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ARCADIA: Model-Based Collaboration for System, Software and Hardware Engineering

An architecture-centric, tool-supported method

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CSD&M 2013

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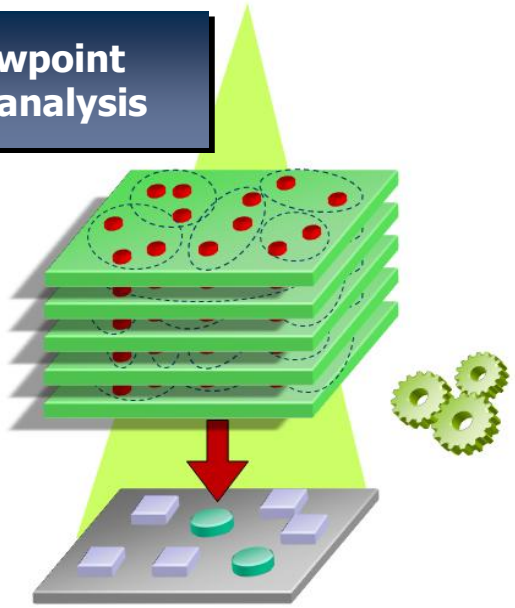
Agenda

1. Essentials of the Arcadia method
2. Arcadia-dedicated modeling workbench
3. Return on experiment

Requirements for a Scalable and Adaptable Method

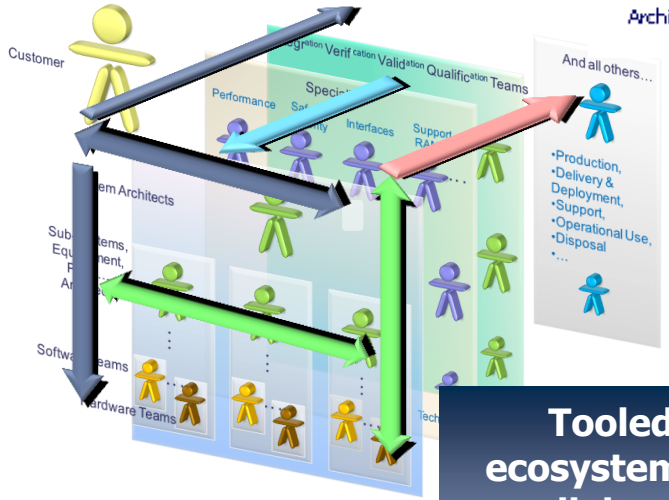
Early validation in short decision loop

Multi-viewpoint trade-off analysis

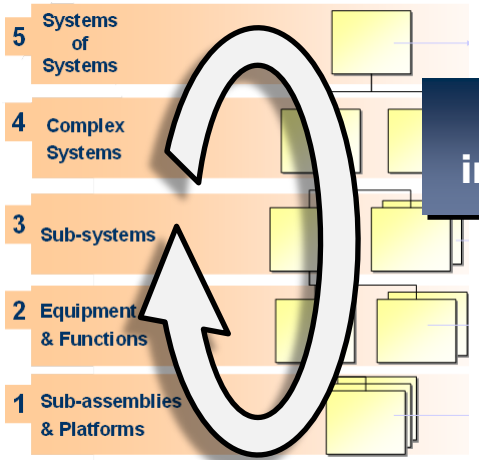


He **d**
flexil **ring?**

ARCADIA
Architecture Analysis & Design Integrated Approach



Tooled-up ecosystem-wide collaboration



Multi-level impact analysis

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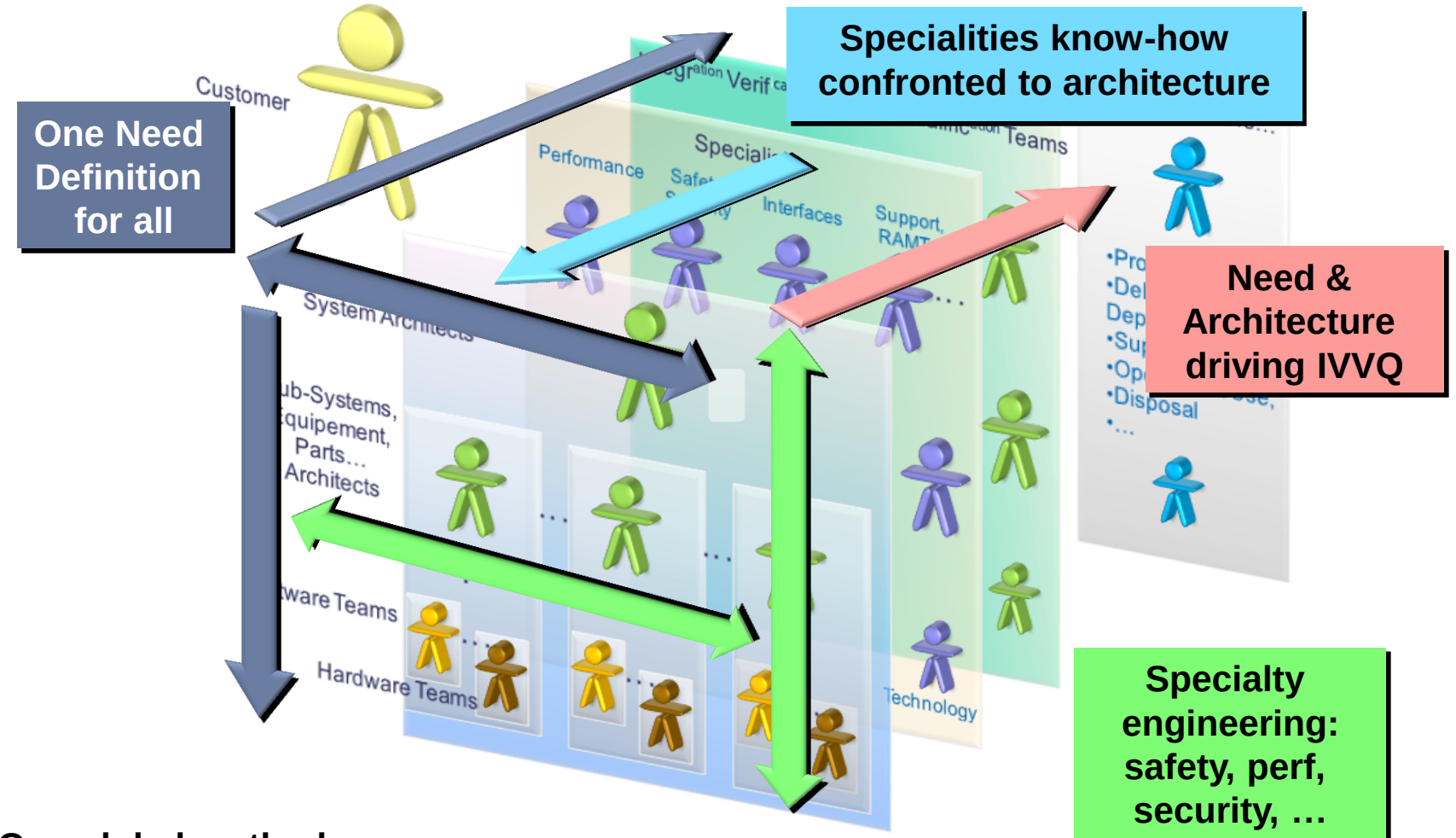
ARCADIA Goals & Action Means



One global method,
adaptable/adapted to each domain

Efficiently support and secure the engineering collaboration

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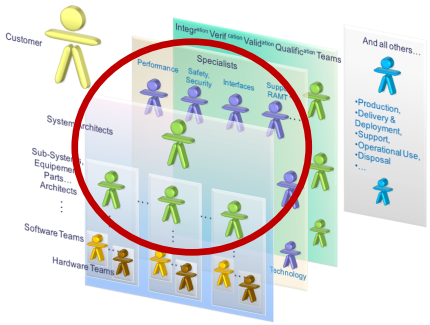
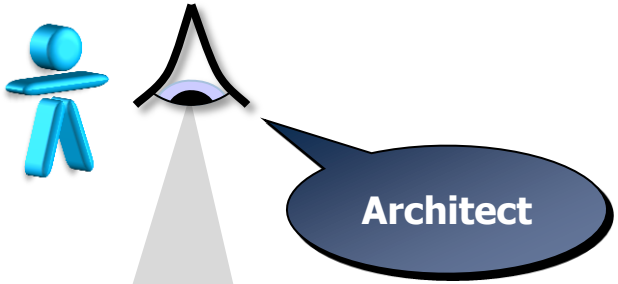
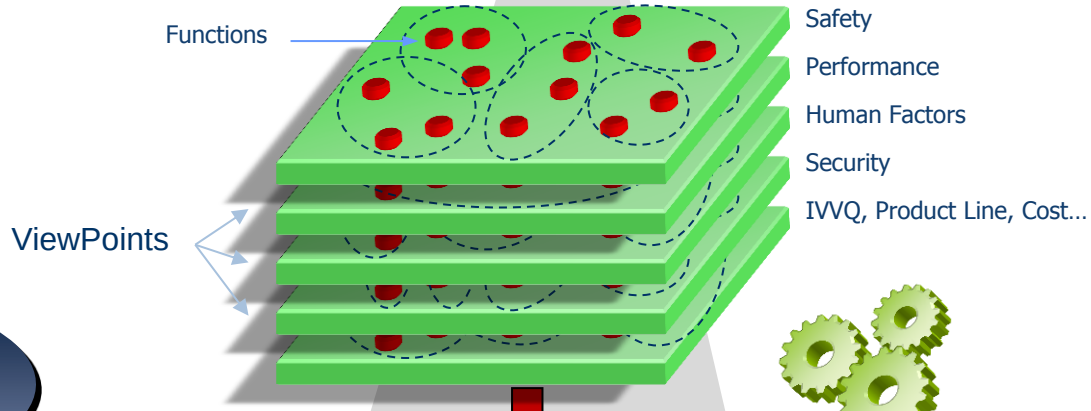
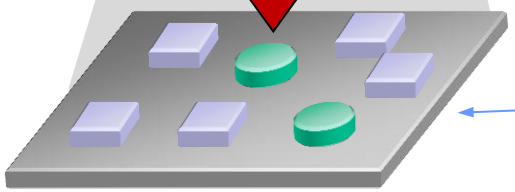
Early Validation: Specialties Know-How Confronted to Architecture









Multi-viewpoint trade-off analysis (see ISO 42010 standard)

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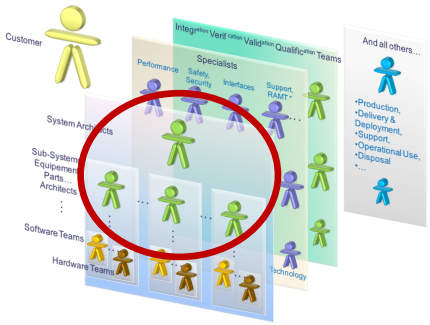
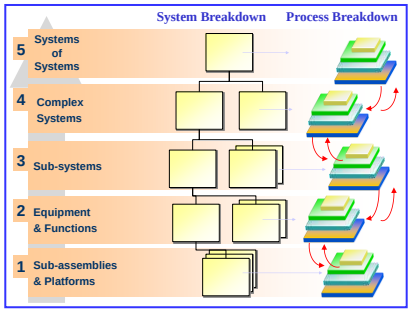
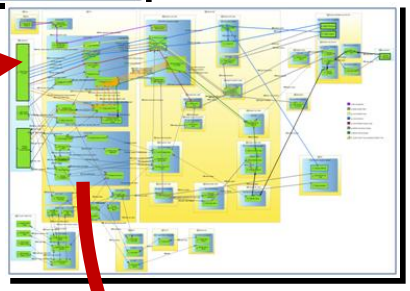
Mastering Complexity through Multiple Abstraction Levels



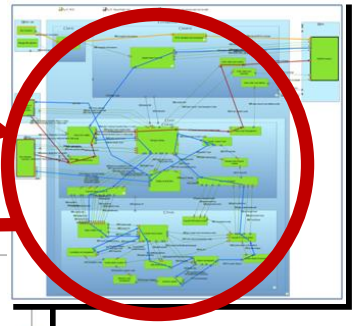


System Engineering

Sub-Systems Engineering



Software/Hardware Engineering



Maintaining consistency across engineering phases

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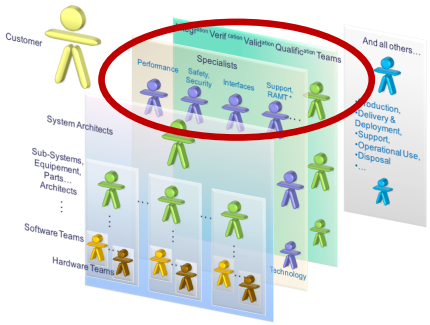
Using ARCADIA Engineering Models to Drive IVVQ



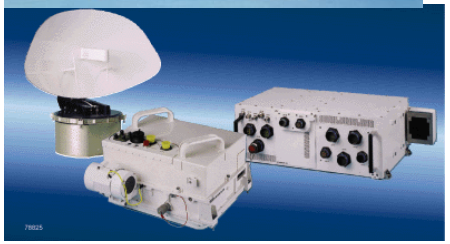
Define IVV Strategy

Focus on Functional Content and Architecture

Operational Need, Functional Contents

Master Development Ups and Downs

ARCADIA
Architecture Analysis & Design Integrated Approach



System Components

Control Maturity of Deliveries

Optimize IVVQ Globally
(incl. Enabling Systems / Test Means)

Test Benches

Mission System
Radar
Receiver
Software/HW

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Agenda

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Method-Supporting Tool: A Key Enabler

Manage Information Complexity

- Automatic synthesis, simplification on diagrams, modelling aids
- Modularity (viewpoints and transitions)
- Separation of concerns through viewpoints and diagram layers

Ease Capitalization

- Concepts
- Engineering rules
- Architectural assets
- Centralize information managed by specialized tools

Manage a Common Reference Model

- Configuration management
- Collaboration between stakeholders (multi-user access on a shared model)
- Coupling with change management, test environments, documentation generation, etc.

Arcadia-supporting tools are crucial for the best benefit of the method

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Rationale for an Arcadia-Dedicated Workbench

Several Alternatives

- Arcadia method is tool-agnostic
- Tooling can be minimal… or sophisticated
- Profiling UML/SysML would be a natural option

Thales previous experiences with UML Profiling

- Poor adoption by system engineers
- Meta-models constrained by UML concepts
- Representations constrained by existing UML diagrams

Development of a dedicated workbench (DSL)

- Freedom both in language and representation
- Close to UML/SysML, interoperable with MODAF-like Architecture Frameworks
- Extensible in many ways for domain-specific purposes (Sirius / Eclipse EMF foundations)

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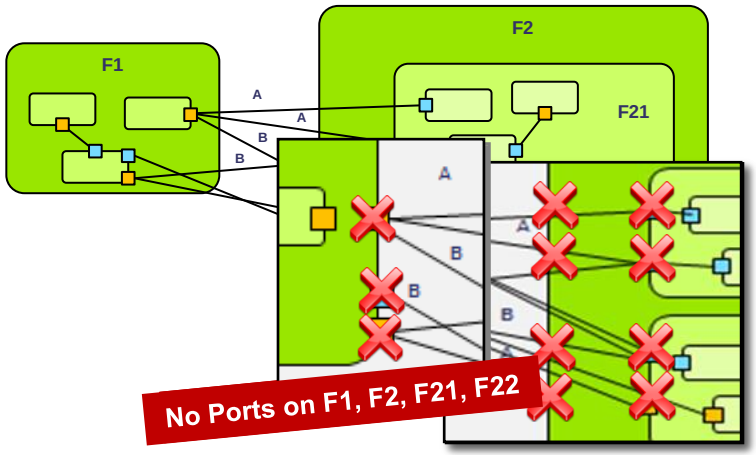
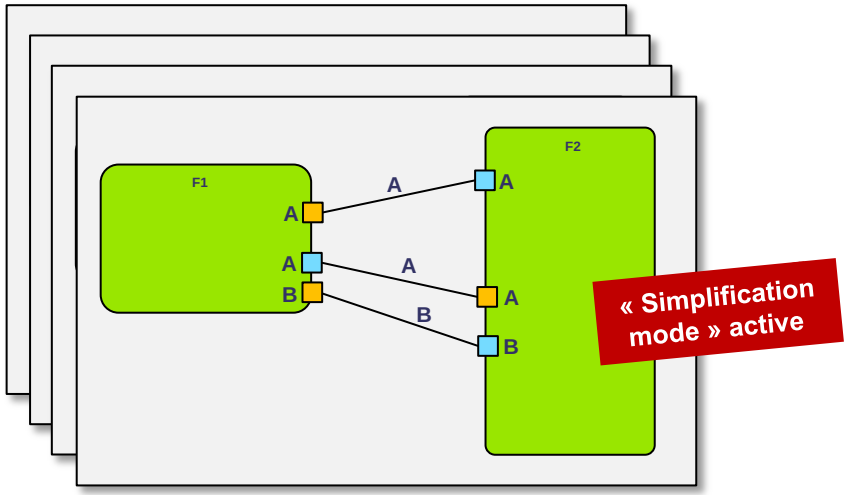
Focus on Two Keys of the Arcadia Modeling Workbench

Hiding complexity: Model ≠ Representations

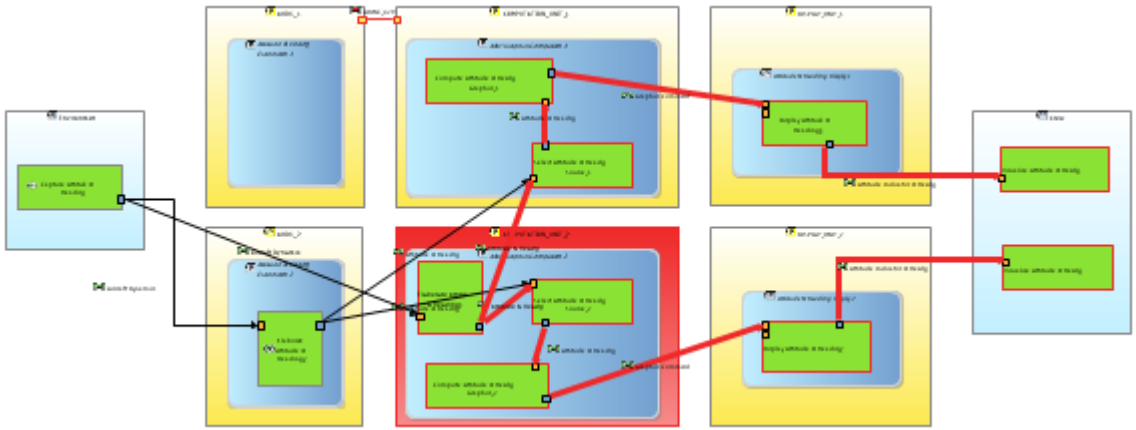
Actual Model Content



Graphical Representations



Layered / filtered diagrams for viewpoint visualization



System Architecture

Safety Viewpoint

Resource Viewpoint

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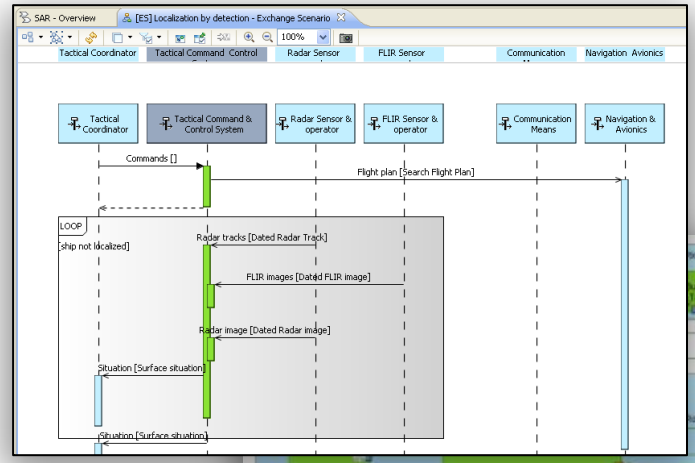
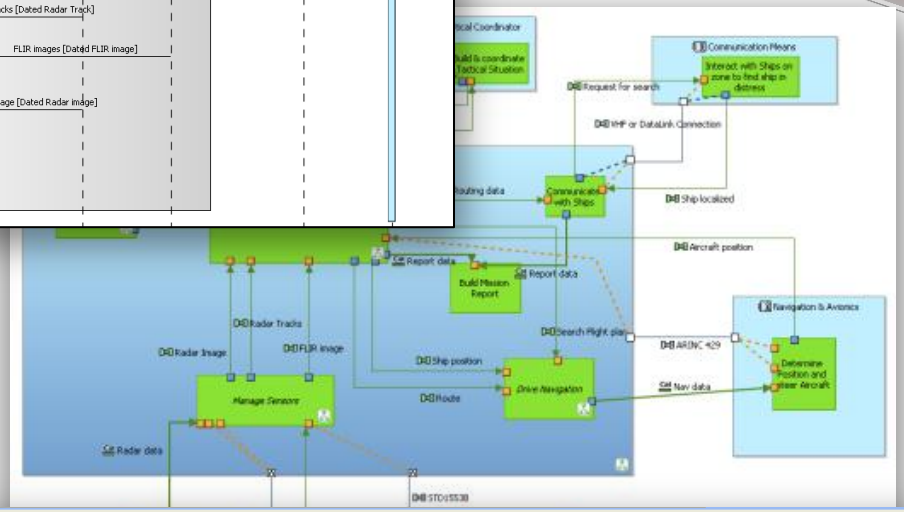
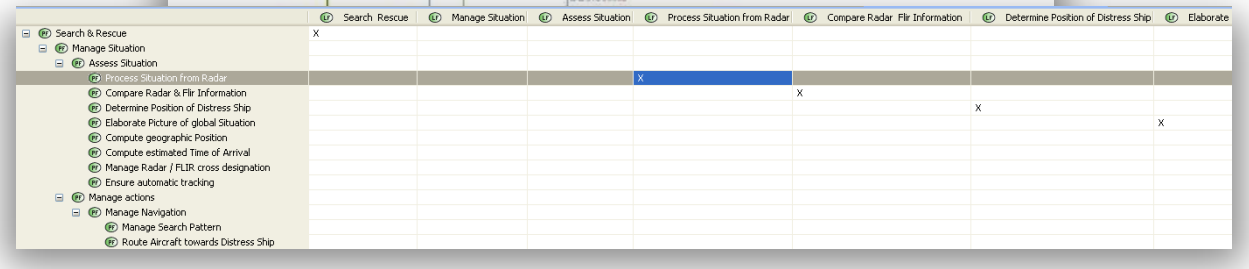
Overview of the Modeling Workbench Main Features







Edition Tools

Layered diagrams,
Tables, Editors

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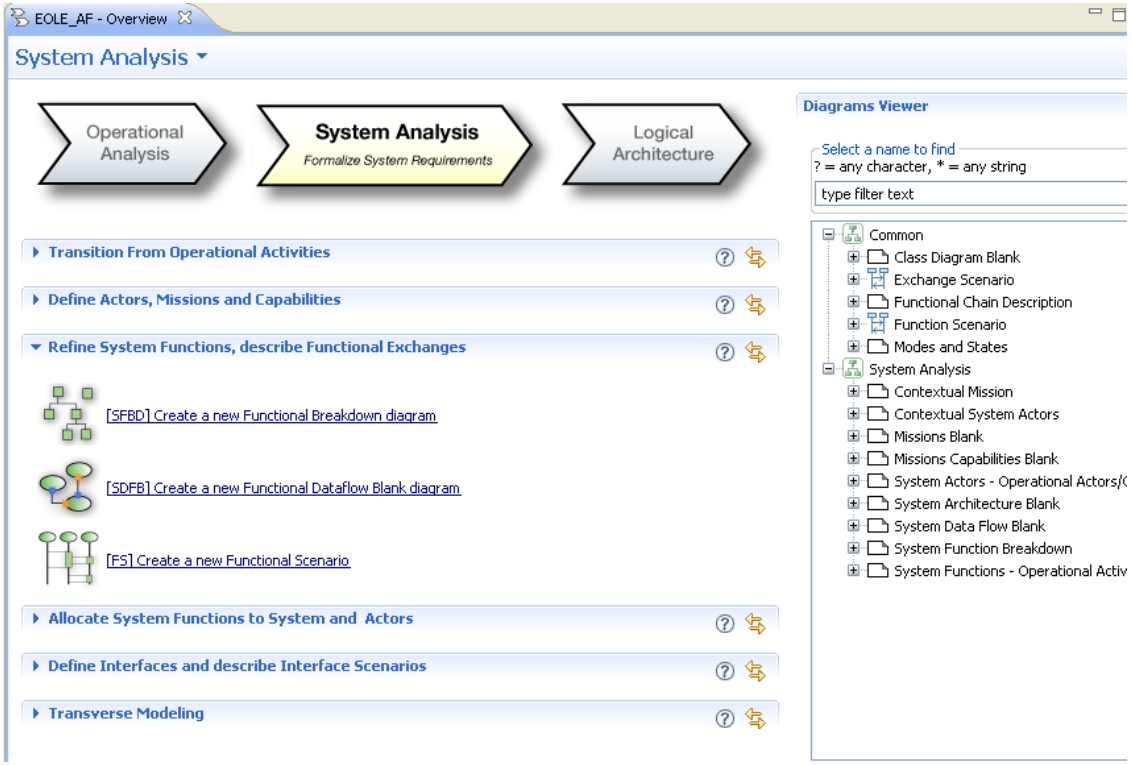
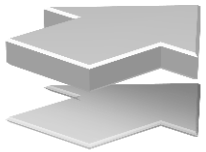
Overview of the Modeling Workbench Main Features





Edition Tools
Layered diagrams,
Tables, Editors

Embedded Methodological Guide

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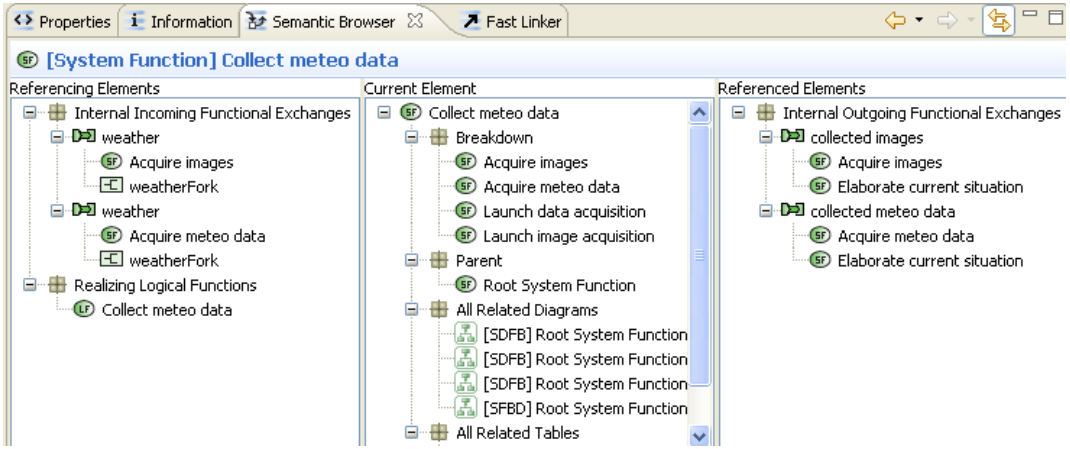
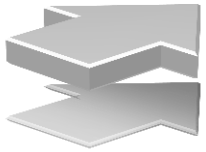
Overview of the Modeling Workbench Main Features





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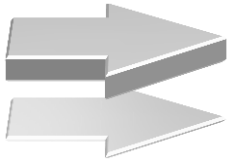

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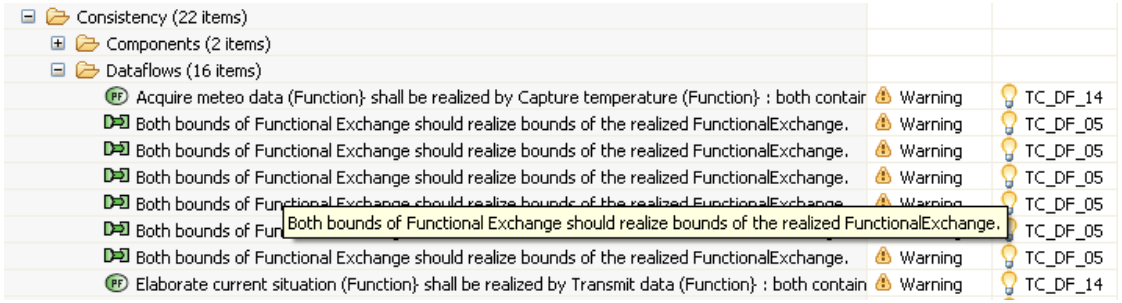

Model Analysis
Semantic browser,
Model check, Etc.

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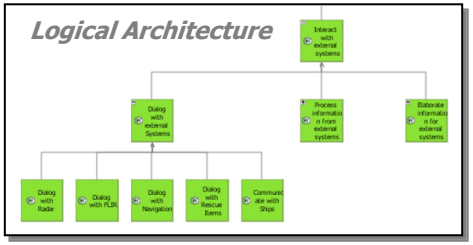

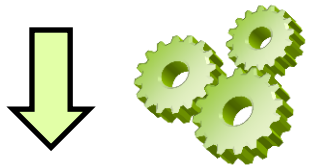

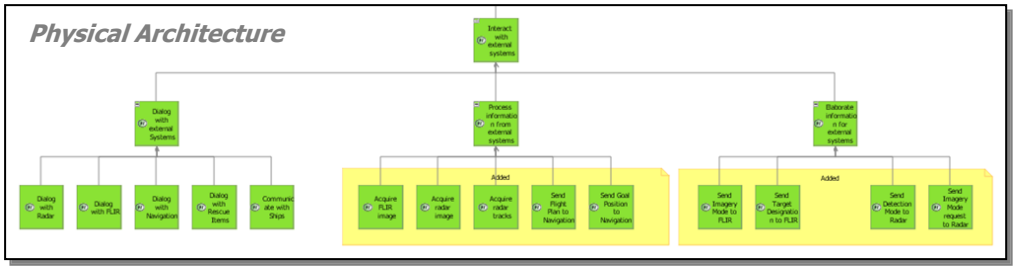

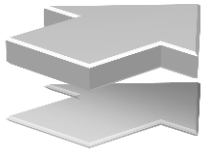

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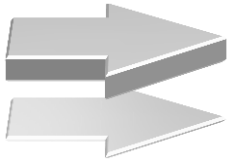

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Model Analysis
Semantic browser,
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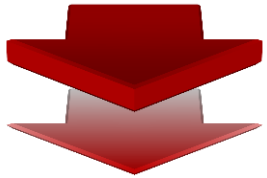

Iterative Transition Tools
Traceability, Generation

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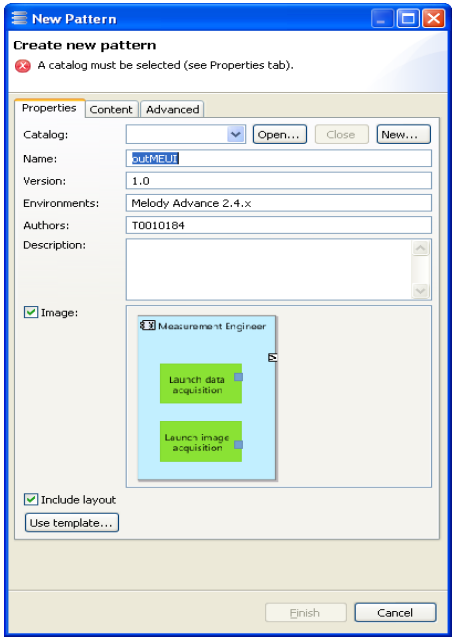
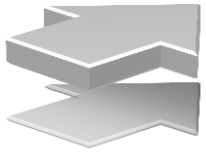
Overview of the Modeling Workbench Main Features





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Layered diagrams,
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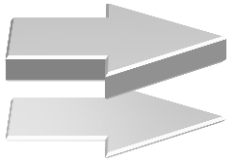

Embedded Methodological Guide

Modularity & Reuse
Librairies, Patterns,
Etc.

Model Analysis
Semantic browser,
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Iterative Transition Tools
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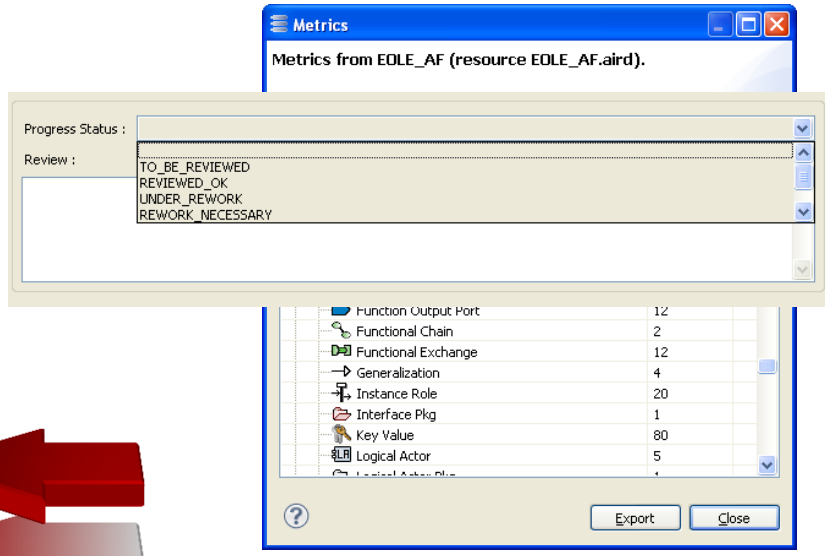
Overview of the Modeling Workbench Main Features



Edition Tools
Layered diagrams, Tables, Editors

Model Monitoring
Progress, metrics

Embedded Methodological Guide

Modularity & Reuse
Librairies, Patterns, Etc.

Iterative Transition Tools
Traceability, Generation

Model Analysis
Semantic browser, Model check, Etc.

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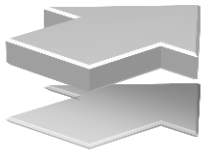
Overview of the Modeling Workbench Main Features

Extensibility
New diagrams, new layers, M2 extensions, Etc.

Edition Tools
Layered diagrams, Tables, Editors



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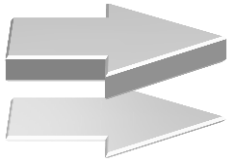

Embedded Methodological Guide

Modularity & Reuse
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Quick demonstration!

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Proven Benefits

- A strong lever for engineering transformation
- Field-proven in real industrial situations
- Leading to a better mastering of products, costs and cycles
- Improving architecture quality and sharing as well as IVV mastering

Deployed or under adoption in various Thales divisions, including industrial partnerships

Operational Deployment within Thales

Critical Information Systems

- Ground Exploitation Systems
- Command & Control (air, sea, railways…)
- Large secured Communication Networks…
- Satellite Control Networked Ground Stations

Embedded Systems

- Combat Systems (Radar, Self Protection, Optronics…)
- Mission Systems (Air, Sea, Ground)
- Satellite Constellations
- Avionics Suites
- Computing Systems
- Electrical Power Systems
- Thermal Cooling Systems
- Railways signalling Systems






Engineers trained per year

Daily users

50+ Projects

500+ Diagrams / Models

1000+ Nodes / Diagrams

200,000+ Model Elements

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Thank you for your attention!

Any Questions?