A Model for retrofit projects

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- Systems engineer in the infrastructure and industrial domain
- Focus on Model Based (Systems) Engineering
- Jan.de.liefde@thecollective.si

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Some definitions

Retrofit:

- to modify equipment (in airplanes, automobiles, a factory, etc.) that is already in service using parts developed or made available after the time of original manufacture.
- (of new or modified parts, equipment, etc.) to fit into or onto existing equipment.
- to replace existing parts, equipment, etc., with updated parts or systems.

Source: Internet

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Issues

- Systems (or parts of it) are end of life
- People with knowledge of the processes/systems are retiring
- Documentation is outdated/incomplete
- Performance requirements

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- “Goals” of the model:
  - The Model act as a “single source of thruth” for
    - Engineering
    - Maintenance
    - Testers
    - Asset management
    - Etc.
  - The Model act as a knowledge base for:
    - Maintenance
    - Asset management
    - Engineering
    - Testers
    - Operators
    - Project management
    - Etc.

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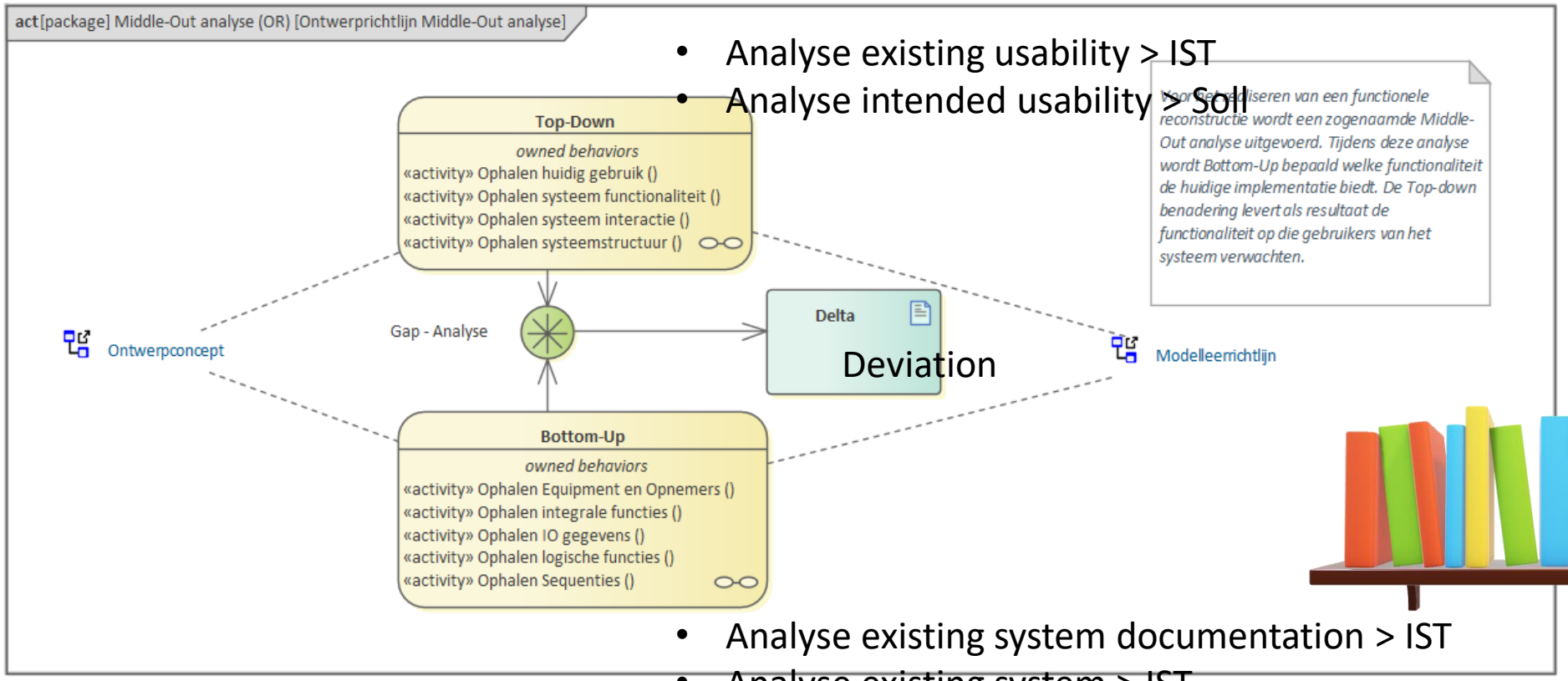
Middle-Out analyse > “Ist/Soll”



- Analyse existing usability > IST
- Analyse intended usability > Soll

- Analyse existing system documentation > IST
- Analyse existing system > IST

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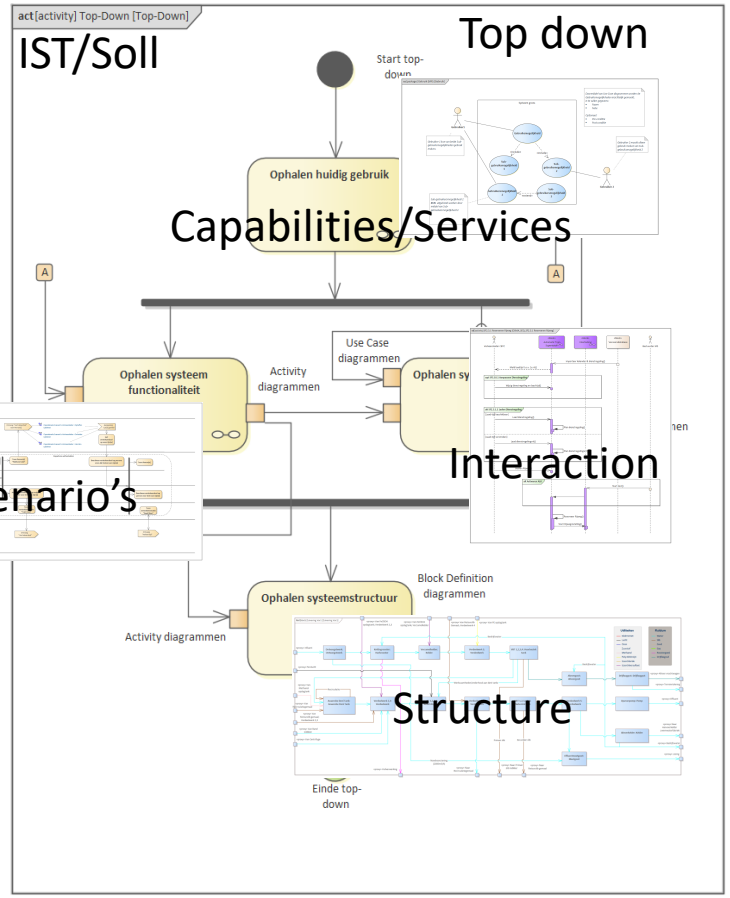
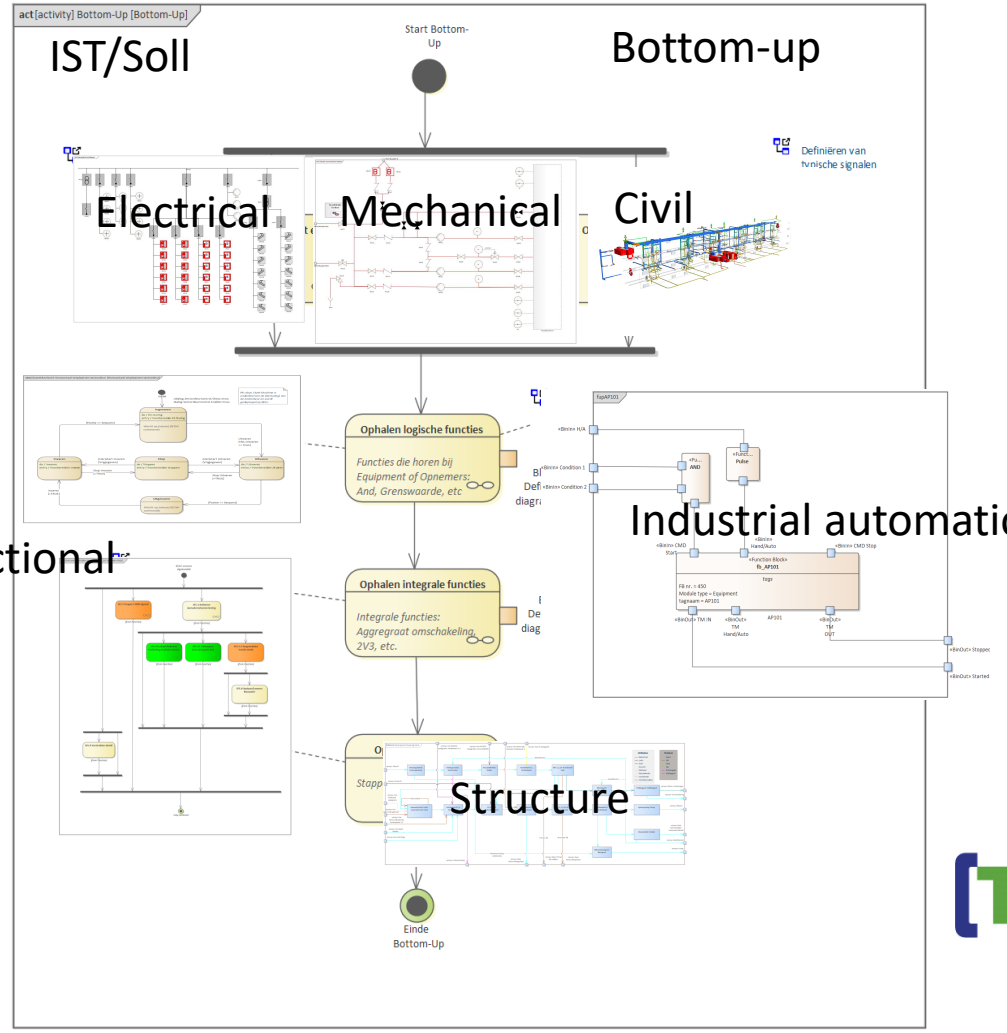
Middle-out analysis: Process





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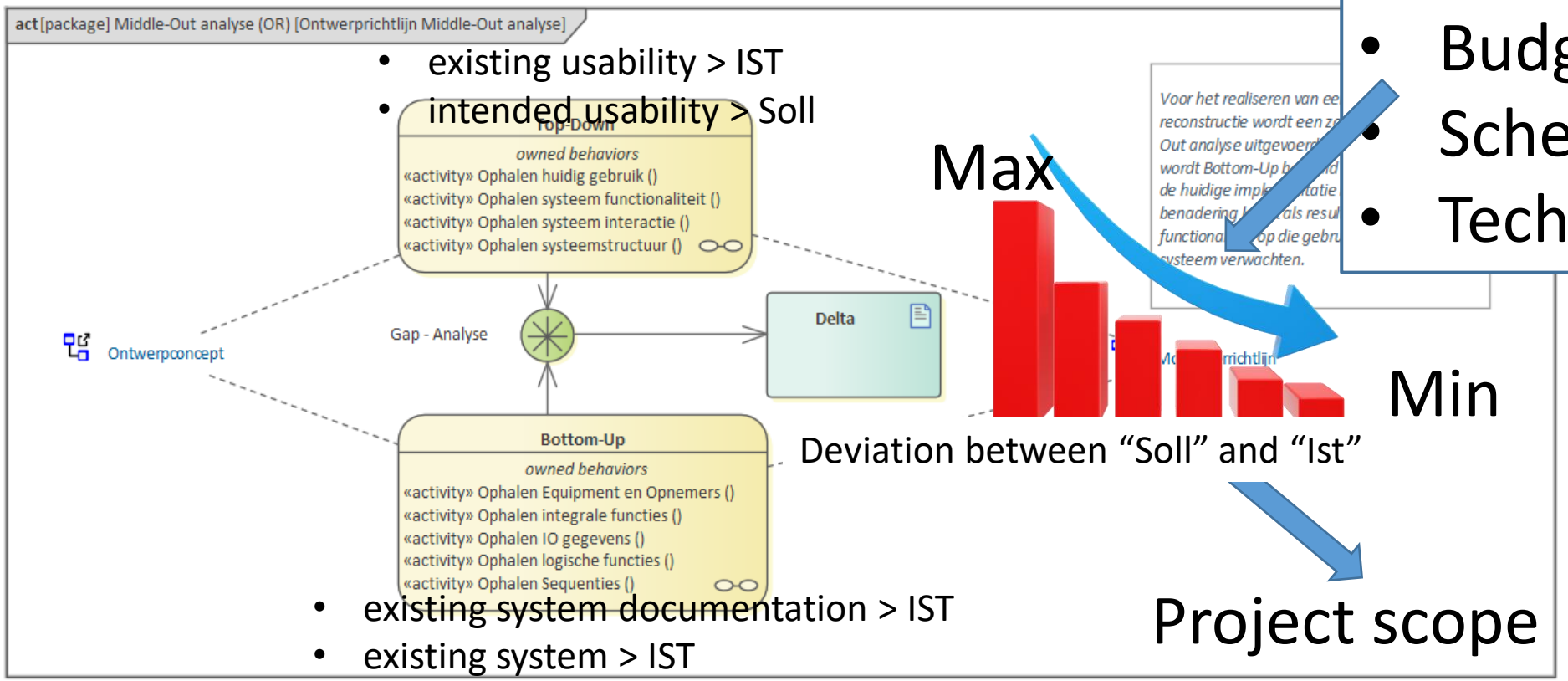
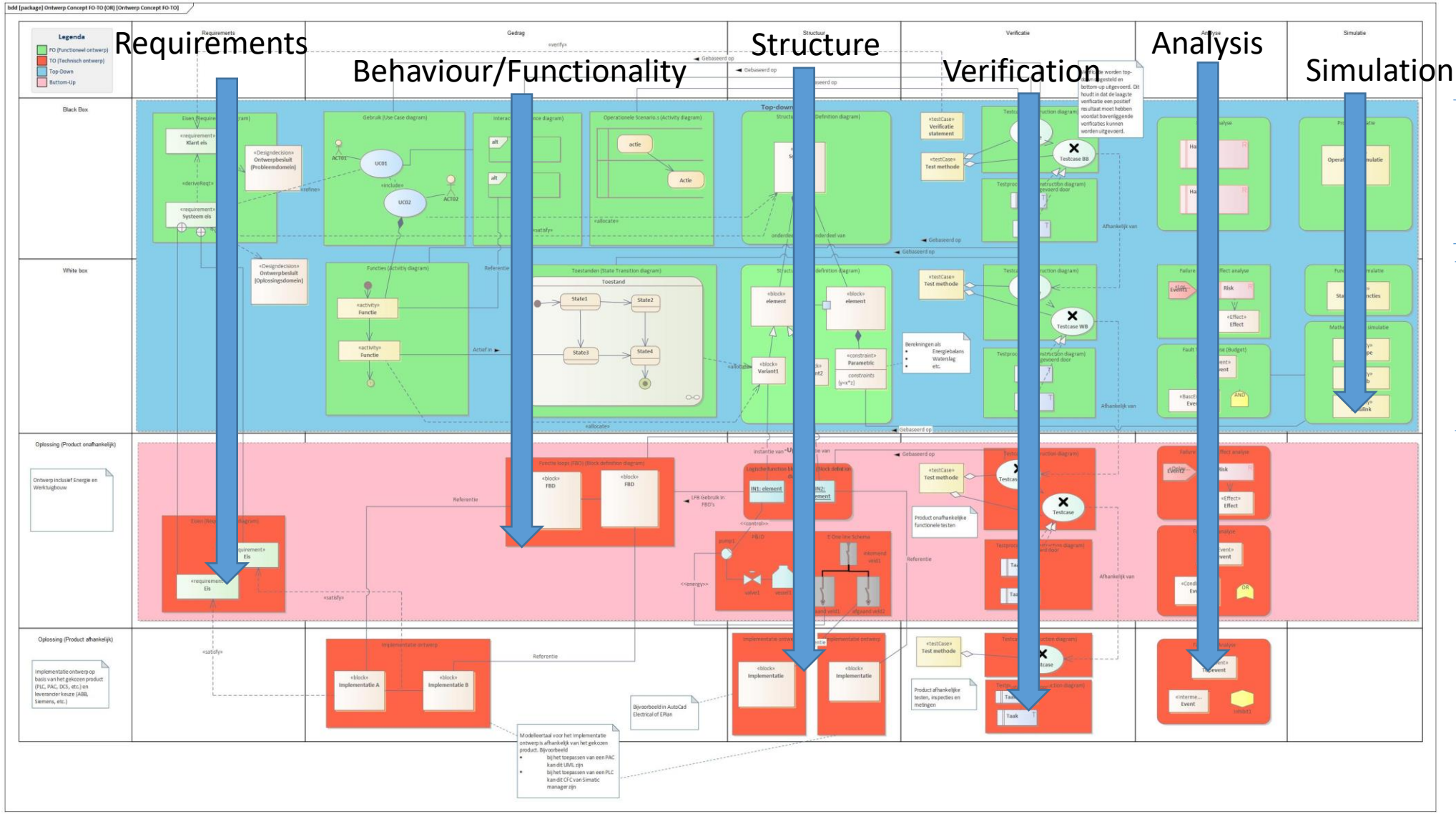
Middle-Out analyse: Project scope



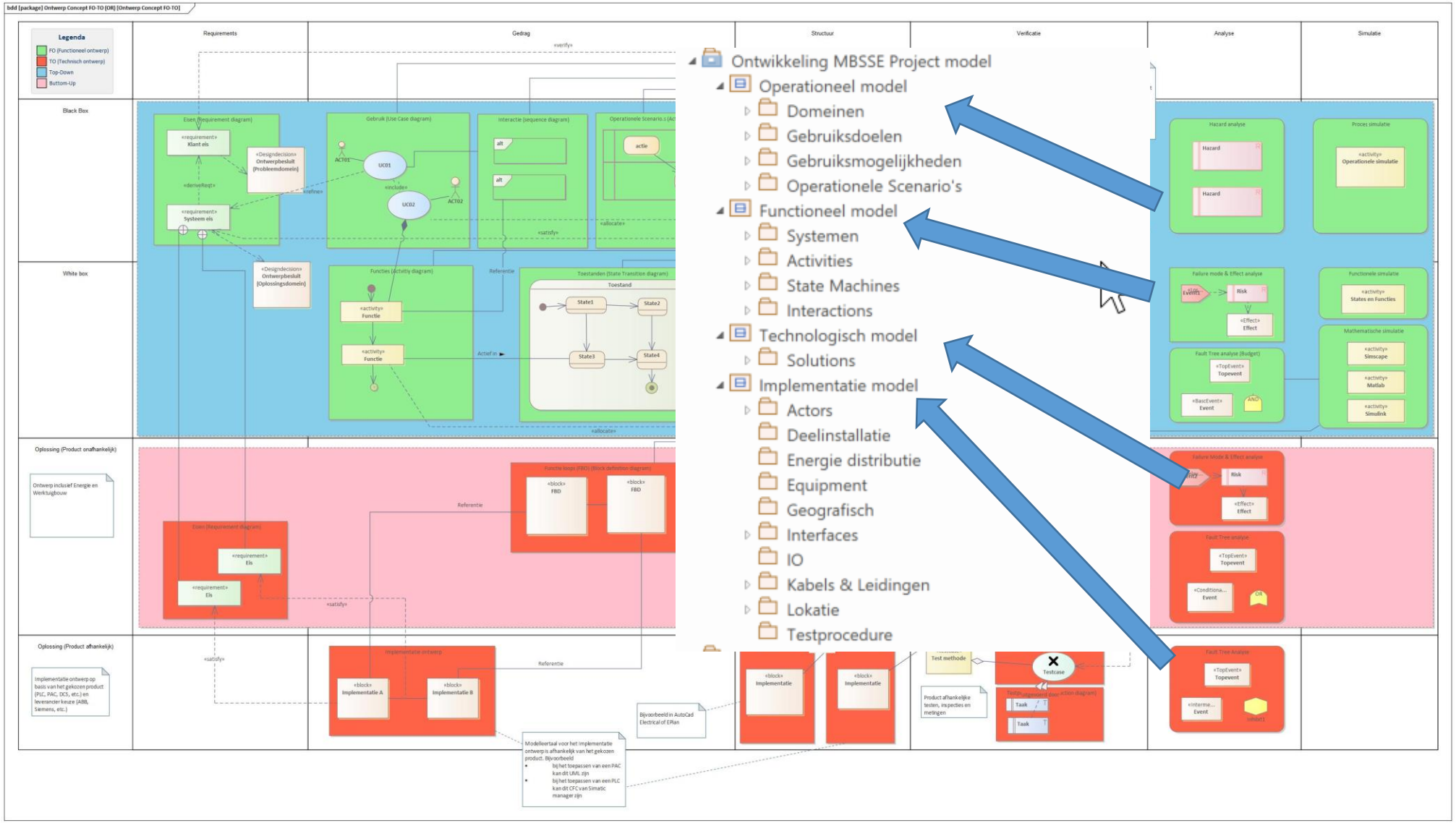
Criteria:

- Performance
- Budget
- Schedule
- Technology

Analysis/Design concept



Model structure



Operational analysis
Ist/soll

Functional analysis
Ist/soll

Technology analysis
Ist/soll

Configuration analysis
Ist/soll

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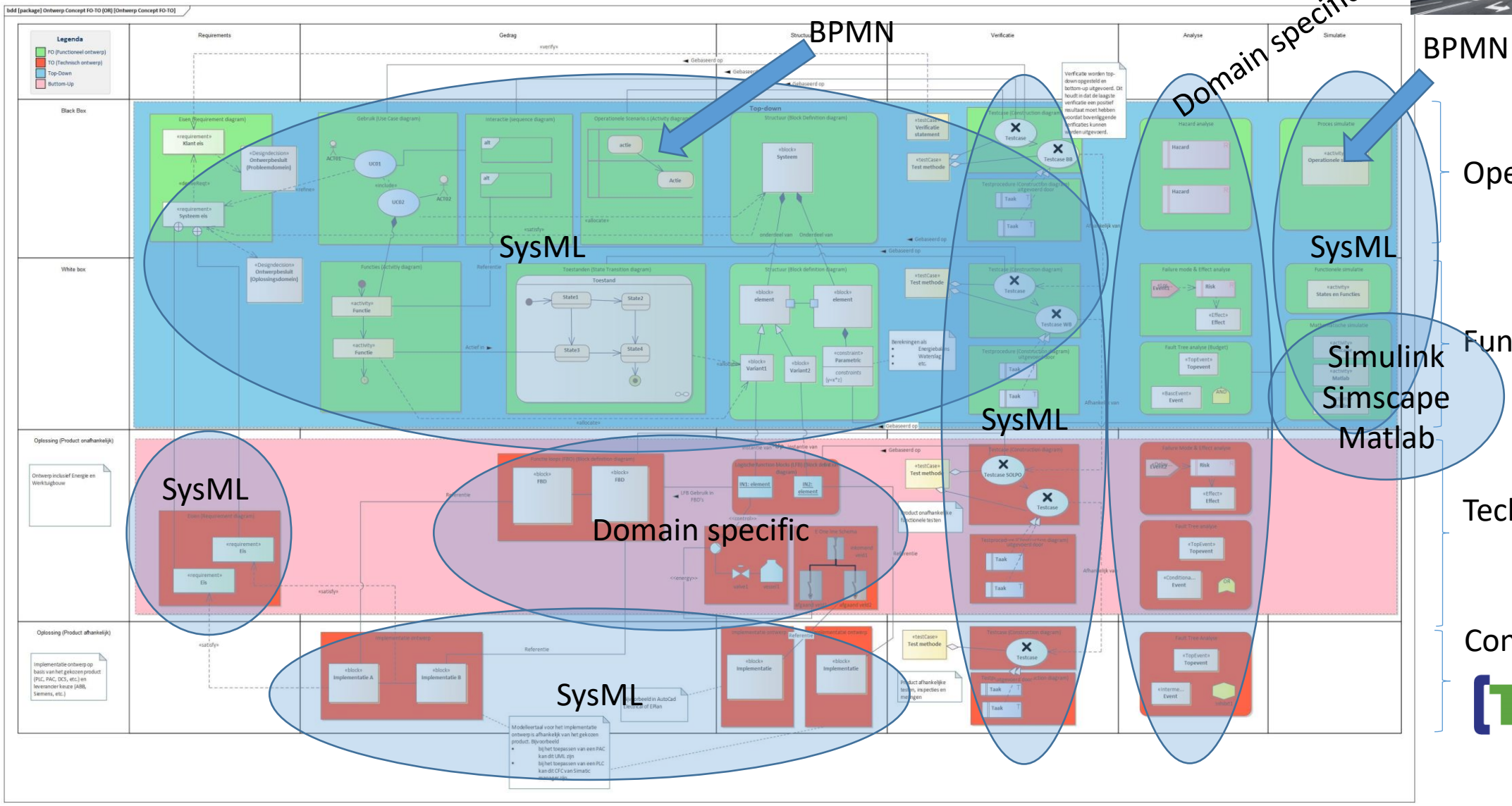
Modeling languages



Traceability

BPMN

BPMN

Traceability

Traceability

SysML

SysML

SysML

Simulink
Simscape
Matlab

Operational analysis
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Functional analysis
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Technology analysis
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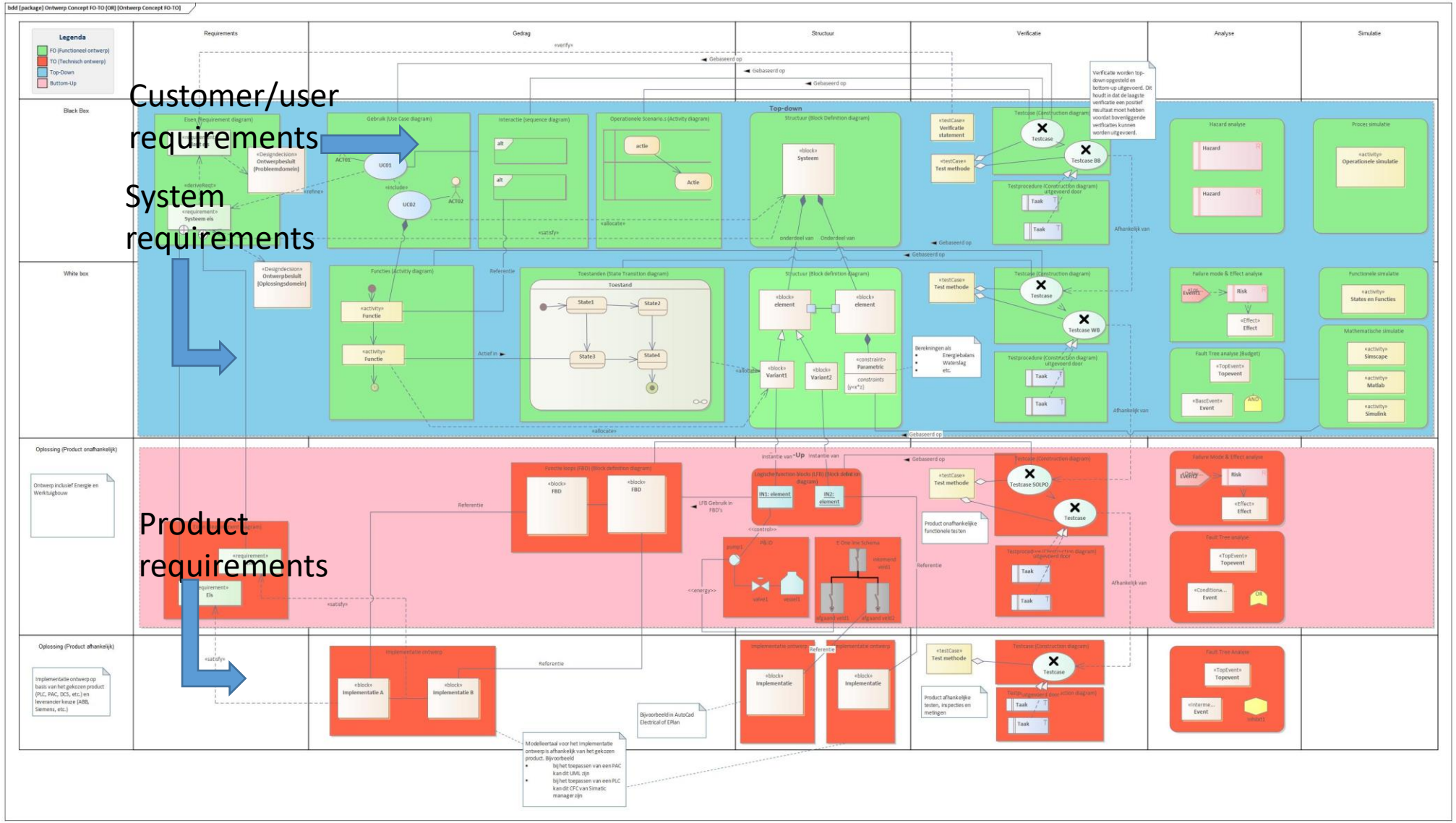
Requirements



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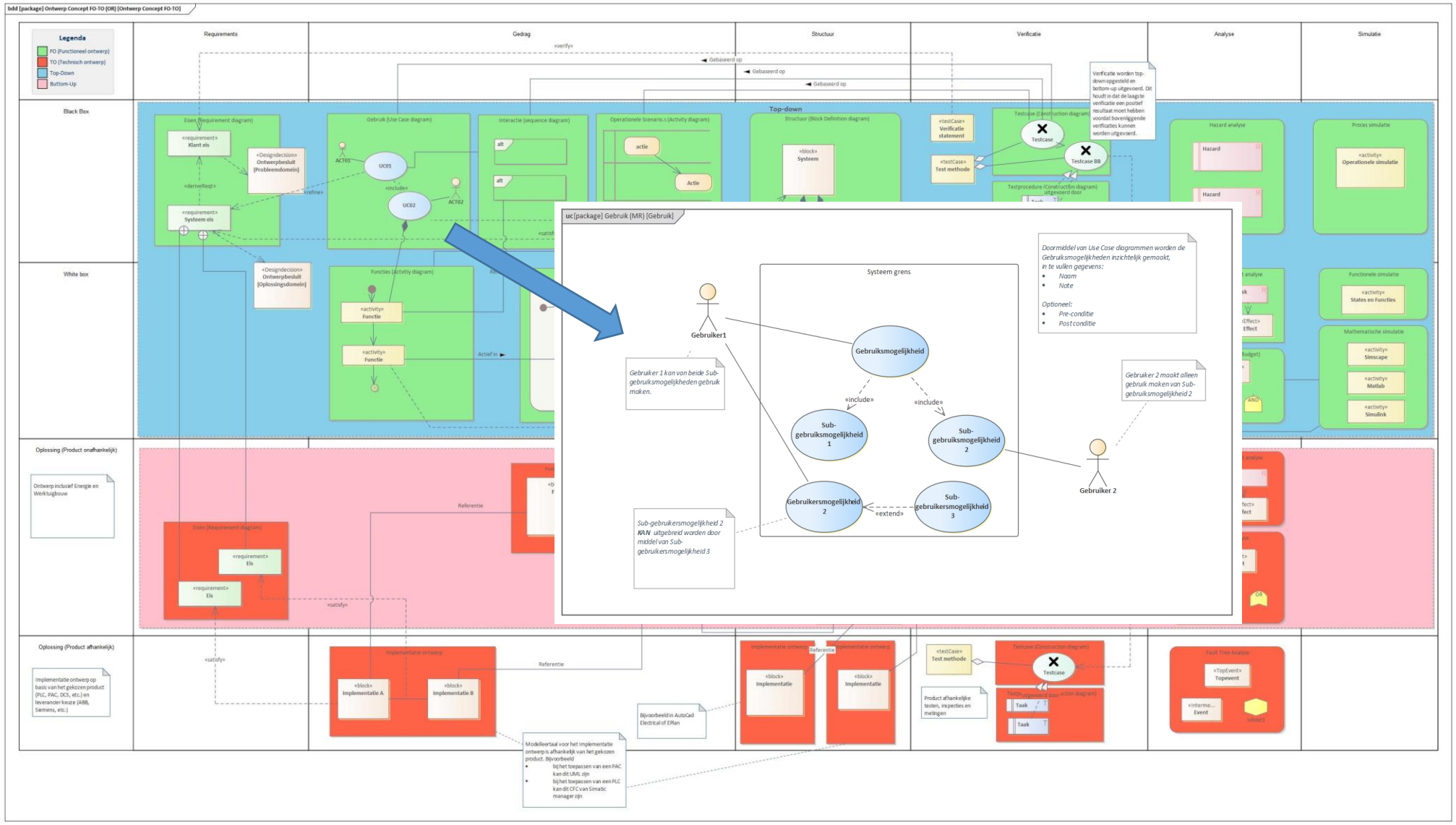
Capabilities/Services



Operational analysis
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Functional analysis
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Technology analysis
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Configuration analysis
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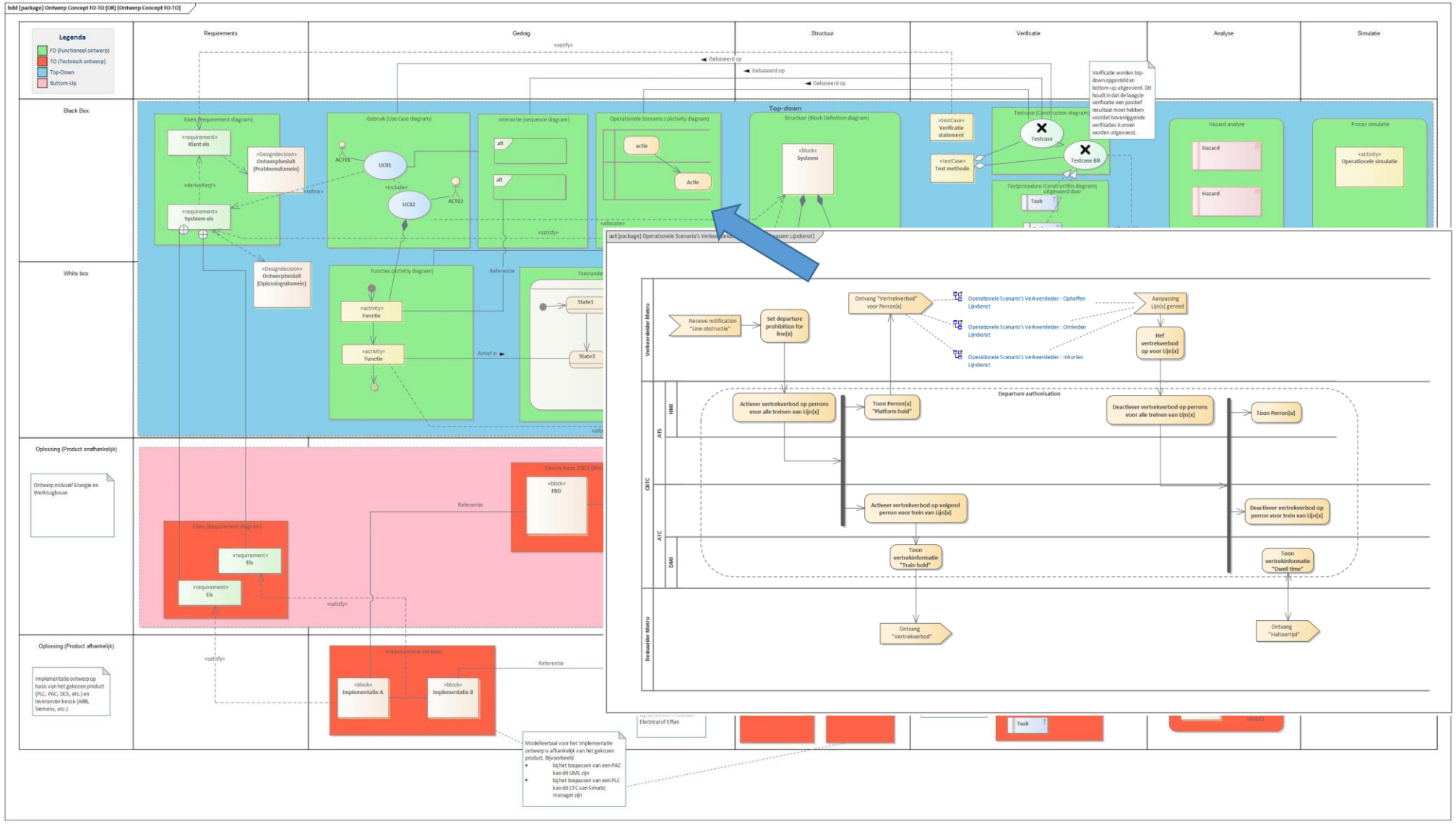
Operational scenario’s



Operational analysis
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Configuration analysis
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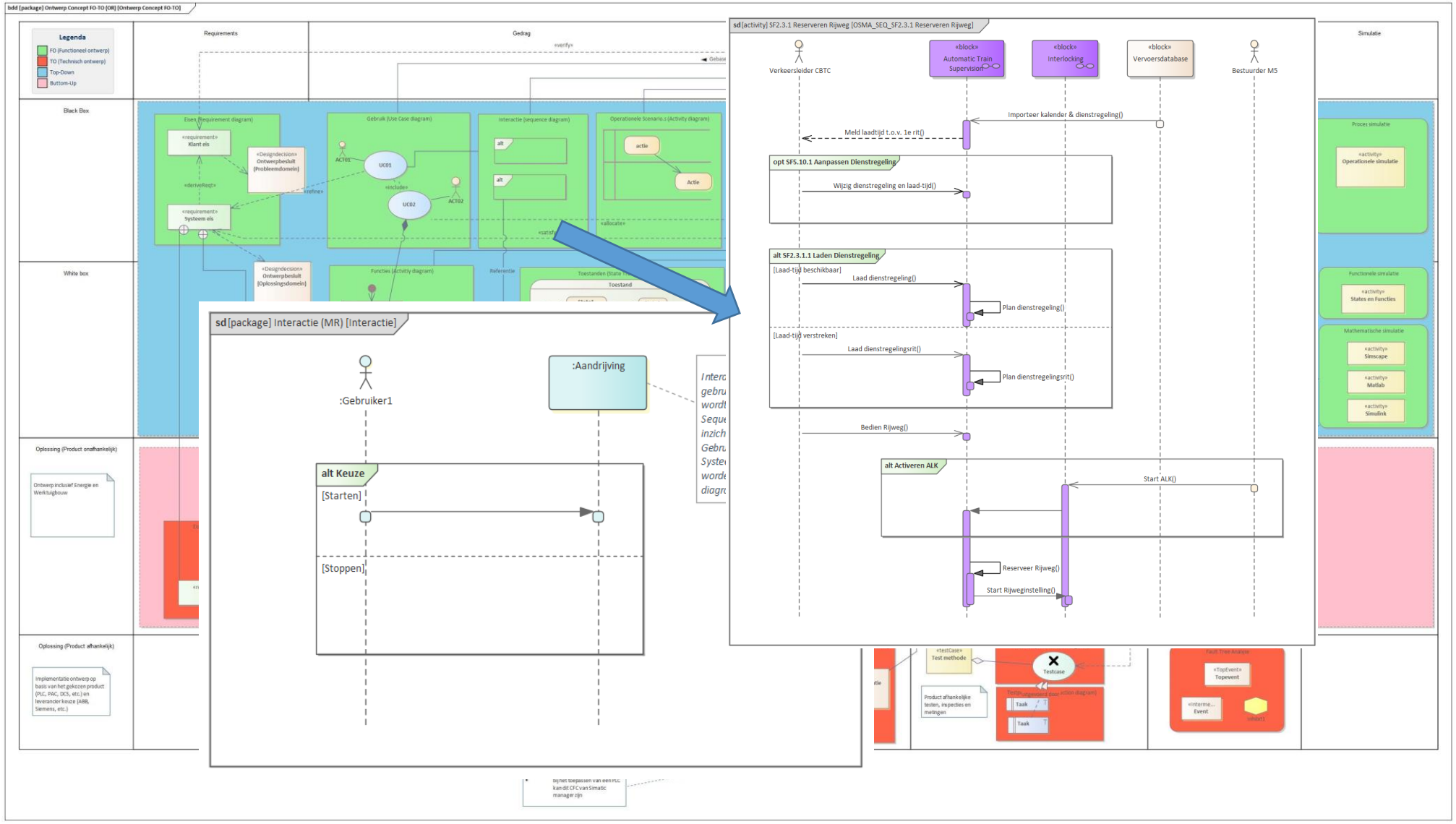
System interactions



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Technology analysis
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Configuration analysis
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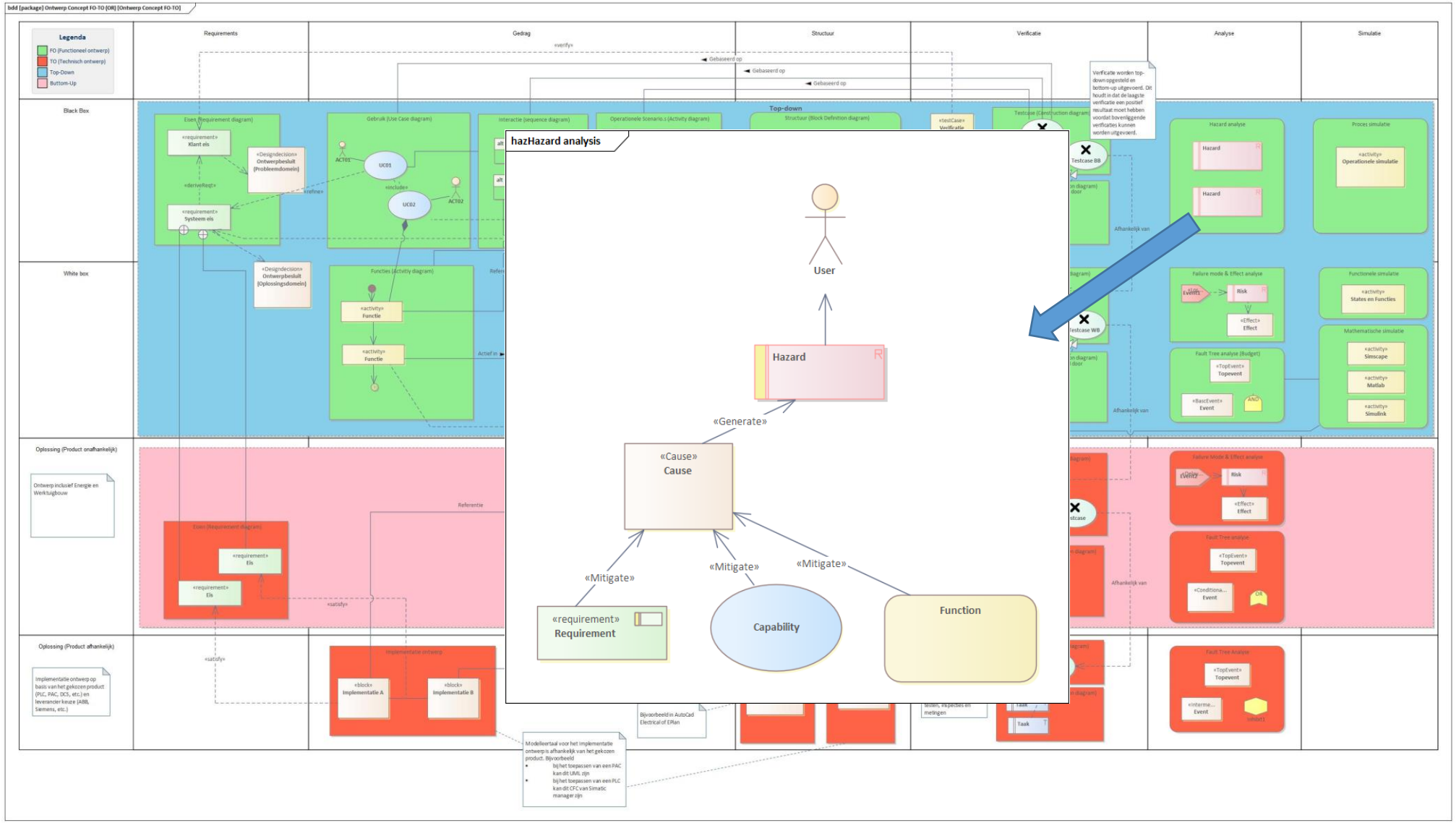
Hazard analysis



Operational analysis
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Functional analysis
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Technology analysis
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Configuration analysis
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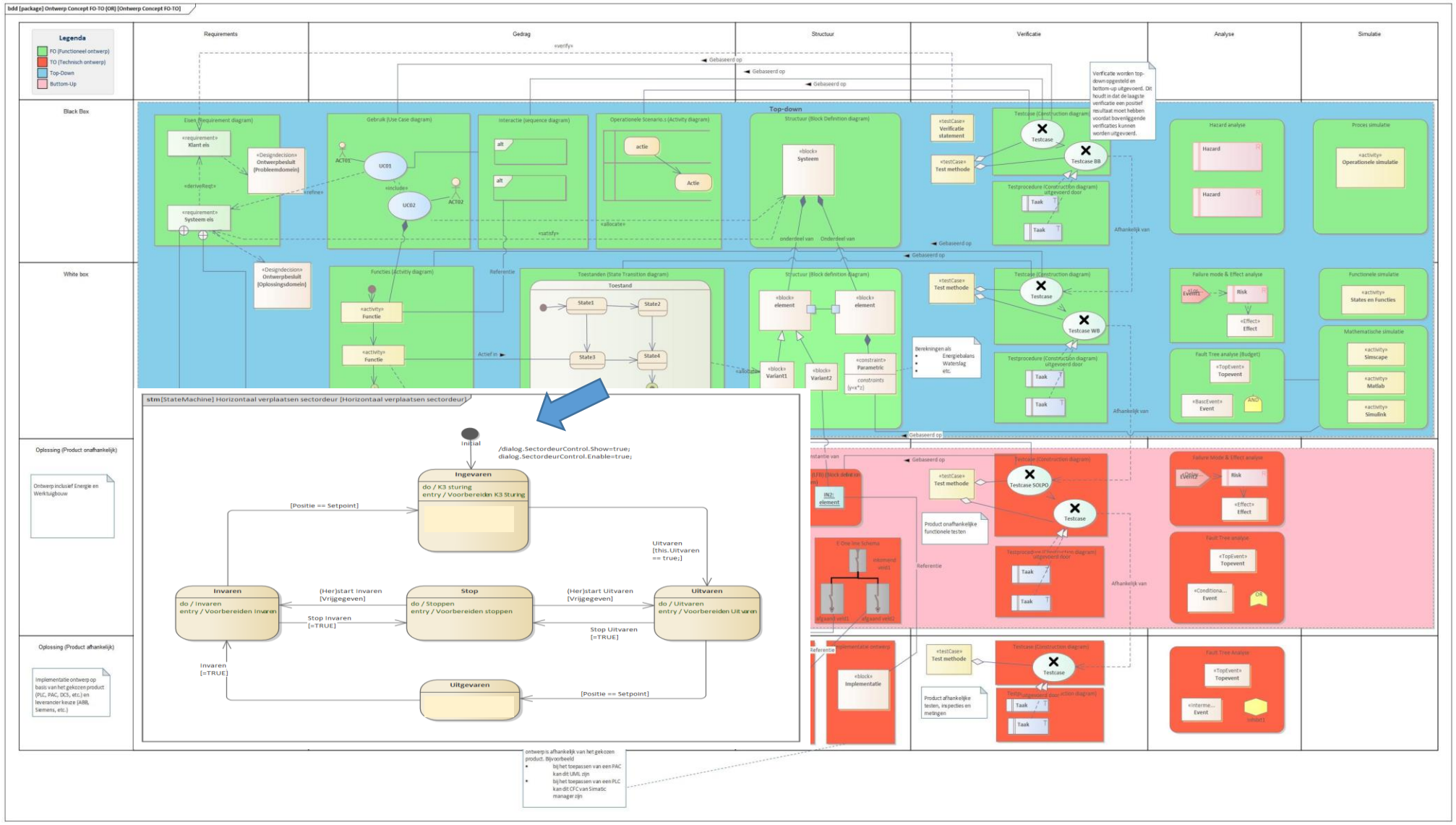
System States



Operational analysis
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Functional analysis
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Technology analysis
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Configuration analysis
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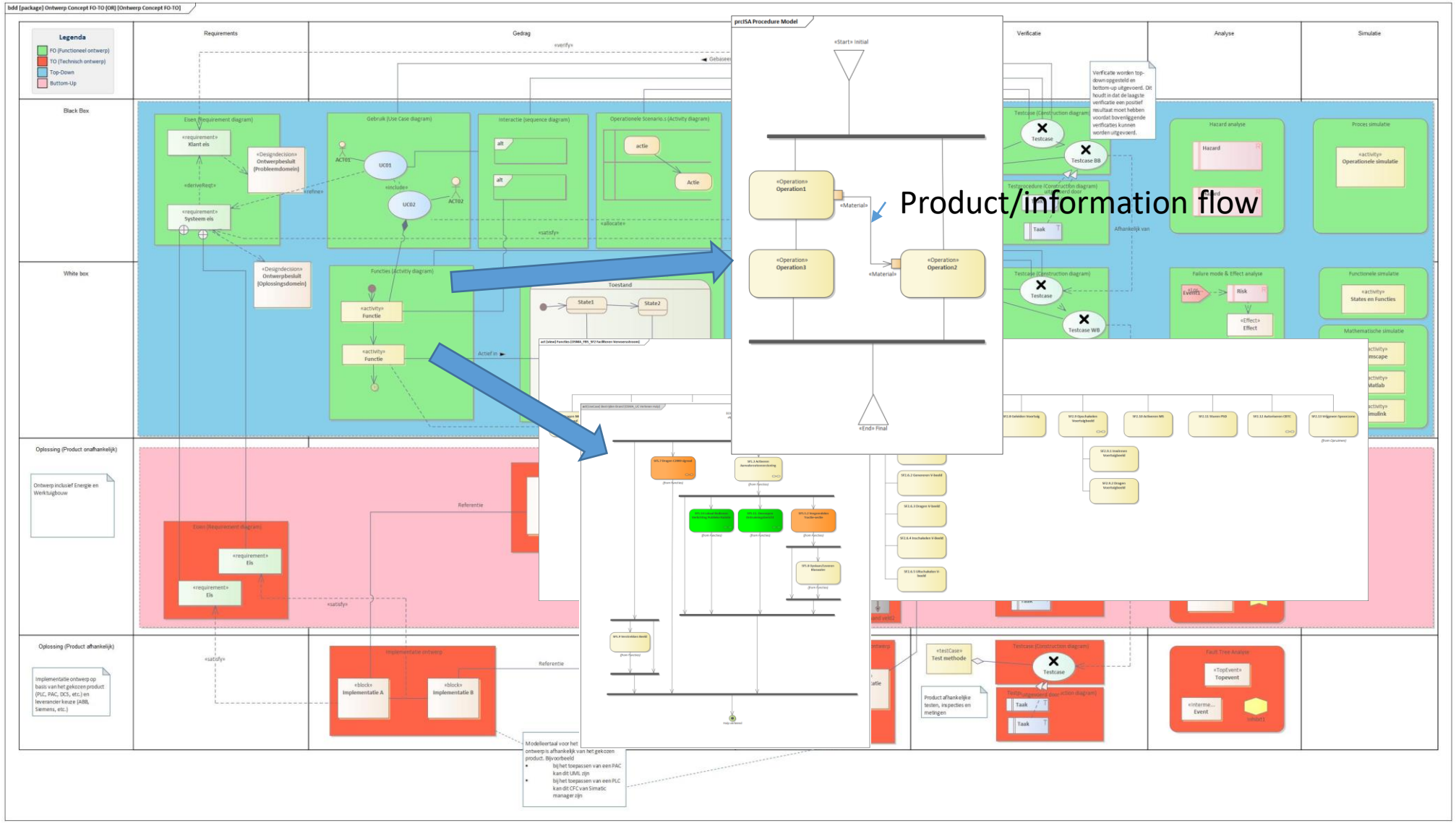
System functions



System structure

Flows (legenda):

- Energy
- Chemicals
- Liqued
- Gas
- Etc.

Structure

Parametric

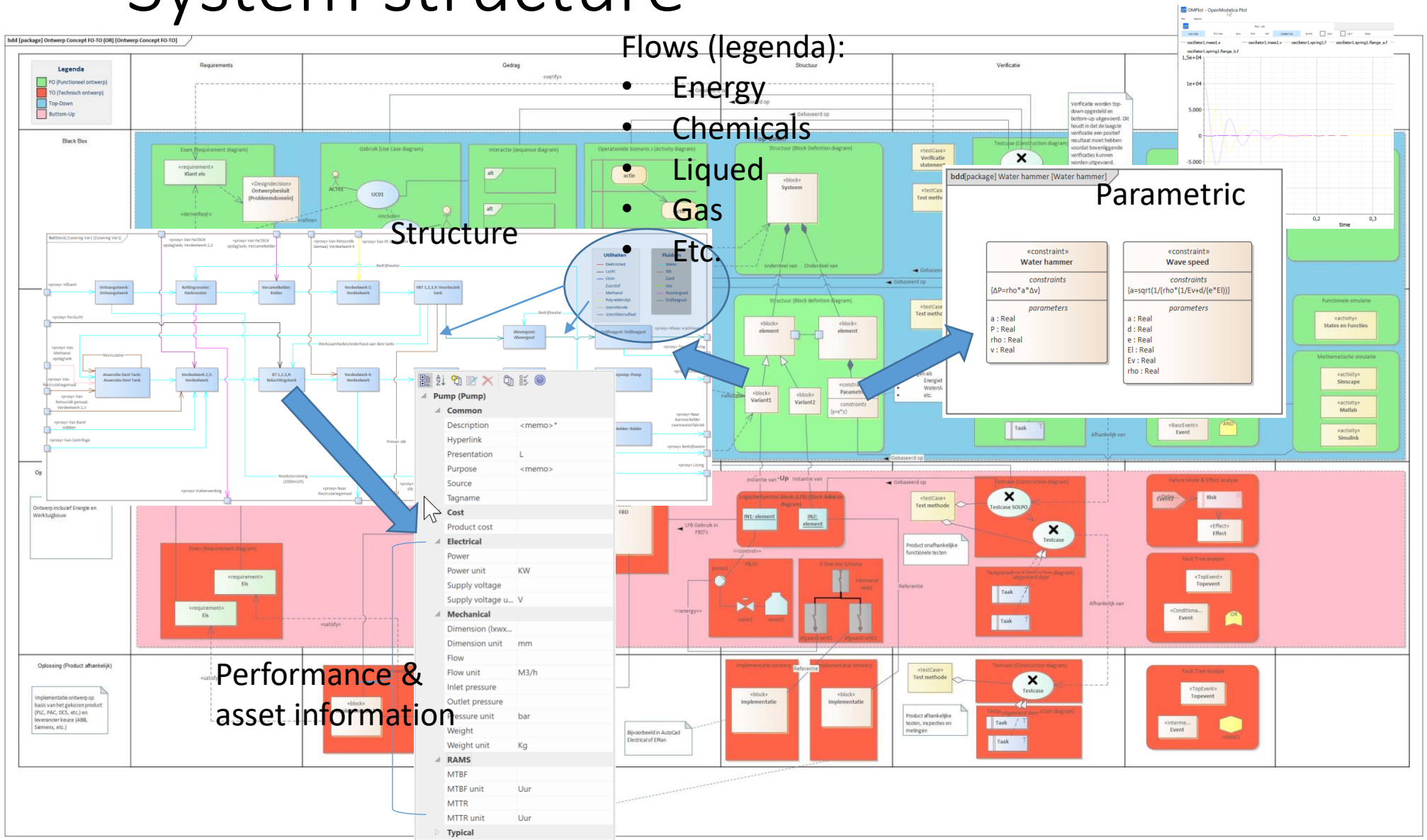
Performance & asset information

Operational analysis Ist/soll

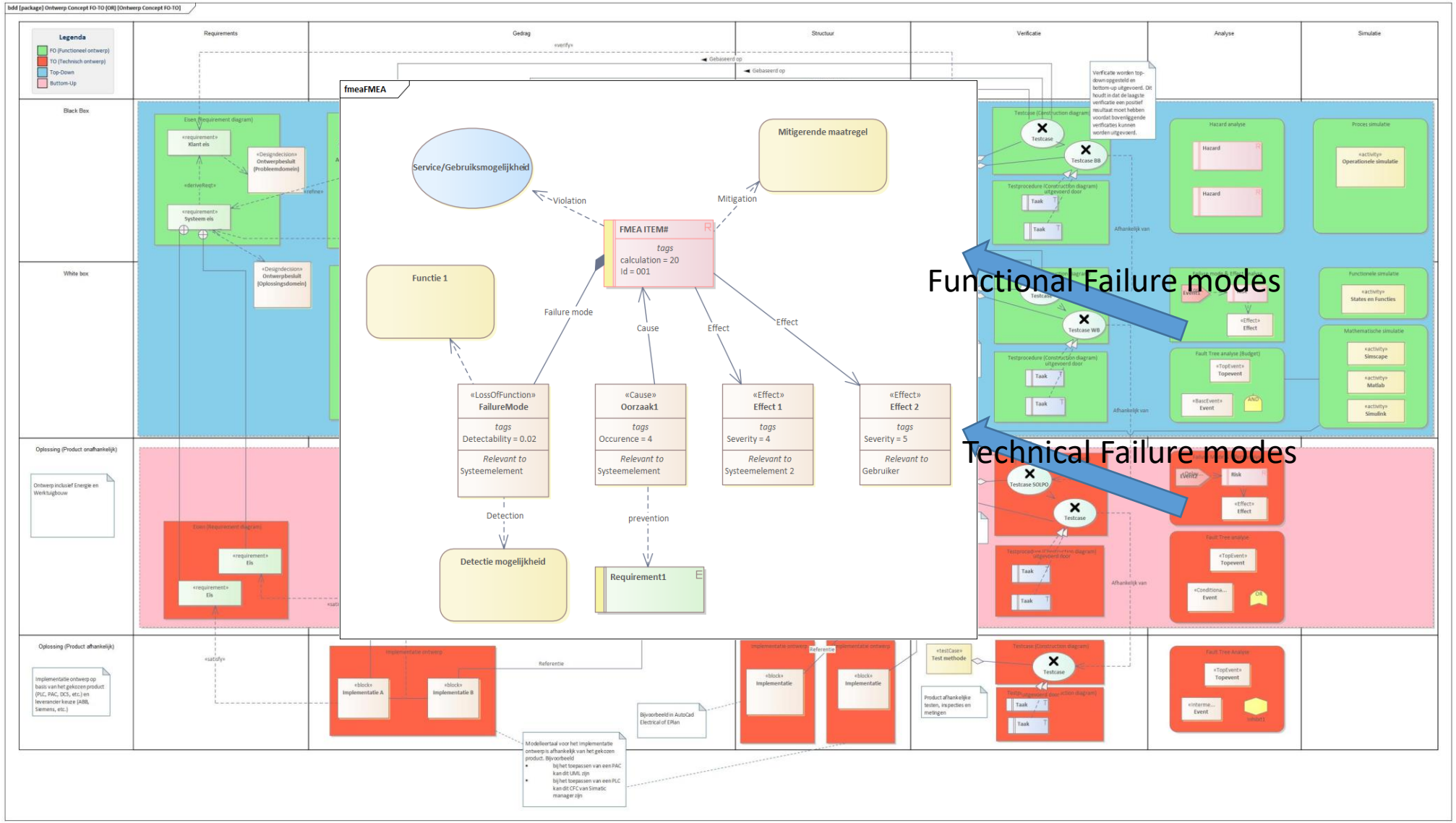
Functional analysis Ist/soll

Technology analysis Ist/soll

Configuration analysis Ist/soll



Failure mode analysis



Operational analysis
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Functional analysis
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Technology analysis
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Configuration analysis
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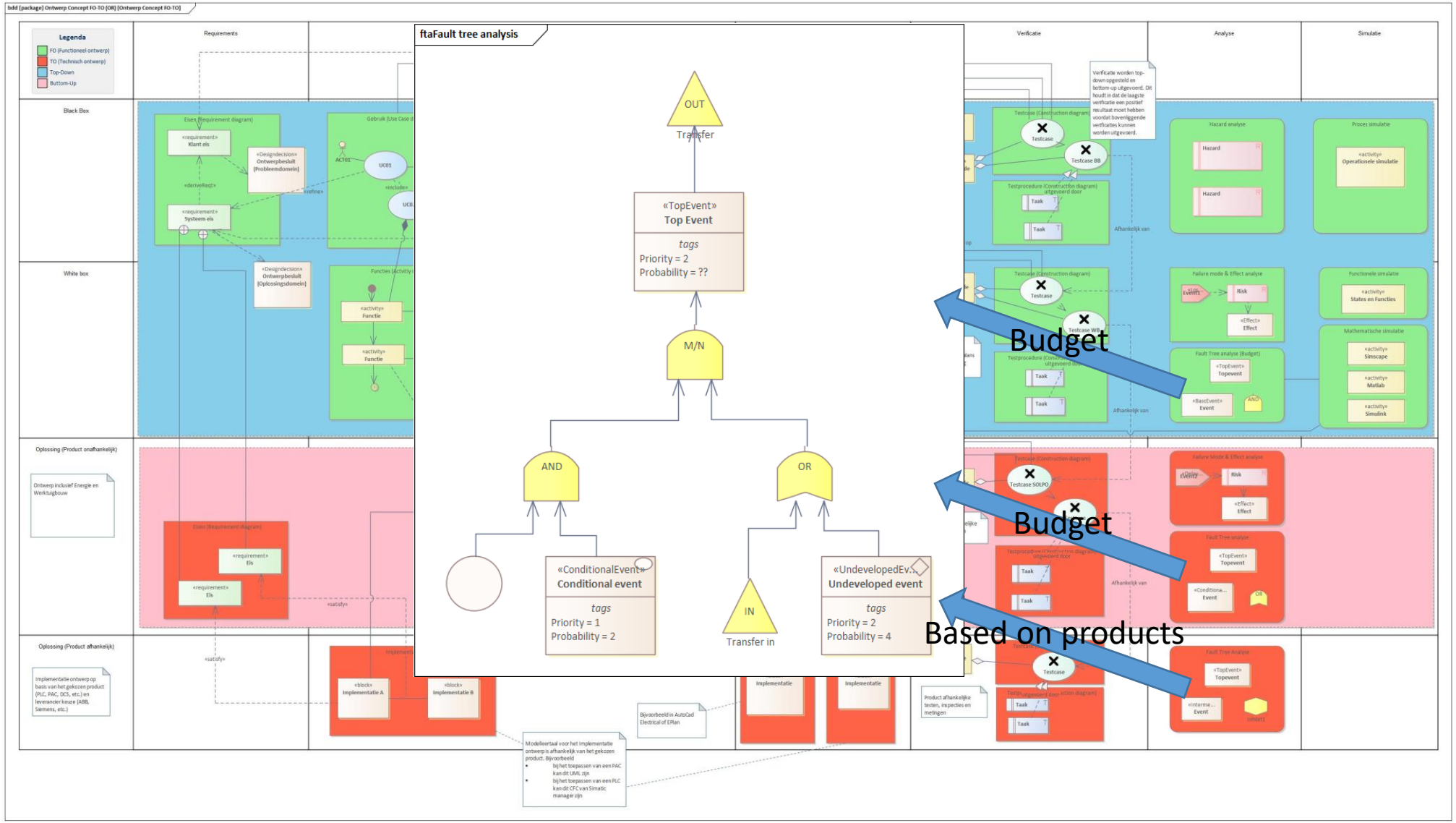
Fault tree analysis



Operational analysis
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Functional analysis
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Technology analysis
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Configuration analysis
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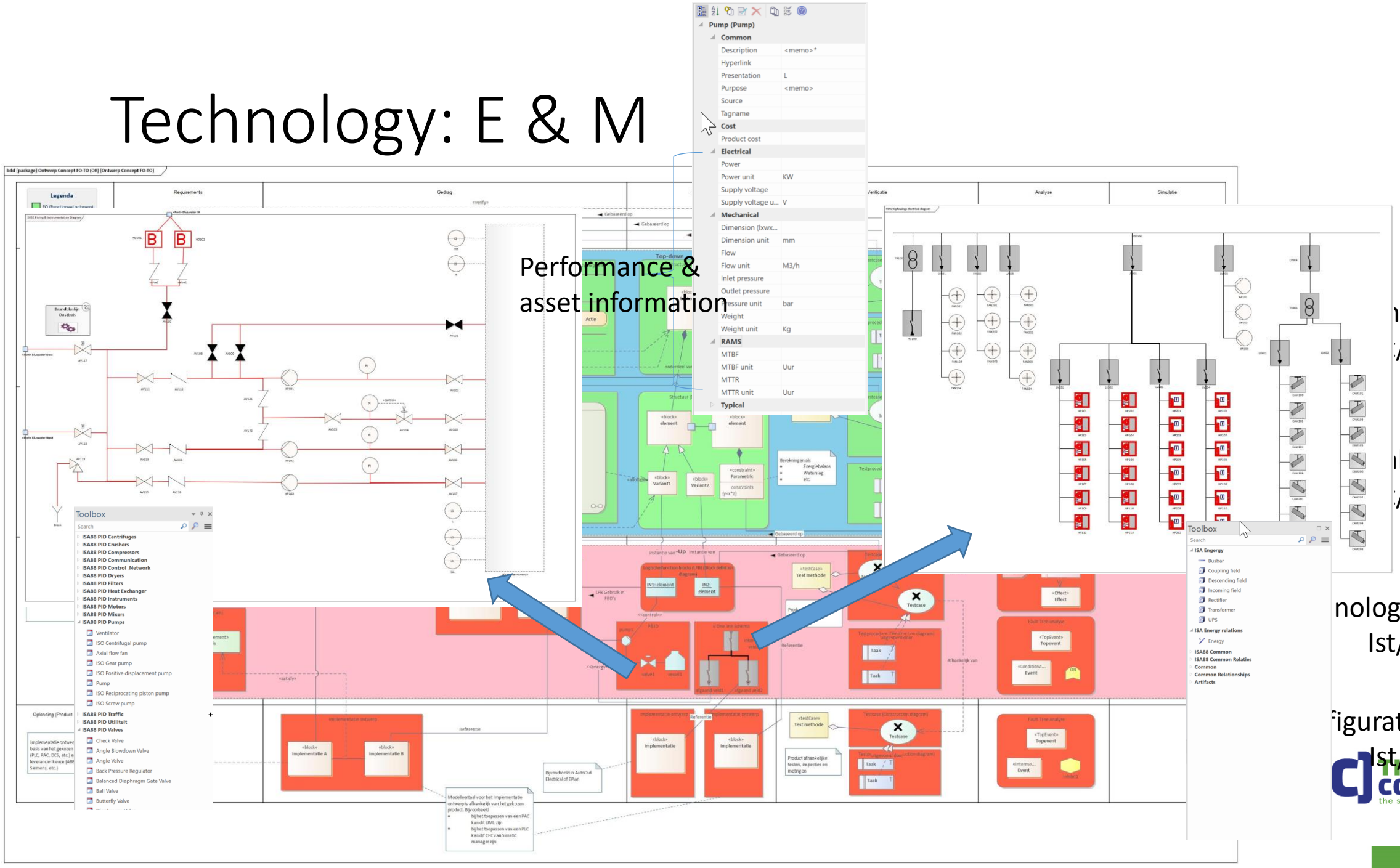
Technology: E & M



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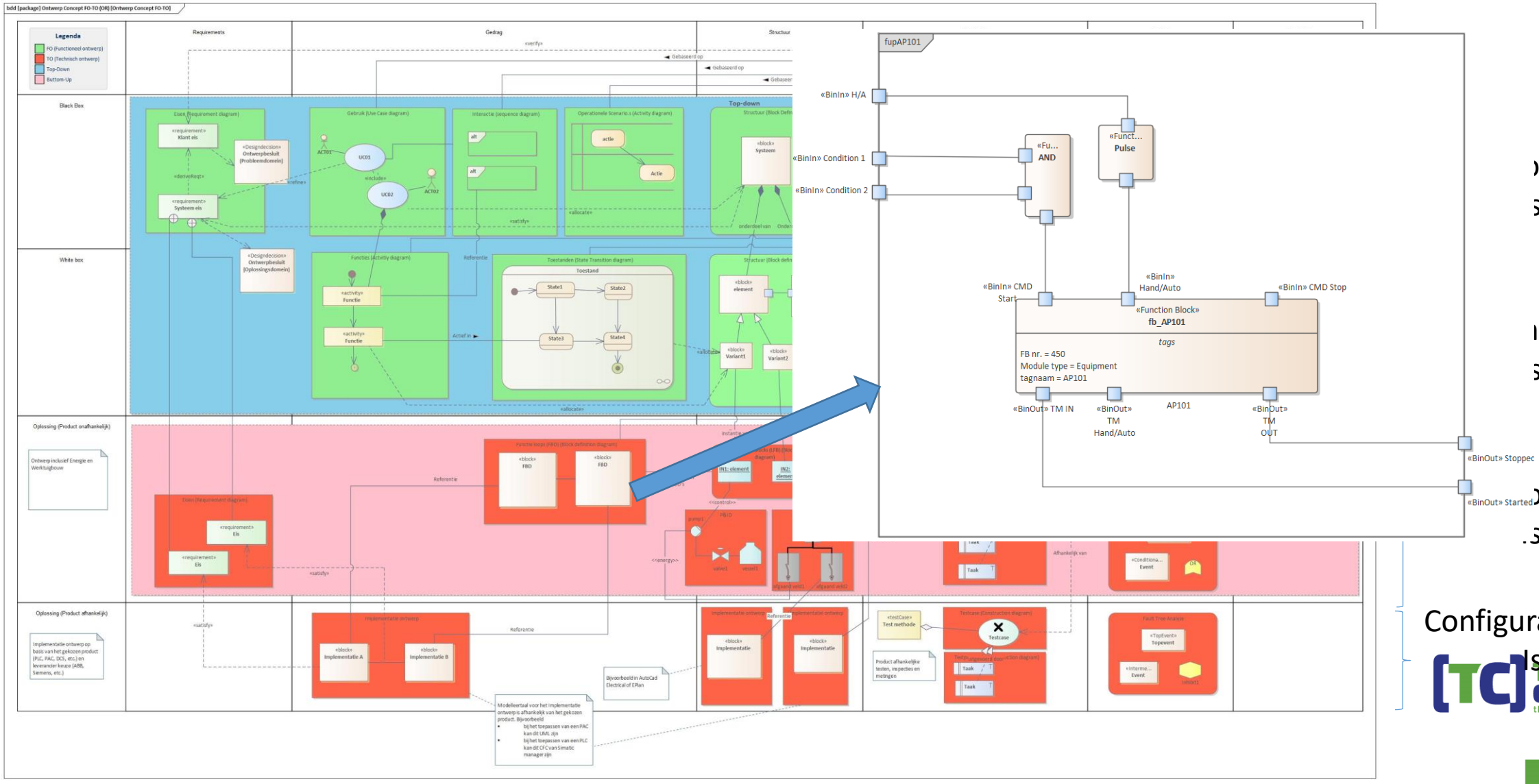
Industrial automation



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Configuration analysis
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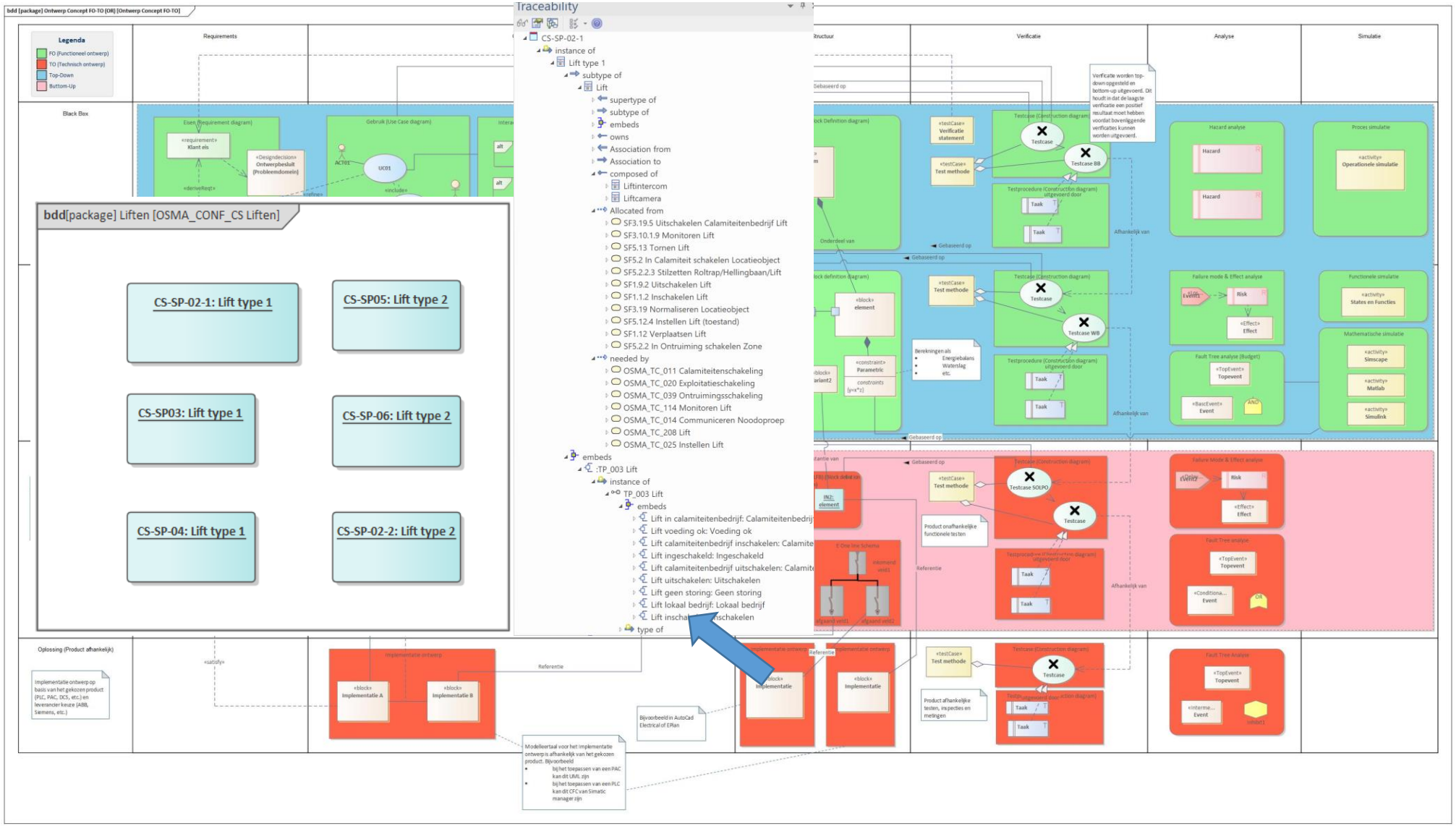
Configuration



Operational analysis
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Functional analysis
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Technology analysis
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Configuration analysis
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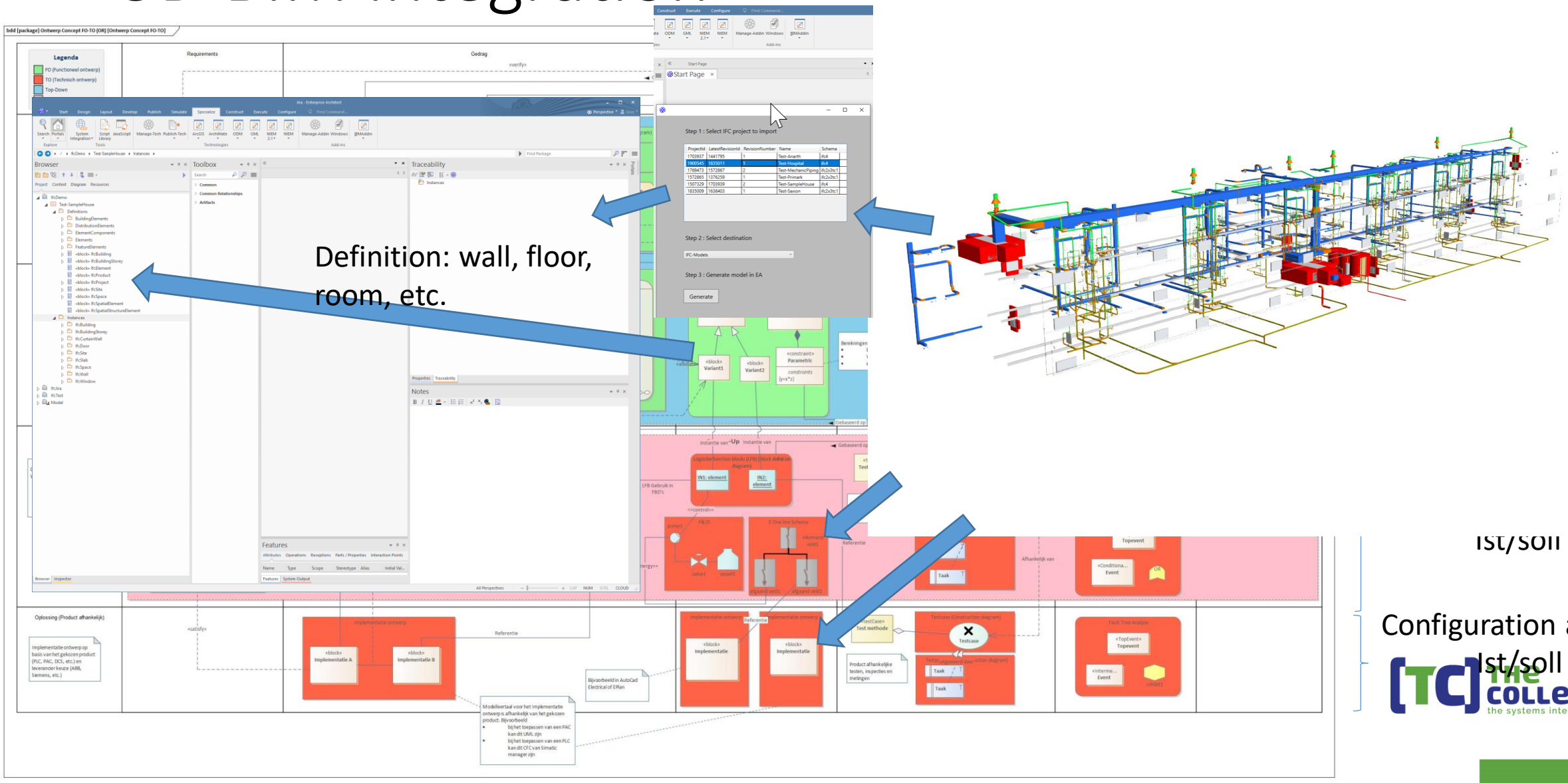
3D BIM integration



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Configuration analysis Ist/soll

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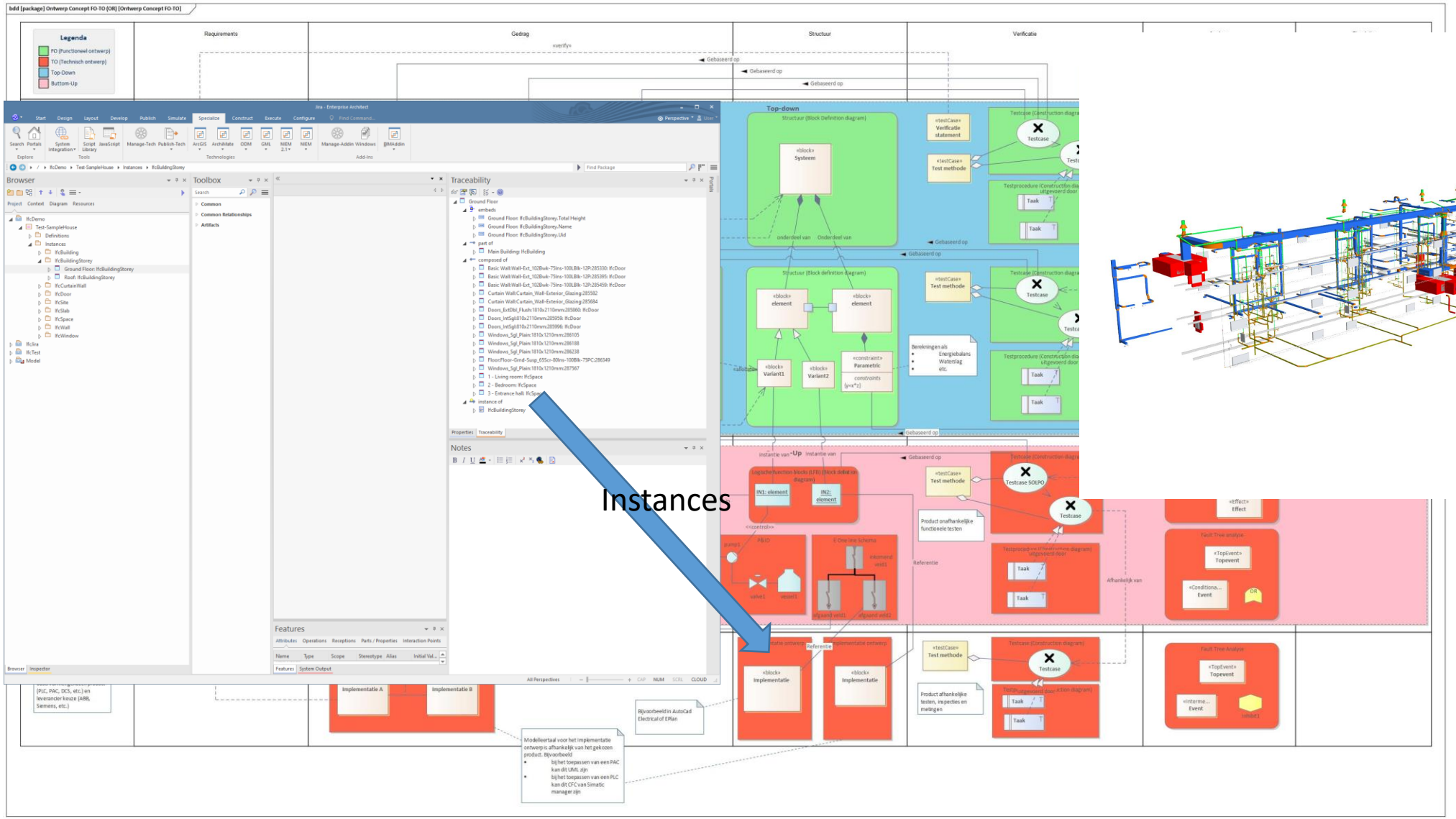
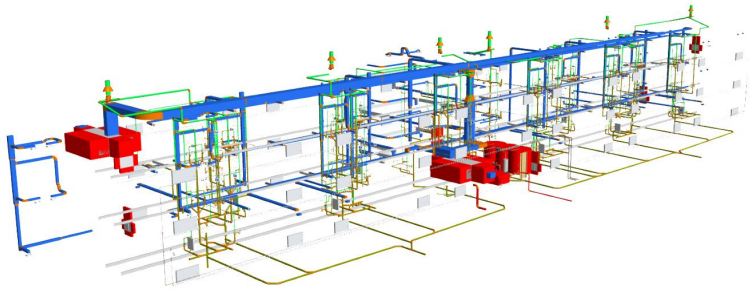
3D BIM integration





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Technology analysis
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Configuration analysis
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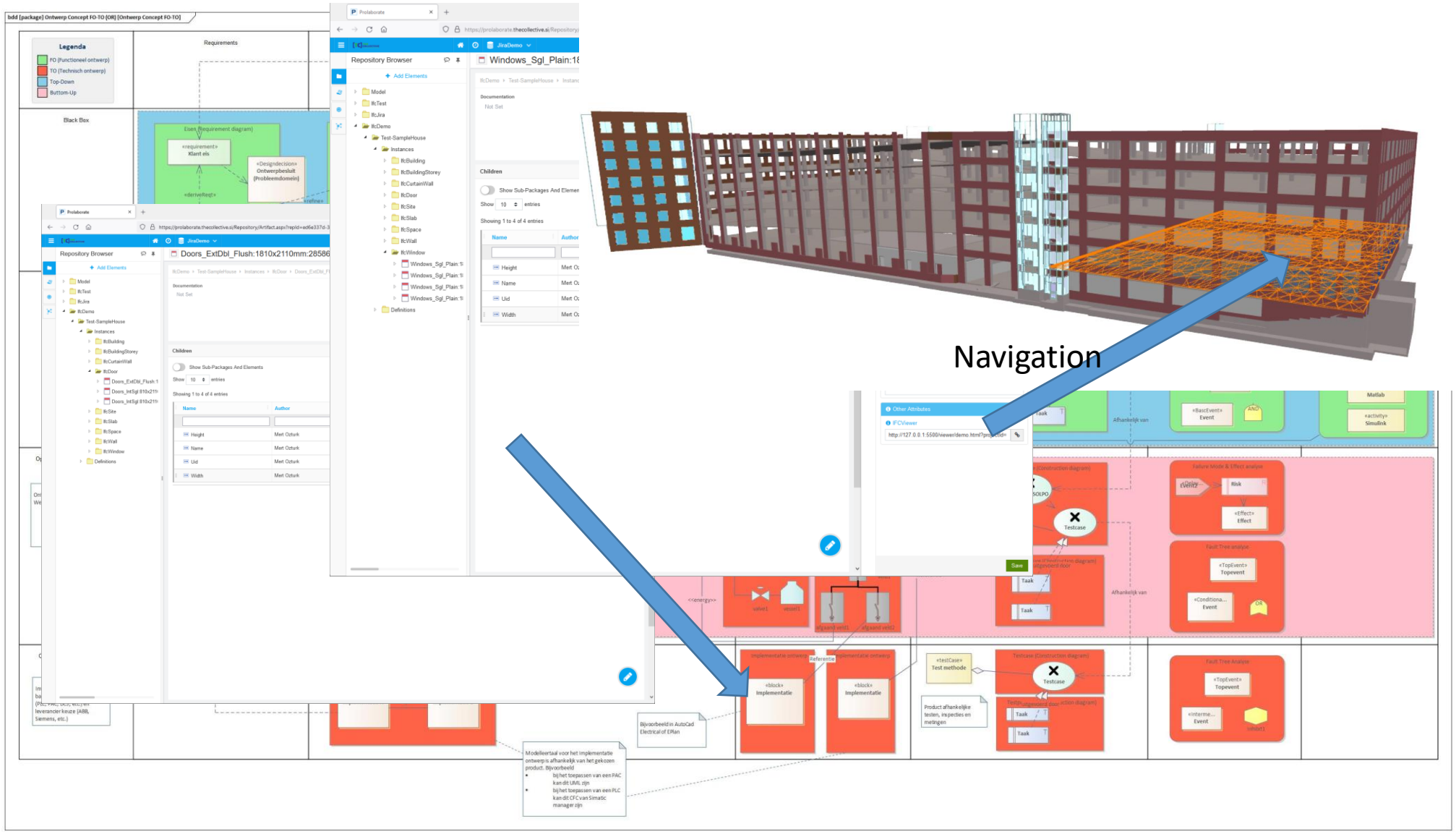
3D BIM integration



Operational analysis
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Technology analysis
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Configuration analysis
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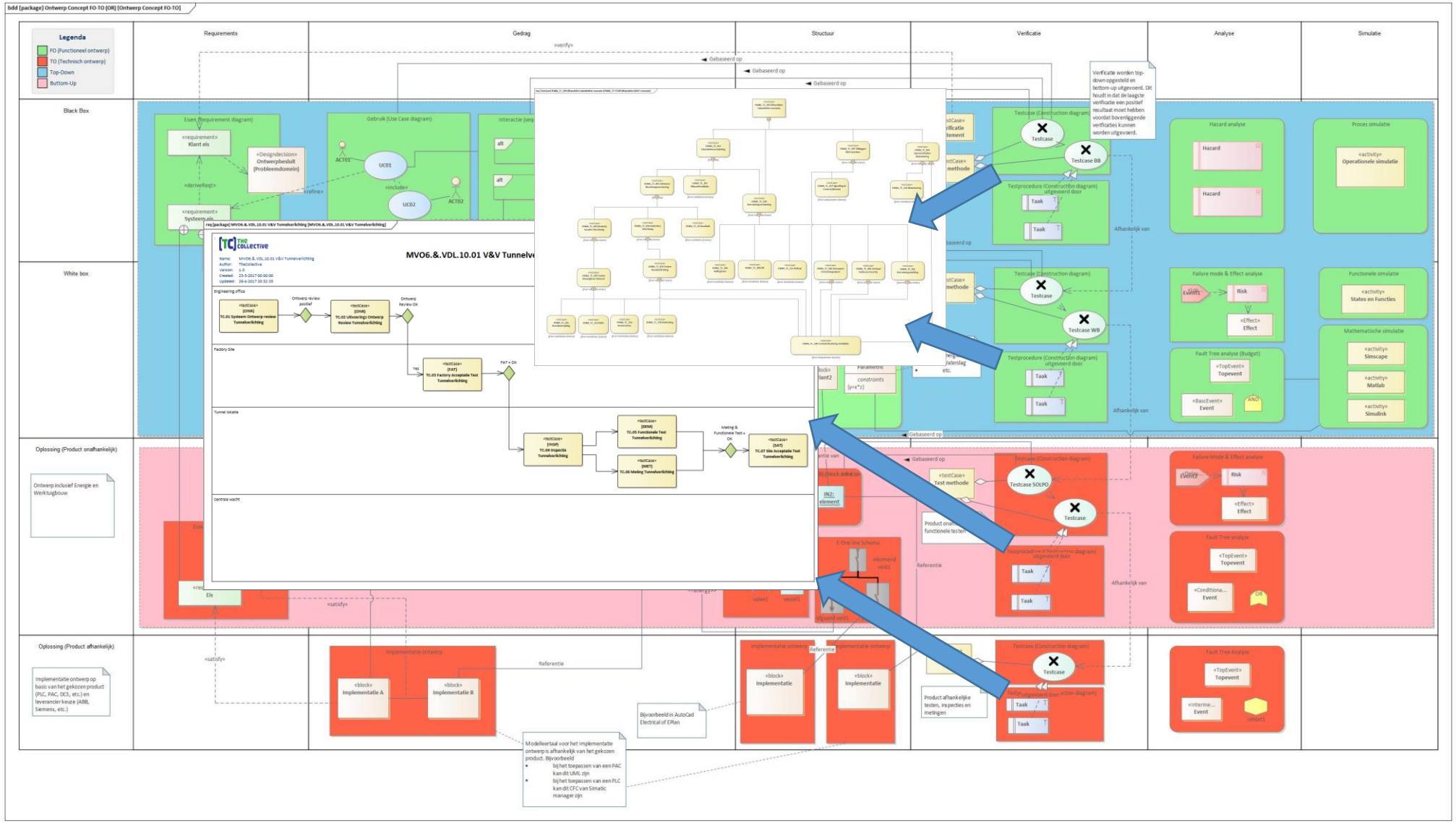
Verification



Operational analysis
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Functional analysis
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Technology analysis
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Configuration analysis
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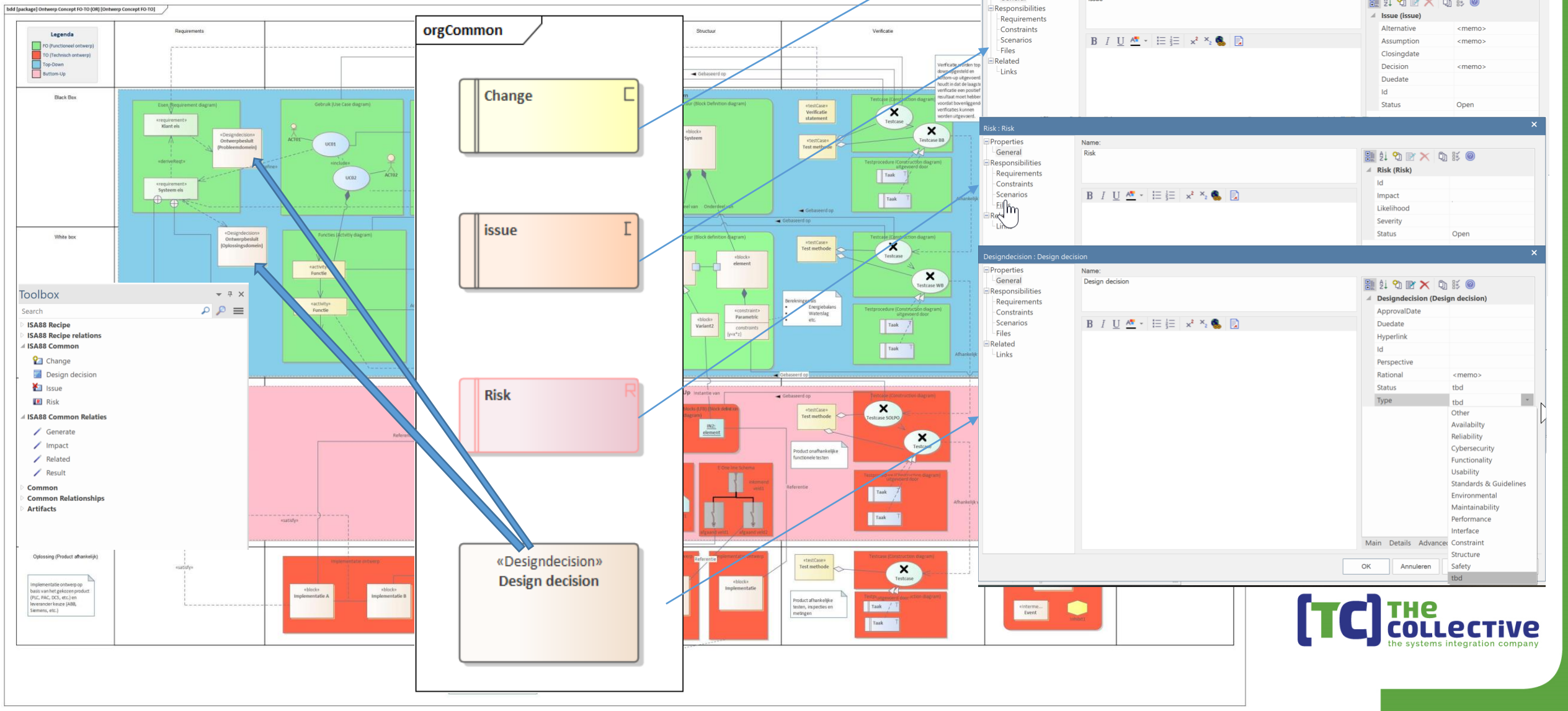
Management



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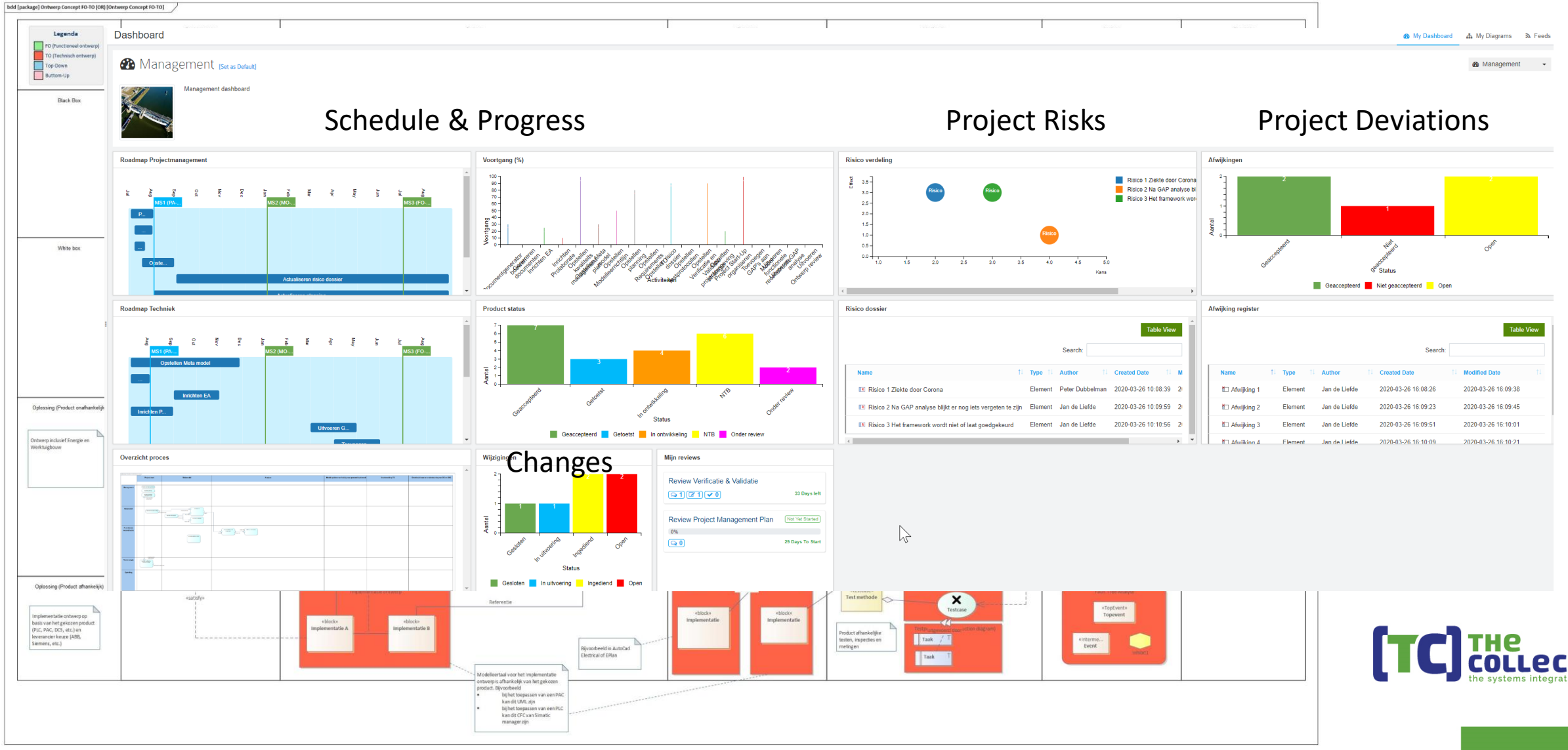
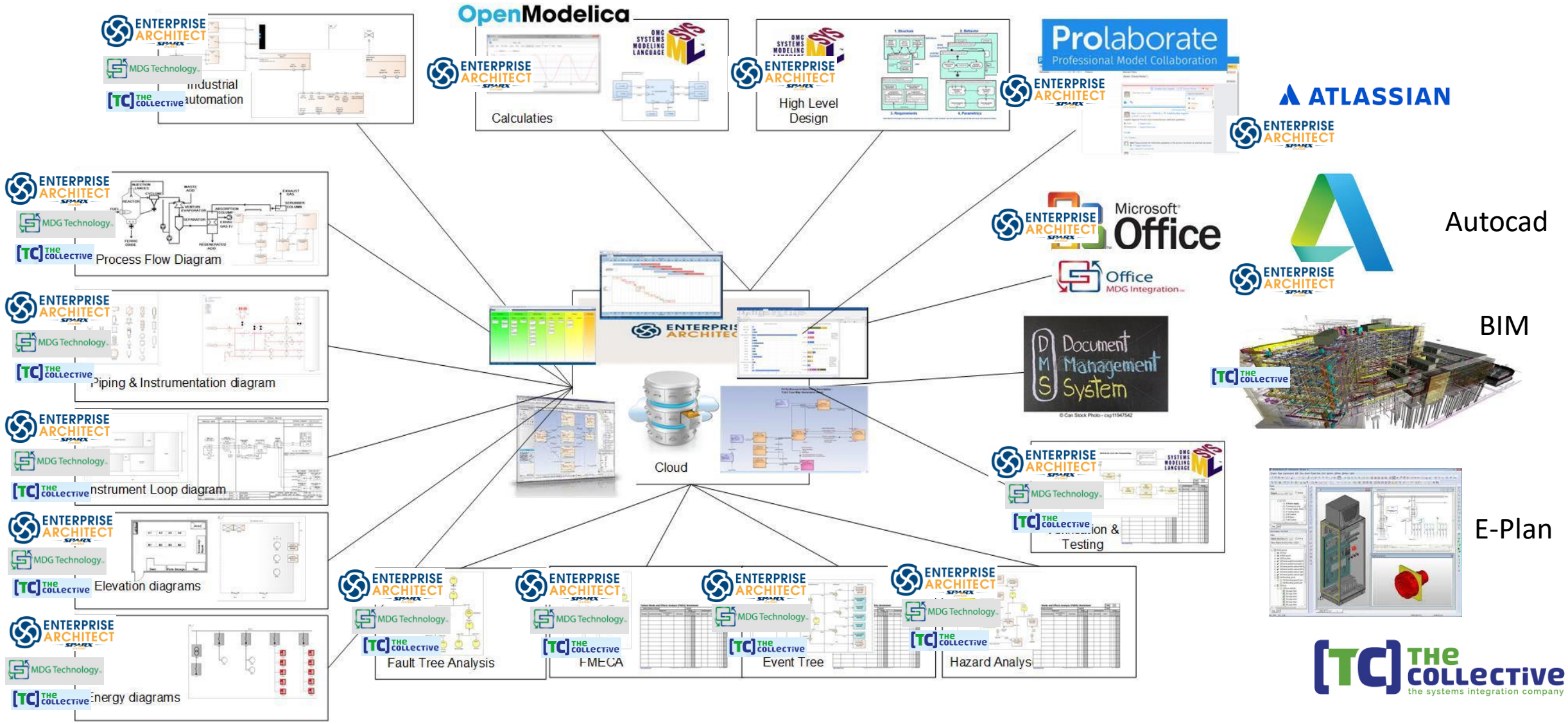
Management


Dashboard
Management
Management dashboard
Schedule & Progress
Project Risks
Project Deviations
Changes
Roadmap Projectmanagement
Voortgang (%)
Risico verdeling
Afwijkingen
Roadmap Techniek
Product status
Risico dossier
Afwijking register
Overzicht proces
Mijn reviews
Review Verificatie & Validatie
Review Project Management Plan
Geaccepteerd
Niet geaccepteerd
Open
Getoetst
In ontwikkeling
NTB
Onder review
Gesloten
In uitvoering
Ingediend


ENTERPRISE ARCHITECT
MDG Technology
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Industrial Automation
OpenModelica
Calculaties
High Level Design
Prolaborate
Professional Model Collaboration
ATLASSIAN
Process Flow Diagram
Microsoft Office
Office MDG Integration
Autocad
Piping & Instrumentation diagram
Document Management System
BIM
Instrument Loop diagram
Cloud
Elevation diagrams
Verification & Testing
E-Plan
Fault Tree Analysis
FMECA
Event Tree
Hazard Analys
Energy diagrams
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