



AeroSpace and Defence
Industries Association of Europe



MoSSEC

Child of CRESCENDO

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Introduction

- » All of this has now been officially released by the ASD Strategic Standardisation Group (ASD SSG).
 - See http://www.asd-ssg.org/asd_ssg_standards
- » Airbus and Eurostep partners in CRESCENDO and in two follow-up projects:
 - CONGA (2 years from Feb 2013)
 - TOICA (3 years from Sept 2013)
- » Both are covered by project agreements including release procedures
- » Both are contributing to the MoSSEC standard development which is intended to be an open development

CRESCENDO and MoSSEC

- » CRESCENDO was the European Research Project that finished in October 2012.
 - CRESCENDO stands for: “**Collaborative and Robust Engineering using Simulation Capability Enabling Next Design Optimisation**”
 - The results of CRESCENDO are jointly owned by the partners and are private unless specifically approved for publication

- » MoSSEC is pushed under ASD as an emerging standard.
 - MoSSEC stands for: “**Modeling and Simulation information in a collaborative Systems Engineering Context**”.
 - The MoSSEC project is and will be open



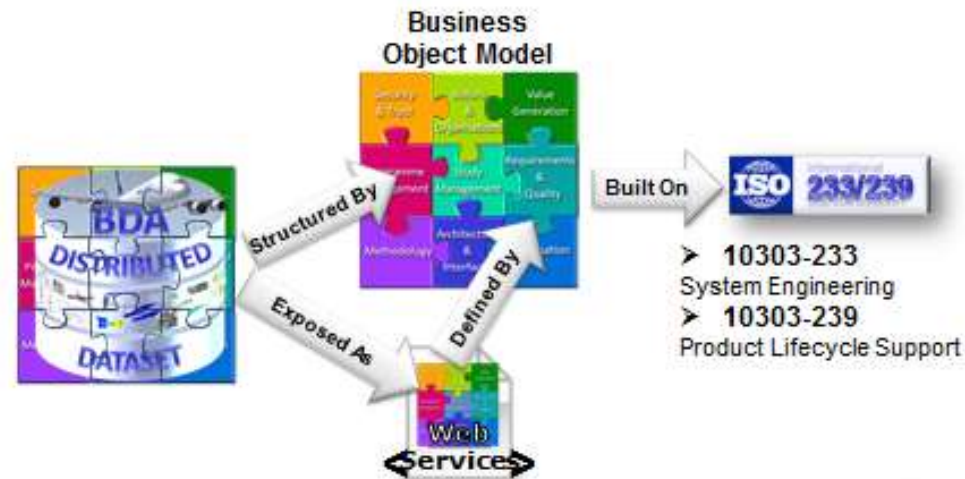
Achievements

- [PDT Europe 2012 presentation by Peter Coleman](#)

- **Define a model of the data that is used and generated**
 - Make use of existing data models such as those from relevant standards (Systems Engineering, PLCS)
- **Develop web services that enable creation, updating, search and read of the data**
- **Implement the web services against a collaboration hub**

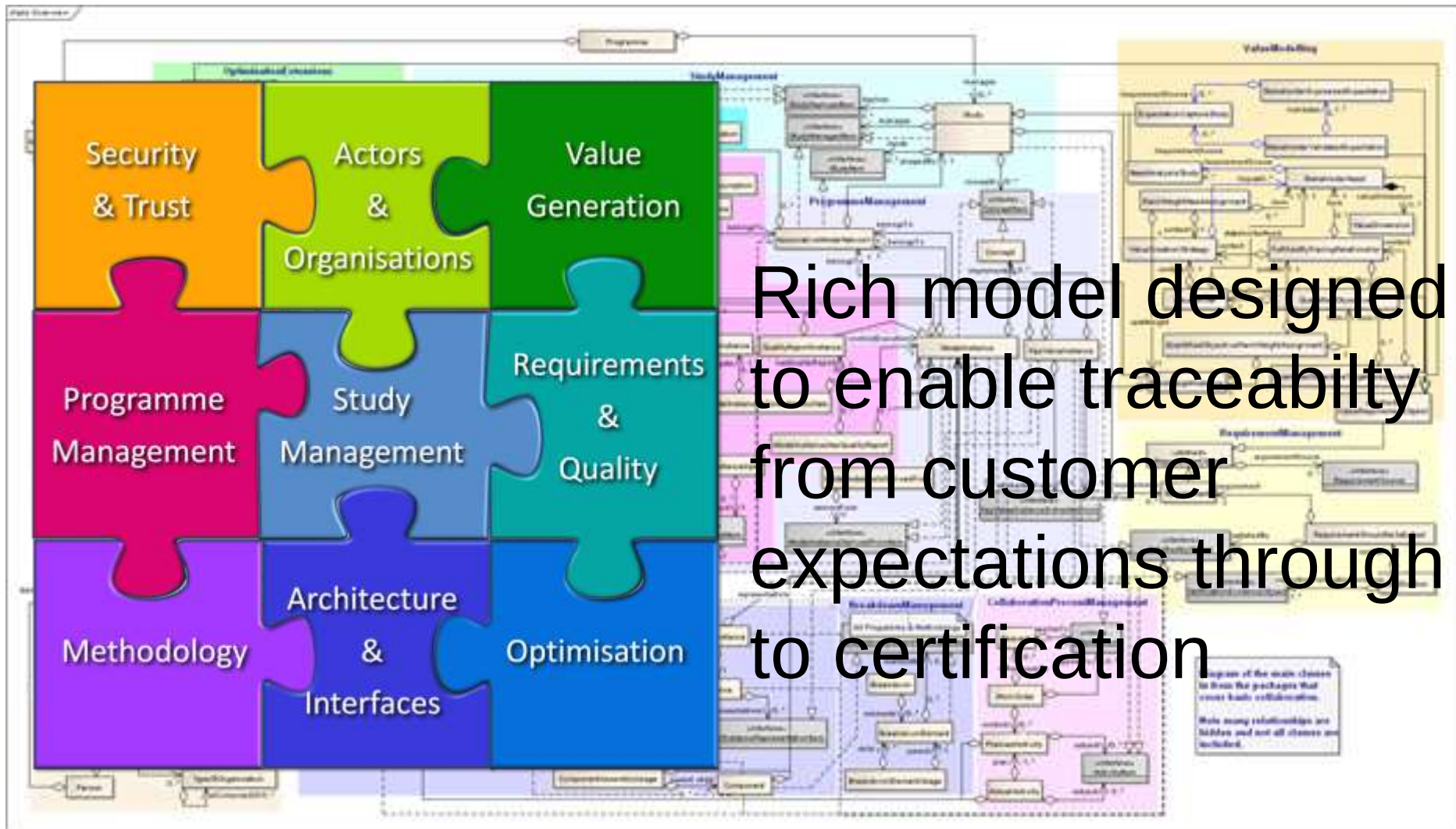


Development of a Common Approach



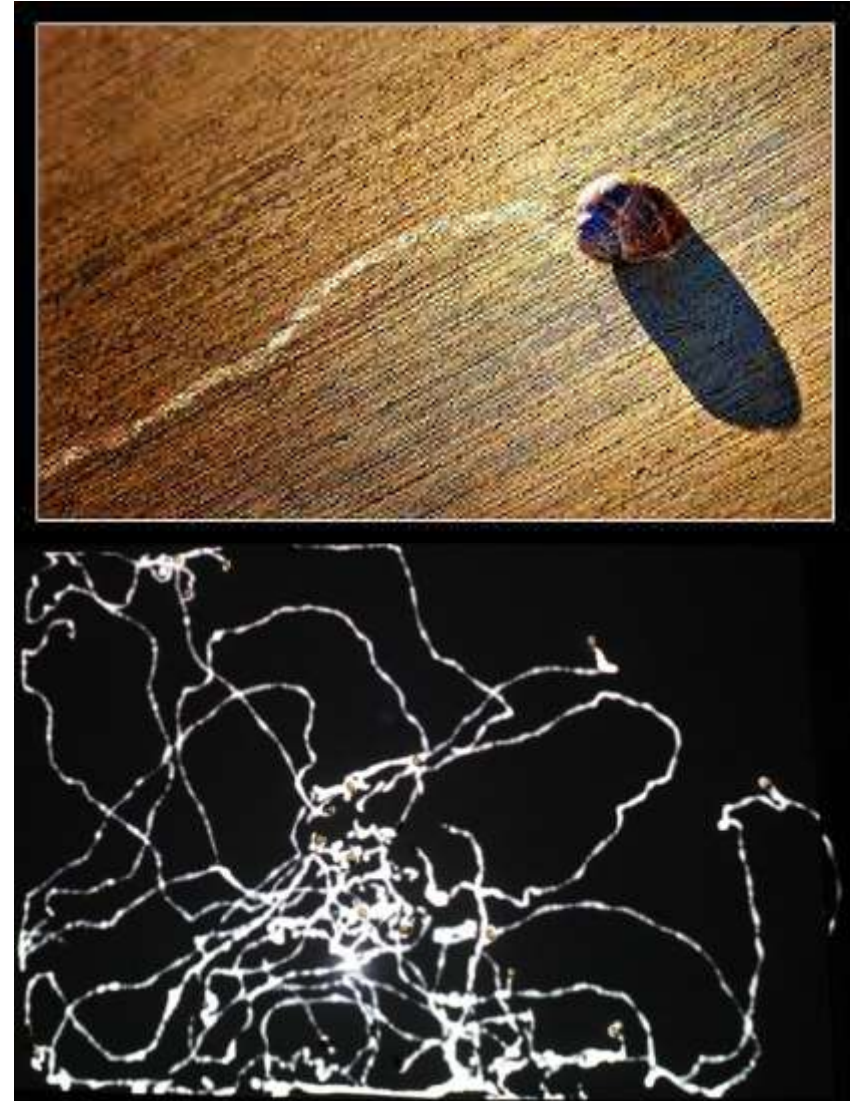
→ A Common Approach – built on ISO standards

The BDA model

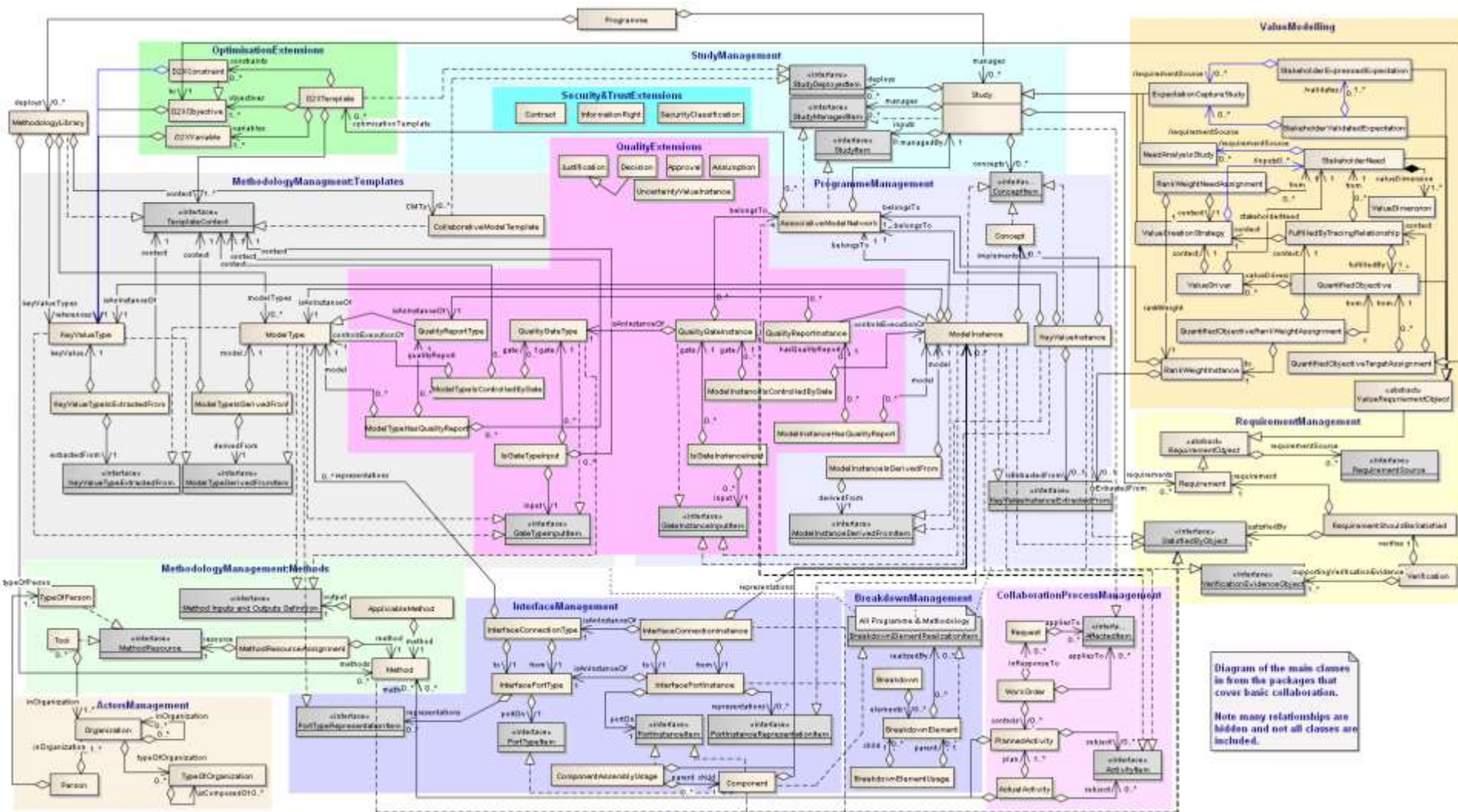


Philosophy

- » The model is intended to capture the whole simulation process
 - Study intent
 - Relationship to requirements
 - Models and values as inputs
 - Models and values as outputs
 - Quality aspects
 - Library of simulation types
 - Process record
 - » How long, who, what,...
- » It operates at the meta data level
 - Lots of data about data!!!
- » It is intended to be process and simulation type independent
- » Joined up “big picture” view

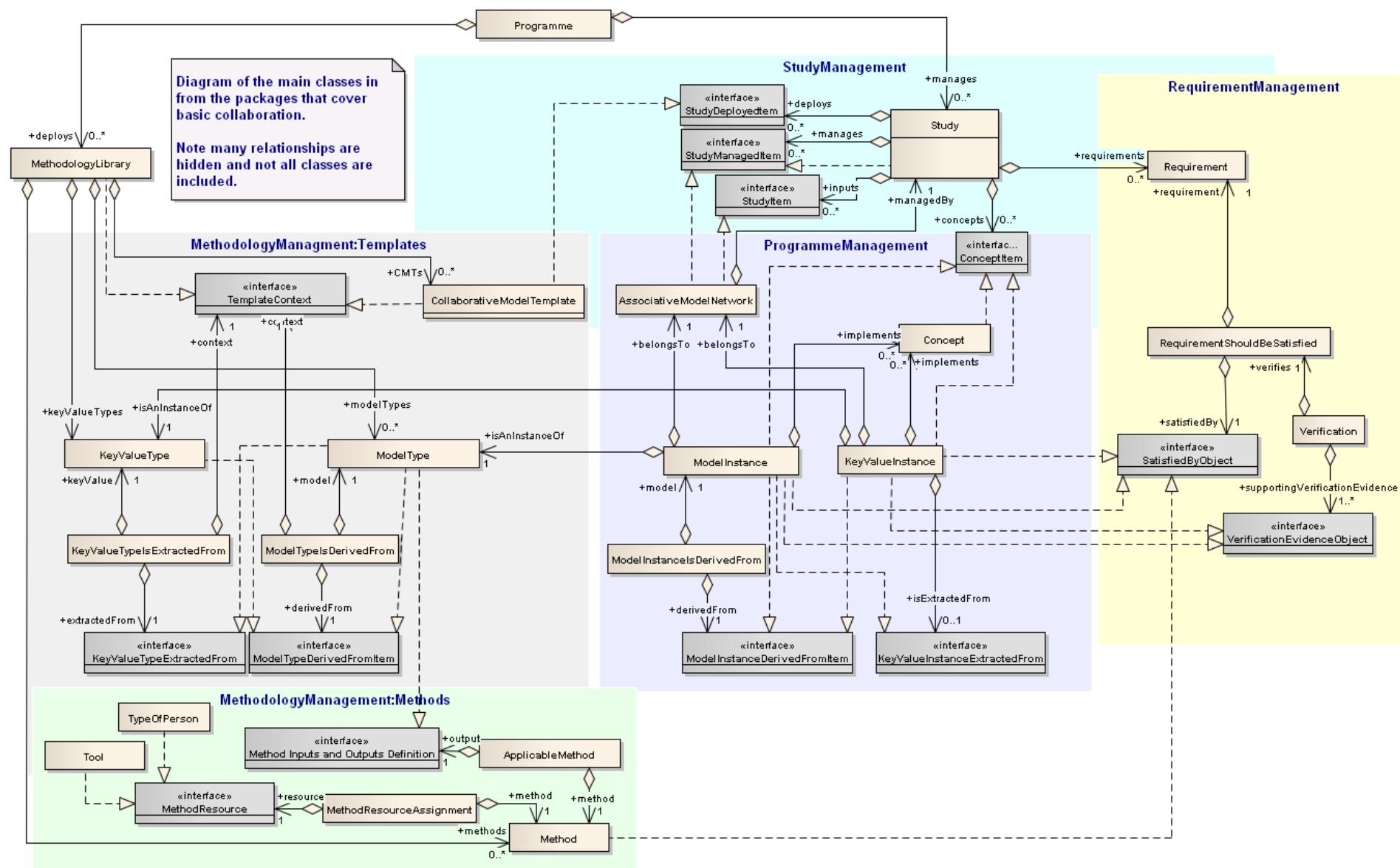


BDA Object Model Overview



Key objects

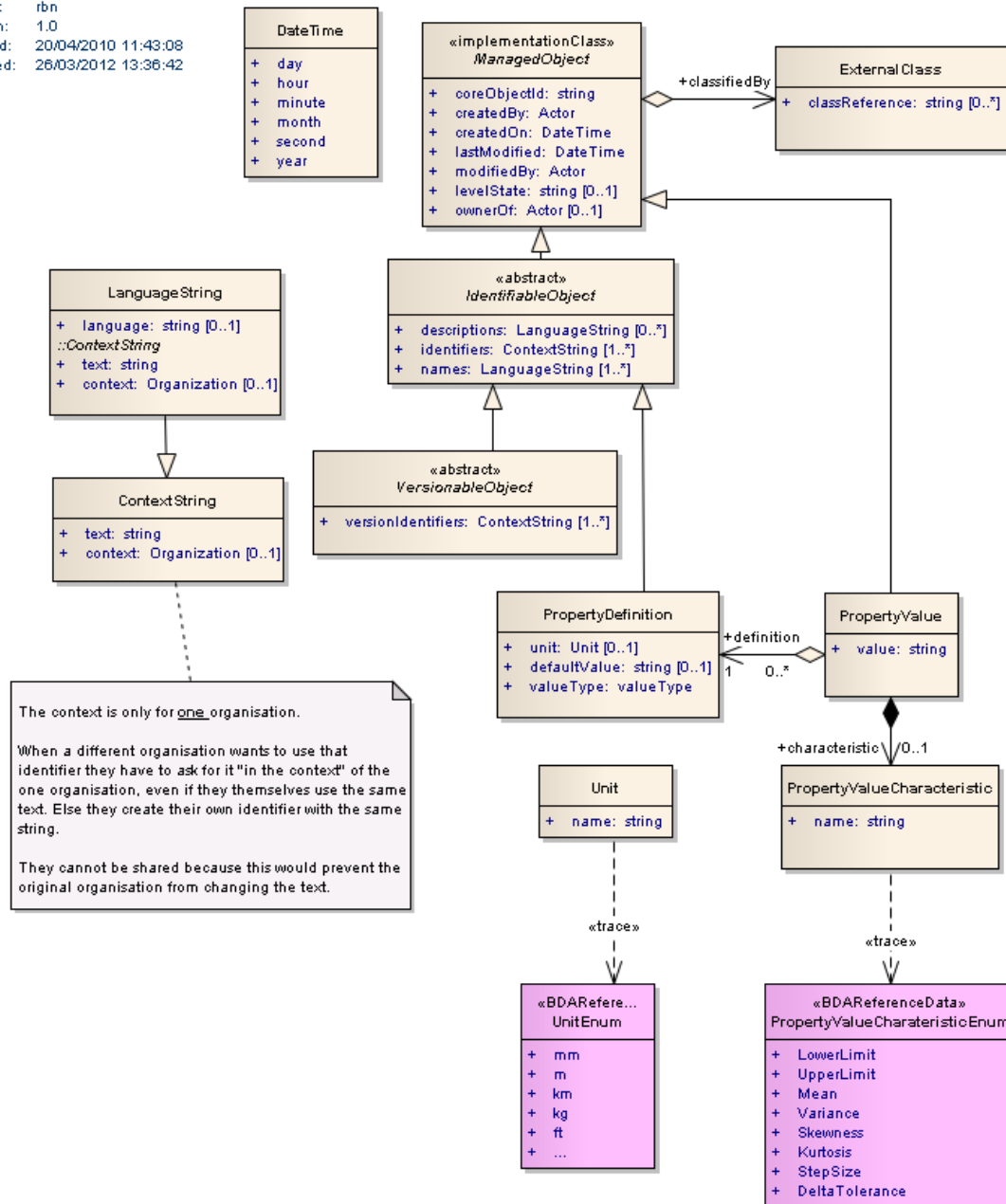
- » Study
- » Associative Model Network [AMN] and Collaborative Model Template [CMT]
- » Model Instance and Model Type
- » Key Value Instance and Key Value Type
- » Requirement, should be satisfied by, and verification
- » Method and Tool
- » Organisation, Type of Organisation, Person and Type of Person
- » Methodology Library
- » Approval
- » Documents (e.g. managed in a PDM system)



Base Objects

- » The BDA Object model uses an object-oriented style
- » Objects are declared as subtypes of base objects

: BaseObjects
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Study

- » A (collaborative) study is package of work that is launched by a Programme to drive the design, modelling, simulation and verification of something. Studies can launch multiple nested (sub)studies allowing complex product/system engineering activities and datasets to be organised and managed.
- » Studies can have different purposes, e.g. evolving the design, managing change, performing trade-off analysis, investigating sensitivity of a solution to uncertainty, performing optimisation, developing the detail of the design, developing new methods and tools, combining results from other studies into a single baseline.

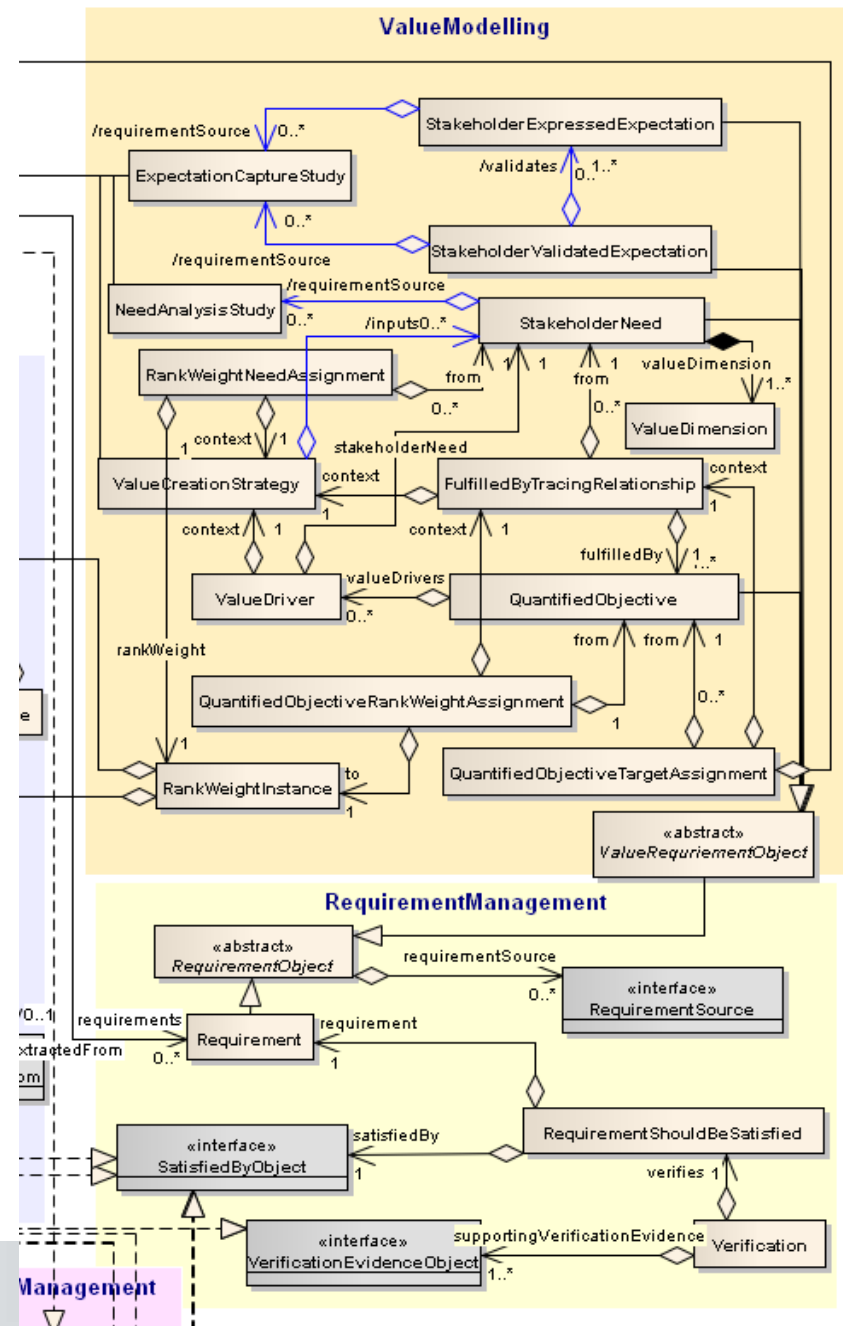


Associative Model Network [AMN]

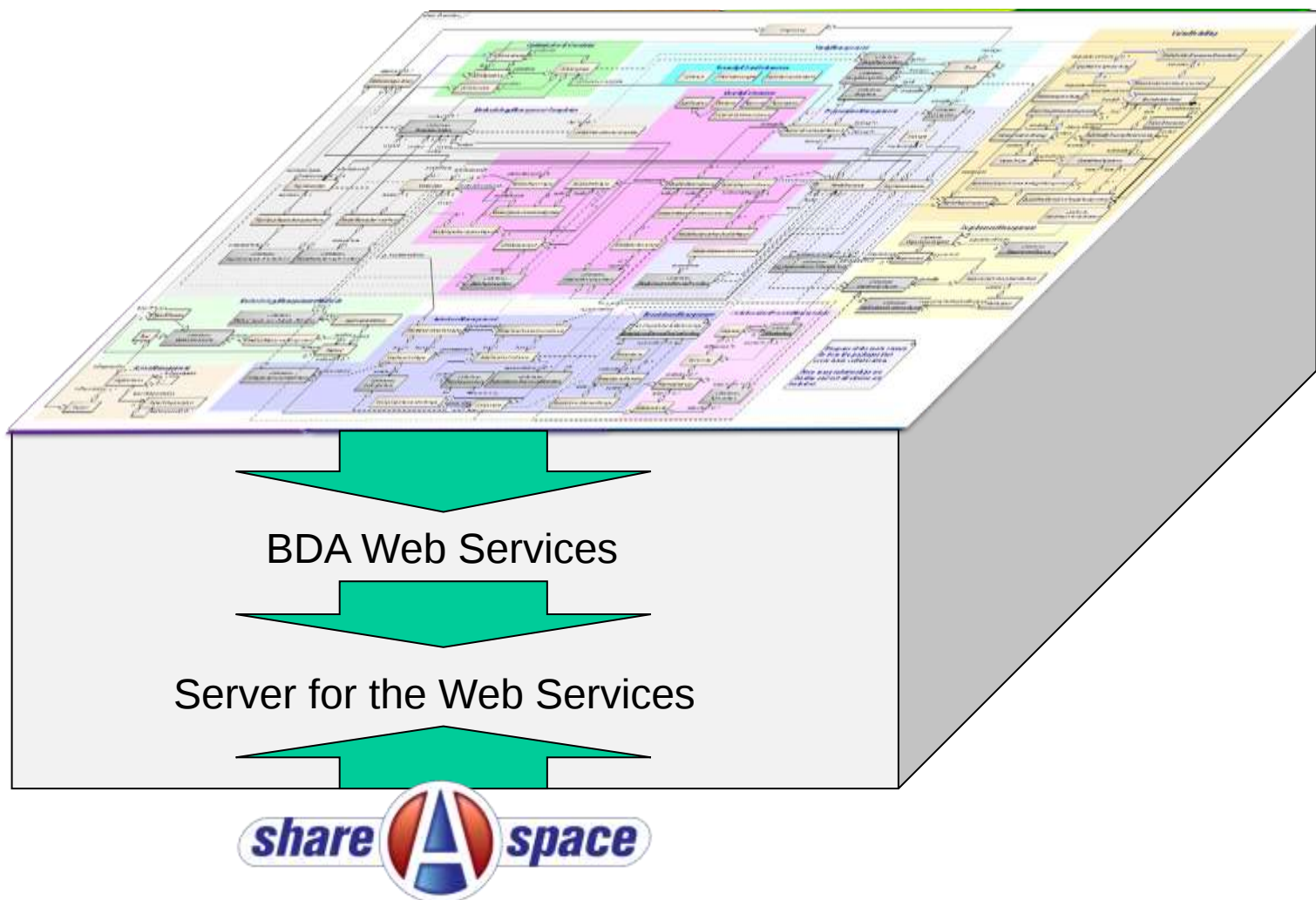
- » An Associative Model Network [AMN] is a container that identifies all the elements that together represent the set of activities and results for a study.
- » The associativity between these elements firstly represents the evolving plan of what is to be done, and finally represents the audit-trail of what has been done.
- » Each element in the AMN has an understanding of its dependencies (what it is derived from), and so together they make up a network of associative models. These allow to plan and record the "who", "what", "where", "when", "how" and "why".
- » The dependencies can link to elements outside of the AMN, so enabling proper interconnection to previous results and to systems engineering context.

Requirements

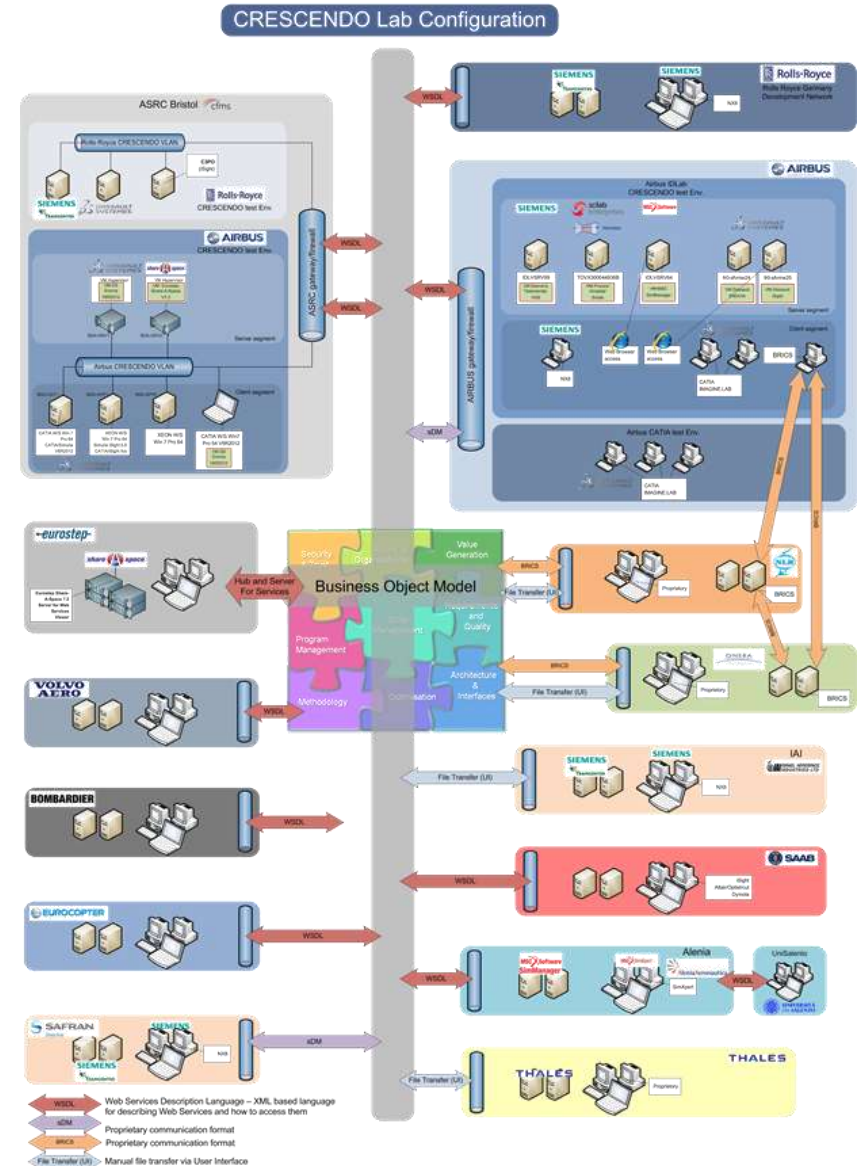
- » Requirements are 4 steps into the anticipated process
- » Requirements core model is as per AP233/239



- It all starts from the BDA Object Model:

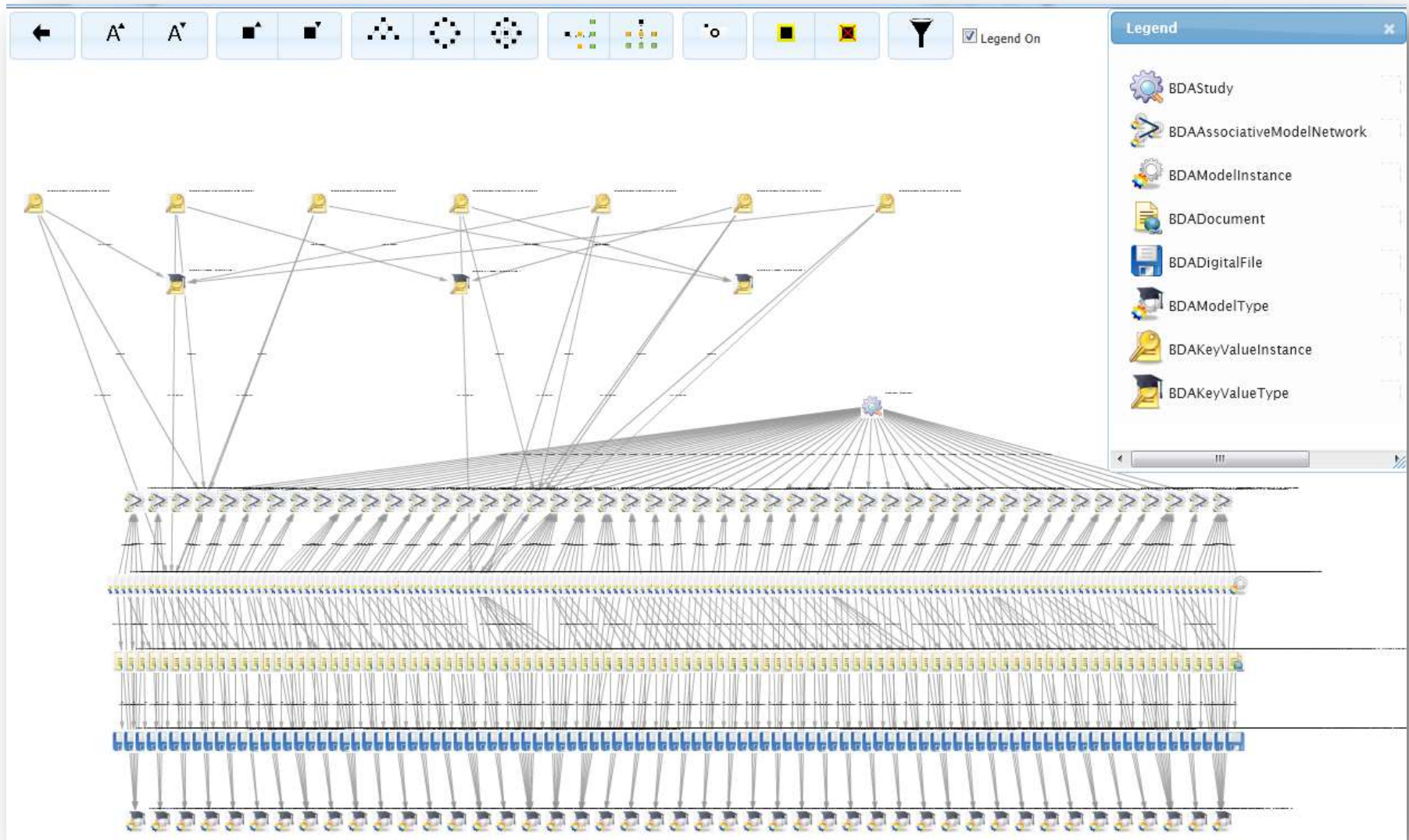


- **Outcome 1:** Now have a validated design approach for information web services based on an object model
 - Efficient and re-usable
 - Accessible to implementers
- **Outcome 2:** Validated that collaboration hub can support modelling and simulation as part of life cycle
 - Approach feasible
- **Outcome 3 (Eurostep):** Showed that Share-A-space™ can handle M+S data without need to change core model
 - Needed to add viewer





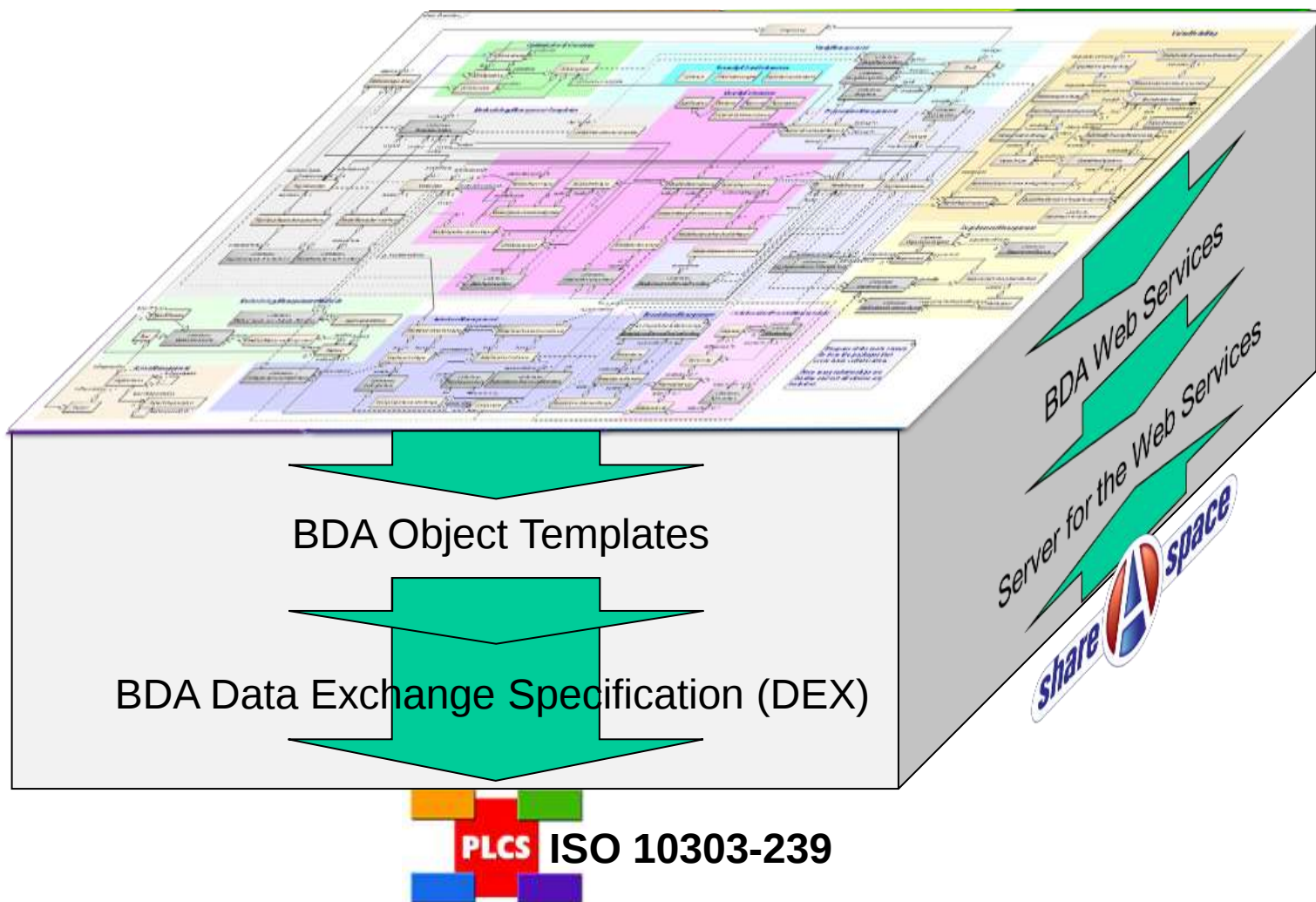
Viewer showing data created by MSC using the BDA web services



Web services

- » The following material describes the web services and how they work.
 - They are defined using a wsdl plus set of associated XMLSchema files
 - As they are defined in XML you can apply stylesheets to the definitions to get a more friendly form
- » All available on www.asd-ssg.org/asd_ssg_standards

- From the BDA Object Model:



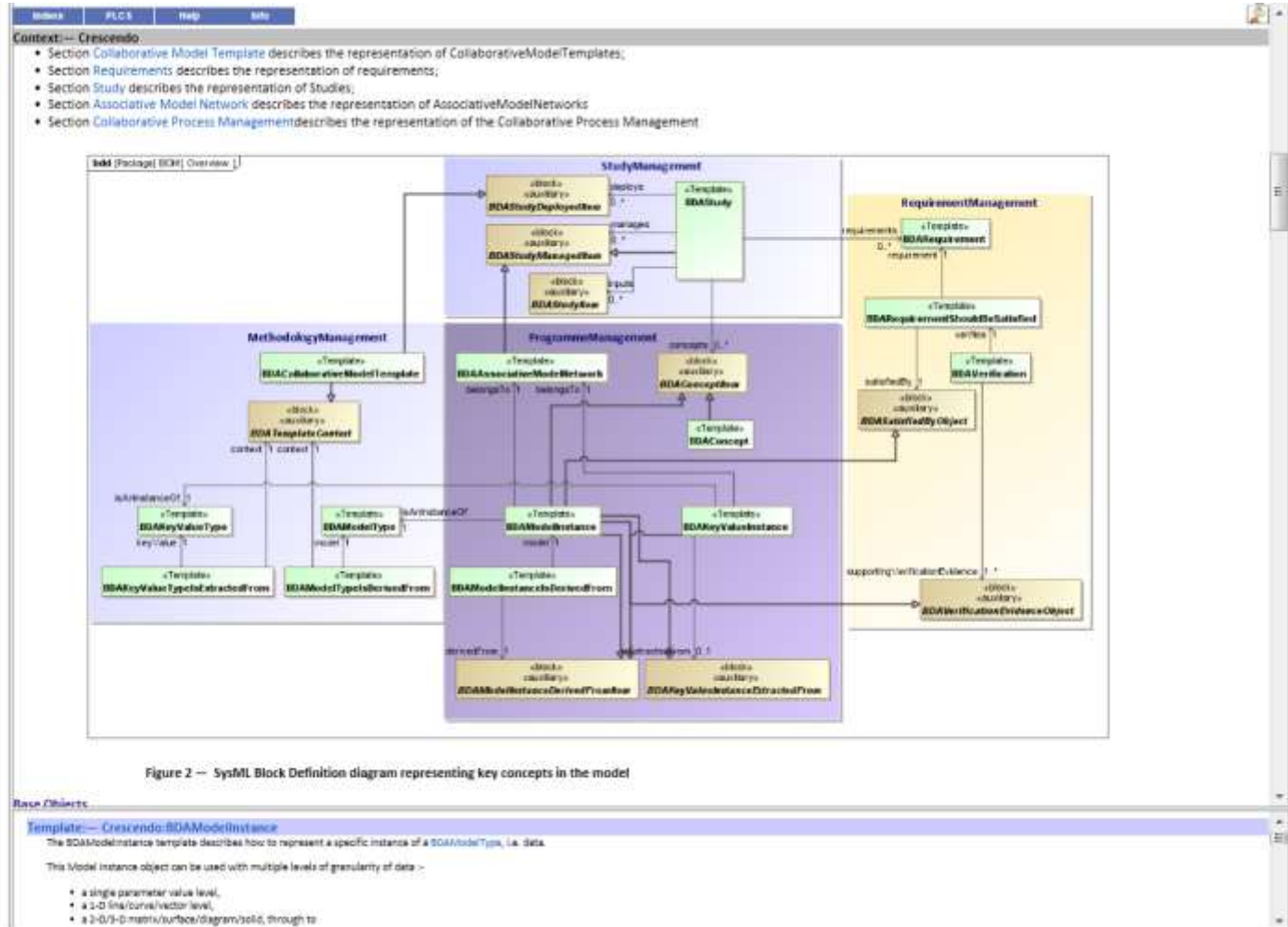


MoSSEC in PLCSlib

- PLCSlib is the SysML based environment for defining DEXs (Data Exchange Specifications)

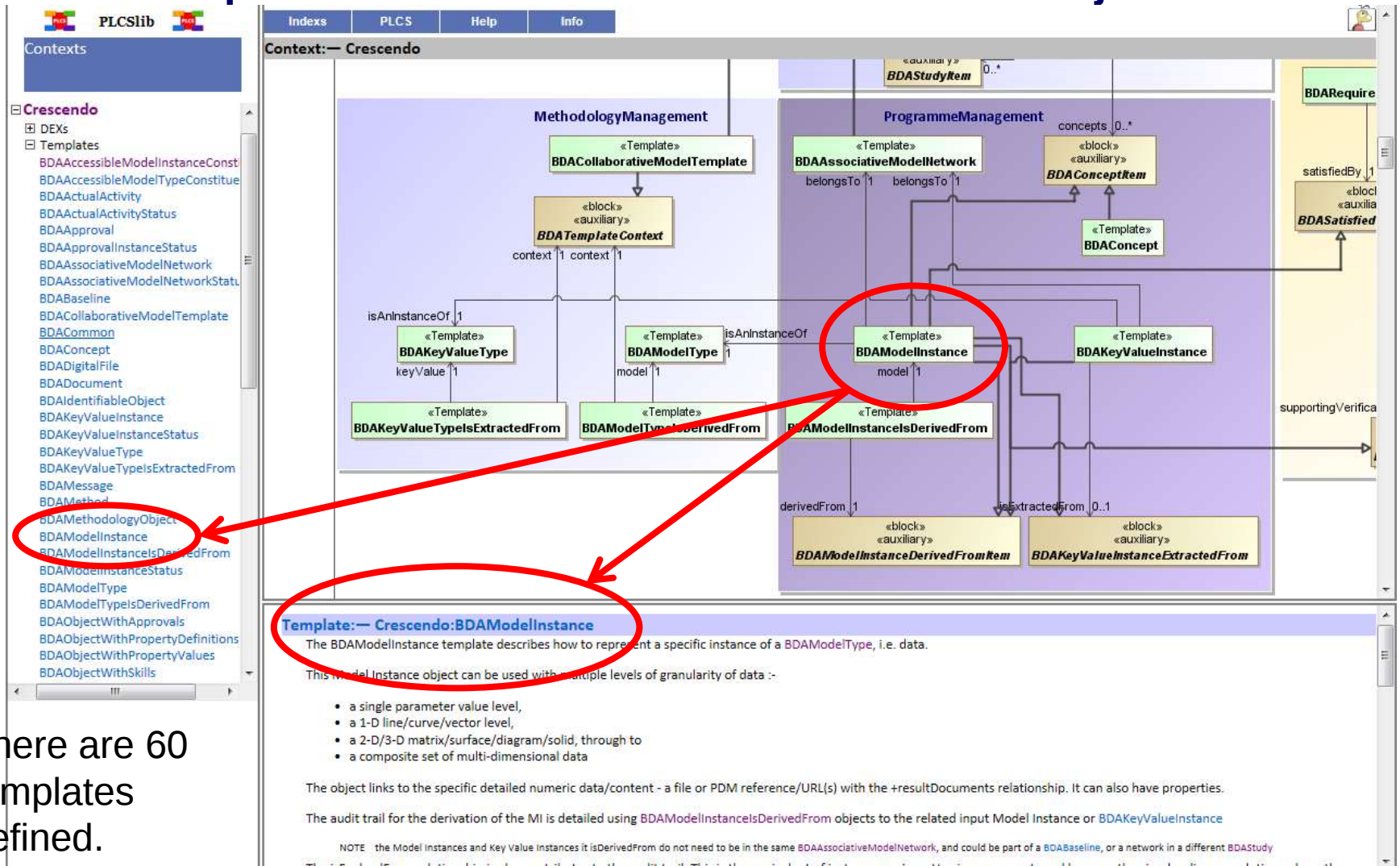
The screenshot displays the PLCSlib web application interface. The browser address bar shows the file path: `file:///D:/Eurostep/PLCSlib/plcslib/build/index.htm`. The application has a navigation menu on the left with the following items: **Contexts**, **AerospaceAndDefense**, **CRESCENDO** (selected), **DEXs**, **Templates**, **Reference Data**, **DNV**, **Exemplar**, **OASIS**, **RASSC**, and **SwedishDefence**. The main content area is titled "Context:— CRESCENDO" and features the CRESCENDO logo and the text: "Collaborative and Robust Engineering using Simulation Capability Enabling Next Design Optimisation". Below this, there is a definition of a context and a list of DEXs. The "Status" section indicates "Release 0.1 - Draft for initial CRESCENDO review". The "Intellectual Property" section states: "Project co-funded by the European Commission within the Seventh Framework Programme (<http://www.crescendo-fp7.eu>). © 2012 CRESCENDO. All Rights Reserved. This software has been produced under the EC FP7 Grant Agreement 234344. This document and its contents remain the property of the beneficiaries of the CRESCENDO Consortium and may not be distributed or reproduced without the express written approval of the CRESCENDO Coordinator, Airbus Operations Ltd. CRESCENDO DEX Author: Eurostep Group AB Last modification: 2012/07/24 Support: crescendo-support@eurostep.com". The "Introduction" section states: "This context is used to collect the DEXs, templates and models developed under the CRESCENDO project." The "Business Process Model" section states: "A high level overview of the business processes that trigger the exchange of data is provided in Figure 1." A "NOTE" at the bottom states: "The process shown are high level and are intended to highlight the exchange of data across organizational boundaries. The data to be exchanged is specified by DEXs."

- The approach uses the BDA Business Object Model as its starting point



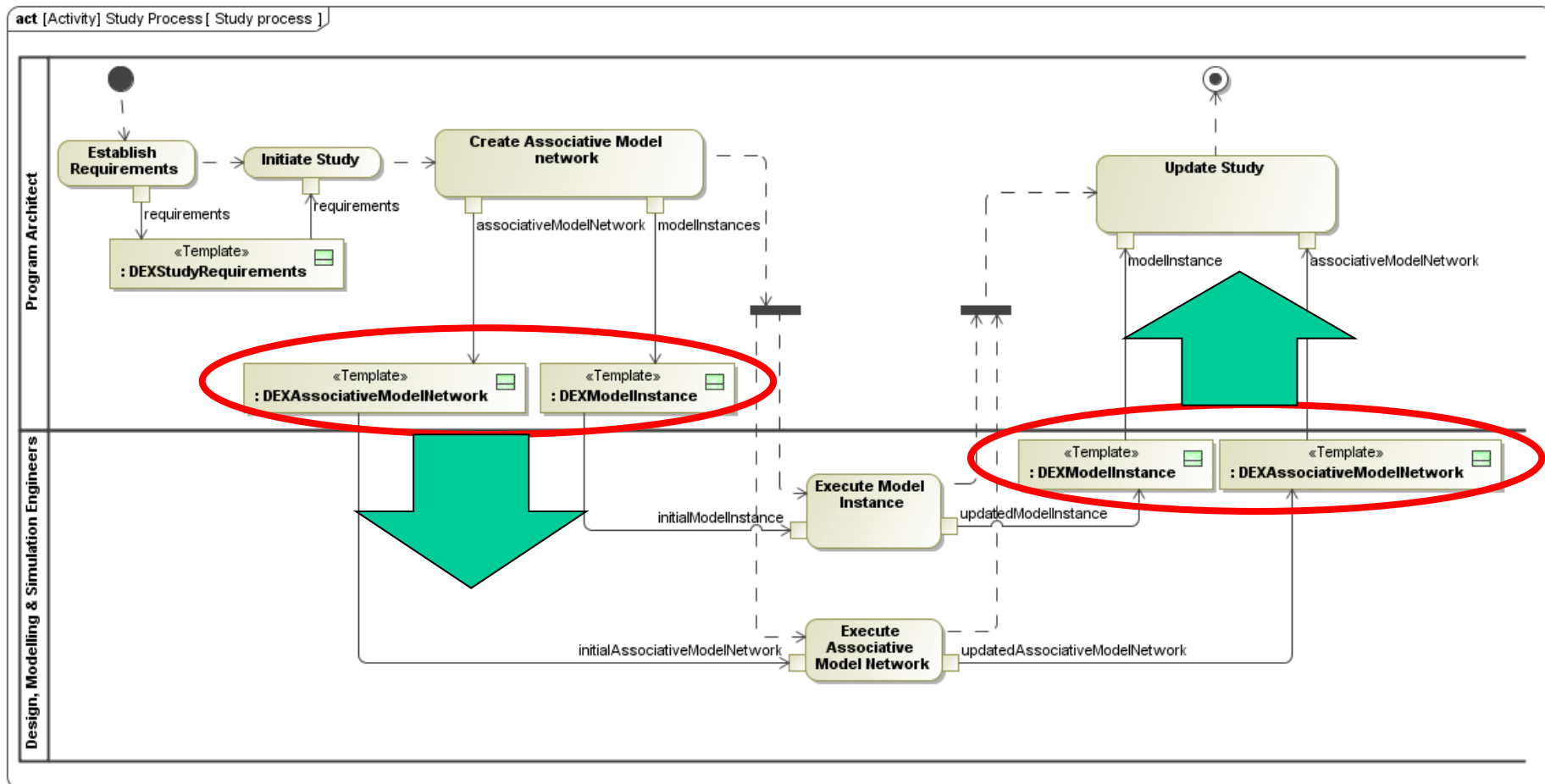
The strong use of inheritance within the BDA BOM inspired development of corresponding capabilities within PLCSlib

- One template is defined for each BDA Business Object



There are 60 templates defined.

- To enable exchanges to specify and update AssociativeModelNetworks and ModelInstances

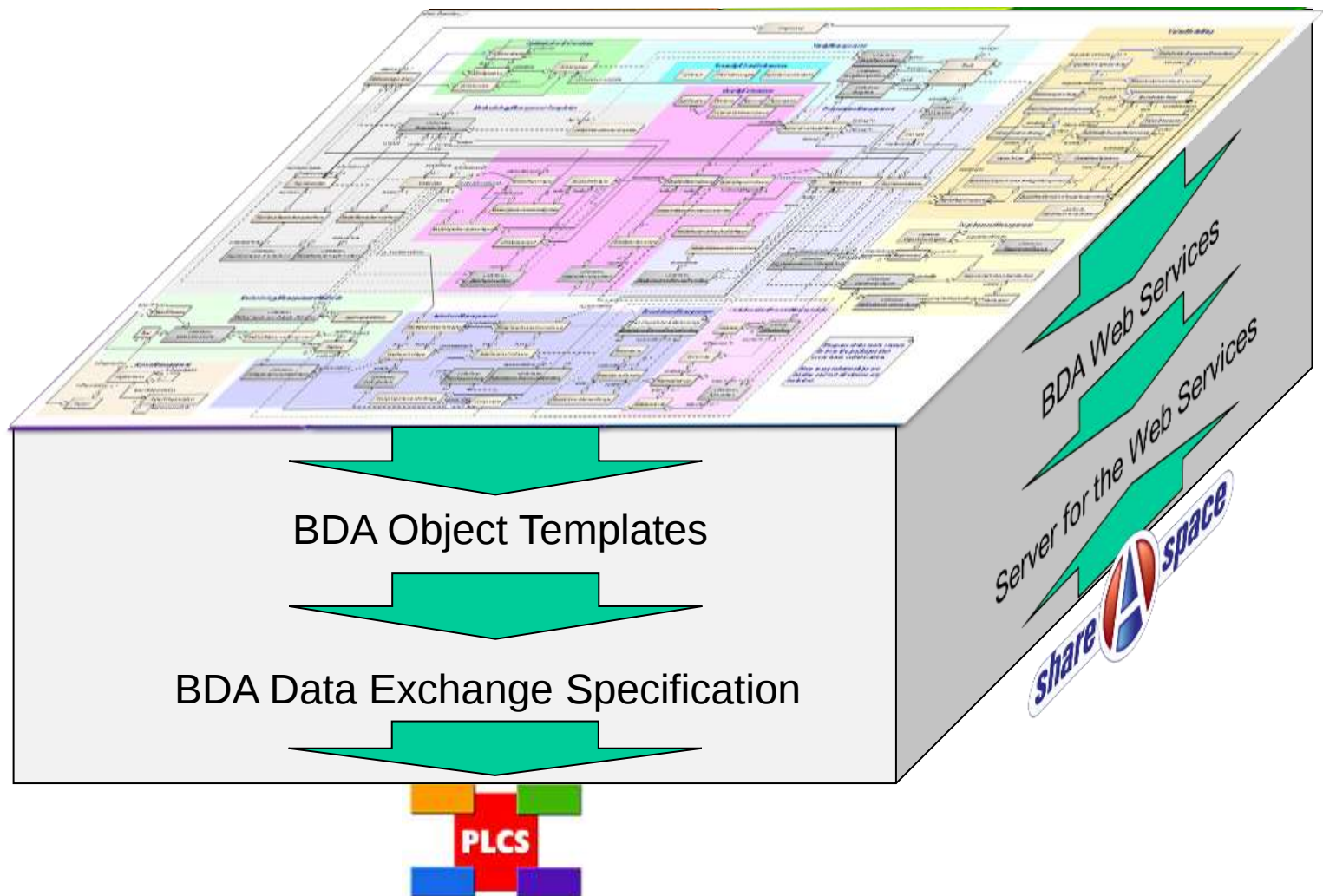




DEX development – lessons learned

- **The BDA Business objects map one to one to templates which specify the mapping to PLCS**
 - This makes the use of PLCS as an exchange/archive mechanism closely compatible with the BDA Web Services as the means to share
- **The BDA Object Model is designed to enable sharing and forces all items to exist within a defined context (such as a Study)**
 - The DEX development follows this paradigm
 - Some ability to exchange partial data or data without context may be required
- **The process of defining templates corresponding to the BDA's inheritance led to improvements to PLCSlib as it required and tested additional aspects to cleanly handle the inheritance in SysML**

- The Model driven approach has worked!



MoSSEC

- » The released material includes:
 - The BDA Object Model
 - The web services
 - The DEXs
- » Although coming from an Aerospace project it is NOT intended to be aerospace specific
- » It builds on AP239 (and AP233)
- » The follow-on projects to CRESCENDO (CONGA and TOICA) have agreed to keep all MoSSEC related material open
- » Airbus and others are keen to have other parties, e.g SAVI, involved