



**26<sup>th</sup>** annual **INCOSE**  
international symposium

Edinburgh, UK  
July 18 - 21, 2016

# **Leveraging tradeoff, bridging the gap among disciplines**

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# INTRODUCTION:

## WHY THIS PRESENTATION ?

# A challenge

**Evolution**

**REQUIREMENTS**

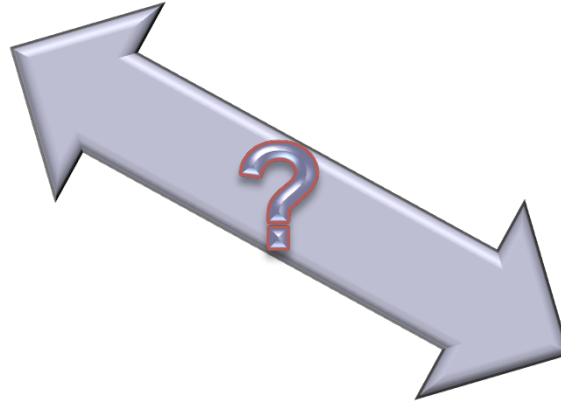
**Impacts  
????**

**TRADE-OFFS**

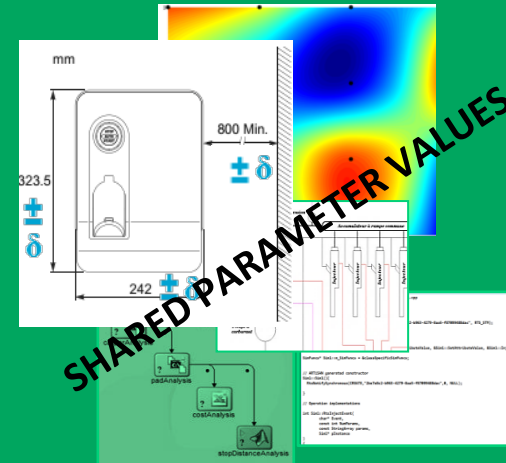
**SHARED PARAMETER VALUES**

# Industrial issue

REQUIREMENTS



TRADE-OFFS

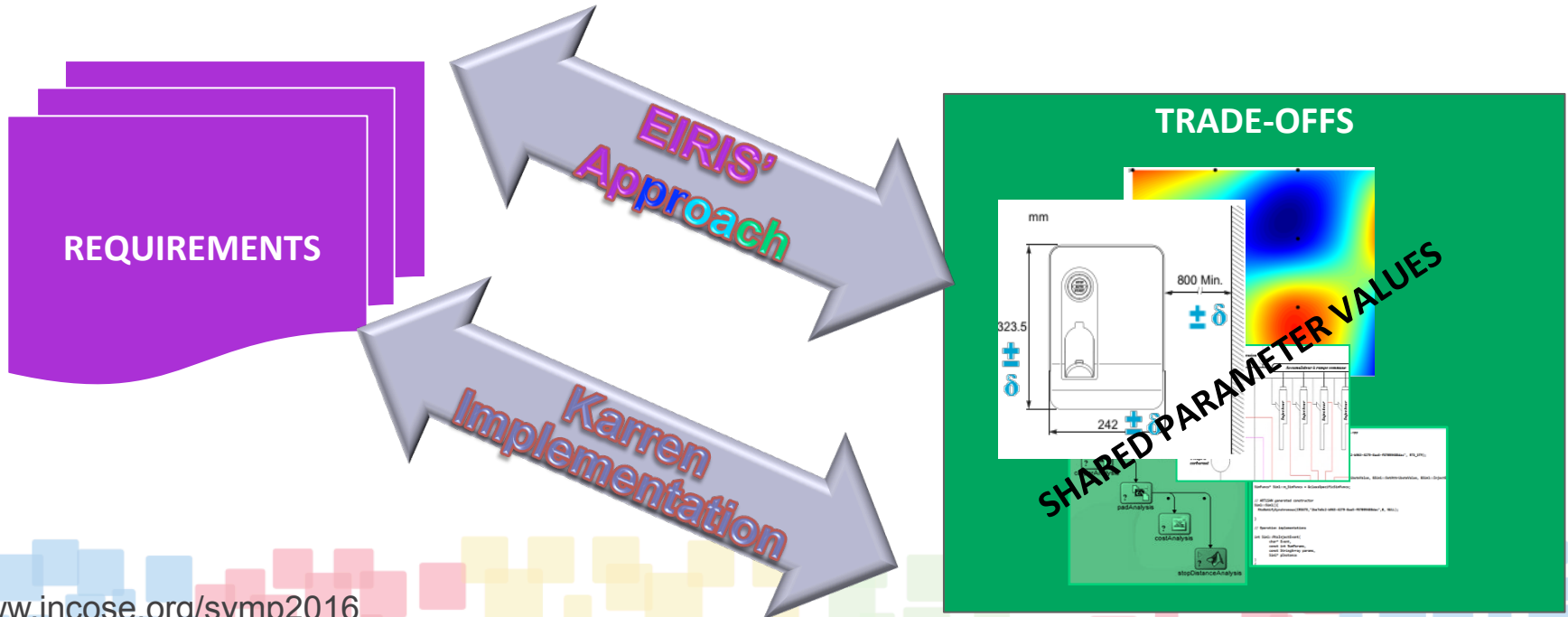


# A project



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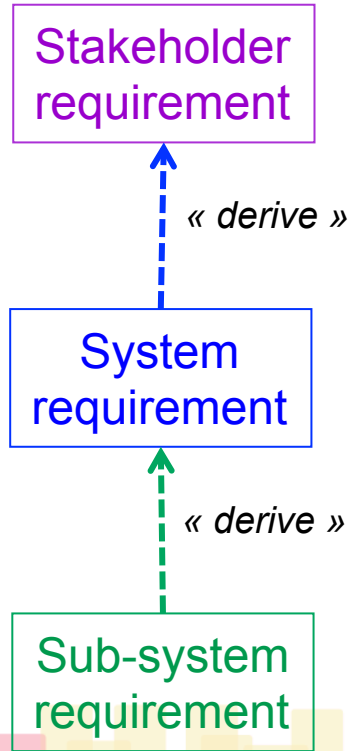
# APPROACH

# Principles of the approach



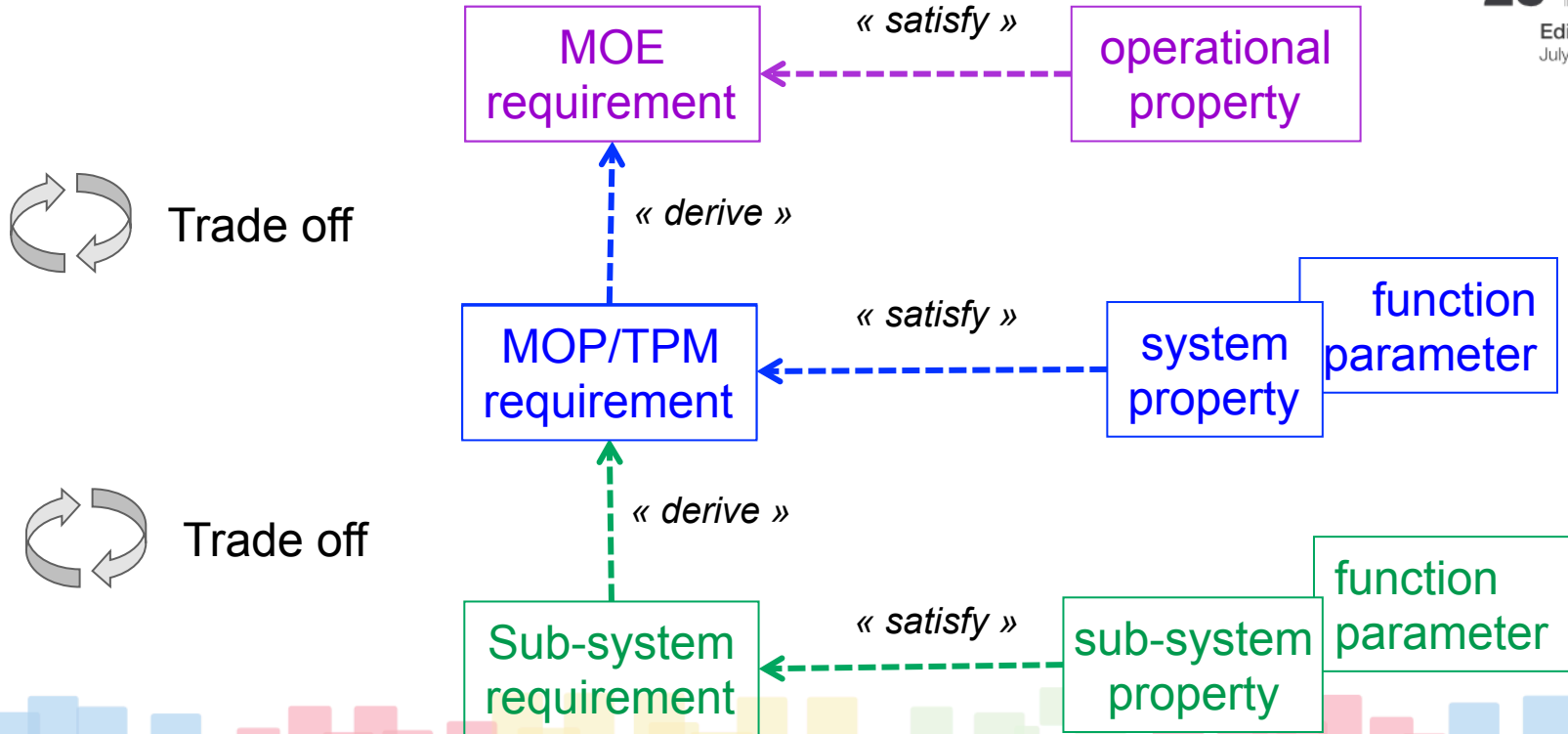
- Not changing the processes and methods of the teams;
- Not changing the tools the teams are use to;
- Providing a hub for collaboration : a methodological framework and a tool,
- To connect the different disciplines (including SE).

# Systems engineering: Requirement view





# Systems Engineering: Quantitative view





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# The basics of the tool implementation

- Leveraging the knowledge management concept of

## Information Core Entity (ICE)

## Knowledge Domain

ICE N, v..

Param ...,  
Param ...,

Rule ...,  
Rule ...,

ICE 1, vx

Param a,  
Param b,  
Param c,

Rule A,  
Rule B

ICE 2, vy

Param a,  
Param d,  
Param e,

Rule M,  
Rule N

ICE 3, vz

Param b,  
Param e,  
Param f,  
Rule T,

**ICE definition**

**Conflict  
Check**

**Value publication**

**Tradeoff study**

**Alternative A  
VX**

instance  
ICE 3, vz

instance  
ICE 2, vy

instance  
ICE 1, vx

**ICE instantiation**

**User  
workspace 1**

**User  
configuration**

instance  
ICE 2, vy

instance  
ICE 1, vx

**Value assignement**

**User  
workspace 2**

**User  
configuration**

instance  
ICE 3, vz

instance  
ICE 1, vx

# A COLLABORATIVE PROCESS AND THE RELATED META-MODEL

Systems engineering:  
Defining alternative architecture  
solutions

## Requirement repository

Requirement  
Sys. level S

## System model repository

« satisfy »  
1,n

SE quantified  
element

Architecture  
alternative

SE quantified  
element

## Shared definitions and knowledge



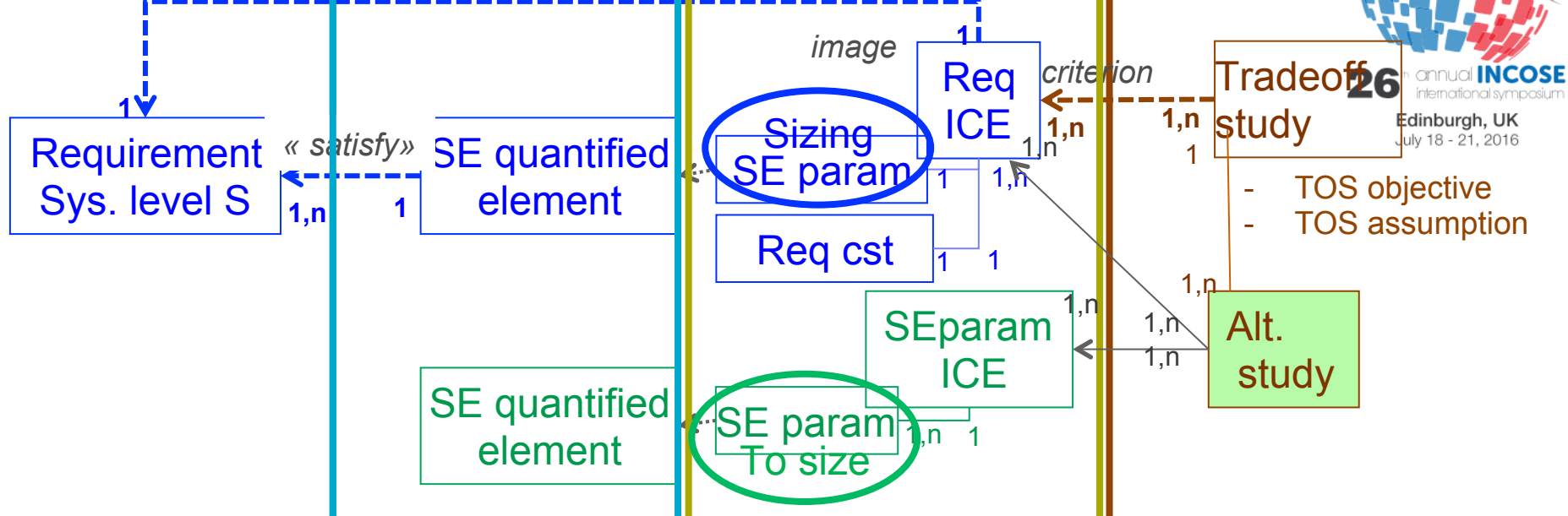
Systems engineering:  
Defining the contracts for  
alternative assessment

## Requirement repository

## System model repository

## Shared definitions and knowledge

## Tradeoff Environment



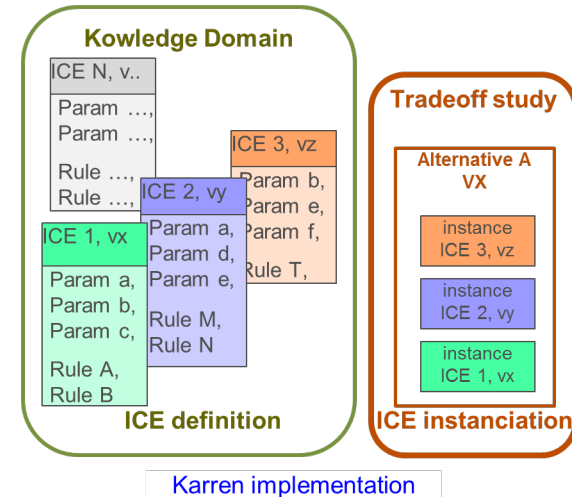
Contract for alternative assessment

Systems engineering:

Organizing workshops with the  
involved disciplines.

Disciplines:

Identifying the relevant  
calculation rules / models

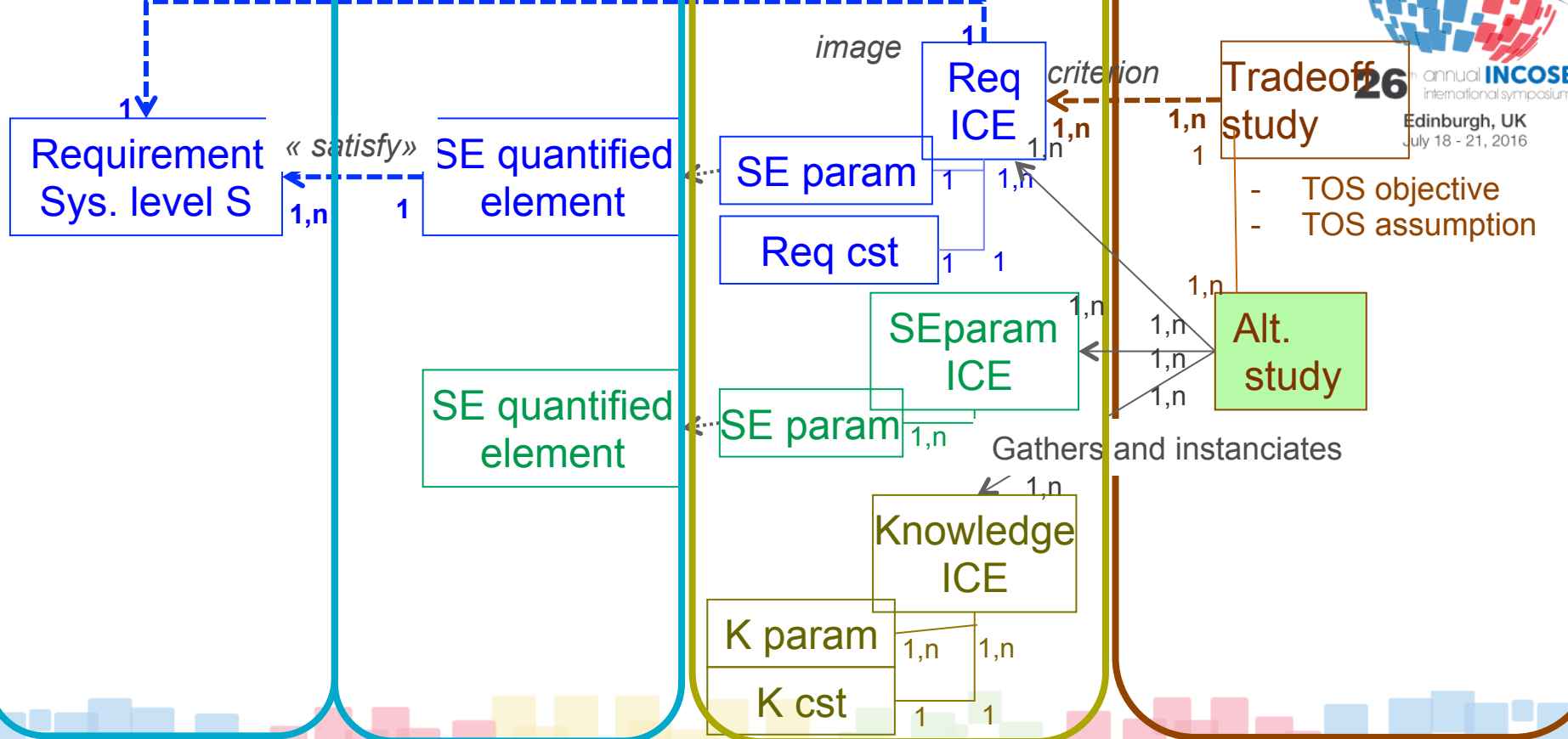


## Requirement repository

## System model repository

## Shared definitions and knowledge

## Tradeoff Environment

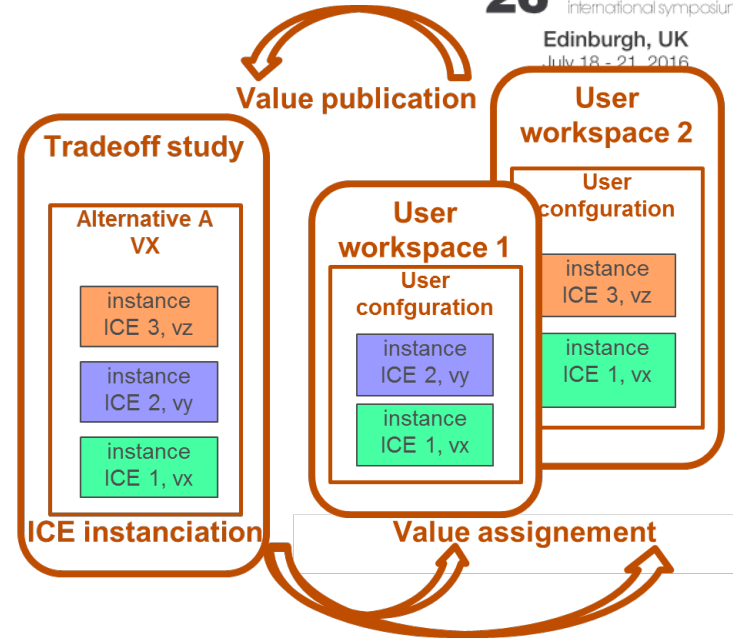


Disciplines:

Carrying out calculations and  
publish results

Systems engineering:

Checking conflicts



## Requirement repository

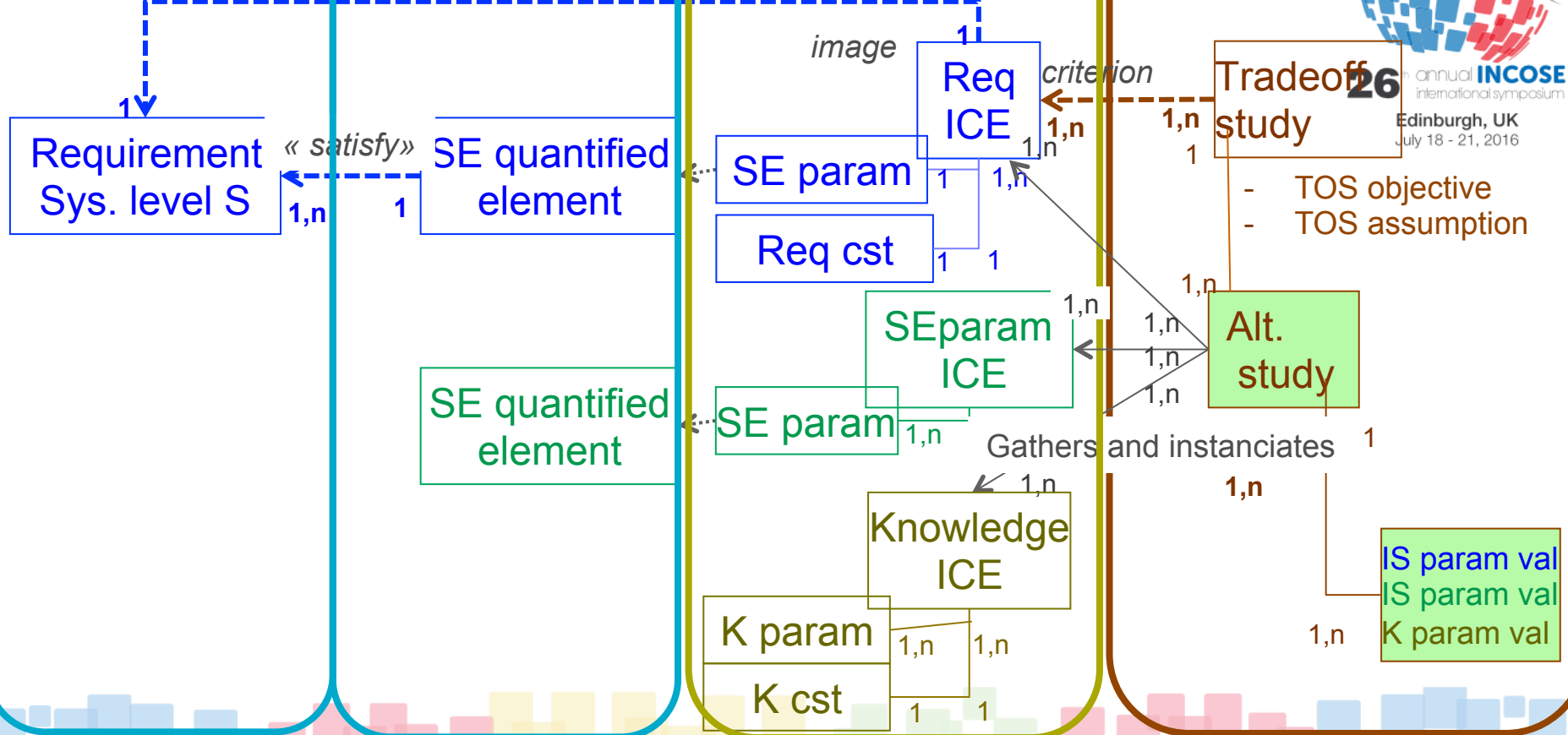
## System model repository

## Shared definitions and knowledge

## Tradeoff Environment



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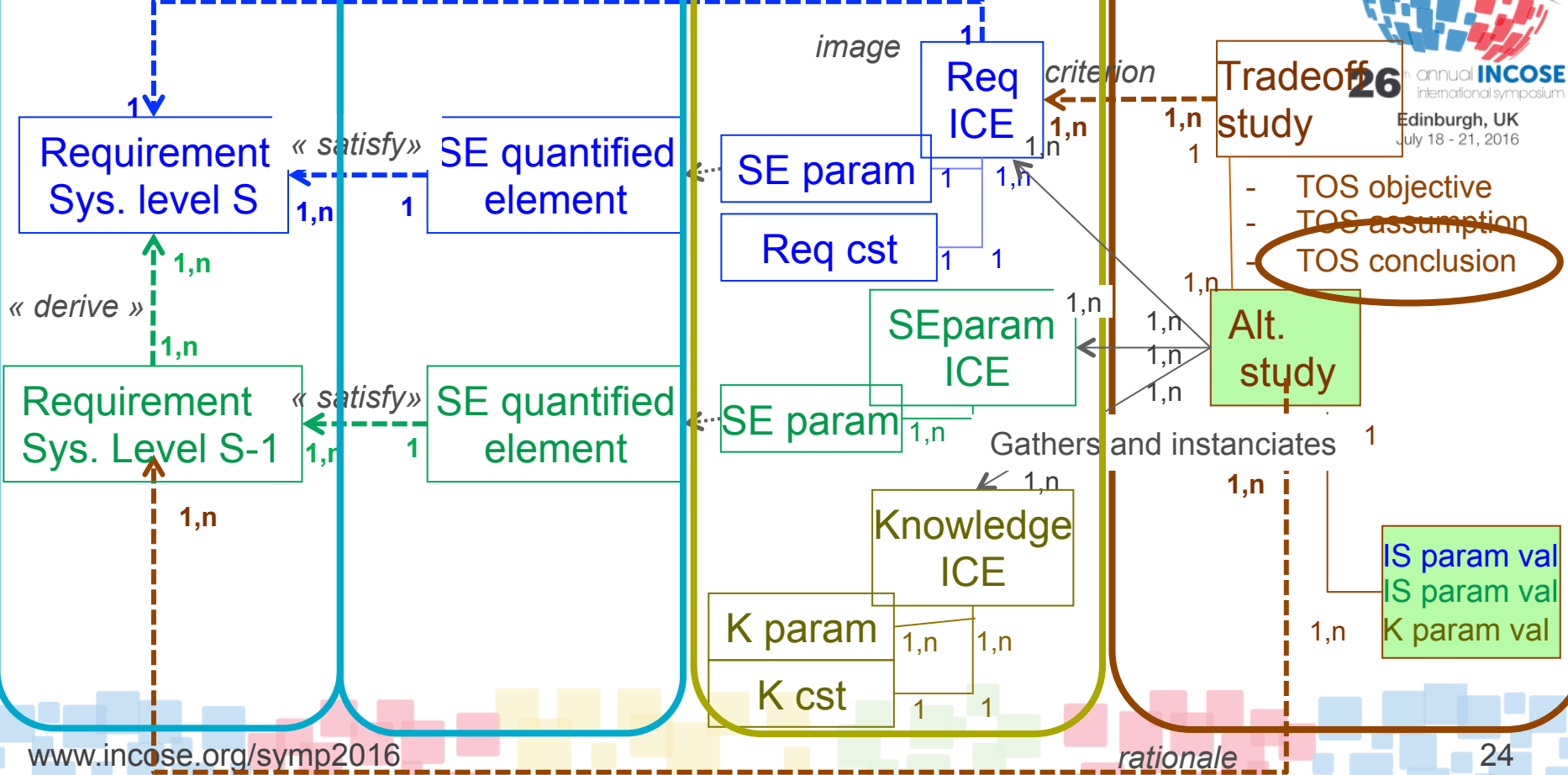
# Systems engineering: Making architecture decisions

## Requirement repository

## System model repository

## Shared definitions and knowledge

## Tradeoff Environment





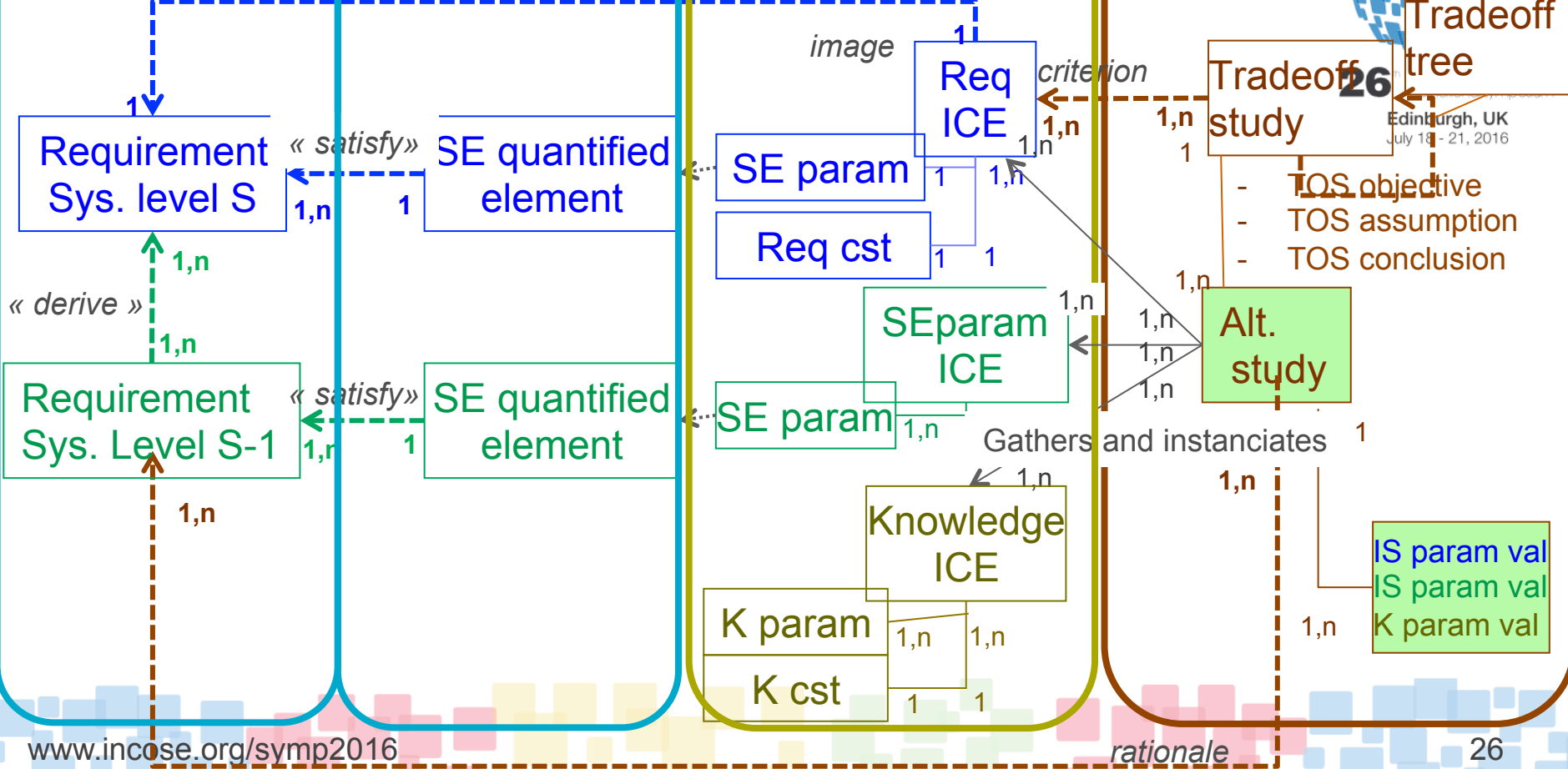
# Systems engineering: Constructing the tradeoff tree

## Requirement repository

## System model repository

## Shared definitions and knowledge

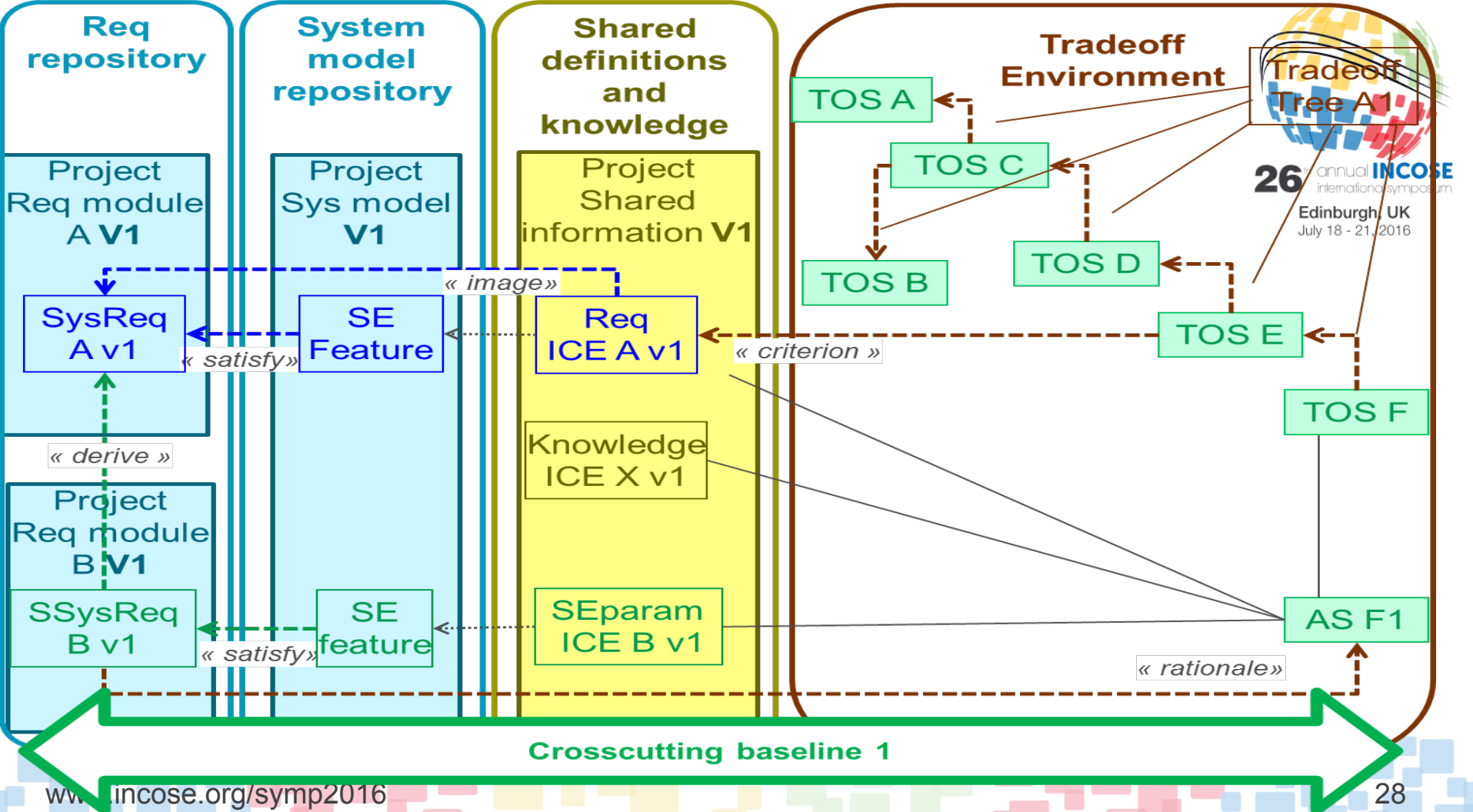
## Tradeoff Environment

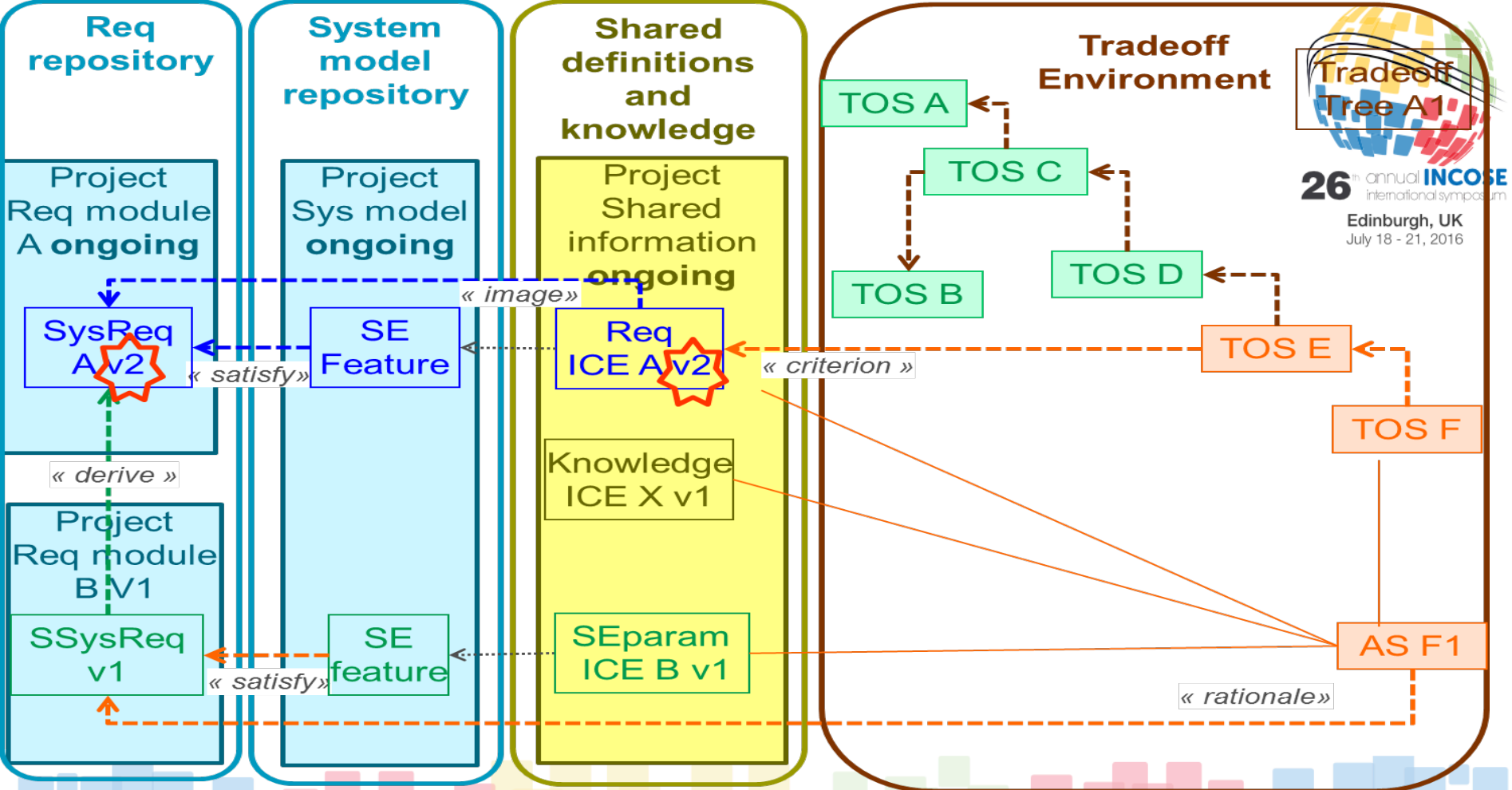


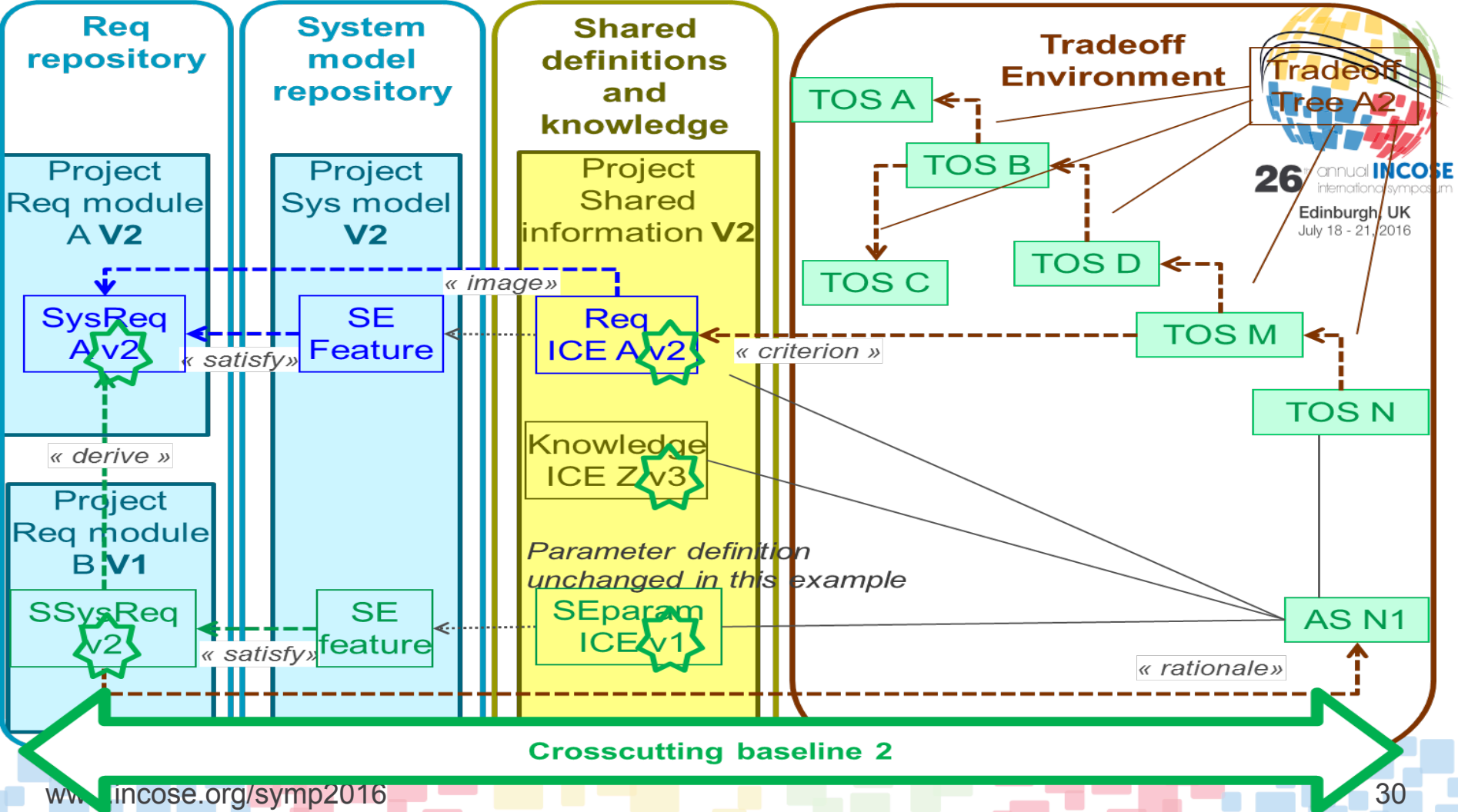
# NEXT STEPS

## MANAGING PROJECT BASELINES

## AND EVOLUTIONS



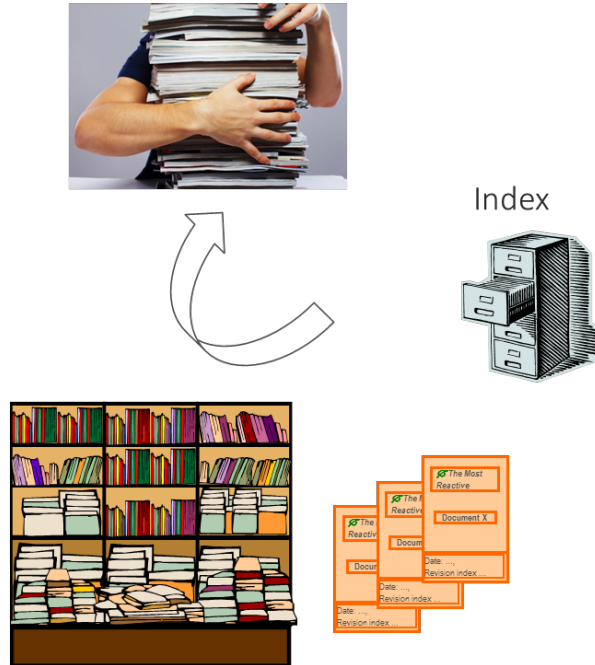




# Extended Model-Based systems engineering

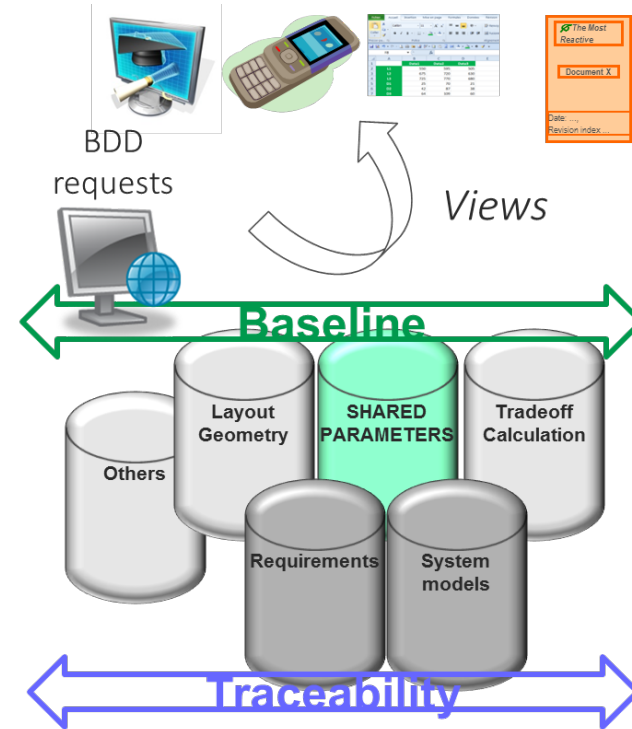


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Source  
EIRIS Conseil

Documentary  
approach



Model-based  
approach

**IN CONCLUSION:**

**MEETING AGAIN IN 2 YEARS TIME**

**AND RIGHT NOW**





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**BECAUSE THE ISSUE IS FAR FROM NEW,**

**WHY NOT MEET**

**AN INNOVATIVE SYSTEM ARCHITECT...**

**BACK ACROSS THE CENTURIES.**