



**2017**

annual **INCOSE**  
international workshop

**Los Angeles, CA, USA**

January 28 - 31, 2017

# **Data Exchange Standards Overview**

## **AP233/AP239/AP242 and MoSSEC**

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# Nigel Shaw

- Chair of Editing Committee for STEP first release (c.1998-1995)
- Chair of ProSTEP Round Table (1995-99)
- Lead modeller on NATO CALS Data Model
- Technical Architect for AP239 (PLCS) (1999-2004)
- MD of Eurostep Limited since 1995
- Worked with SAVI team 2013-2016
- Interested in all kinds of information standards



# Agenda

- Introduction – then specifics
  - STEP
  - AP242 and its predecessors
  - AP239
  - AP233
  - MoSSEC
- Discussion



# STEP

- Standard for the Exchange of Product Model Data
  - ISO 10303 coming from ISO TC 184/SC 4
    - Industrial automation systems and integration — Product data representation and exchange
  - Started in 1984, first release 1995
  - Original problem:
    - Industry's data locked into CAD Systems



# STEP Technology

- From the beginning the aim was a model-driven standard
  - Predated XML, UML, SysML, XMI, etc.
- So had to invent its own technology
  - EXPRESS language to define the what
    - ISO 10303-11
  - Mapped to a file format and other implementation forms
    - ISO 10303-21
- Later XML arrived
  - ISO 10303-28
    - Not a success – too many options and not enough of “a standard”
- Approach now being revisited/revised: Future STEP Architecture
  - Using SysML (alongside EXPRESS)
    - Parametric diagrams as means to map between layers
  - Challenged to simplify rather than complicate whilst keeping legacy!



# STEP APs

- The initial Committee Draft aimed at one solution for everybody
  - Not smart enough to do this in late 1980's
- Introduced Application Protocols
  - Specialised usage for specific needs
    - E.g. Furniture, Automotive, Systems Engineering
- All based on common resources
  - Lots of overlap
  - Different but overlapping specialisations



# AP203 and AP214

- US Aerospace plus others created AP203
  - ISO 10303-203 “Configuration controlled 3D design of mechanical parts and assemblies”
- Automotive (largely European) created AP214
  - ISO 10303-214 “Core data for
  - automotive mechanical design processes”
- Massive overlap but some significant differences
  - CAD Vendors used one code base
  - Both widely used
- By 1999 solid model exchange between CAD systems at high success rate



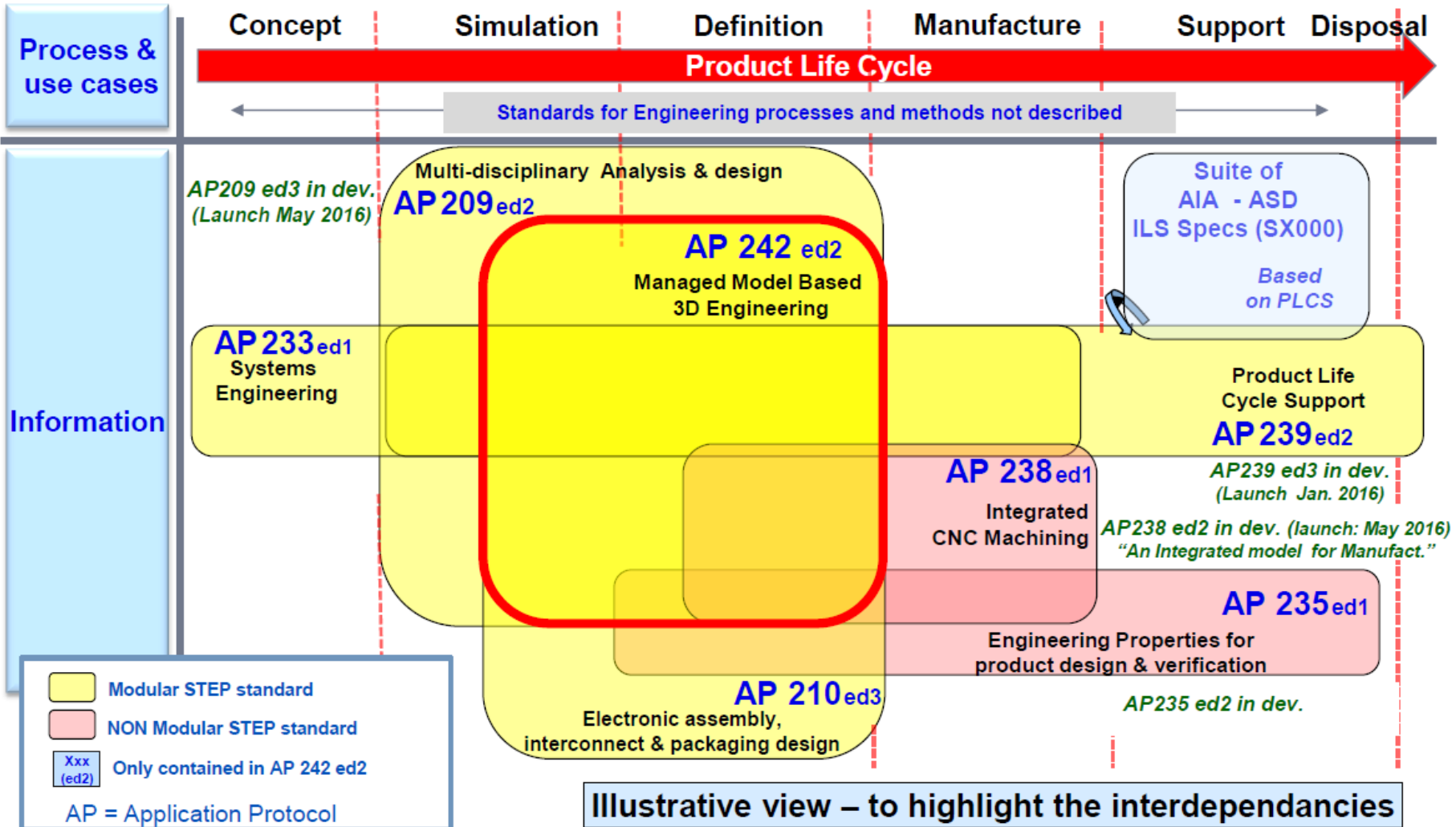
# AP242 - Consolidation

- Became clear that the duality of 203 and 214 held back vendor implementation
  - And need single choice for Long Term Archive (LOTAR)
- So it was decided to create AP242 merging the capabilities of both
  - And introducing new technology
    - Business Objects & Fixed XML Schema
- First edition released alongside new versions of:
  - AP209: Multidisciplinary analysis and design
  - AP210: Electronic assembly, interconnect and packaging design
- Currently working edition 2

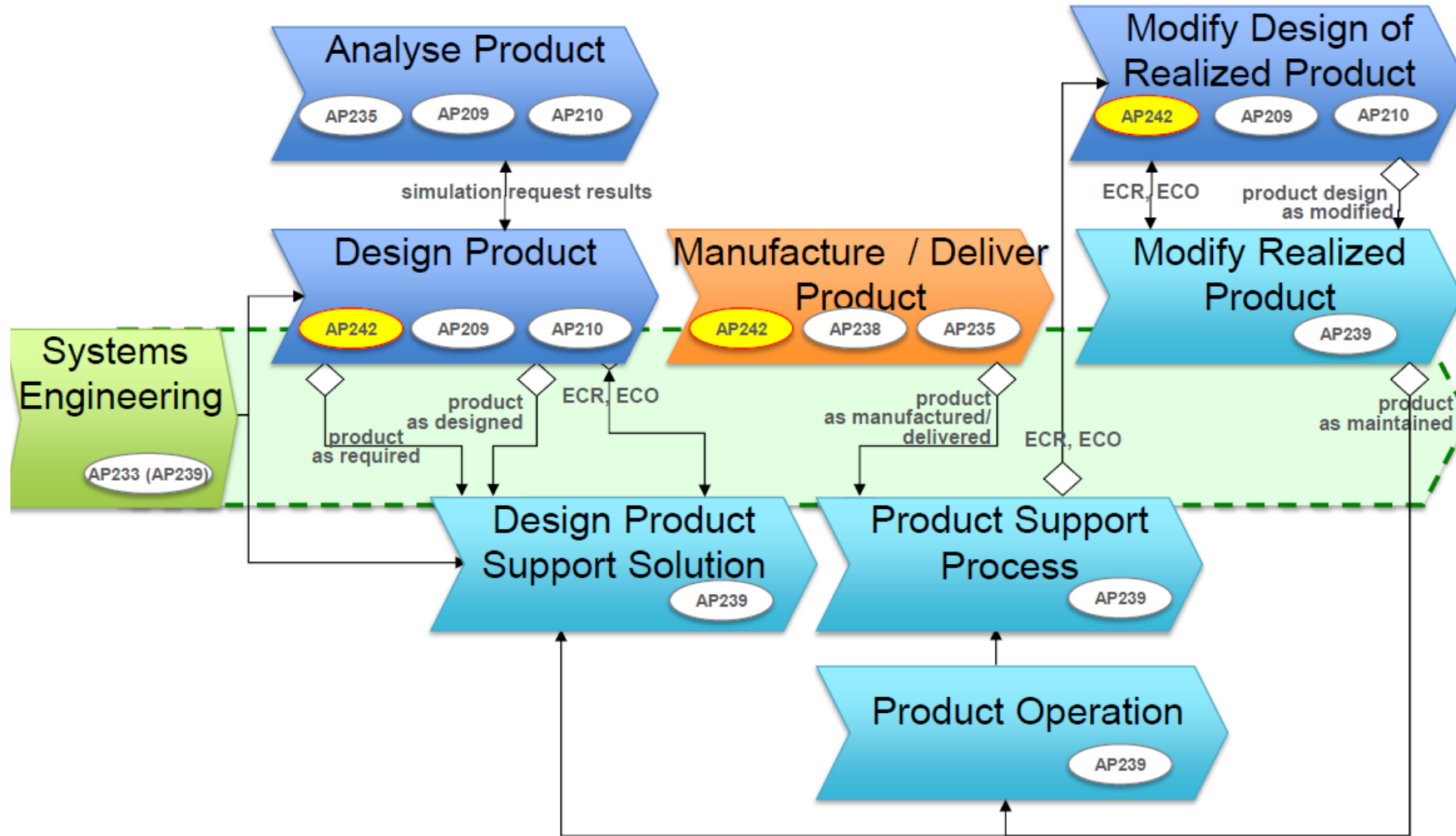




# AP242 is the core standard for 3D MBD exchange, part of the STEP standards suite for PLM interoperability : Overview of STEP Application Protocols



# STEP AP242 is complementary to activity models of other ISO STEP standards for product life cycle





# Expansion in scope – Not just exchange

- Initially STEP aimed at exchange of a snap-shot of product data
- Requirement to manage:
  - Sharing
  - History
  - Whole life cycle (cf. Design)
    - Enable feedback
  - Two prime examples:
    - ISO 15926: Oil and Gas
    - ISO 10303-239: Product Life Cycle Support
  - Also MoSSEC

Same ISO committee but  
Ontology based approach  
“One model to do everything”  
4D approach  
with reference data extensibility



# AP239 – PLCS e1 2005

- ISO 10303-239: Product Life Cycle Support
- Created by consortium of industry and Government (5 Defence organizations)
- Key problem: How to keep the information needed to operate and maintain a product aligned with the changing product over its life cycle?
  - Designed to capture history of change
- Had to break some core STEP assumptions
  - Modelling details: e.g. Product has ~~an id~~ one or more id's over time
  - Implementation of the Business Object Model
  - Extensible model through use of OWL reference data



# AP239 – PLCS e2 2010-12

- After feedback concerning
  - Non-mainstream technology (i.e. EXPRESS)
  - Issues with applying Part 28 XML
- Brought in more of AP233 scope
- Added use of SysML alongside EXPRESS
- Tuned and normative single XML schema
  - Standardised in OASIS PLCS TC



# AP239 e3 – current initiative

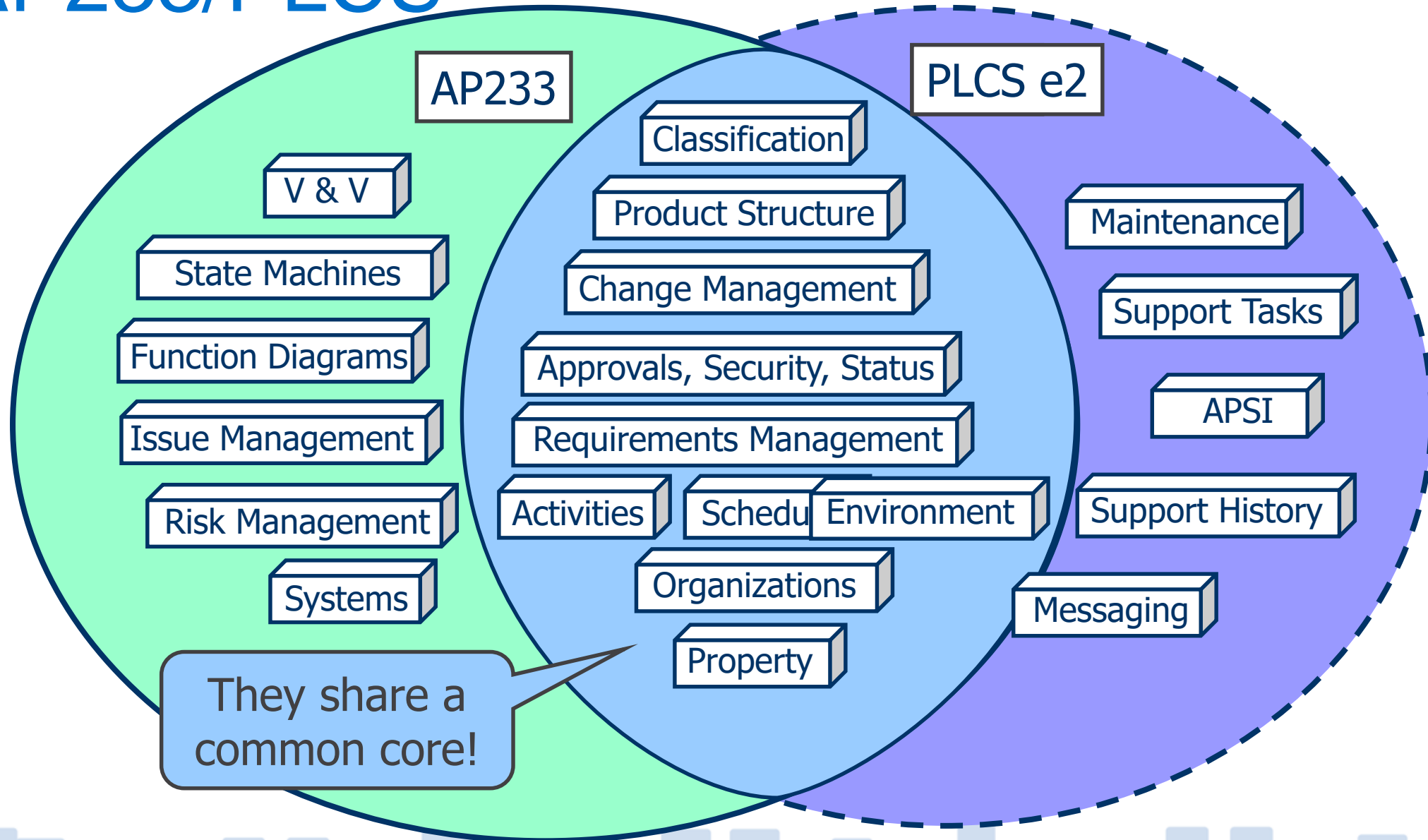
- Bring it back to ISO TC184/SC4
  - OASIS PLCS TC
- Airbus now involved/driving
- Harmonise with AP242 and ASD standards to provide coherent capability



# AP233 – Systems Engineering

- ISO 10303-233 2012
- Started early 1990s with the European SEDRES project
- Key problem: Why has it taken so long for companies from 4 countries to design one fighter aircraft?
- Long gestation: ball passed to NASA & NIST
- Harmonised with PLCS
- Common core compatible with SysML
  
- Has not succeeded except in very small niches

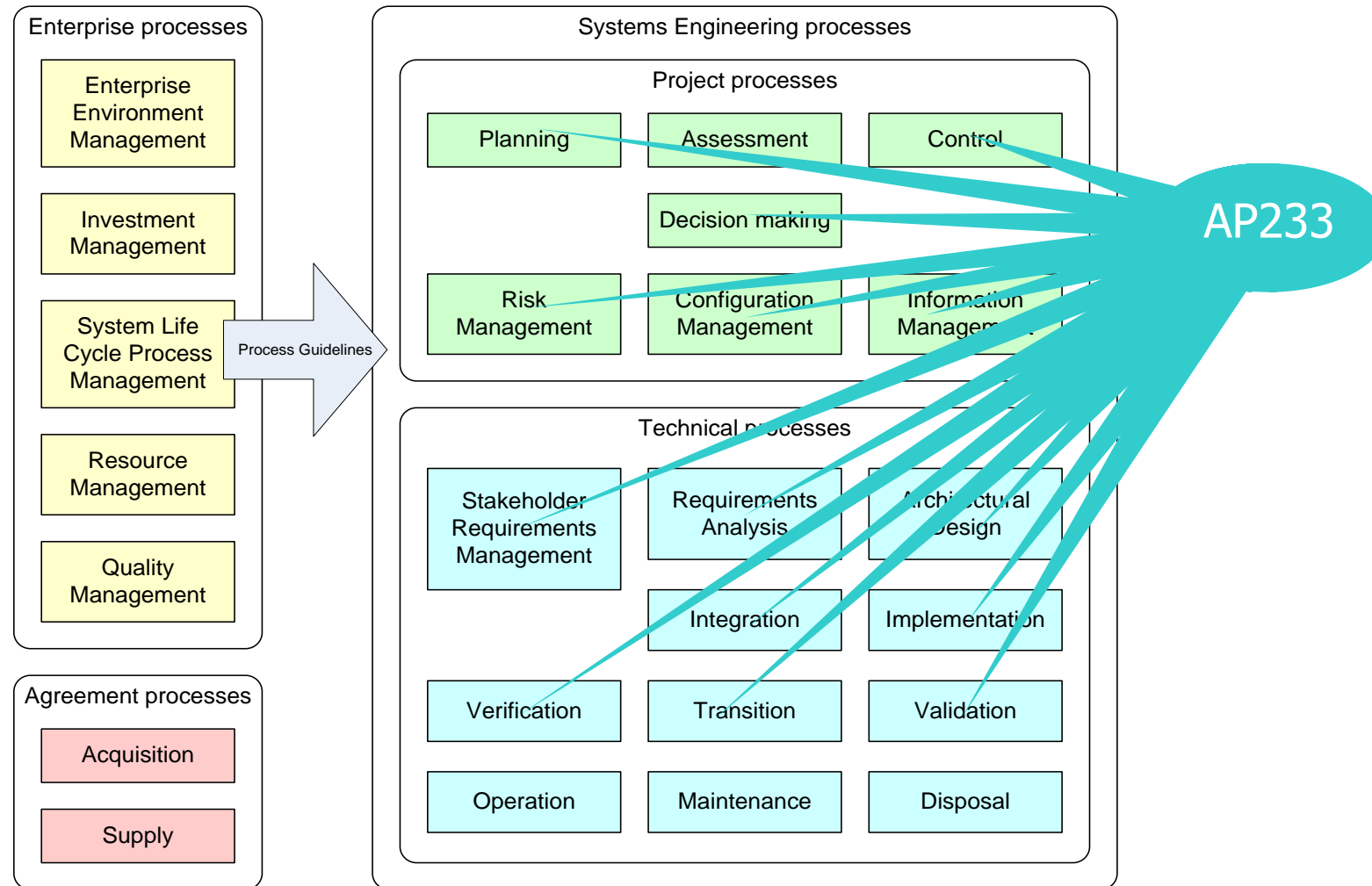
# AP233/PLCS







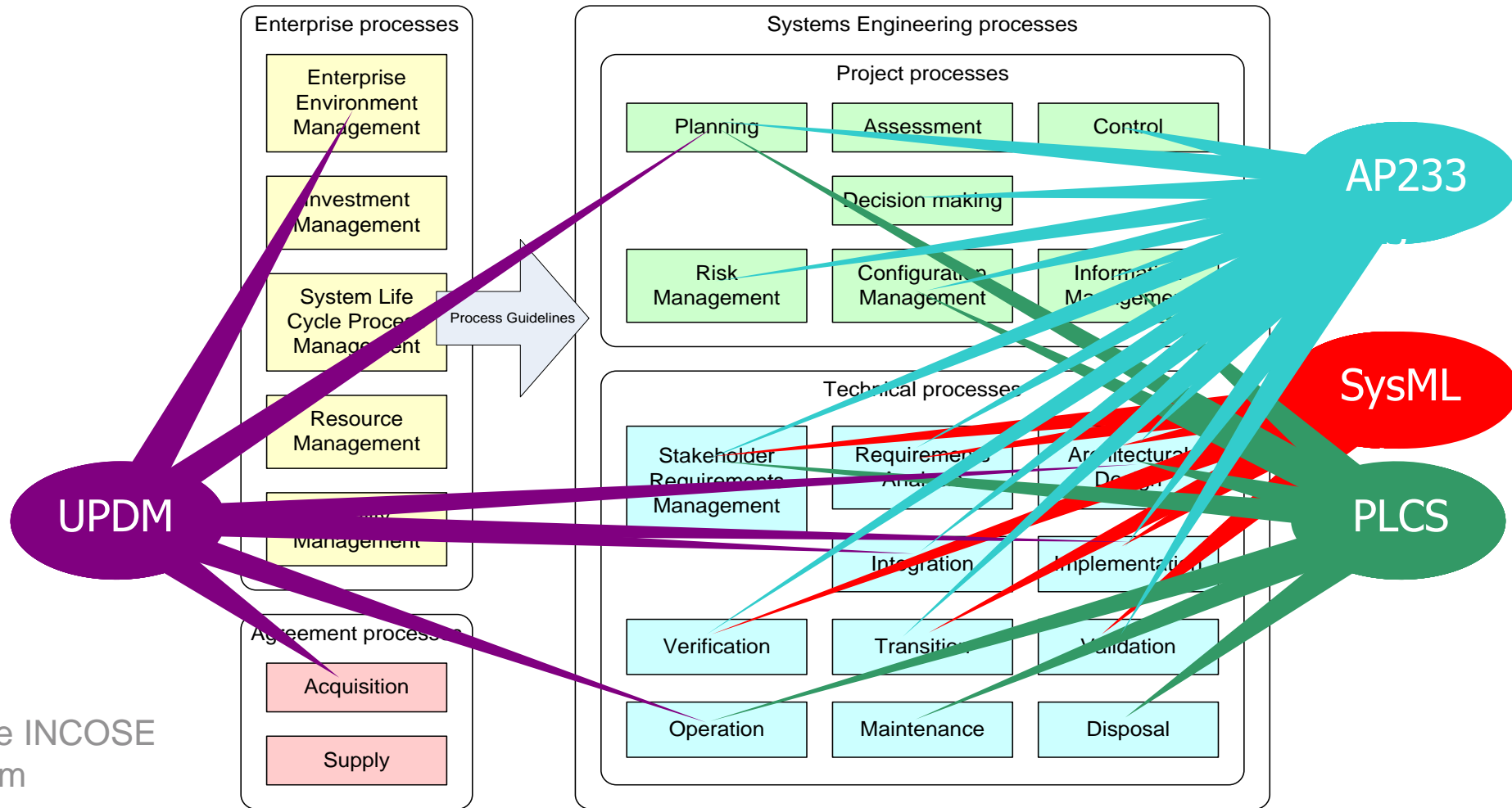
# AP233 and SE Processes



Presented to the INCOSE  
2008 Symposium



# Information Standards



Presented to the INCOSE  
2008 Symposium



# AP233 – Where next?

- Debate on-going
  - Keep standalone
  - Merge with AP239 and/or AP242
    - All three include requirements and tracing
- Relationship to MoSSEC
  - See next slide



# MoSSEC

- Modelling and Simulation information in a collaborative Systems Engineering Context
- New work item under ISO TC 184/SC 4
- Originates from Airbus led EU research projects
  - Not Aerospace specific
- Key problem: Enable an Aircraft Architect to know where a value came from and where has it been used
  - Capture Audit Trail of System Simulation across organizations and disciplines
  - MoSSEC reuses a lot of PLCS/AP233 structures
  - Details of specific simulations could be handled using native, AP209 or even AP233

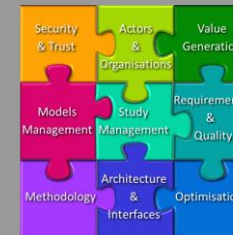


# Specific updates

Ap242

Ap239 e3

MoSSEC



Ap239  
Background



# Other standards that play into SE

- ReqIF
  - OSLC
  - XMI
  - UML/SysML
  - AADL
  - Lots of tool specific formats
    - Modelica, Simulink, CAD, PDM/PLM
  - Architecture Frameworks
  - ILS Standards
- } Serious Overlap with STEP APs!

The nice thing about standards is there are so many to choose from!

# Let's talk!





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