

# Decision Modeling with ADMentor – Users Guide/Use Case Walkthrough

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**Authors (of this Document):** Lukas Wegmann and Olaf Zimmermann, Hochschule für Technik Rapperswil (HSR FHO), Switzerland.

**Acknowledgment:** ADMentor is the result of a research collaboration between HSR FHO and ABB Corporate Research.

## 1. AD Mentor at a Glance

ADMentor is an add-in to Sparx [Enterprise Architect](#) Version 10 (and higher) that supports the sharing of architectural decision knowledge across projects:

*Context matters* when it comes to experience sharing; therefore simplistic best practices rules and design-by-authority are bound to fail in the real world. This makes architectural decision knowledge particularly precious. However, such knowledge changes frequently, and architecture documentation budgets typically are very limited. Therefore, knowledge reuse by chance is not going to happen.

*Decision guidance models, created with the ADMentor tool, fill the gap between static and stale reference architectures and patterns and retrospective decision capturing in meeting protocols, project wikis, or software architecture documents.*

**Source:** ADMentor project website, <https://www.ifs.hsr.ch/index.php?id=13201>

The key features of ADMentor are:

- Problem space modeling: recurring design decisions, options to be considered (as envisioned in this [IEEE Software/InfoQ article](#)) - providing a checklist effect
- Solution space modeling: decisions made and their rationale – yielding a continuous decision log
- Model tailoring (context-specific filtering), decision backlog management
- Rich text editing, model refactoring, reporting via Enterprise Architect integration
- Decision capturing with lightweight decision capturing templates such as Y-statements (as introduced in this [IEEE Software/InfoQ article](#))
- Question, Option, Criteria (QOC) diagram support
- Sample guidance models compiling decisions that recur in cloud application design and workflow design

ADMentor's technology highlights include:

- UML Profile and MDG Technology with state-of-the-art Architectural Knowledge Management (AKM) semantics, optimized for decision modeling with reuse
- Model tailoring and filtering capabilities based on Tagged Values (UML extension mechanism)
- Decision space analytics
- RESTful HTTP interface for tool integration

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## 2. Install AD Mentor

### 1.1 Software Prerequisites

- Sparx Enterprise Architect (EA) Version 10 or higher
- Microsoft .NET Framework 4.5  
(Download at <http://www.microsoft.com/en-us/download/details.aspx?id=30653%20>)

### 1.2 Installation

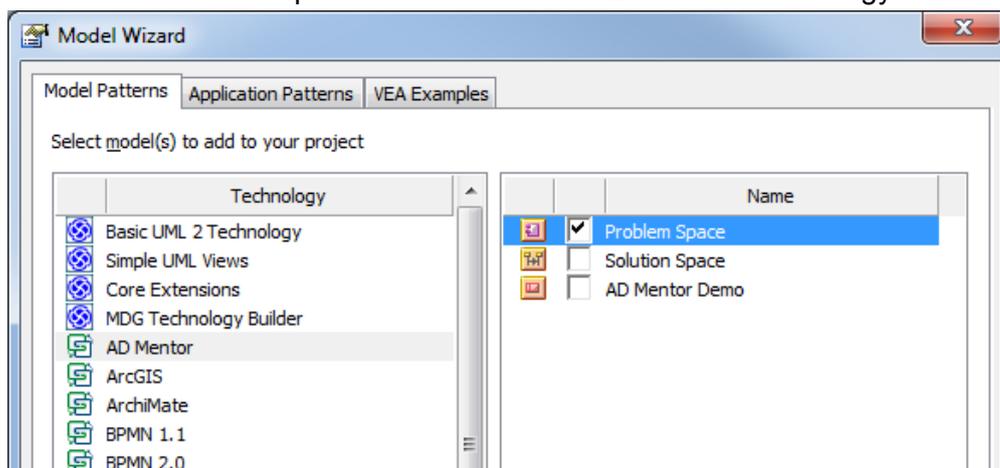
1. Execute “ADSetup.msi”.
2. Follow the installation wizard.

Although you have to select an installation folder during the setup, the installation will not create any files in this folder. The setup process only adds the required libraries to the system’s Global Assembly Cache and registers the Enterprise Architect Add-In.

## 2 Model a Reusable Problem Space

### 2.1 Create a new Problem Space

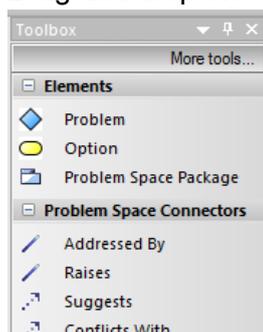
1. Navigate to “Project” → “New Model...” (or press Ctrl + Shift + m).
2. Select the “Problem Space” model from the “AD Mentor” technology.



### 2.2 Add Problems/Options to the Problem Space

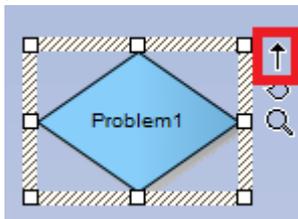
#### 2.2.1 Using the Toolbox

1. Open a “Problem Space” Diagram.
2. Drag and drop the desired element type to the diagram.

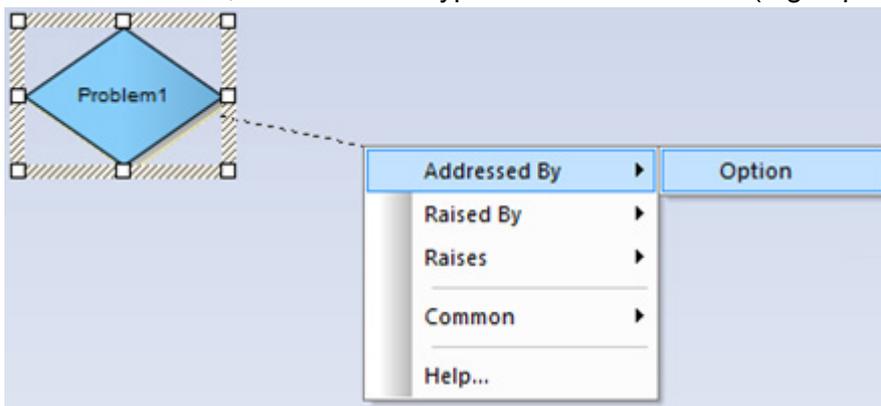


## 2.2.2 Using Quick Links

1. Select an existing element in a Problem Space diagram, e.g. a Problem or an Option.
2. Click on the Quick Linker arrow at the top right corner of the shape and drag it to the position where the new element should be created.



3. Select the connection type that should be used to associate the new element with the selected element, as well as the type of the new element (e.g. Option or Problem).



The above quick link reads as “Problem 1 should be addressed by a new Option”.

Quick links can also be used to connect two existing elements.

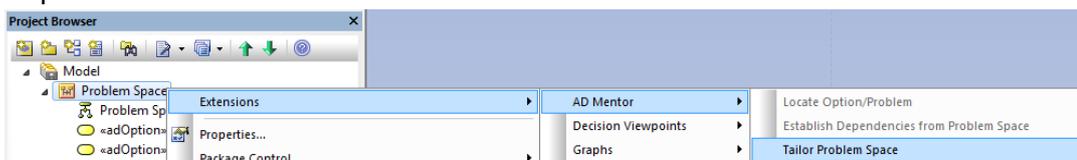
For more information on quick links, see

[http://www.sparxsystems.com/enterprise\\_architect\\_user\\_guide/10/modeling\\_basics/quick\\_links.html](http://www.sparxsystems.com/enterprise_architect_user_guide/10/modeling_basics/quick_links.html).

## 3 Create a Tailored Problem Space Export

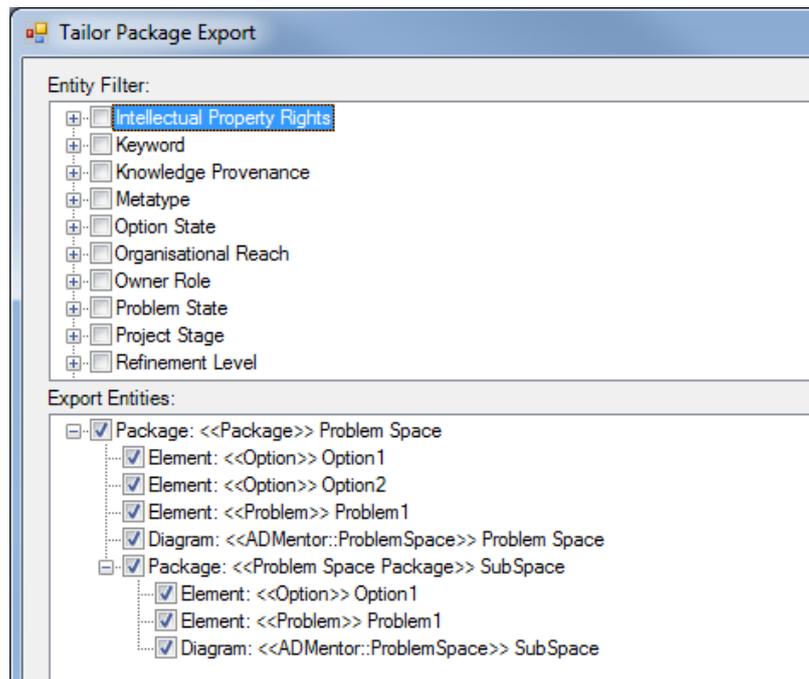
A Problem Space may contain information that should not be used to create a concrete solution. This information may include confidential data or information that is clearly not related to the solution. This is why AD Mentor offers a feature to export a subset of a Problem Space that is specifically *tailored* to the needs of a particular solution project.

1. Right click on a package containing Problem Space items in the Project Browser.
2. Select the “Extensions” → “AD Mentor” → “Tailor Problem Space” menu item. AD Mentor may now take up to a minute, or more for very large models, to calculate the required information.



3. Adapt the filter that you want to apply on the Problem Space in the upper half of the “Tailor Package Export” dialog. The lower half of the dialog lists the entities that match the selected filter and will be exported when clicking “Export”. You can also

select/deselect individual entities to specify an even finer grained tailoring of the problem space.

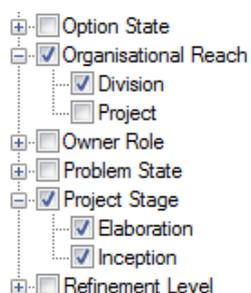


- When you click on “export”, AD Mentor asks for a location for the XML export. Choose an appropriate path and filename and start the export by clicking “Save”. Depending on the size of the Problem Space, the export may take several seconds.

The entity filters allow selecting elements with desired properties. These properties include the tagged values defined by ADMentor (see Section 10), keywords and other element properties defined by Enterprise Architect and the type of the element.

The top-level nodes of the filter tree form a conjunction (logical and). Hence, elements must match every selected top-level filter to be included in the export. The options in each top-level filter are a disjunction (logical or). An element must match one of the selected properties.

For instance, the following filter selection accepts elements that have an “Organisational Reach” of “Division” and are in the “Project Stage” “Elaboration” or “Inception”:



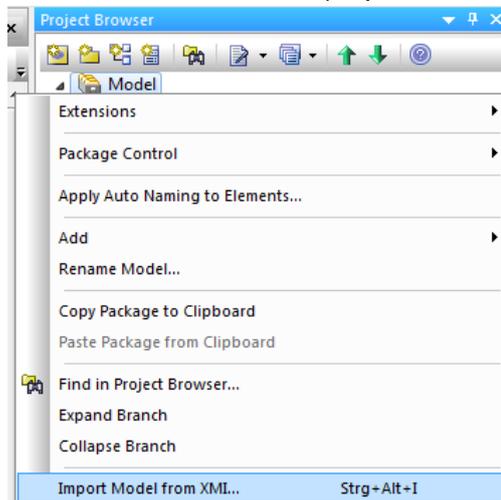
**Diagrams** and **Packages** are included in the export if they match the selected filter or they contain elements that match a selected filter.

And finally, there is an additional rule, that an **Option** derives properties from a **Problem** when these two elements are connected by an “isAddressedBy” relationship and the property

is not present in the Option. For example, an Option does not have a “Project Stage” tag, but derives its project stage tag from all Problems that are addressed by this Option.

### 3.1 Import a Tailored Problem Space into another Project

1. Open an EA Project file.
2. Right click on the Root Model in the Project Browser and select the “Import Model from XML...” menu item (or press Ctrl + Alt + I).

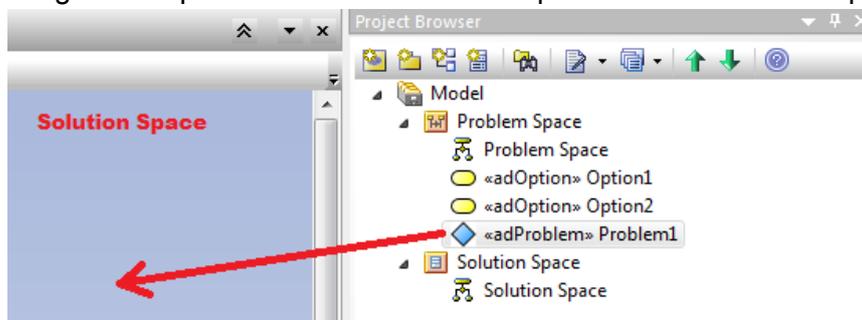


3. Enter the location of the tailored XML export file and click on “Import” to start the import.
  - a. If you import the XML into the same project file as the one used to generate the export, you have to select the “Strip GUIDs” option to prevent collisions.

## 4 Create a Concrete Solution Space

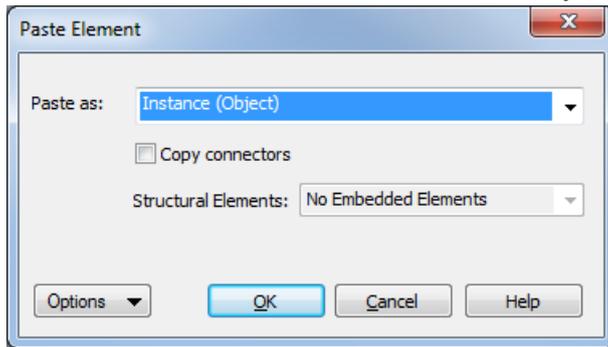
### 4.1 Manually Populate a Solution

1. Create a new Solution Space (in the same way as you create a problem space, see Section 2.1 for instructions).
2. Open the Solution Space diagram that is contained in the new Solution Space. You can also create Solution Space diagrams manually.
3. Drag and drop items from the Problem Space into the Solution Space diagram.



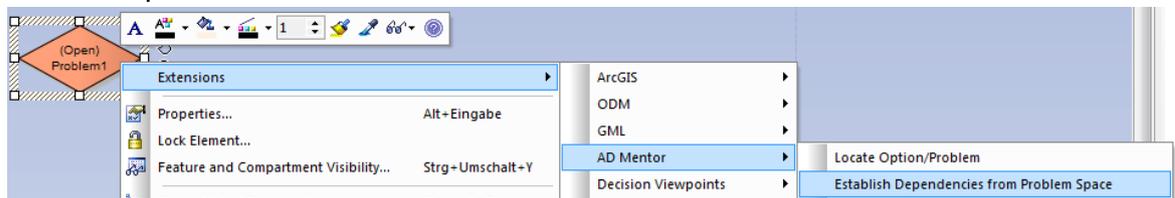
4. Enterprise Architect should now open the “Paste Element” dialog. Select “Instance (Object)” or “Instance (ADMentor::adProblemOccurrence)” in the “Paste as” drop down menu (it doesn’t matter which of these two menu entries you choose). The “Copy Connectors” checkbox has no implications on the outcome, and you can leave

it as is. Confirm the element instantiation by clicking “OK”.

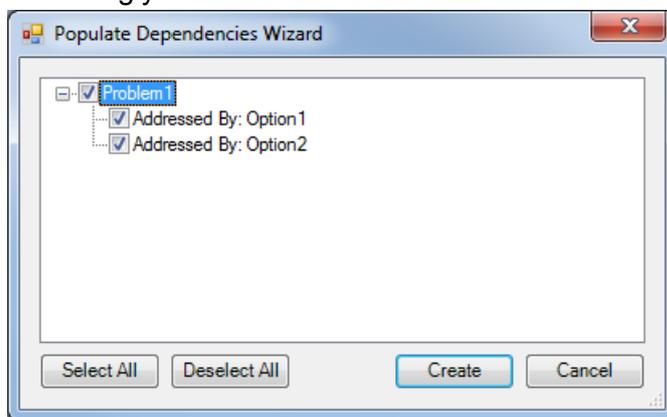


5.

You can also automatically add instances of related Problems/Options to existing Solution Space items: Right click on an Option/Problem Occurrence in a Solution Space diagram and choose the “Extensions” → “AD Mentor” → “Establish Dependencies from Problem Space” menu item.

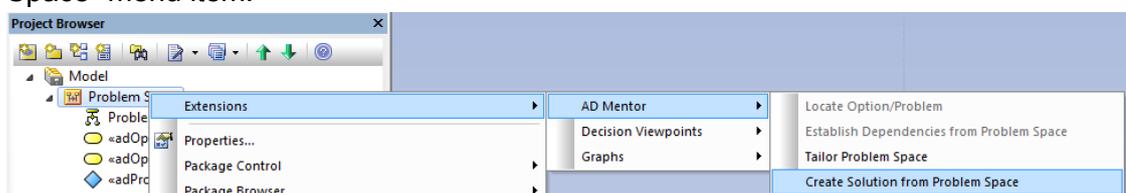


This will open the “Populate Dependencies Wizard”. You can use this wizard to create instances of related elements from the Problem Space in the Solution. When you select related elements and press “Create”, AD Mentor automatically instantiates them accordingly and adds the new instances to the currently open diagram.

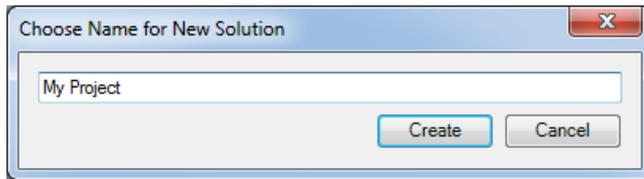


## 4.2 Automatically Instantiate a Complete Problem Space into a new Solution

1. Right click on a package that contains Problem Space items in the Project Browser.
2. Select the “Extensions” → “AD Mentor” → “Create Solution Space from Problem Space” menu item.



3. Enter a name for the solution to be created and click “Create”.

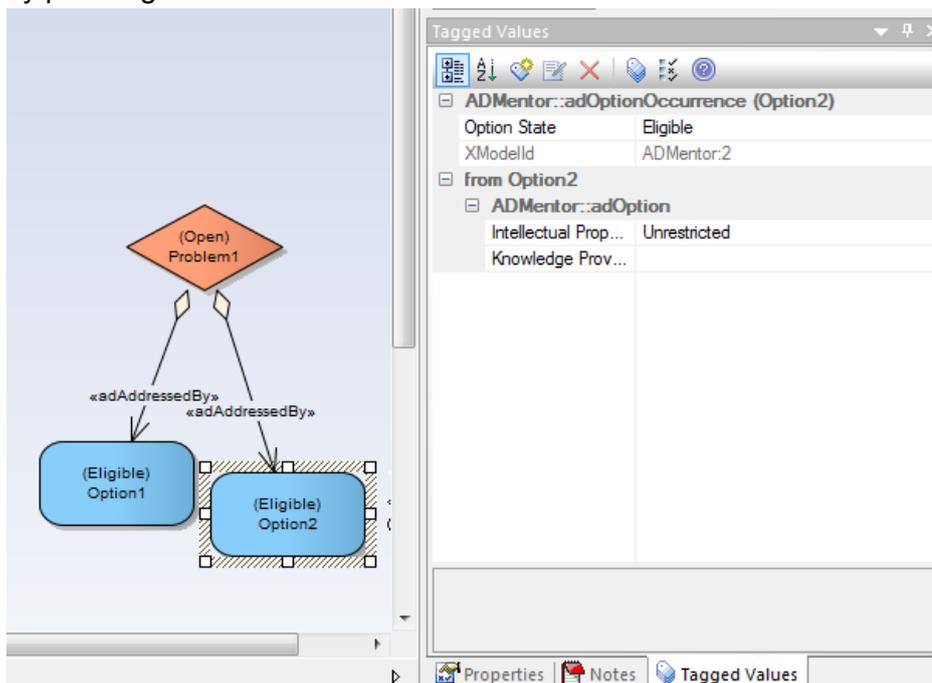


4. AD Mentor now creates a new Solution Space that contains instances of all Problems and Options from the selected package including the according connectors and diagrams. AD Mentor tries to reproduce instantiated diagrams as accurate as possible and also includes references to other elements like notes or requirements that were not instantiated. Unfortunately not all diagram objects can easily be copied. For example embedded images are not supported.

## 5 Document the Decision Making Process

### 5.1 Update the Decision State of an Option Occurrence

1. Select an Option Occurrence in a Solution Space diagram.
2. Open the “Tagged Values” tab that appears near the properties editor (in the default layout of the EA user interface, which can be customized by the user). If you can’t find the tab, you can open it via the main menu under “View” → “Tagged Values” or by pressing Ctrl + Shift + 6.



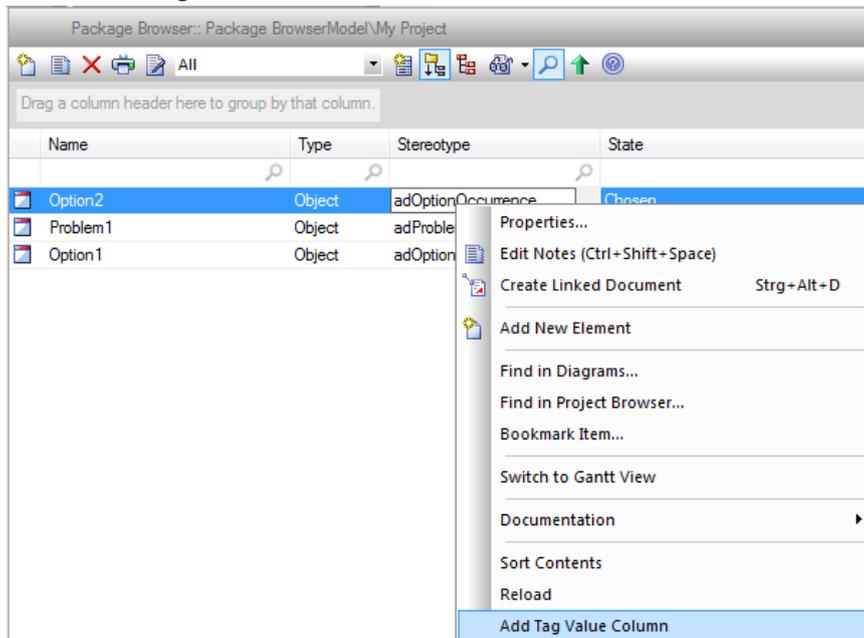
3. Change the “State” value accordingly to your decision. AD Mentor will automatically update the state of associated problems.

AD Mentor also offers a shortcut for documenting past decisions. Just select an Option Occurrence and open in the context menu “Extensions” → “AD Mentor” → “Choose Selected and Neglect not chosen Alternatives”. This will set the state of the selected Option Occurrence to “Chosen” and the state of all other Options of the associated Problem Occurrence that are not “Chosen” to “Neglected”.

You can also neglect all options of a problem and set the problem to state “not applicable” with a problem-level shortcut: “Extensions” → “AD Mentor” → “Neglect all Alternatives”.

## 5.2 Find not yet Decided Problem Occurrences

1. Right click on your Solution Space package in the project browser and select the “Package Browser” → “Standard View” menu item.
2. Right click an item with stereotype “adProblemOccurrence” and choose the menu item “Add Tag Value Column”.



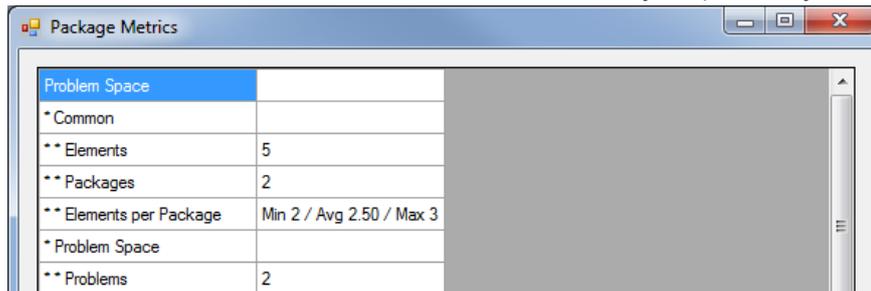
3. Select the radio button “Tagged Values from the selected Element” in the “Add Tag Value Column” dialog.
4. Select the “Problem State” entry in the “Tagged Value” drop down and click “OK”.
5. The package browser now contains a column “Problem State” that displays the decision state of Problem Occurrences. By dragging the “Problem State” column header to the area labeled “Drag a column header here to group by that column” you can group the package contents by the decision state. Additionally, you can specify filters on the decision state by clicking the “Toggle Filter Bar” button .

Further customization of the Standard View of the Package Browser is possible (this is standard EA functionality). For instance, you can add some of the Tagged Values defined in Section 10 to turn the Package Browser into a full *decision backlog*. To save and load such customizations, go to the “Columns Layout” entry in the context menu of the Package Browser.

## 6 Query Metrics on Problem and Solution Spaces

1. Right click on a package in the project browser and select the “AD Mentor” -> “Package Metrics”.

- AD Mentor will now calculate several metrics for you (this may take several seconds).



Problem Space	
* Common	
** Elements	5
** Packages	2
** Elements per Package	Min 2 / Avg 2.50 / Max 3
* Problem Space	
** Problems	2

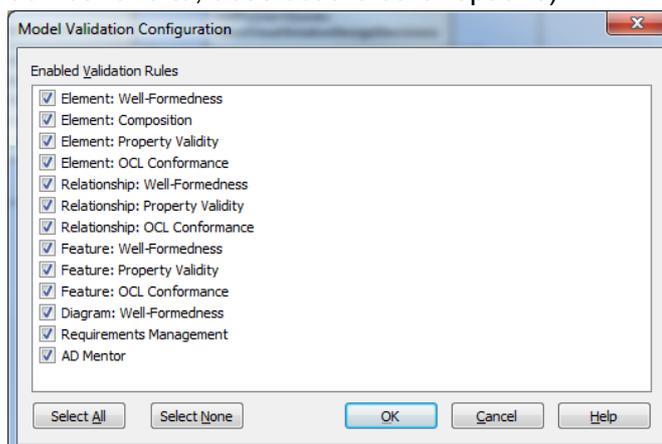
## 7 Validate Problem and Solution Spaces

AD Mentor provides several validation rules for Enterprise Architects built in validation facility. Currently, the following checks are implemented:

- Warning: Problems without associated Options (via AdressedBy links)
- Warning: Options that are not associated with a Problem (via AdressedBy links)
- Warning: Options that address more than one Problem
- Warning: Problem Occurrences without associated Option Occurrences
- Warning: Problem Occurrences that are not associated to a Problem Occurrence
- Error: Problem Occurrences with a state that does not map to the states of the associated Options (Inconsistent State)
- Error: Problem Occurrences with two or more chosen Options that are connected with a “conflictsWith” connector (conflicting Options chosen).
- Warning: ADMentor entities with an outdated model version.
- Warning: Elements that are not part of any diagram

Perform the following steps to run EA’s validation:

- Open “Project” → “Model Validation” → “Configure...” in the main menu.
- Enable the “AD Mentor” validation rules and confirm with “OK” (you may want to, but do not have to, deselect the other options).



- Select the package that you want to validate in the project browser.
- Start the validation via “Project” → “Model Validation” → “Validate Selected” (or Ctrl + Alt + V)
- The validation writes all found issues to the “System Output” tab. This may take several seconds or even minutes, depending on the size of the selected package.

## 8 FAQ

- Which versions of Enterprise Architect are supported by the AD Mentor Add-In?**

The current release is targeted for Enterprise Architect (EA) Version 10. EA Version 11 is supported, but behavior may slightly differ from the description in this walkthrough.
- Can I use AD Mentor and Decision Architect for EA (<https://decisions.codeplex.com/>) in the same project?**

Yes, AD Mentor is designed to cause as few inferences with other add-ins as possible. However, there is (currently) no semantic integration of Decision Architect entities into AD Mentor. That said, it is possible to use general-purpose relationship links such as “trace” to connect Decision Architect decision elements (e.g. in the relationship viewpoint) to problem and/or option occurrences in ADMentor solution spaces. The Relationship viewpoint in Decision Architect is recommended for such integrated, hybrid use of the two architectural decision modeling add-ins.
- Why does the “Create Solution Space from Problem Space” menu command omit instantiation of some connectors in my Problem Space?**

EA prohibits the automated creation of some connectors that can be created manually in the user interface. E.g. add-ins cannot create Association connectors with a Package as a target.
- How can I find out which problem occurrences have been created from the problems in my problem space?**

Right click on the problem in question and select “Find in all Diagrams” (Ctrl + U).

## 9 Known Limitations and Issues (ADMentor Version 1.1)

- The commands “Establish Dependencies from Problem Space” and “Create Solution Space from Problem Space” save all currently open diagrams before execution.
- Adding Option Occurrences that addresses a Problem Occurrence via “Establish Dependencies from Problem Space” does currently not update the state of the Problem Occurrence.
- “Establish Dependencies from Problem Space” may terminate EA under some non-reproducible circumstances. Until now, data loss in the affected project file due to this bug did not occur.
- The XML files generated by “Tailor Problem Space” may contain more information than visible in EA after importing the file. This could lead to leaked confidential information in some rare cases. Importing a tailored XMI into the project that was used to export the file can lead to unexpected results – imported diagrams contain all original elements, even the ones that have been filtered out.

## 10 The AD Mentor UML Profile

### 10.1 Diagram Types

	Description	Available Stereotypes
<b>Problem Space</b>	Models abstract problems and known solutions.	Option Problem Problem Space
<b>Solution Overview</b>	Models the decision process in a	Option Occurrence

concrete project using both solutions from the Problem Space as well as specific Problems and Options defined for this project.	Problem Occurrence Solution Space
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## 10.2 Element Stereotypes

	Description
<b>Problem</b>	A problem that may arise during a project.
<b>Option</b>	A possible solution for a problem.
<b>Problem Occurrence</b>	A concrete problem that arose during a project and had/has to be addressed.
<b>Option Occurrence</b>	A potential, chosen or neglected solution to a concrete problem.

## 10.3 Package Stereotypes

	Description
<b>Problem Space</b>	Bundles Problem Space items
<b>Solution Space</b>	Bundles Solution Space items

## 10.4 Connector Stereotypes

Source	Connector	Target	Description
Problem Problem Occurrence	<b>Addressed By</b>	Option Option Occurrence	An option is a possible solution for a problem.
Problem Problem Occurrence Option Option Occurrence	<b>Raises</b>	Problem Problem Occurrence Problem Problem Occurrence	Points to problems that arise due to the existence of another problem or the decision to use a certain option.
Option Option Occurrence	<b>Suggests</b>	Option Option Occurrence	Points to options that may be preferable when the source option has been chosen to solve a problem.
Option Option Occurrence	<b>Conflicts With</b>	Option Option Occurrence	Points to options that should not be considered when the source option has been chosen.
Option Option Occurrence	<b>Bound To</b>	Option Option Occurrence	Points to options that should be used when the source option has been chosen.
Issue Requirement	<b>Challenges</b>	Option Occurrence Option Occurrence	Denotes that a taken decision should be reconsidered.
Option Occurrence Problem Occurrence	<b>Overrides</b>	Option Occurrence Problem Occurrence	Denotes that a decision has been reconsidered.
Requirement	<b>Positively Assessed By</b>	Option	Marks that an option is assessed positive with respect to the source requirement (QOC)
Requirement	<b>Negatively Assessed By</b>	Option	Marks that an option is assessed negative with respect to the source requirement (QOC)

## 10.5 Tagged Values

	Description	Type	Stereotypes
<b>Intellectual Property Rights</b>	Intellectual Property Rights (IPR) for model element, e.g. confidentiality level and copyright statement.	String	Problem Option
<b>Knowledge Provenance</b>	Reference to the cited source	String	Problem Option
<b>Organizational Reach</b>	Sphere of influence of the problem/option, e.g. entire company (enterprise architecture), single project or (sub-)system under construction.	Enum: Global, Organisation, Program, Project, Subproject, Business Unit, Individual	Problem
<b>Owner Role</b>		String	Problem
<b>Project Stage</b>	Gate in gate model, refinement level in incremental and iterative design etc. (stage in which this problem is typically tackled)	String	Problem
<b>Refinement Level</b>	The abstraction level on which this problem typically occurs	String	Problem
<b>Stakeholder Roles</b>	People with an interest in this problem (note: different from accountable person, owner role)	String	Problem
<b>Viewpoint</b>	e.g. one of the 4+1 views on software architecture, or one of the Rozanski/Woods viewpoints	String	Problem
<b>Problem State</b>	Decision making status (in solution space) This value is derived from the sum of the option states of options that address this problem.	Enum: Open, Partially Solved, Solved, Not Applicable	Problem Occurrence
<b>Option State</b>	Status of option evaluation (in solution space)	Enum: Eligible, Tentative, Chosen, Challenged, Neglected	Option Occurrence
<b>Decision Date</b>	When the decision was taken. This field is automatically set by AD Mentor when the Problem Occurrence's state changed to "Solved" the first time.	Date	Problem Occurrence
<b>Revision Date</b>	Date when this model element was last revised (or has to be revised in the future)	Date	Problem Occurrence
<b>Due Date</b>	Until when should this problem be decided	Date	Problem Occurrence

## 10.6 Usage of General Properties

	Description	Type	Stereotypes
<b>Alias</b>	Short name of problem/option,	String	Problem

	synonyms		Option
<b>Role</b>	Not used	String	Problem Occurrence Option Occurrence
<b>Keywords</b>	Topic tag	String	Problem Option Problem Occurrence Option Occurrence
<b>Author</b>	Creator of model element	String	Problem Option Problem Occurrence Option Occurrence
<b>Language</b>	Not used	Enum	Problem Option Problem Occurrence Option Occurrence
<b>Status</b>	Editorial state	String	Problem Option Problem Occurrence Option Occurrence
<b>Complexity</b>	Technical risk, effort for/of decision making	String	Problem Option Problem Occurrence Option Occurrence
<b>Difficulty</b>	Not used	String	(shown by EA in Package Browser, but not in Properties views)
<b>Priority</b>	Not used	String	(shown by EA in Package Browser, but not in Properties views)
<b>Version</b>	Editorial version (knowledge engineering, document level)	String	Problem Option Problem Occurrence Option Occurrence
<b>Phase</b>	Not used (or knowledge engineering phase)	String	Problem Option Problem Occurrence Option Occurrence

## 11 More Information

- Conference paper:
  - O. Zimmermann, L. Wegmann, H. Koziolk, T. Goldschmidt, [Architectural Decision Guidance across Projects](#), Proc. of. IEEE/IFIP WICSA 2015
- Website at HSR FHO
  - <https://www.ifs.hsr.ch/index.php?id=13201>
- Contact:
  - Olaf Zimmermann, [ozimmerm@hsr.ch](mailto:ozimmerm@hsr.ch)