## WG Founding Members

Name	INCOSE Membership Status	Organization	Country
Lisa Murphy	Regular INCOSE Member	Siemens PLM	USA
Gelys Tranco	WG Member	TMT CORPORATION	USA



Microsoft Word  
7 - 2003 Document



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## CM WG Purpose

... is to ensure that the **state of the art** and the **body of knowledge** in **CM** be used to enhance the state of the art and the body of knowledge of **SE**; and vice versa. The CM WG will lead this effort within INCOSE; in liaison with external CM related **experts, standardization bodies** and other **organizations** and **communities**, as appropriate.





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# Configuration Management

Successful demonstration → the projectile hit target

Buyer: 'Build me 100 more'

Industry had the following dilemma:

- The prototype was expended...
- No adequate records
- Technical publications did not reflect built...

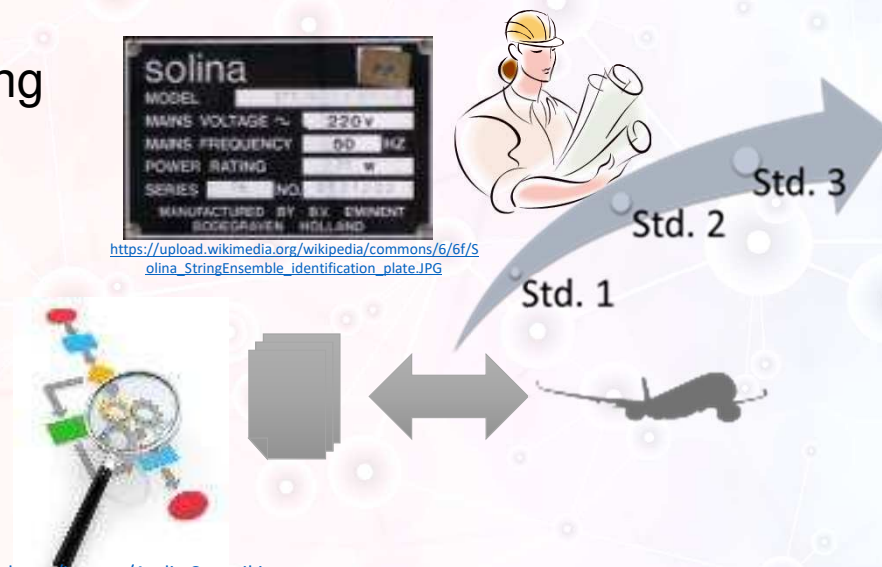
**... a second success could not be guaranteed,  
nor an identical article produced.**



# Configuration Management

## Main activities (ISO 10007):

- Configuration management planning
- Configuration identification
- Change control
- Configuration status accounting
- Configuration audit

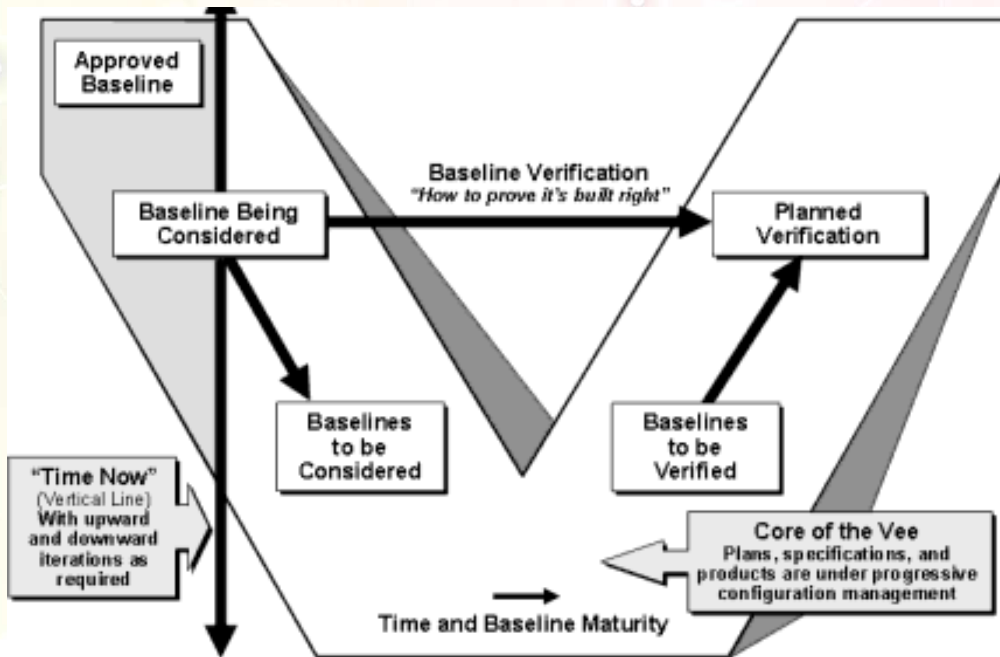


Requirements for CM can be found in the [ISO 10007](http://tapoueh.org/images/Audit-Conseil.jpg), [EIA 649 B](https://upload.wikimedia.org/wikipedia/commons/6/6f/Solina_StringEnsemble_identification_plate.JPG), [EN 9100](http://tapoueh.org/images/Audit-Conseil.jpg) standards, the specific domain of activity regulations (e.g. **EASA** and **FAA** regulation for the aerospace industry) and recommended practices (e.g. **ARP4754** for the aerospace industry)

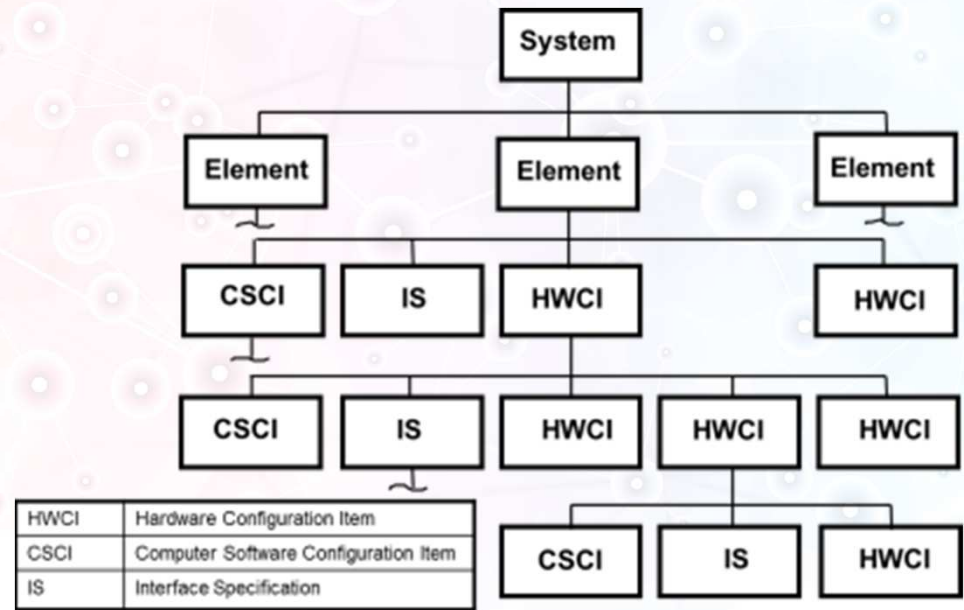


# SE and CM today

## SE - Baselines



## CM – Configuration Items





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## Areas of focus (down-selected)

- Configuration Management vision in a Digital Thread /. Digital Twin Implementation. (Alek Przybylo)
- Managing CM across an extended enterprise including SoS – (Mario Kossman)
- Upgrade/Create CM glossary to include MBSE scope. –David Hetherington
- The update of the INCOSE Handbook and the SEBoK.



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# Let's do some work / brainstorm!

Topic

.....

What would you expect from the topic?

What do you see in the topic? (and outside)

What contribution could you bring (if any)?



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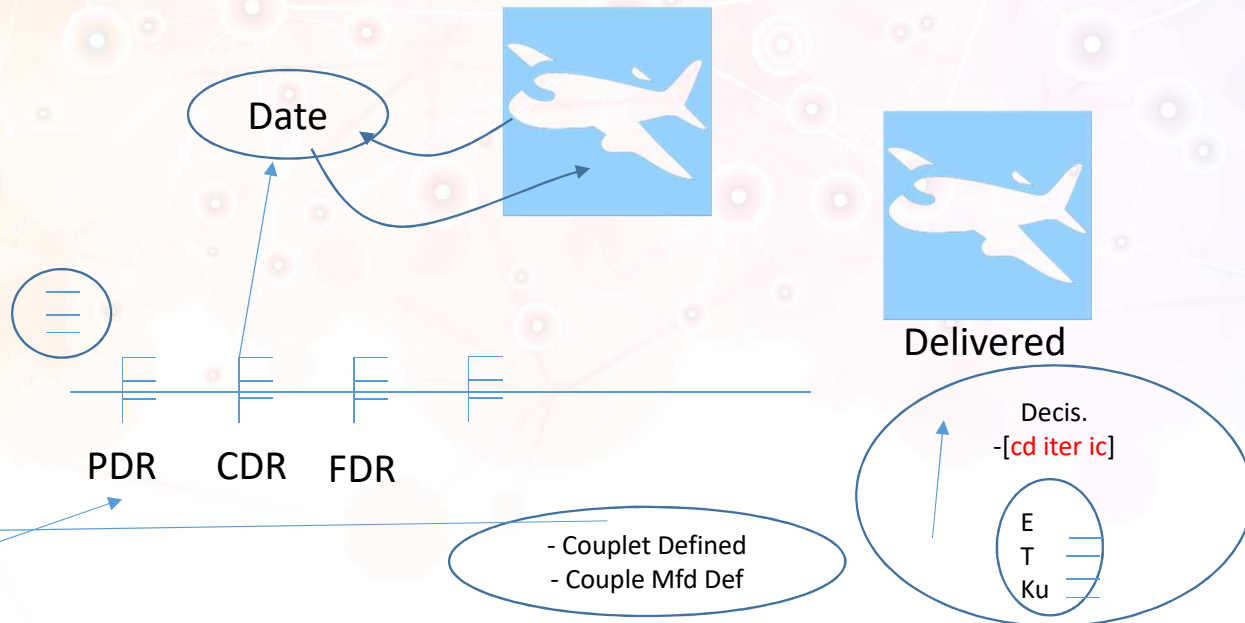
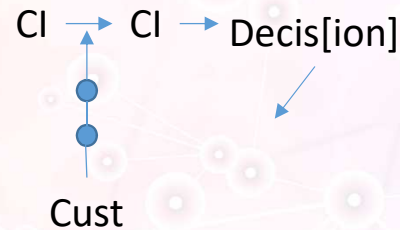
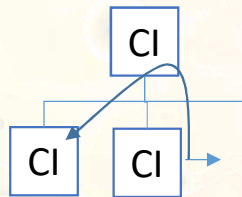
# Configuration Management vision in a Digital Thread /. Digital Twin Implementation. - Alek Przybylo

- Digital thread and digital twin
  - The digital thread and digital twin concepts rely on a very tight integration between the different abstractions and domains of the artifacts being modeled (in the case of the digital thread) as well as between the models and the physical artifacts (in the case of the digital twin). Change management is the heart of this capability since any changes in the physical artifact need to be represented in the model (e.g. capturing the serial number of a product component installed for a specific product unit for in service tracking purposes) and any change in one area of the model needs to be propagated to any other areas of the model or to other models that have a dependency on it (e.g. a change in requirement affecting multiple elements in the functional, logical and physical domains).
- Model correctness
  - One of the key issues in this space is that a model is only as useful as it is correct. Models are often developed at the early stages of a program and are then neglected due to the large amount of effort required to keep them up to date. This causes the models to be used less and the urgency of updating them goes down because of a perceived lack of benefit. Thus sets in a vicious circle that eventually causes the models to be completely abandoned. In order to circumvent that the modelling systems need to be better at automatically keeping the model up to date and embedding the update of the model into the critical path of any change.
- Visibility of impact
  - Another issue is that too often, software tools take the approach where the impact is only visible after the affected parts of the model are accessed by somebody who then discovers that his model is no longer valid and needs to reverse engineer the changes that were made. At this point, the model is often broken because the full impact of the change has not been properly assessed. This aspect is further discussed in section 3.2.
- Linked repositories
  - In an environment where no single application or repository owns the entire model, there is a need for relationships between the different model elements in different repositories. While that can be achieved today with URIs or other such methods, the relationships are typically not under configuration control leading to issues with links getting broken or changed without proper change authority. Those inter-repository relationships need to be controlled with the same rigor as intra-repository ones, with the same impact analysis, permission control and other capabilities.



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# Configuration Management vision in a Digital Thread /. Digital Twin Implementation.







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# Configuration Management vision in a Digital Thread /. Digital Twin Implementation.

- What would you expect from the topic?
  - Definition of the digital twin: digital representation of the product which is maintained throughout the lifecycle
  - What is digital thread? Traceability

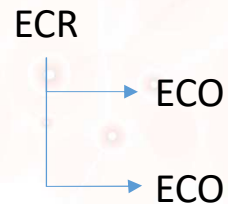




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# Configuration Management vision in a Digital Thread /. Digital Twin Implementation.

- What do you see in the topic? (and outside)
  - Granularity of Config[uration] items
  - Change control of the digital twin



- Information for all stakeholders => each had own views



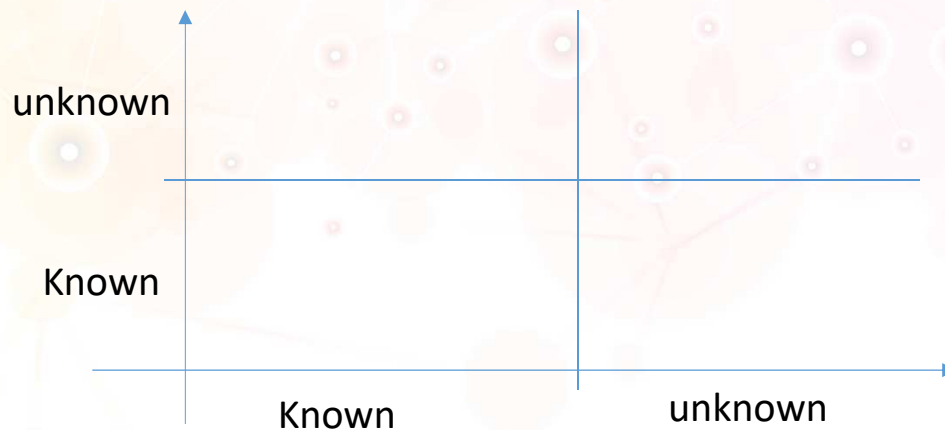
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# Configuration Management vision in a Digital Thread /. Digital Twin Implementation.

- What contribution could you bring (if any)?

- Know Known
- Know Unknown
- Unknow Unknown
- Unknow Known

To be addressed by CM



For the digital twin



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# Managing CM across an extended enterprise including SoS – Mario Kossman

- Today products tend to be increasing in complexities, shorter times to market demanded with reduced costs and high reliability is also anticipated. High value products have long lifecycle and may well spans several decades. Over these long time scales we should expect and anticipate customer and market conditions to develop. Systems Engineering, Design and CM need to be closely integrated to address this situation.
- CM is required to establish and maintain the integrity of all identified outputs of a project or process and make them available to concerned parties.
- CM as a discipline is well placed to establish traceability and controlling baseline evolutions between all relevant stakeholders information. For this to work CM must be extended throughout the entire life cycle and across all systems.
- To effectively apply CM across extended enterprise SoS new frameworks are needed. Capturing extended enterprise configuration into the overall SoS configuration and the tools to do this. We cannot ignore that legal and industrial relationship aspects will need to also be addressed.
- There is much to discuss.

# Managing CM across an extended enterprise including SoS

What problems can we solve with CM?

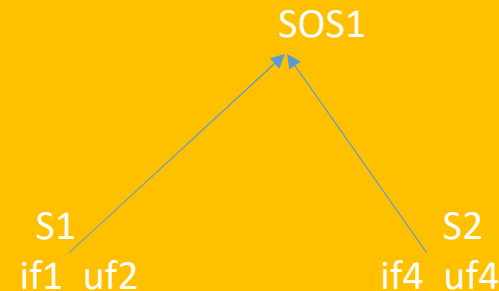
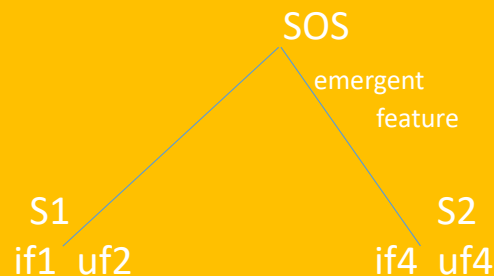
The handling of intended vs unintended features will be different

Story:

- Cell phone prohibited
- - 3G was jammed
- 4G was introduced
- => SoS

CM can track which versions of (SoS) systems can support the SoS behaviour

Rijkswaterstaat [Directorate-General for Public Works and Water Management] now provides an API for data for Flitsmeister [travel planning app]. Then CM helps to secure this on change of travel systems => good example of extended enterprise





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# Managing CM across an extended enterprise including SoS

- What do you expect from the topic ?

What is most important: extended enterprise or SoS?

Is there a common understanding of SoS

SoS a combination of elementary systems that were not meant/designed to work together

What do you need as a systems engineer to know of configuration along the entire lifecycle.

Borders conditions for extended enterprise are given by contracts

Extended Enterprises (SoS) systems from different suppliers with separate intellectual property or planning

# Managing CM across an extended enterprise including SoS

- What do you see in the topic? (and outside)

How to handle unexpected features with respect to CM

Only an aspect of CM as SoS has been discussed. There are more aspects

Eduard: For SoS owner, a SoS works the same way as a system. But not for the suppliers of the contributing systems

CM shall help to identify all stakeholders and interfaces

CM for services

Standards to secure interfaces between components of the SoS





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# Upgrade/Create CM glossary to include MBSE scope. – David Hetherington

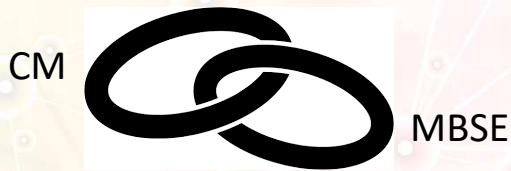
- **Survey** - What vocabularies have already been defined by other standards or communities? I will need help from Thad Henry and others who have relationships with other communities.
- **Collate** - Create a master list that shows what definition came from where. I run a small publishing company with my wife and know a lot about text processing tools. I will probably just do this off-line.
- **Review** - Are their conflicts? Which definitions do we like best? Here I will need more participation, but a lot can be done offline and by e-mail.
- **Feedback** - Where we discover conflicts between existing definitions, as a courtesy we will let the owners know. This will be a combination of offline prep by me to collate/package the information and then delivery by whoever had the relationship.
- **Gap Analysis** - Are there other terms that urgently need definition? Here we can discuss. I would tend to want to strictly limit the list of backwards facing terms that we spend time on. As for novel/new terms from our other two main activities, I think we will be making a baseline here with flexibility to add as new concepts are uncovered.
- **Good Enough Definitions** - For the urgent and immediate gaps, we should create "good enough" definitions. Focus will be on getting workable (if not quite perfect) definitions in place quickly without going down a rat hole into endless philosophical hair splitting.
- **Consolidated Baseline** - Create the baseline (version 1.0.0) of our glossary showing what definitions we have selected and where we sourced them from along with new ones we have added.



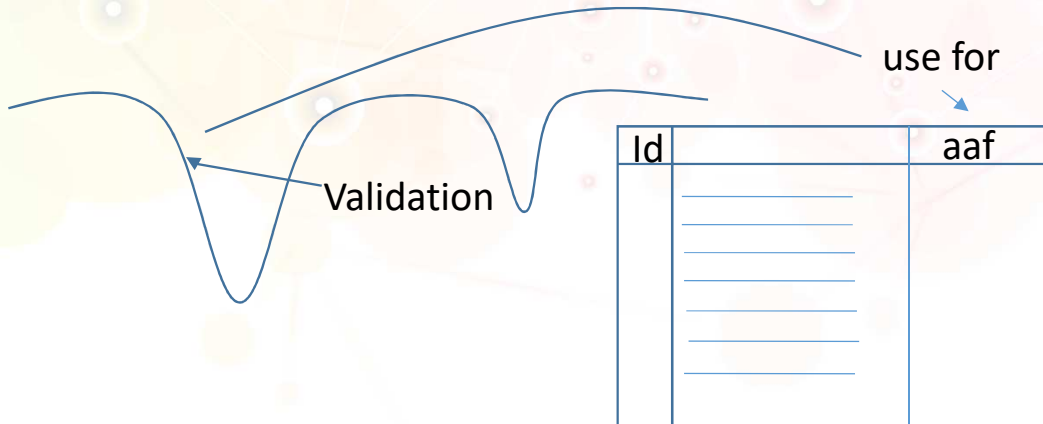
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# Upgrade/Create CM glossary to include MBSE scope.

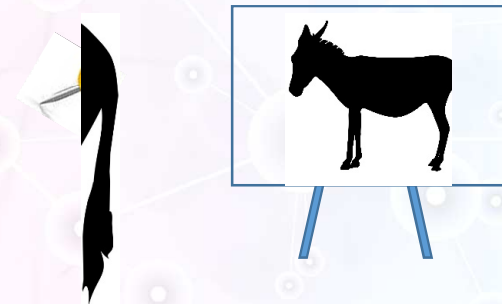
Can MBSE & CM make your CM Process more efficient?



Due to better insight constraints within the system

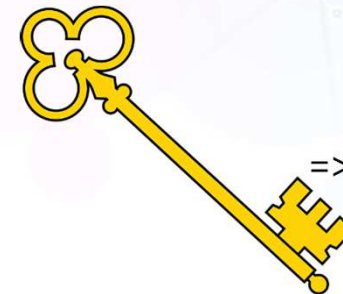


No more searching for constraints



based on experts judgement

golden key



=> Configuration items



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## Upgrade/Create CM glossary to include MBSE scope.

- What would you expect from the topic?
  - Definitions of terms that expand to models MBSE
  - Tangible products
  - Models are similar to software in terms of management
  - Delta between old school CM and MBSE CM “what’s in it for me”



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## Upgrade/Create CM glossary to include MBSE scope.

- What do you see in the topic? (and outside)
  - ISO9000
  - ISO 42010
  - OMG MDA; STEP AP233
  - ISO 50001      Validation ↔ CM
  - Efficiency in searching for constraints instead of expert judgement



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## Upgrade/Create CM glossary to include MBSE scope.

- What contribution could you bring (if any)?
  - Qualification by simulation (Cees)

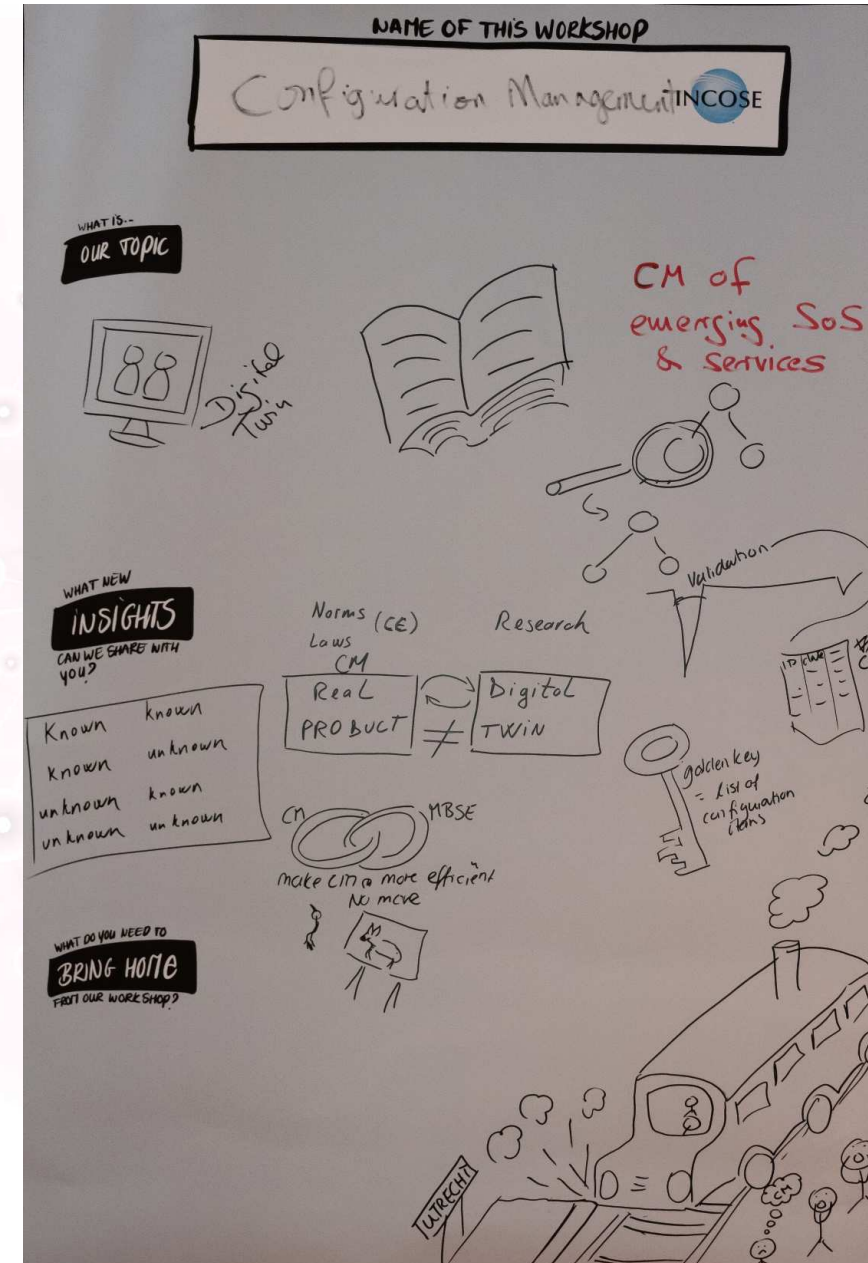




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# Consolidation of results

- Glossary - CM Now
  - Validation for CM
  - Golden key know your Cis
  - CM & MBSE efficiency
- Digital thread / Digital twin
  - Norm body CE level of traceability
  - Knowns unknowns etc..
- CM for EE and SoS
  - CM applied for emergent behavior
  - Apply this for services
  - Prevent bad luck with CM
- Link between Product Line Engineering WG and CM WG





# Conclusion

