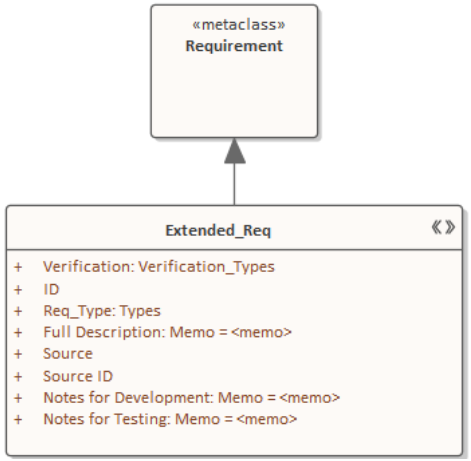
Extending the Requirement Type

An MDG Technology for adding attributes to manage requirements for systems and software engineering projects



Who Am I

- Systems Engineer
- Modeling Consultant
- Sparx representative to the OMG
- Member of the Requirements Working Group at INCOSE
  - A special thank you to Mark Harris and Lou Wheatcraft of the RWG for their reviews of this presentation

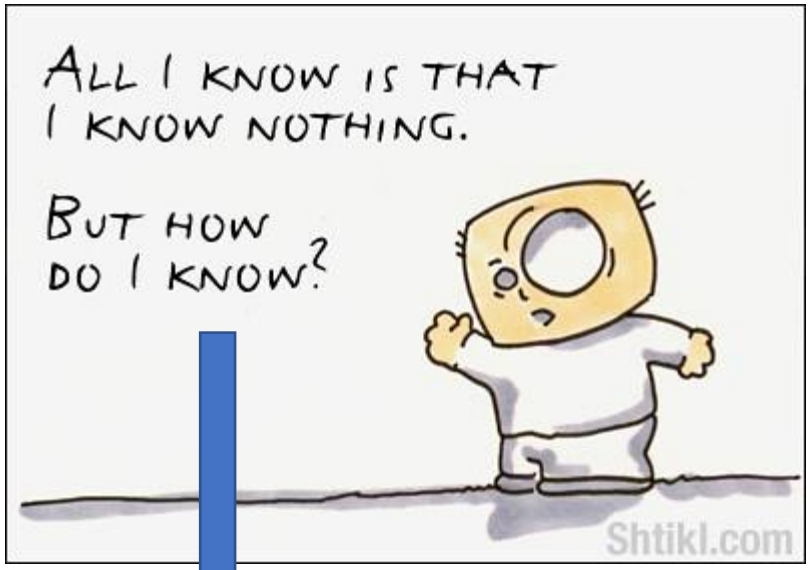
Abstract

- Because UML® does not define a requirement element type, Enterprise Architect includes one in the Core Extensions set of elements. SysML® includes a requirement element type that expands the EA type with two attributes. In the Guide for Writing Requirements, the INCOSE Requirements Working Group has defined a further expansion of the numbers and types of attributes that need to be considered in requirements engineering. In the software arena, Karl Wiegers has written extensively about software requirements and what you need to know about them. This presentation describes an MDG Technology that addresses the INCOSE recommendations and maps them to Wiegers' recommendations for attributes to capture about your requirements. We will explore both the creation and the use of the extended requirement elements.

The UML Requirement Element

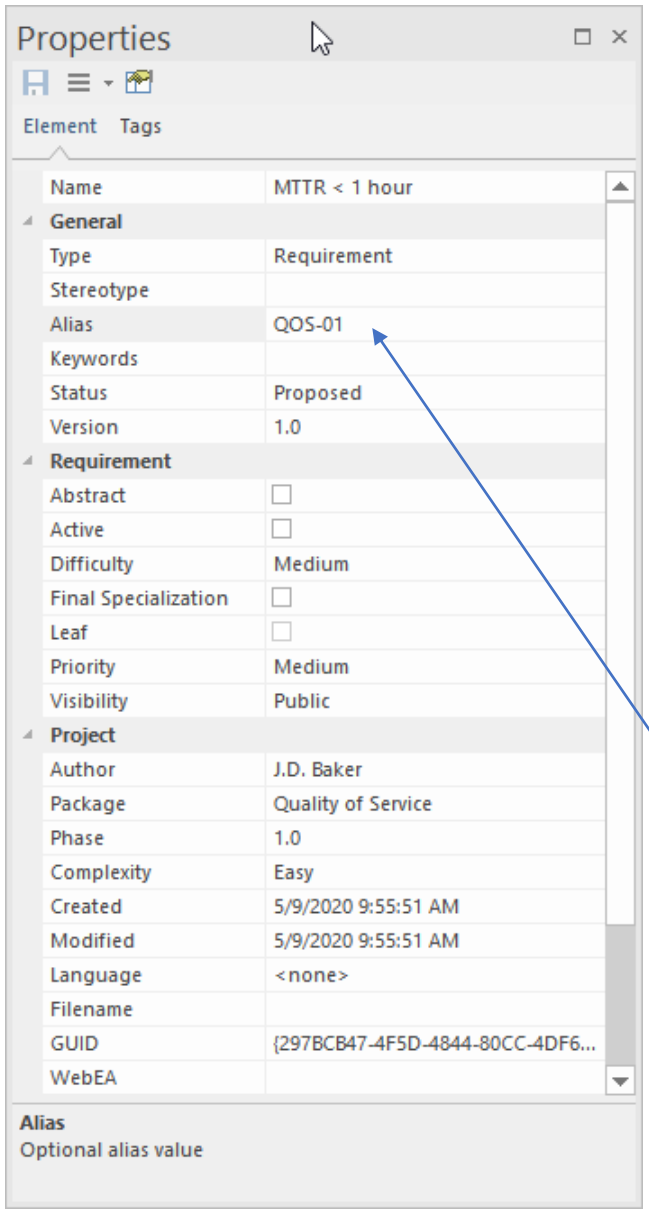
UML 1.x

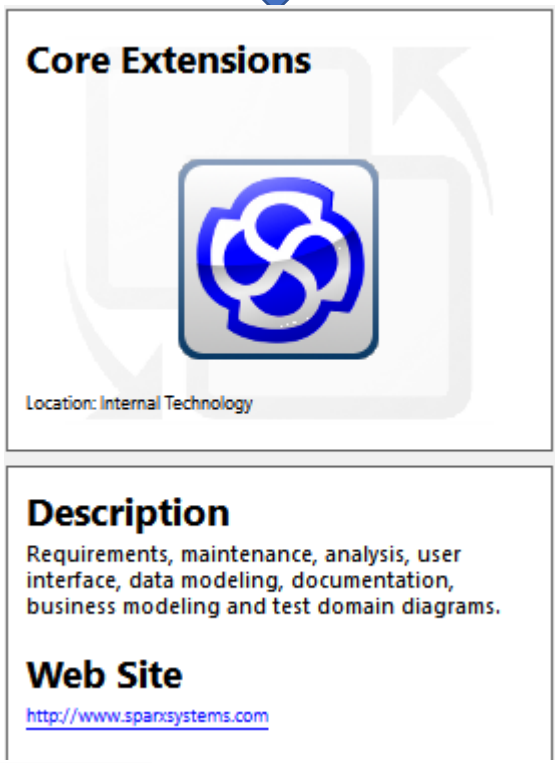
UML 2.x

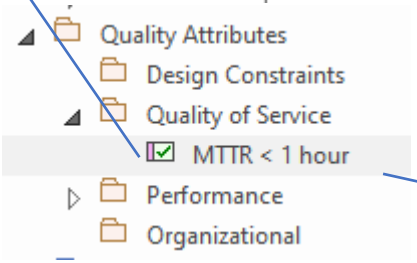


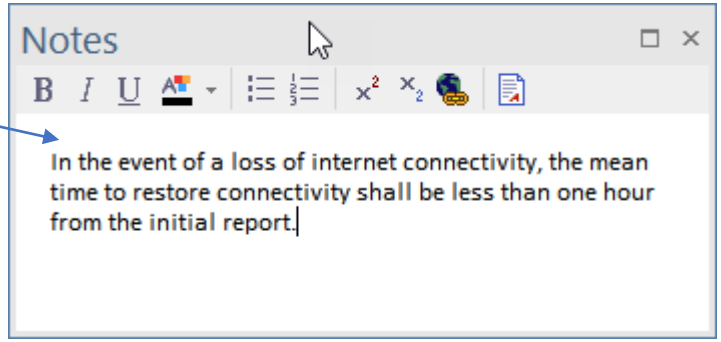
EA told me so

The EA Requirement Element

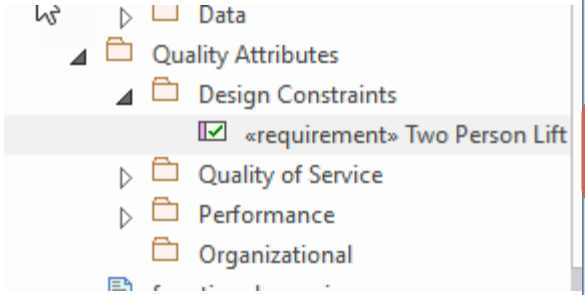




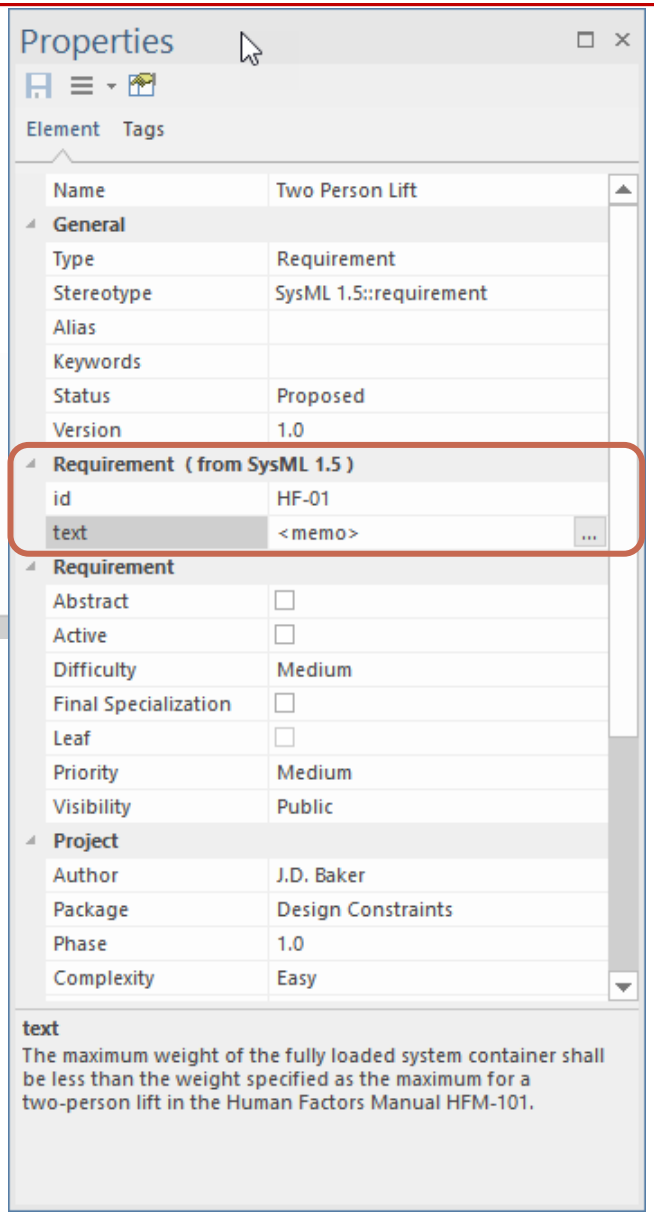


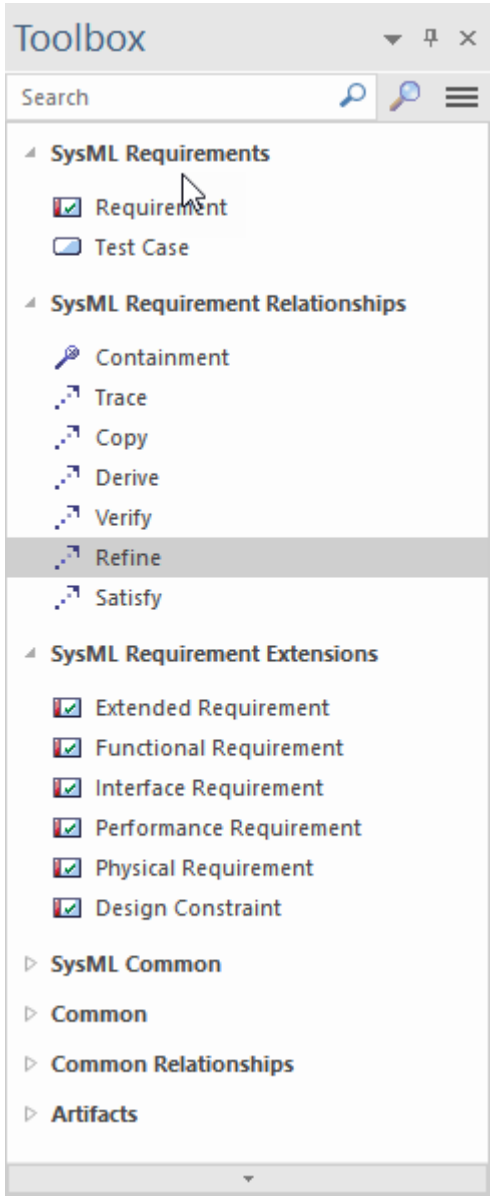


SysML Requirements

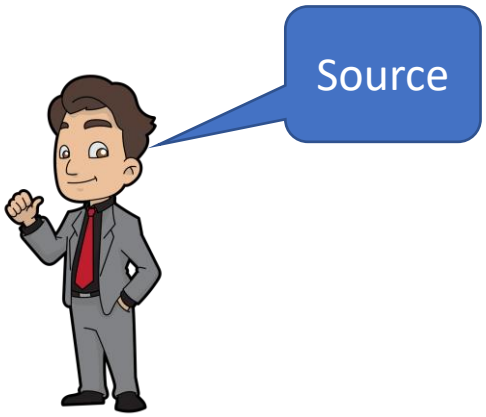


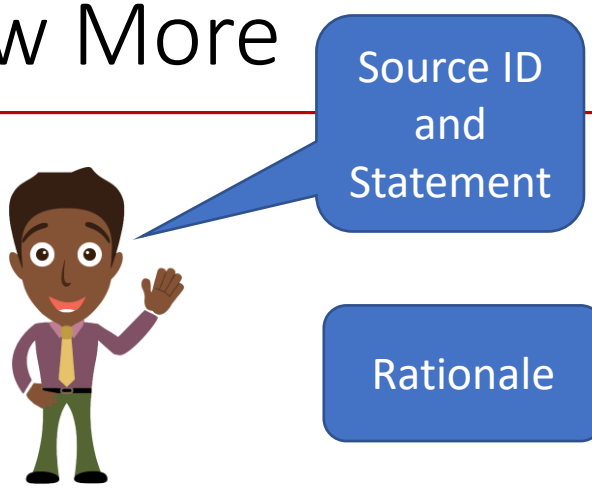
ID and Text are implemented as Tag Values in EA

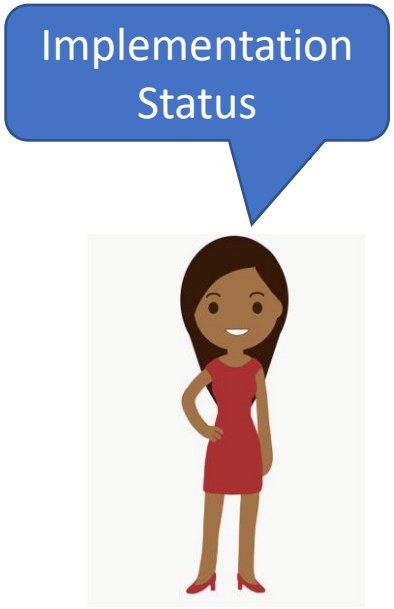




But We Need to Know More



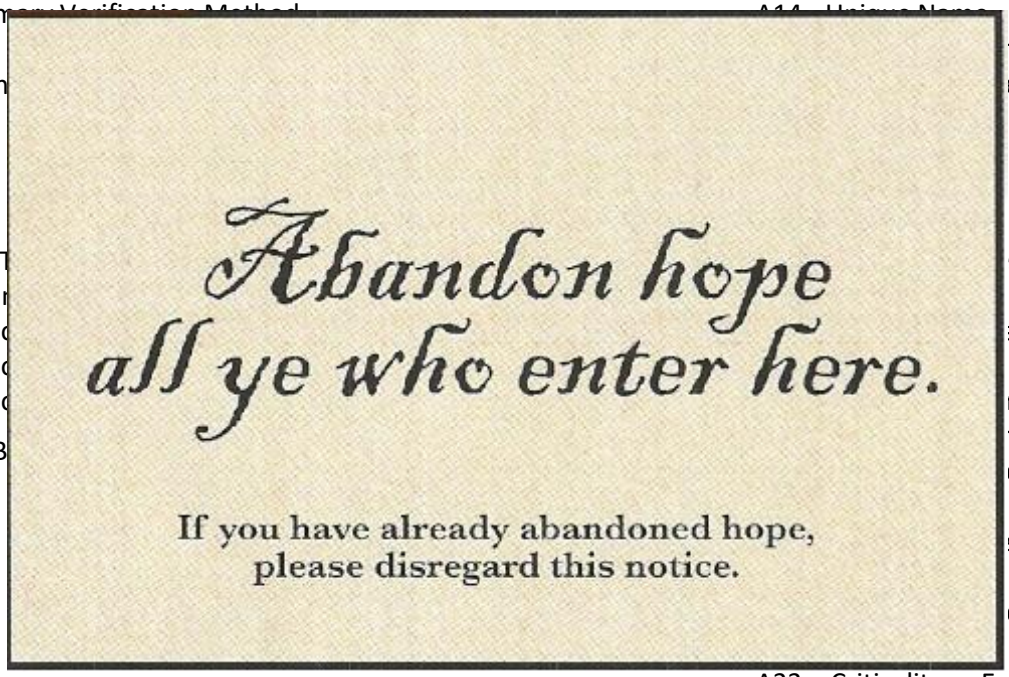




INCOSE GfWR

ATTRIBUTES TO HELP DEFINE THE REQUIREMENT AND ITS INTENT
A1 - Rationale
A2 - System of Interest (SOI) Prim
A3 - SOI Verification Approach
A4 - Trace to Parent Requiremen
A5 - Trace to Source
A6 - Condition of Use
A7 - States and Modes
A8 - Allocation
ATTRIBUTES ASSOCIATED WITH T
A9 - SOI Verification or Validatio
A10 - SOI Verification or Validati
A11 - SOI Verification or Validati
A12 - SOI Verification or Validati

ATTRIBUTES TO SHOW APPLICAB
A39 - Applicability
A40 - Region
A41 - Country
A42 - State/Province
A43 - Application
A44 - Market Segment
A45 - Business Unit
A46 - Business (Product) Line



ATTRIBUTES TO HELP MAINTAIN THE REQUIREMENTS
A13 - Unique Identifier
nor
ent Entered
r
ange
rson
ement Verification Status
ement Validation Status
or requirement)
mentation)
ce Definition
equirements
A33 – Criticality or Essentiality
A34 – Risk (of implementation)
A35 – Risk (Mitigation)
A36 - Key Driving Requirement (KDR)
A37 - Additional Comments
A38 - Type/Category

THERE'S MORE!! "*This list is not exhaustive* "

What Else Does GfWR Say?

"It is not the intention that an organization should include all of these attributes when defining needs or requirement expressions."

"As with the use of all information, a "lean" approach should be taken when deciding which attributes will be used - don't include a specific attribute unless you, your team, or your management has asked for that attribute and will be using that attribute in some manner to manage the project and set of requirements."

First Group

- ATTRIBUTES TO HELP DEFINE THE REQUIREMENT AND ITS INTENT
  - A1 – **Rationale**
    - A separate note in SysML
  - A2 **- System of Interest (SOI) Primary Verification Method**
  - A3 - **SOI Verification Approach**
  - A4 - Trace to Parent Requirements
    - An attribute implemented as a relationship in EA
  - A5 - Trace to Source
    - An attribute that could be implemented as a relationship in EA
  - A6 - Condition of Use
    - Still trying to figure out how this is an attribute
  - A7 - States and Modes
  - A8 - Allocation

Second Group

- ATTRIBUTES ASSOCIATED WITH THE SOI AND ITS VERIFICATION
  - A9 - SOI Verification Level
  - A10 - SOI Verification Phase
  - A11 - SOI Verification Results
  - A12 - SOI Verification Status

Baker sez – this information is better captured as a verification case, not isolated with the requirement element.

Third Group

- ATTRIBUTES TO HELP MAINTAIN THE REQUIREMENTS
- **A13 - Unique Identifier**
- **A14 - Unique Name**
- **A15 - Originator/Author**
- **A16 - Date Requirement Entered**
- A17 – Owner
  - *As long as it's not a person's name*
- A18 – Stakeholders
  - *RACI Matrix*
- A19 - Change Board
- A20 - Change Status
  - *Use a separate Change element*
- A21 - Version Number
- A22 - Approval Date
- A23 - Date of Last Change
- A24 - Stability
- A25 - Responsible Person
  - *No person's names*
- A26 – Need or Requirement Verification Status
- A27 – Need or Requirement Validation Status
- A28 - Status (of the need or requirement)
- A29 - Status (of implementation)
- A30 - Trace to Interface Definition
- A31 - Trace to Peer Requirements
- **A32 - Priority**
- **A33 – Criticality or Essentiality**
- **A34 – Risk (of implementation)**
  - *Not embedded in the requirement*
- A35 – Risk (Mitigation)
- A34 - Key Driving Need or Requirement (KDN/KDR)
- **A35 - Additional Comments**
  - *Notes in EA*
- **A36 - Type/Category**

Fourth (and Last) Group

- ATTRIBUTES TO SHOW APPLICABILITY AND ALLOW REUSE
  - A39 - Applicability
  - A40 - Region
  - A41 - Country
  - A42 - State/Province
  - A43 - Application
  - A44 - Market Segment
  - A45 - Business Unit
  - A46 - Business (Product) Line

Wiegers Suggestions

- Date the requirement was created (A16)
- Current version number of the requirement (A21)
- Author who wrote the requirement (A15)
- Priority (A32)
- Status (A28)
- Origin or source of the requirement (A5)
- Rationale behind the requirement (A1)
- Release number or iteration to which the requirement is allocated (A29?)
- Stakeholder to contact with questions or to make decisions about proposed changes (A17 and 18)
- Validation method to be used or acceptance criteria (A3)

- "Selecting too many requirements attributes can overwhelm a team. They won't supply all attribute values for all requirements and won't use the attribute information effectively. Start with perhaps three or four key attributes. Add others only when you know how they will add value."
- Chapter 27, Software Requirements 3rd ed. by Karl E Wiegers and Joy Beatty Published by Microsoft Press, 2013

Our Requirement Metadata

• Date the requirement was created (A16)	• Created property
• Current version number of the requirement (A21)	• Version property
• Author who wrote the requirement (A15)	• Author property
• Priority (A32)	• Priority property
• Status (A28)	• Status property
• Origin or source of the requirement (A5)	• extension
• Rationale behind the requirement (A1)	• extension
• Release number or iteration to which the requirement is allocated (A29?)	• Phase property
• Stakeholder to contact with questions or to make decisions about proposed changes (A17 and 18)	• extension
• Validation method to be used or acceptance criteria (A2)	• extension

Where do we capture the attributes in EA?

Not Sufficient!

Our Requirement Metadata

- Requirement ID
- Requirement Name/Short Text
- Requirement Statement
- Verification
  - Analysis
  - Inspection
  - Demonstration
  - Test
- Type (e.g. FURPS+)
  - Functional
  - Usability
  - Reliability
  - Performance
  - Supportability

- Alias property is often used
- Name property
- Extension
- Extension

- Extension

7 Attributes Noted as "Extension"

- Rationale
- Source
- Stakeholders (RACI)
- Validation Method
- Verification Method
- Requirement Statement
- Requirement Type

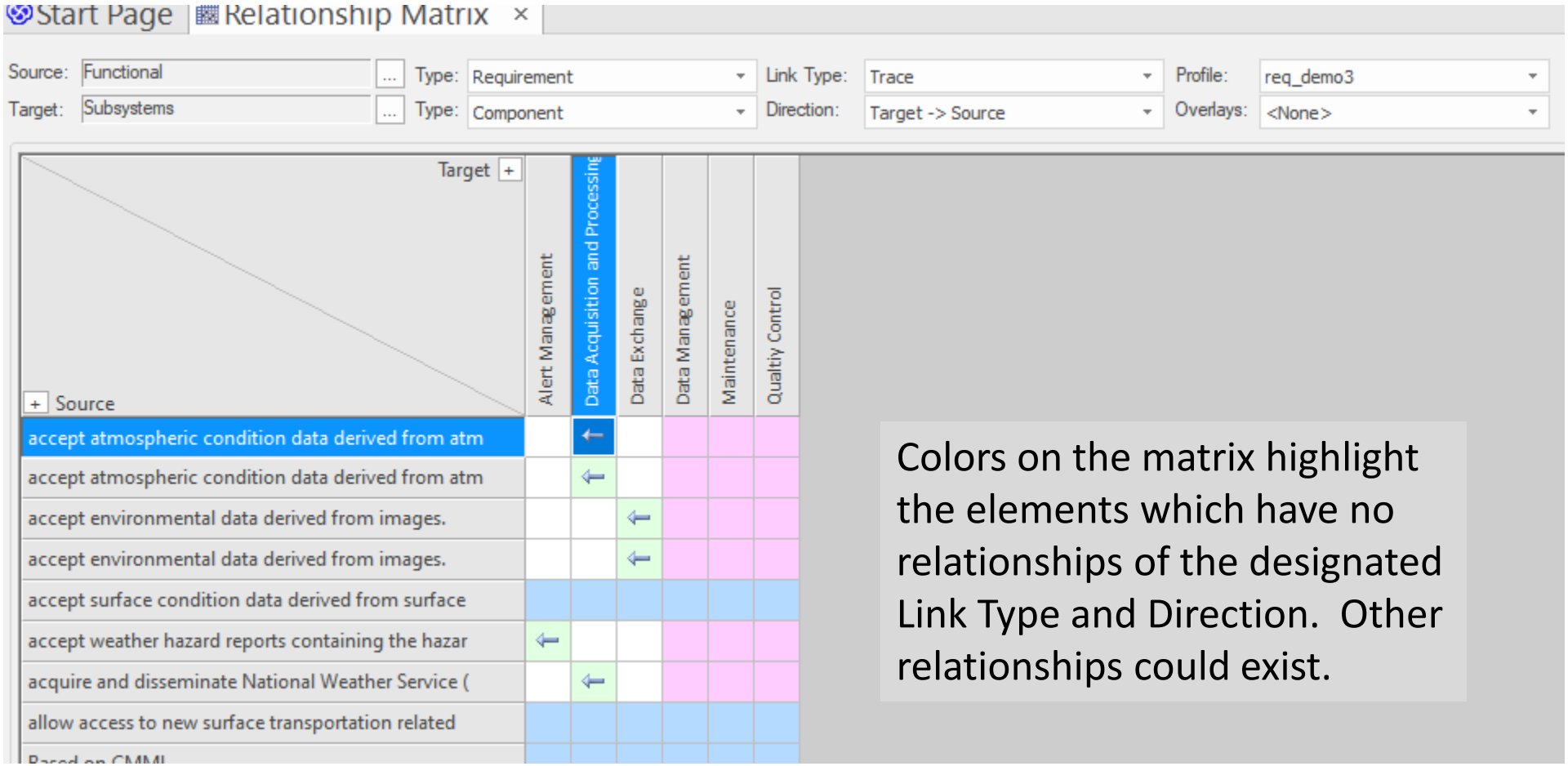
- A stereotyped comment in SysML
  - Not sufficient
- A Tag Value
- A Relationship matrix
- ?
- Tag Value
  - The profile also includes the need for a verification requirement
- Tag Value
- Tag Value

Requirement traceability

- The Requirements Traceability Matrix (RTM) is used to control & track system level, allocated and derived requirements.
- A Requirements Analysis Checklist and the Requirements Management Planning Template may describe the RTM and the RVTM.
- The RTM and RVTM are not distinct files. They are created as needed by EA

- Why use requirements traceability?
  - Ensure that the system does what it is supposed to do
  - Ensure that the system does only what it is supposed to do
  - Assess impact of change
    - Find related requirements
    - Inspect related requirements

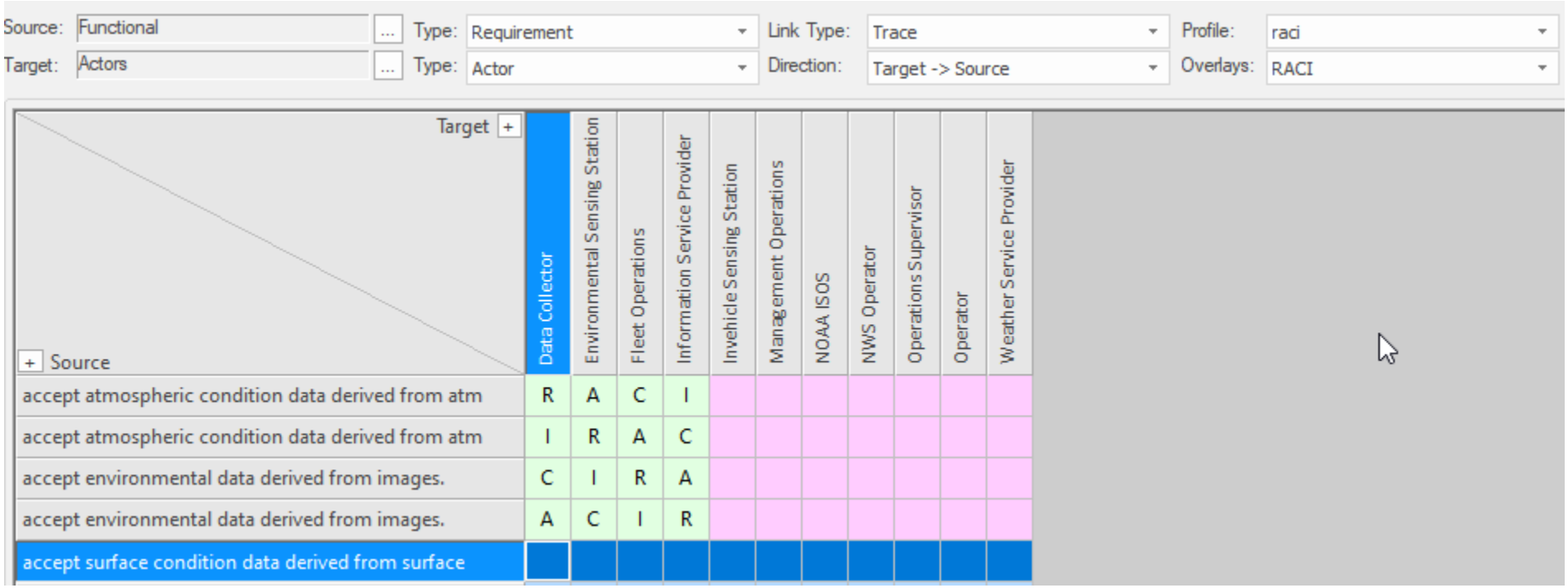
Relationship Matrix



Colors on the matrix highlight the elements which have no relationships of the designated Link Type and Direction. Other relationships could exist.

An alternate visualization of the requirements and one of their trace relationships

Stakeholder Matrix



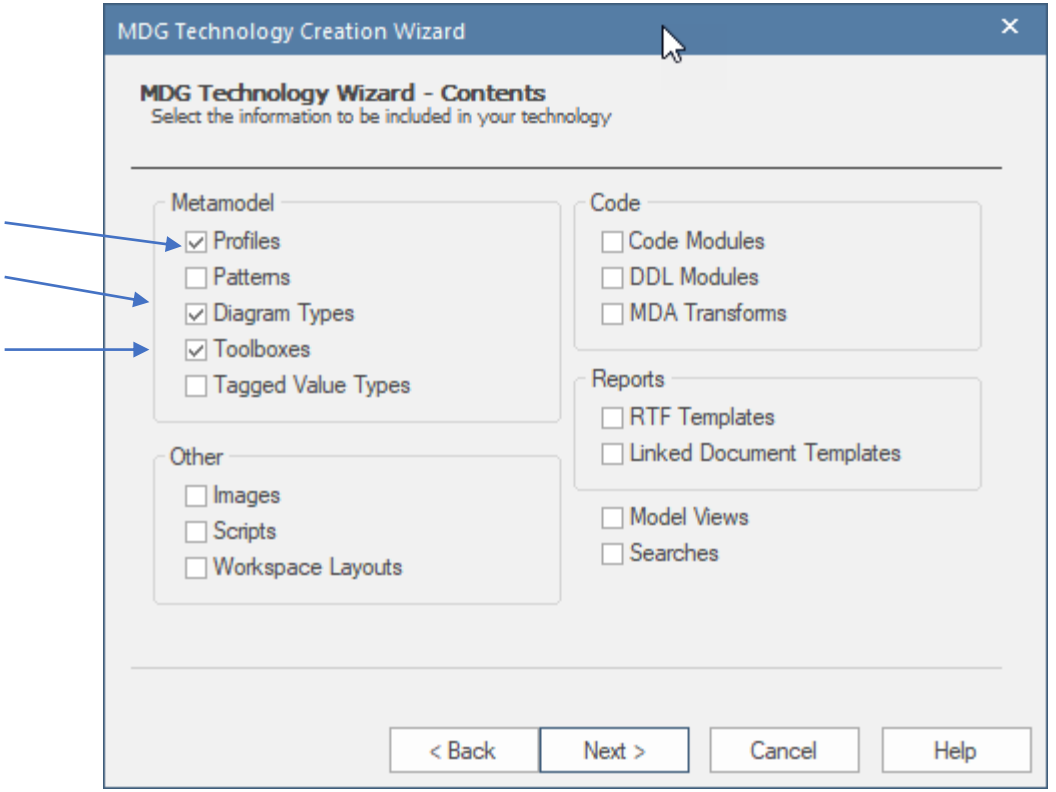
Real UML relationships exist behind the matrix overlay.

Other metadata

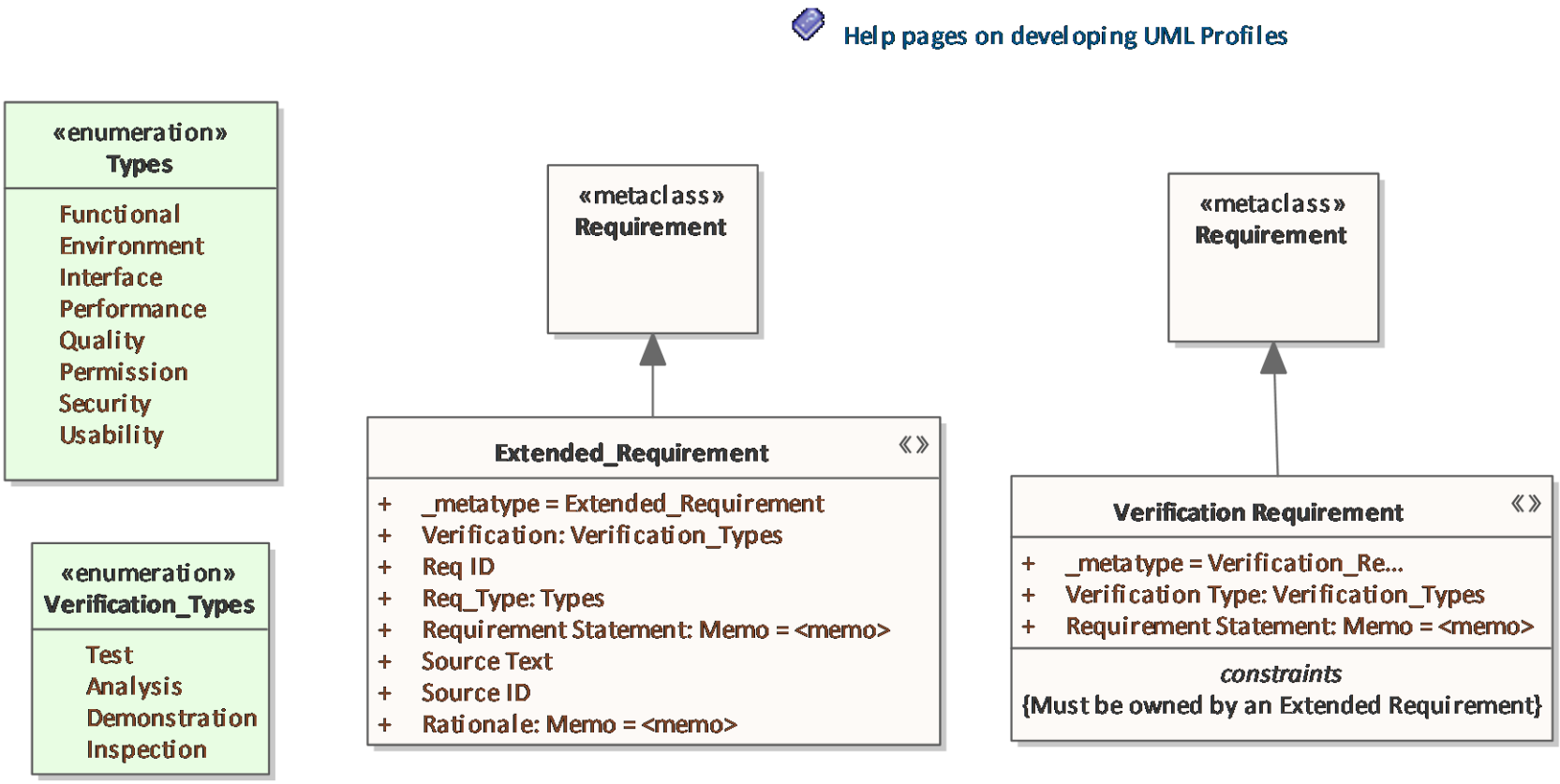
- Risks
  - IN EA these can be captured as elements
  - More flexibility in reporting
  - The same risk can be associated with multiple requirements
- Verification level
  - Adding test cases to the model can provide more than just a level identifier
- Tracking “Deleted” requirements could be a challenge since they need to be present in the model but flagged as deleted

Model Driven Generation

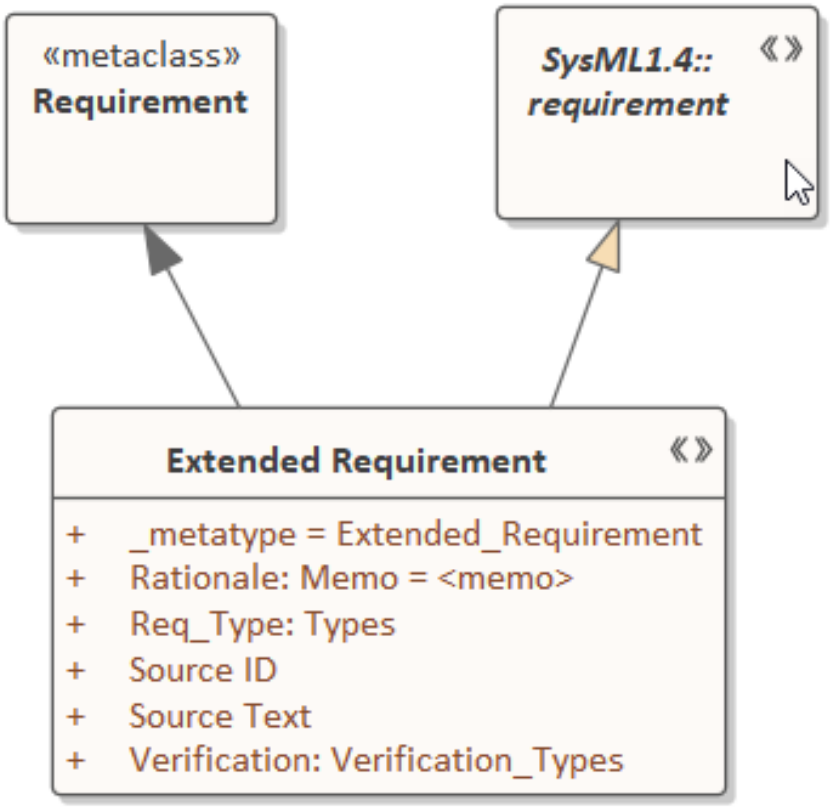
An EA extension mechanism that is based on models and metamodels



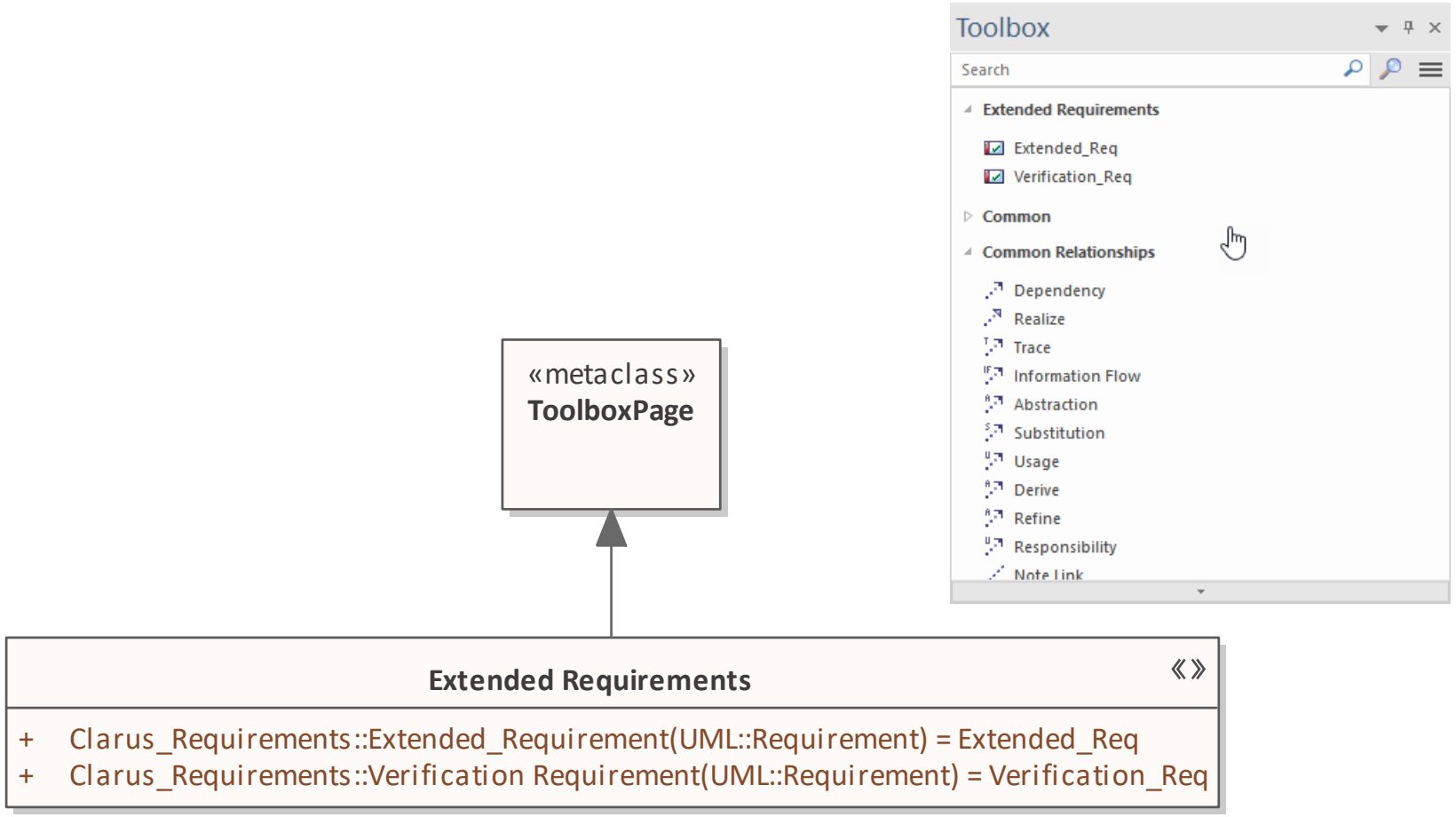
The MDG Technology Model



The SysML Variant

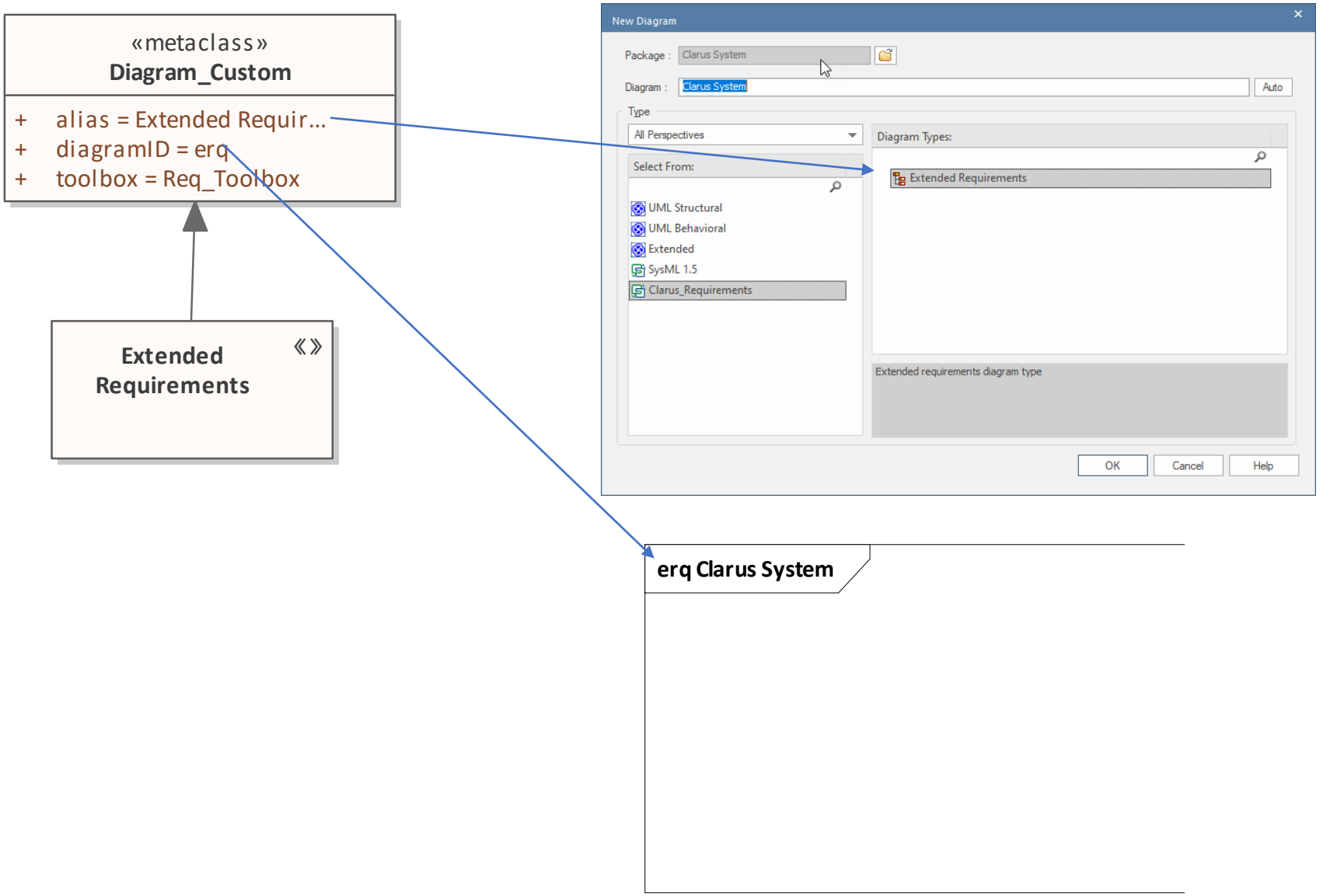


Toolbox Profile

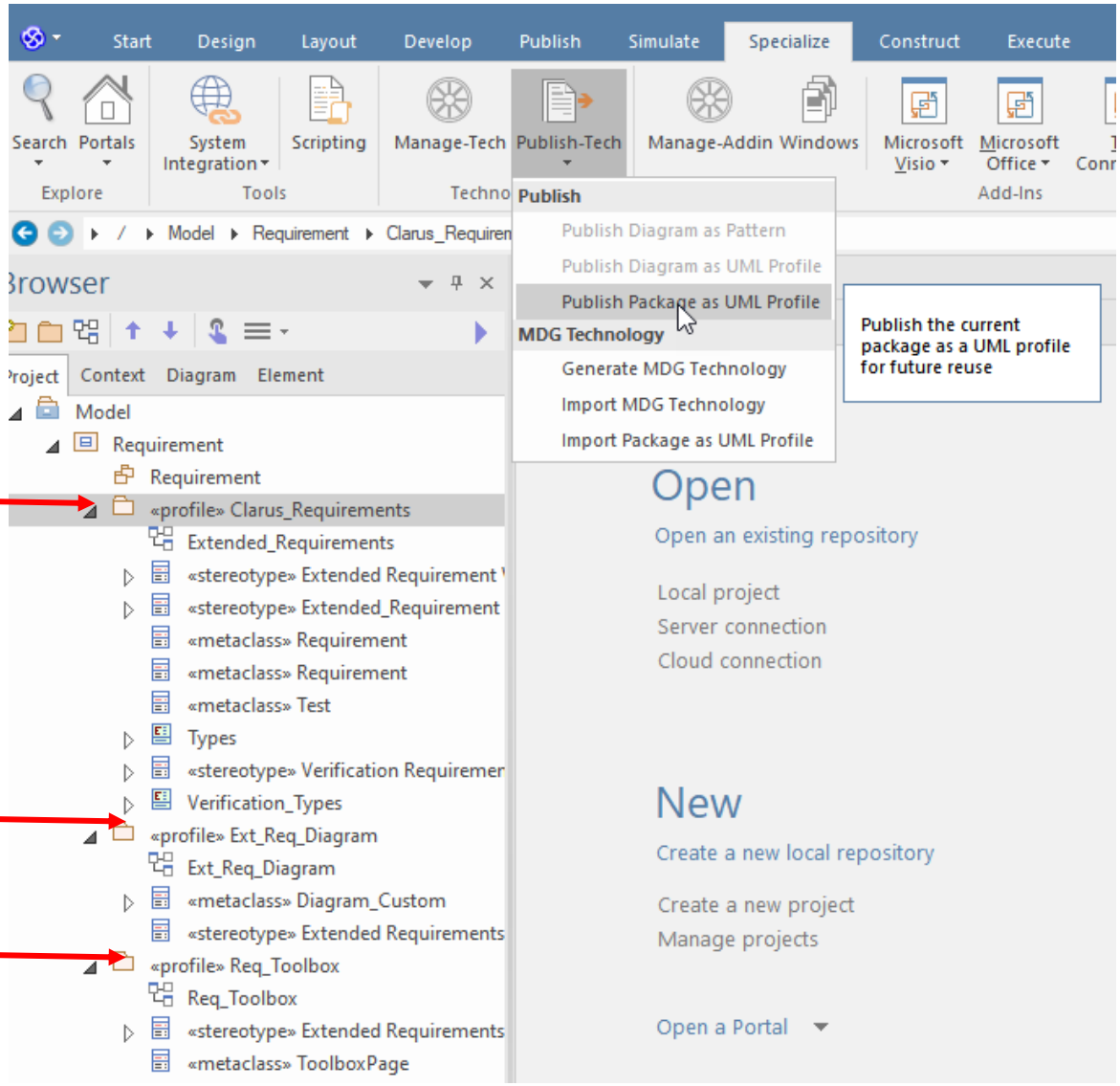


There are only two elements here, but we could add elements from UML or relationships to the toolbox page

The Diagram Profile



Creating the MDG Technology

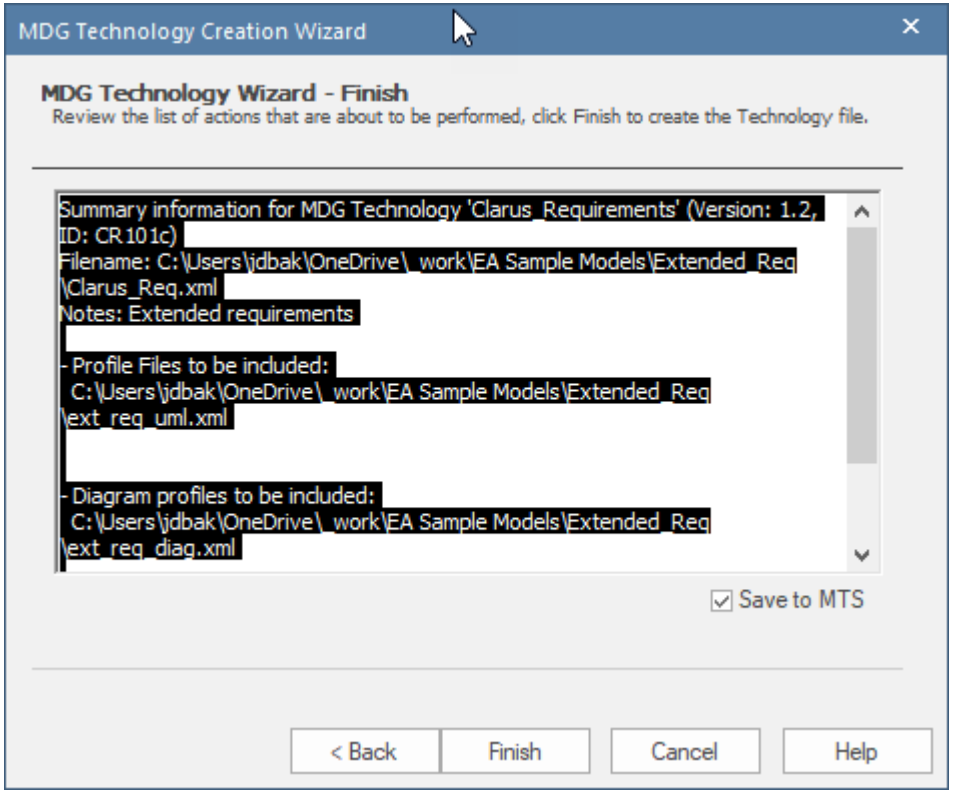


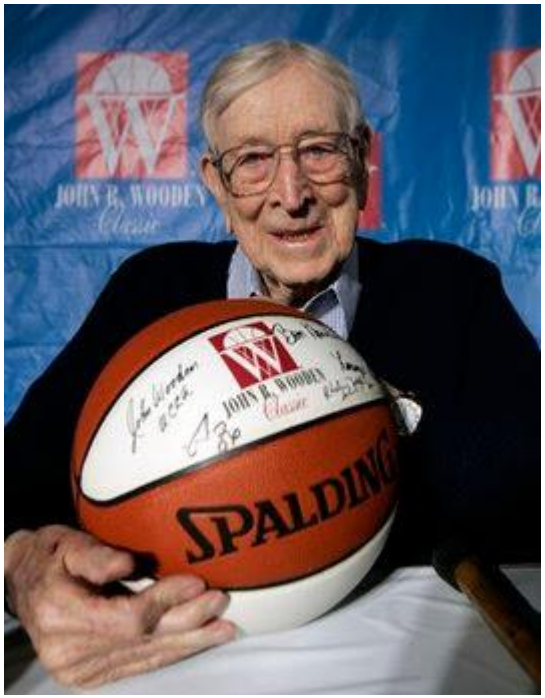
UML

Diagram

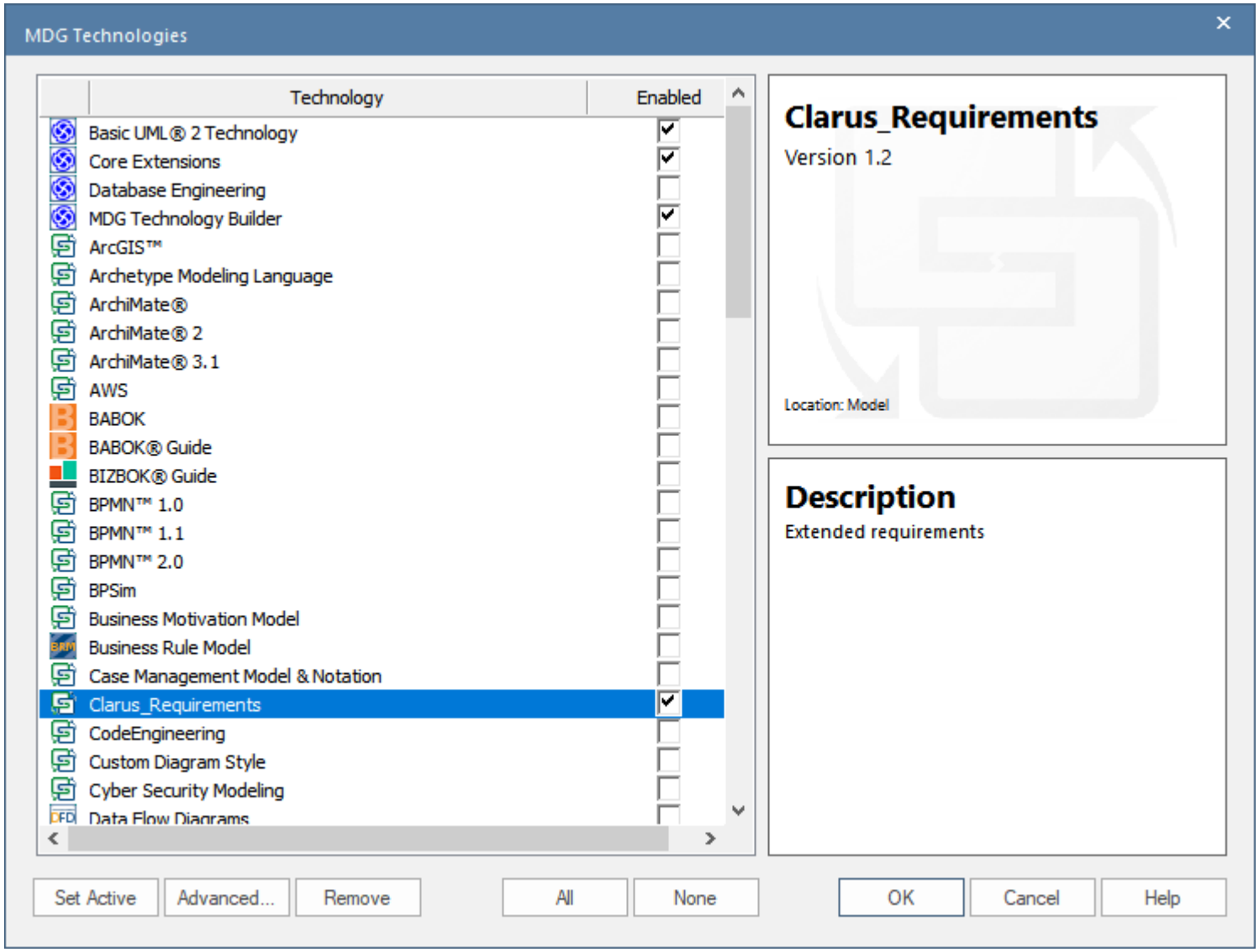
Toolbox

MDG Technology Creation Wizard

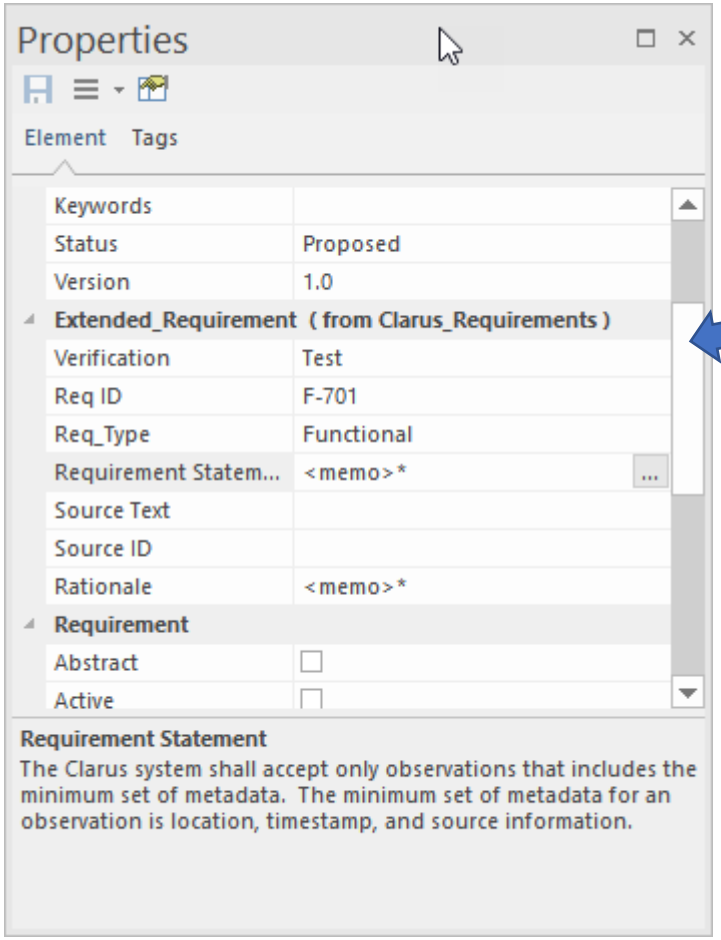


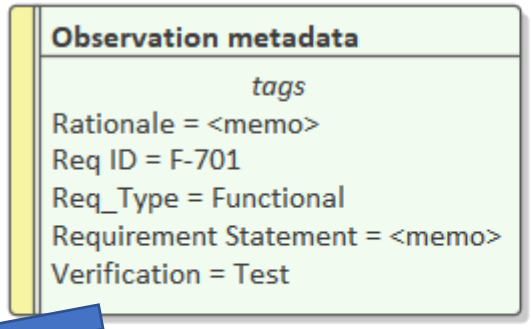


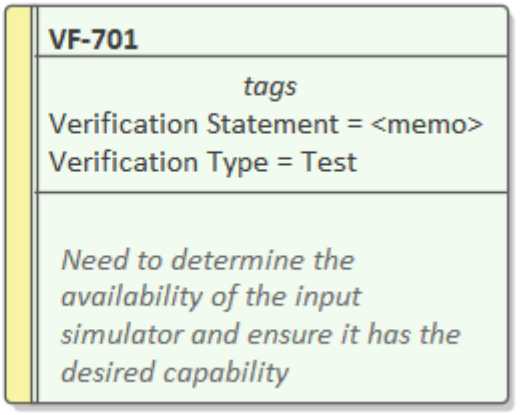
Import the MDG Technology

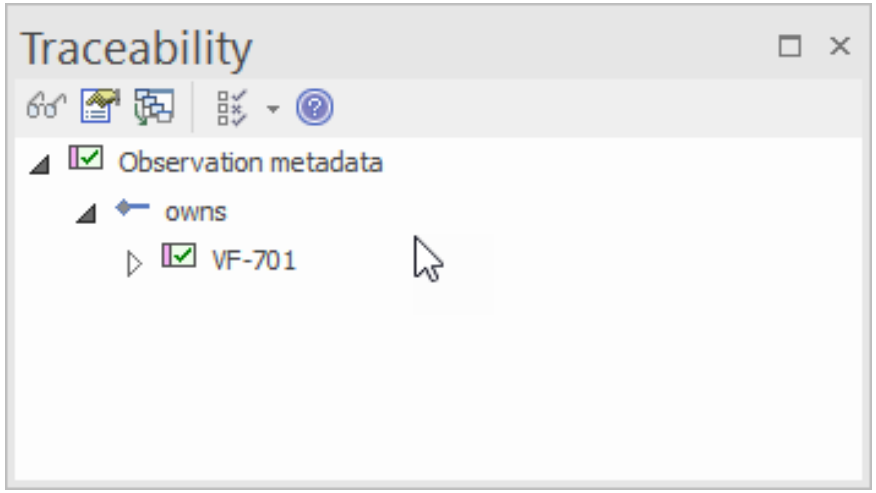


An Example

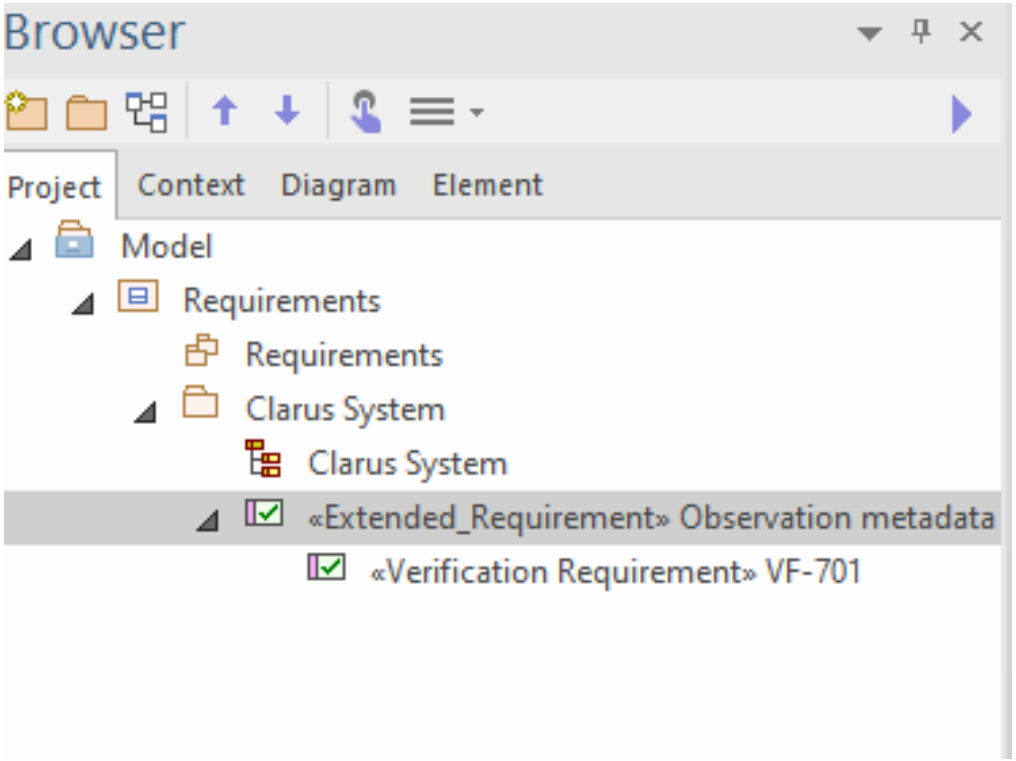








Model Organization

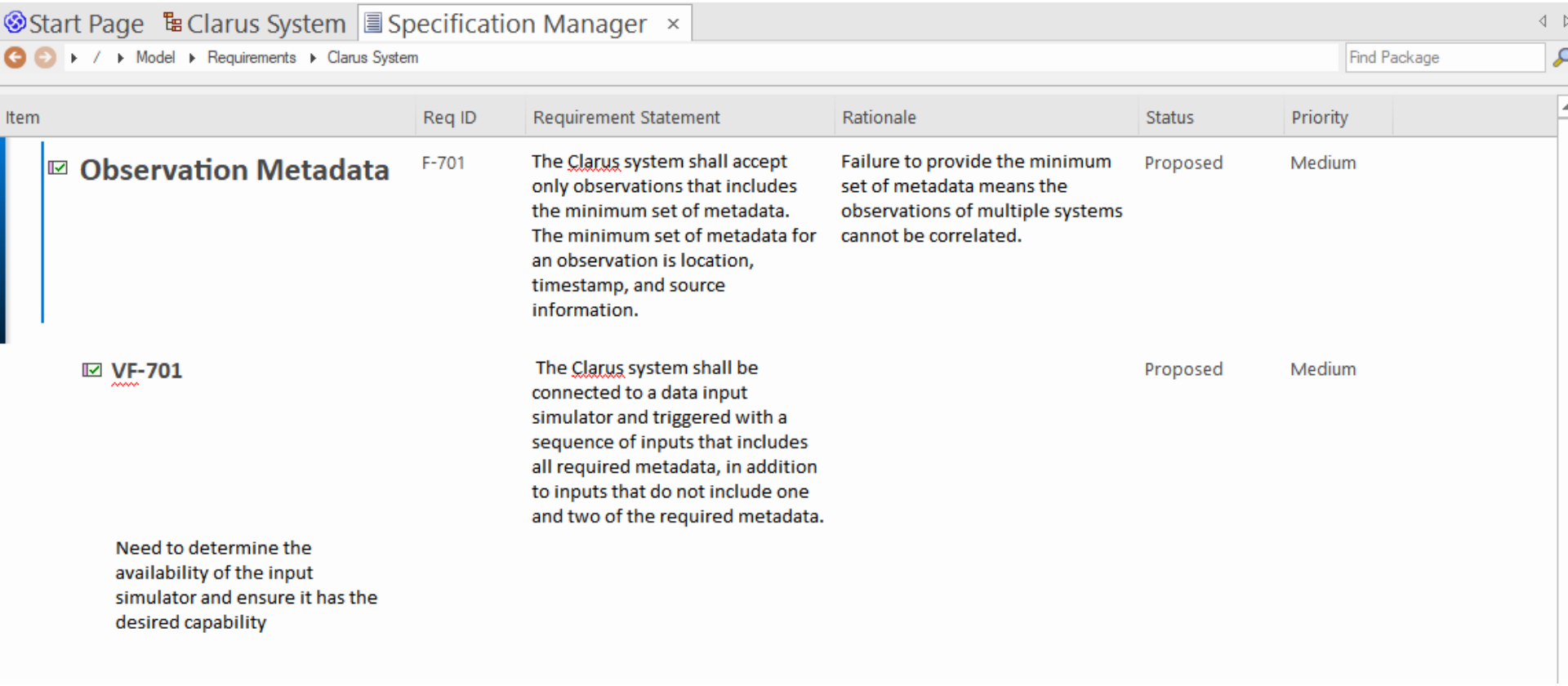


Are We There Yet?

- Requirements have exactly the attributes we need
- Verification consideration is an upfront process
- Things are really coming together
- But I don't want to have to do all that clicking around. I miss the way my requirements used to look

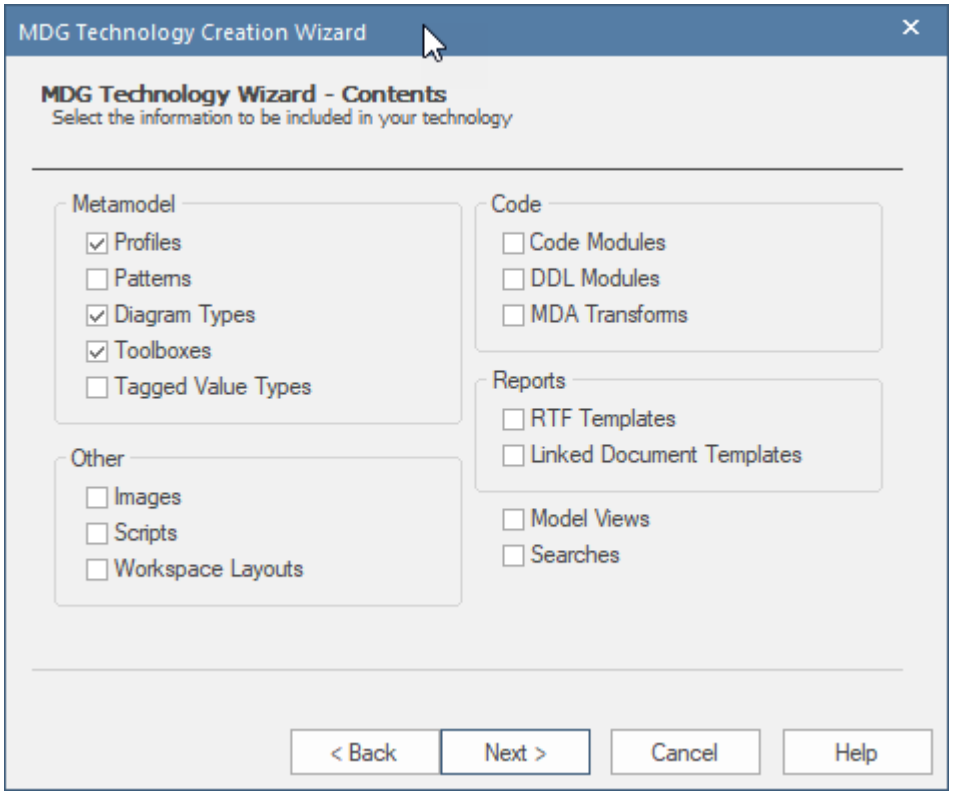
There is no need to fear,
Underdog is here!!

Putting It All Together



The EA Specification Manager provides the capability to present the requirement expression in a traditional view while maintaining the information as model elements and associated attributes. Like everything else in EA, if you change the value of an attribute here, it is changed everywhere in the model

Going Forward



There's more to add to your productivity.

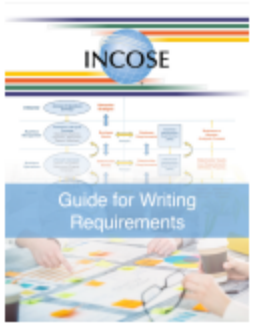
Create your own modeling language with just the right attributes and other modeling support.

Make EA work the way you need it to work.

Q&A in the Teams Discussion Forum

MS Teams Location

References



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6 REVIEWS

by Karl E Wiegers and Joy Beatty

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Me