Attach Models functionality in VEDA FE

Introduction and motivation

This feature enables linking up to 3 different VEDA-TIMES models to be run as a single model. This can be used to achieve two different objectives:

1. To establish a "hard link" between two (or three) existing models.
2. To split an existing large model in to two or three parts, in case some databases are approaching the 2GB limit of Microsoft ACCESS.

This functionality is designed in a way that allows continued (independent) development of the models that are being linked. The link can be established just by using *additional* scenario files in each of the components, so that the independent version can be reinstated simply by unselecting this additional scenario. Basically, this additional scenario is used to shut down parts of the model that are now being captured in the model that it is being linked with. For example, assume that models **A** and **B** are being linked. **A** might have an exogenous import of oil, which should now be replaced by an endogenous trade with model **B**. This additional scenario would simply bound the exogenous import to zero. It is normally convenient to create a third model for creating trade links when two models are being linked.

A full example

I have used two of the newly constructed demo models for this purpose - #5 and #4, naming them AttMod-A and AttMod-B, respectively.

AttMod-A has two regions – REG1 and REG2. Let's say these are oil importing countries, with other endogenous trade between them.

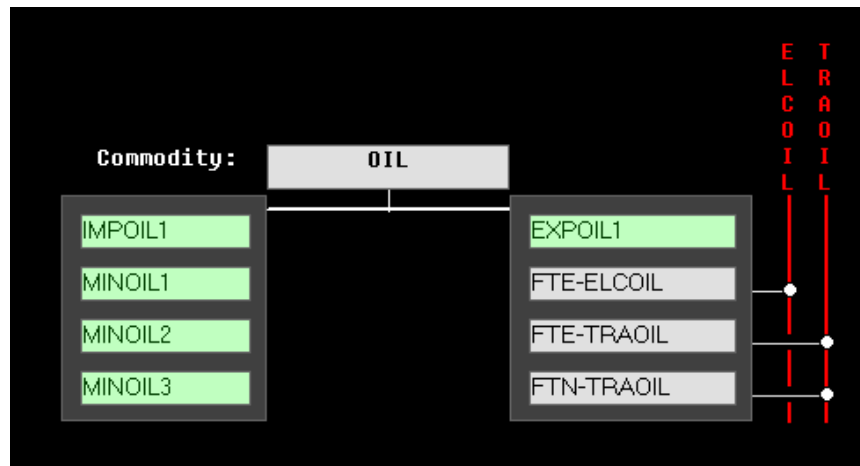AttMod-B has one region – REG3, which is an oil exporting country.

FIGURE 1 OIL IN ATTMOD-A AND ATTMOD-B (BEFORE LINKING)

Figure 1 shows the oil production/consumption processes in both models before they are linked.

We would like to do the following to establish a hard-link between the two models:

1. Deactivate IMPOIL1 in REG1 and REG2
2. Deactivate EXPOIL1 in REG3
3. Create an endogenous export of oil from REG3 to REG1 and REG2

This is accomplished by creating one scenario file in each of the models being linked, and creating a small new model to establish endogenous trade between the two existing models.

SCENARIO IN ATTMOD-A

Figure 2 shows the scenario file that is created in AttMod-A.

1. Row #4: makes GAMS interpret zeros from this scenarios as NULL (to delete previously specified values) rather than EPS
2. Row #10: updates any previously specified bounds on IMPOIL* processes to "0" (NULL)
3. Row #5: bounds the IMPOIL* processes to zero

All this is basically only to deactivate IMPOIL* processes. Note that if these processes were a part of some UCs, then they will need to be adjusted too. And the scenario name should be chosen such that it appears at the end of the list of scenarios, so that bounds specified in any of the scenario files are updated in this scenario. Remember that VEDA takes values only from the alphabetically inferior scenarios for UPDATE transformations.

◢	A	B	C	D	E	F	G
1							
2		~TFM_INS					
3		Time Slice	LimType	Attribute	Year	AllRegions	Pset_PN
4				OFFEPS		1	
5			UP	ACT_BND	0	2	IMPOIL*
6							
7							
8		~TFM_UPD					
9		Time Slice	LimType	Attribute	Year	AllRegions	Pset_PN
10				ACT_BND		0	IMPOIL*

FIGURE 2 SCEN_ZLINKWITHMODELB-OFFEPS IN ATTMOD-A

SCENARIO IN ATTMOD-B

Figure 3 shows the scenario file that is created in AttMod-B.

1. Row #4: makes GAMS interpret zeros from this scenarios as NULL (to delete previously specified values) rather than EPS
2. Row #10: updates any previously specified bounds on EXPPOIL* processes to "0" (NULL)
3. Row #5: bounds the EXPOIL* processes to zero

All this is basically only to deactivate EXPOIL* processes.

◢	A	B	C	D	E	F	G
1							
2		~TFM_INS					
3		Time Slice	LimType	Attribute	Year	AllRegions	Pset_PN
4				OFFEPS		1	
5			UP	ACT_BND	0	2	EXPOIL*
6							
7							
8		~TFM_UPD					
9		Time Slice	LimType	Attribute	Year	AllRegions	Pset_PN
10				ACT_BND		0	EXPOIL*

FIGURE 3 SCEN_ZLINKWITHMODELA-OFFEPS IN ATTMOD-B

NEW MODEL ATTMOD-LNK_AB

This simple model only has:

1. All three regions – REG1, REG2 and REG3 declared in SysSettings
2. Oil commodity declaration (for all regions) in the B-Y template
3. Trade links between REG3, REG1 and REG2 declared in ScenTrade__Trade_Links
4. Parameters for the new endogenous trade in ScenTrade_TRADE_PARAM

ATTACHING THE MODELS IN VEDA FE

Here are the steps to create a linked model in VEDA FE.

IN ATTMOD-A

Create a case where the new scenario is selected (as the last scenario)

IN ATTMOD-B

Create a case where the new scenario is selected (as the last scenario)

IN ATTMOD-LNK_AB

1. Open case manager and click the little "expand" button (⊞) at the bottom-right of list of regions. This will open the new attach models form, shown in Figure 4.
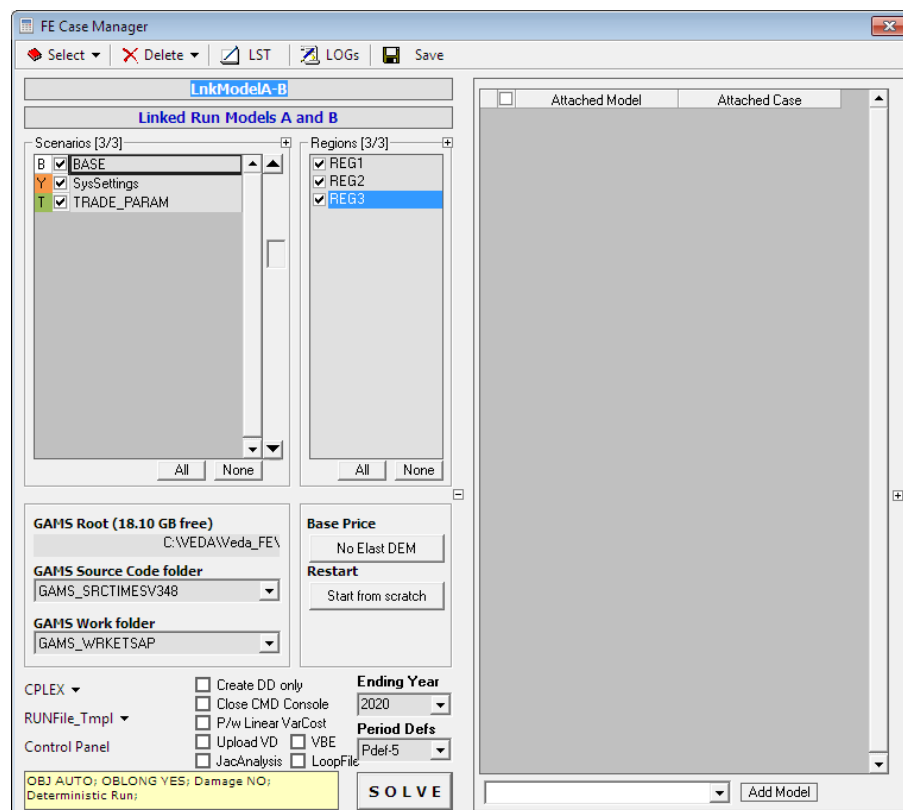

FIGURE 4 ATTACH MODELS FORM BEFORE DECLARING MODELS TO BE ATTACHED

2. Select AttMod-A from the drop-down list at the bottom of the new form and click "Add Model" button
3. Add model AttMod-B in the same way
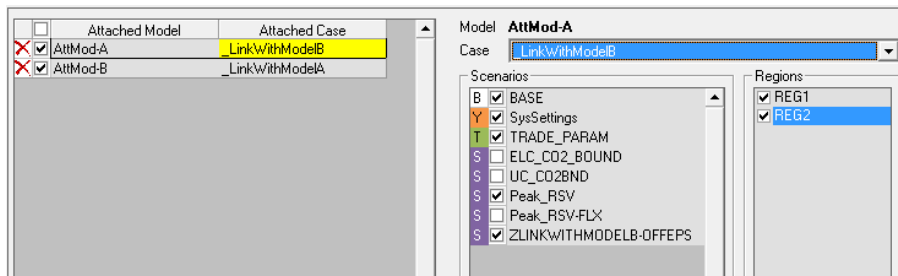
4. Select the new cases declared in these models by highlighting the model in the left list and selecting case in the list on the right side, as shown in Figure 5.

5. Launch a run via the regular SOLVE button, run the two models hard-linked via the new model.

THE RUN FILE FOR AN ATTACHED MODEL CASE

Figure 6 shows a section of the RUN file that drives attached model cases. It has INCLUDE statements for DD files in 3 sections:

1. From AttMod-Lnk_AB, where others are attached
2. With prefix "AttMod-A_" from the first attached model
3. With prefix "AttMod-B_" from the second attached model

```
64    $BATINCLUDE BASE.dd
65    ***
66    $BATINCLUDE AttMod-A_BASE.dd
67    $BATINCLUDE AttMod-A_SYSSETTINGS.dd
68    $BATINCLUDE AttMod-A_TRADE_PARAM.dd
69    $BATINCLUDE AttMod-A_PEAK_RSV.dd
70    $BATINCLUDE AttMod-A_ZLINKWITHMODELB-OFFEPS.dd
71    ***
72    $BATINCLUDE AttMod-B_BASE.dd
73    $BATINCLUDE AttMod-B_SYSSETTINGS.dd
74    $BATINCLUDE AttMod-B_PEAK_RSV.dd
75    $BATINCLUDE AttMod-B_ZLINKWITHMODELA-OFFEPS.dd
76    ***
77    $BATINCLUDE SYSSETTINGS.dd
78    $BATINCLUDE TRADE_PARAM.dd
```

FIGURE 6 RUN FILE FOR AN ATTACHED MODEL RUN

The DD files without any prefix are from the model where others are attached. All scenarios before SysSettings are at the top of this list and the rest are at the bottom.

RESULTS

FIGURE 7 COMPARING INDEPENDENT RUNS OF MODELS WITH A LINKED ONE

Figure 7 shows that exogenous imports and exports of OIL are replaced by endogenous trade in the linked run.