

HOW-TO: From Architecture to Design

This document describes how to go from an AO-ADL software architecture to a Theme/UML design model through the use of AO-ADL Tool Suite and MagicDraw Standard Edition 15.0 (or higher).

1. Load software architecture with AO-ADL Tool Suite

It's out of the scope of this how-to to explain detailed use of the AO-ADL Tool Suite; we are going to see only the necessary steps to complete the AO-ADL to Theme/UML transformation of the attached example.

1. Install the AO-ADL Tool Suite, instructions are available in:

<http://caosd.lcc.uma.es/aoadl/download.htm>

2. Unzip example repository (it is available to be downloaded from the previous URL)
3. Run AO-ADL Tool Suite.
4. When the tool asks for a repository, select the unzipped repository folder. If the tool does not ask for a repository, load it by clicking the button *Load a repository...* (see
5. Figure 1).

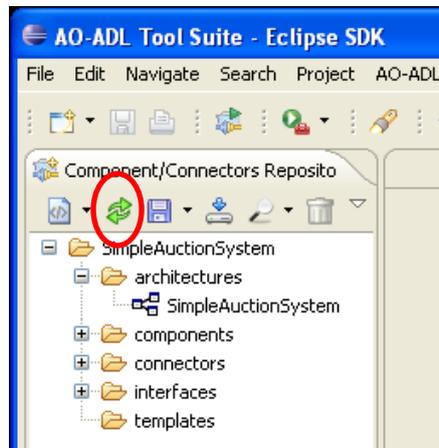


Figure 1: *Load Repository...* button

2. Generation of Theme/UML skeleton

1. In the loaded repository (see Figure 1), expand the *architectures* folder.
2. Select the software architecture to be transformed (e.g. *SimpleAuctionSystem*) and click right button.
3. Select *Transform* -> *Transform to Theme/UML*
4. Provide a name and a place where the target files of the transformation are going to be stored by clicking *Browse...* button (see Figure 2, A).
5. Choose the themes to be generated for each component.
 - a. Use the *option* combo (see Figure 2, B) to choose the same option for all the components:

- i. One theme per component
 - ii. One theme per each interface of the component
 - iii. One theme per each operation of the component
 - b. Or specify the themes for each component in the tree view (see Figure 2, C).
6. Click *Finish* button.
7. This process generates three files:
 - a. AOADL.profile.uml,
 - b. ThemeUML.profile.uml,
 - c. And the Theme/UML model of the AO-ADL architecture.
8. If the software architecture selected to be transformed owns composite components, the transformation process wizard is automatically launched to transform each composite component. You can always cancel this process and get only the transformation of the software architecture.

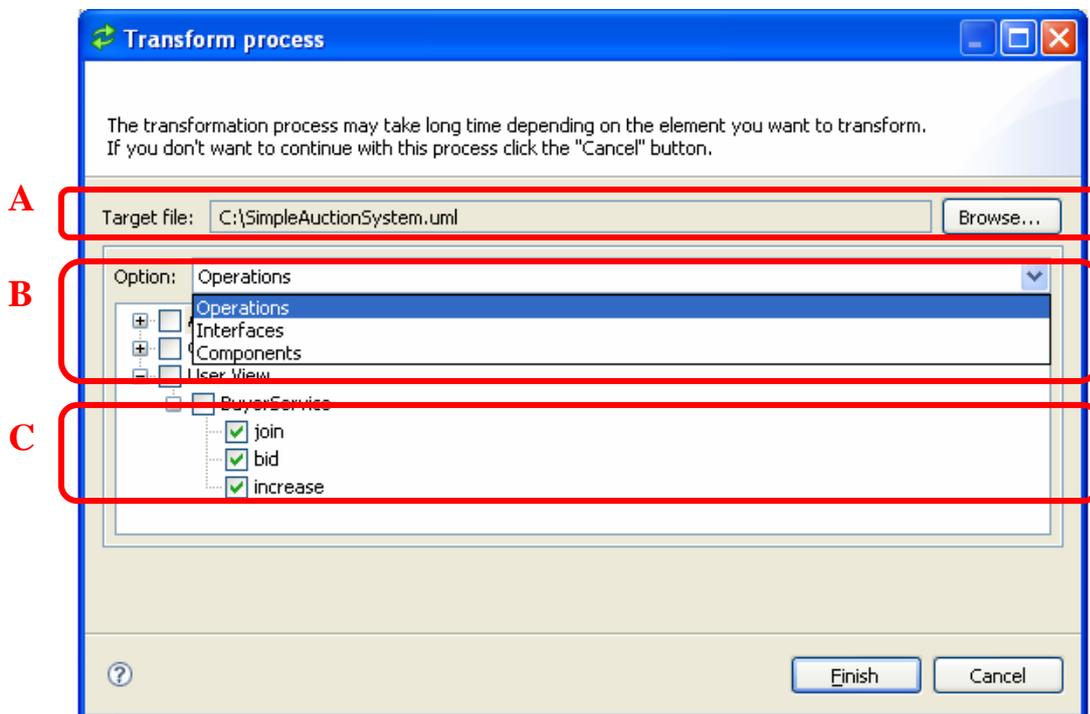


Figure 2: Transformation process wizard

3. Import Theme/UML skeleton with MagicDraw

Now we are going to use MagicDraw to import the output file (i.e. Theme/UML model) from the previous step and create a MagicDraw project. This feature (import from EMF UML 2.x XMI file) is available only for Standard Edition or higher (i.e. Professional and Enterprise). Before importing the model we have to set up an environment option.

1. Run MagicDraw
2. Select *Options* → *Environment* → *EMF UML2 (v2.x) XMI*
3. Set property *Preserve Ids on* to '*Do not preserve*' value.
4. Select *File* → *Open project...*
5. Select the Theme/UML model generated by the AO-ADL Tool Suite
6. In Message Window will appear some messages about Primitive Type mappings. That's correct.

4. Structural diagrams generation with MagicDraw

One of the drawbacks of UML standard is that it does not store information about the diagrams that embed the generated models so we need to (re)generate the diagrams in every tool we use to manipulate the UML models. We have chosen MagicDraw Standard Edition because it provides a set of wizards to automatically generate diagrams from the model¹. We are going to use this feature to generate the class diagrams. This needs to be done in two steps.

First step: A class diagram is generated for each package.

1. Select *Diagrams* → *Diagram Wizards*² → *Package Overview Diagram Wizard...*
2. Click *Next* button.
3. Select all packages except:
 - + Profile packages (*AOADL*, *ThemeUML*, *UML Standard*),
 - + Main (Model) package.
4. Click *Next* button.
5. Click *Finish* button.

Second step: A global class diagram is generated.

1. Select *Diagrams* → *Diagram Wizards* → *Class Diagram Wizard...*
2. Give a name to the diagram (e.g. the model name).
3. Click *Next* button.
4. Select the model in the left window.
5. Click *Add All* button.
6. Remove the following packages:
 - + Profile packages (*AOADL*, *ThemeUML*, *UML Standard*).
7. Click *Next* button.
8. Click *Next* button.
9. Go to Dependency element. Unmark *Show Tagged Values*.
10. Click *Finish* button.

Steps 7, 8, 9 can be omitted if we want to generate the tagged values of dependencies' stereotypes. Notice that this will result on more complex diagrams reducing understandability.

5. Behavioral diagrams generation with AO-ADL Tool Suite

The only shortcoming we have found loading the UML models generated with the AO-ADL Tool Suite into MagicDraw is the lack of support to automatically generate sequence diagrams, what is an important part of the Theme/UML and thus of the mapping from AO-ADL to Theme/UML. We have solved this shortcoming by

¹ The feature of diagram wizard for model visualization is only available in Standard, Professional and Enterprise Editions.

² Another way to access diagrams wizards is *Analyze* → *Model Visualizer*.

implementing our specific sequence diagram generator in the AO-ADL Tool Suite³. These are the steps that need to be followed to generate sequence diagrams from a Theme/UML model.

1. Save MagicDraw project (you can choose *.mdzip* or *.mdxml* format).
2. Run AO-ADL Tool Suite.
3. Expand the first button menu in the left side panel toolbar (see Figure 3)
4. Select *Generate Sequence Diagram*.
5. Select *Source* and *Target* MagicDraw projects by clicking respective *Browse...* buttons (see Figure 4). The source is the MagicDraw project saved in step 1 and the target is the project we want to generate (it can be the same as the source).
6. Select the *Target model* (Theme/UML) and click *Finish*.

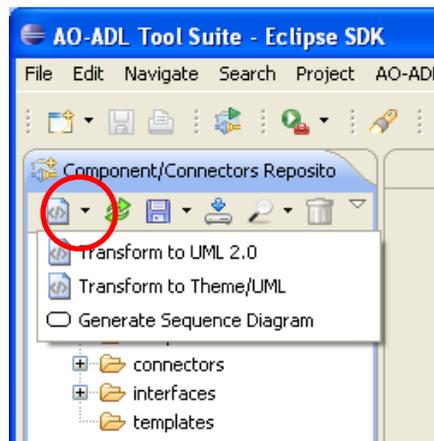


Figure 3: *Generate Sequence Diagram* button

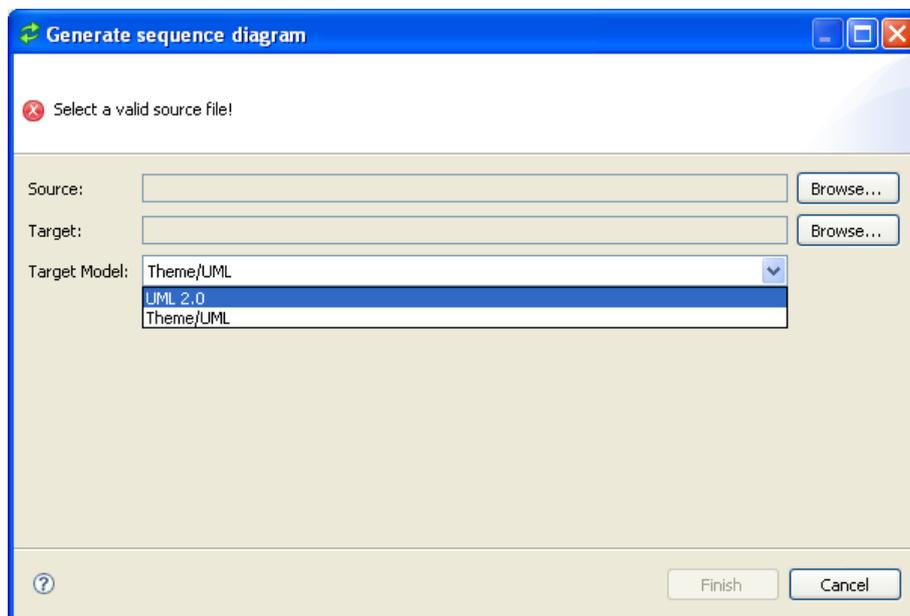


Figure 4: *Sequence Diagram Generation* dialog

³ This new feature of AO-ADL Tool Suite is just a patch necessary to cover the lack of this feature in MagicDraw and it just works fine with MagicDraw projects created from a Theme/UML model generated by the AO-ADL Tool Suite.

Finally we obtain the MagicDraw project with the Theme/UML model and the most representative diagrams ready to continue with the detailed design process.