

MapleMBSE 2024.1 User's Guide

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Introduction

MapleMBSE Overview

MapleMBSE™ gives an intuitive, spreadsheet based user interface for entering detailed system design definitions, which include structures, behaviors, requirements, and parametric constraints.

Related Products

MapleMBSE 2024 requires the following products.

- Excel 2016, Excel 2019 or Excel Office 365 desktop
- Oracle® Java® SE Runtime Environment 8.

Note: MapleMBSE looks for a Java Runtime Environment in the following order:

1) If you use the -vm option specified in **OSGiBridge.ini** (not specified by default), MapleMBSE will use it.

2) If your environment has a system JRE (meaning either: JREs specified by the environment variables JRE_HOME and JAVA_HOME in this order, or a JRE specified by the Windows Registry (created by JRE installer)), MapleMBSE will use it.

3) The JRE installed in the MapleMBSE installation directory.

If you are using CATIA No Magic Server with MapleMBSE, the following versions are supported:

- Teamwork Cloud™ server 2021.x, 2022.x and 2024.x
- Magic Collaboration Studio 2021.x, 2022x and 2024.x

If you are using Eclipse Capella™ with MapleMBSE, the following version is supported:

- 6.0

If you are using Eclipse™, the following version is supported:

- 2024-3

Related Resources

| Resource | Description |
|-------------------------------|--|
| MapleMBSE Installation Guide | System requirements and installation instructions for MapleMBSE. The MapleMBSE Installation Guide is available in the Install.html file located in the folder where you installed MapleMBSE, or on the website. https://www.maplesoft.com/documentation_center/ |
| MapleMBSE Applications | Applications in this directory provide a hands on demonstration of how to edit and construct models using MapleMBSE. They, along with an accompanying guide, are located in the Application subdirectory of your MapleMBSE installation. |
| MapleMBSE Configuration Guide | This guide provides detailed instructions on working with configuration files and the configuration file language. |
| Frequently Asked Questions | You can find MapleMBSE FAQs here: https://faq.maplesoft.com |
| Release Notes | The release notes contain information about new features, known issues and release history from previous versions. You can find the release notes in your MapleMBSE installation directory. |

For additional resources, visit http://www.maplesoft.com/site_resources.

Getting Help

To request customer support or technical support, visit <http://www.maplesoft.com/support>.

Customer Feedback

Maplesoft welcomes your feedback. For comments related to the MapleMBSE product documentation, contact doc@maplesoft.com.

1 Getting Started with MapleMBSE

In this chapter:

- *MapleMBSE Components (page 1)*
- *Launching MapleMBSE (page 4)*
- *Using MapleMBSE Specific Functions (page 7)*
- *Saving the Model (page 11)*
- *Closing MapleMBSE (page 12)*
- *Using the No Magic Teamwork Cloud Adaptor (page 13)*
- *Using the Eclipse Capella Adaptor (page 31)*

1.1 MapleMBSE Components

MapleMBSE provides a platform that you can use to map model information from diagram-based models into a table form. The diagram-based models may be models defined in UML or SysML or other formats specific to modeling tools. For the list of supported model formats see *Supported Model Formats (page 4)*.

The figure below shows the components that MapleMBSE works with and how they relate to each other.

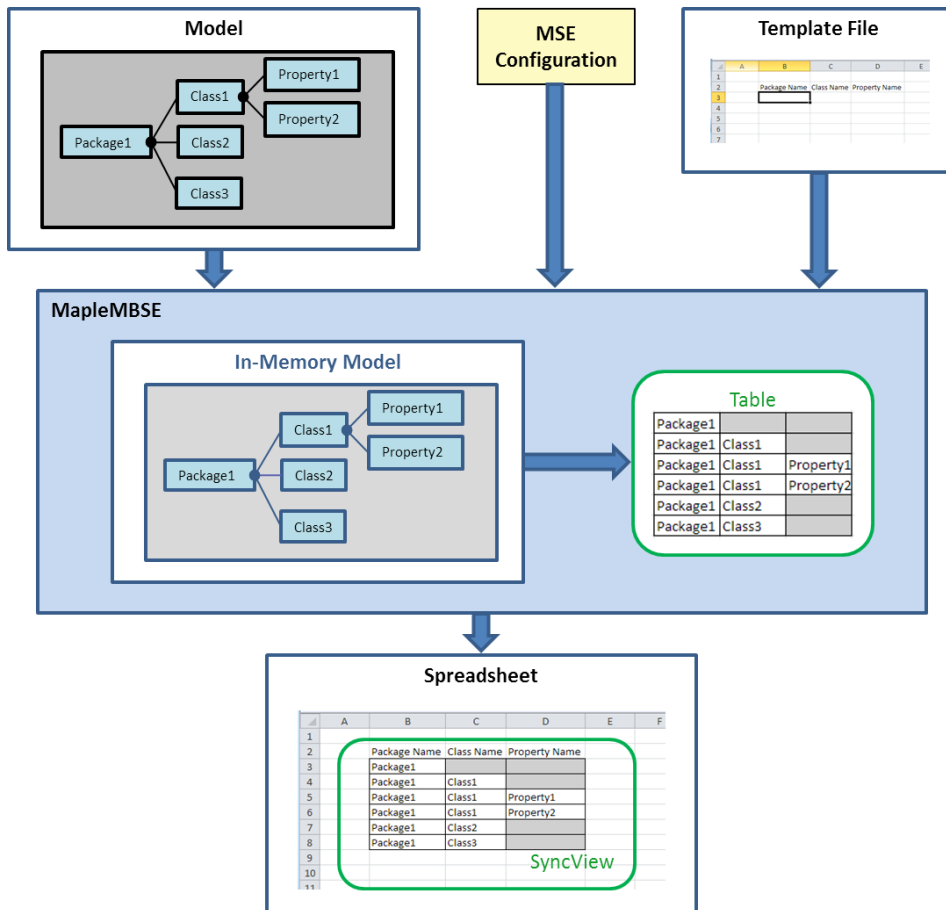


Figure 1.1: A Visual Summary of How MapleMBSE Works

- **Model**
A model in the file system or on the server that you want to display and edit. See *Supported Model Formats* (page 4).
- **Spreadsheet**
An Excel spreadsheet that is used as a user interface for displaying and editing the model data.
- **In-Memory Model**
When MapleMBSE is started it loads the given model into its internal memory. The data in the spreadsheet is synchronized with this in-memory model.

- **MSE Configuration**

The configuration file (.MSE) is created by the user. It provides the rules for how the model is converted and represented in a spreadsheet. The rules specify the following:

1. How the data is to be extracted from the model and how it should be mapped into a table format. The table is shown in green in the Figure above.
2. How and where the extracted table is presented on the spreadsheet. The area of the spreadsheet representing the table SyncView. The SyncView is shown in green in **Figure 1.1**.

You can find detailed instructions about the MSE configuration language in the *MapleMBSE Configuration Language Guide*.

- **Template**

An Excel file with the same name as the MSE configuration file located in the same directory as the MSE configuration file. The file defines formatting such as column width, headers, etc. for the given configuration file. For details see *MapleMBSE Configuration Language Guide*.

The relation between the model file, the model loaded in MapleMBSE's memory, and the spreadsheet is shown in the diagram below.

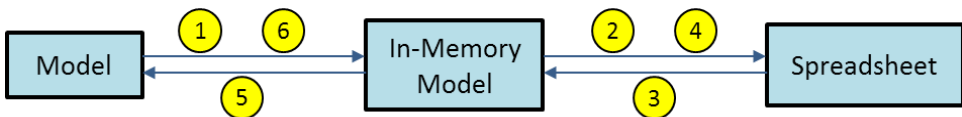


Figure 1.2: Relationship Between Model, In-Memory Model, and Spreadsheet

1. MapleMBSE loads the model from the given file into its internal memory.
2. The data from the in-memory model is loaded into the SyncView area of the spreadsheet.
3. User input on the SyncView area is converted into the changes to the in-memory model.
4. Any other places of the same SyncView or other SyncViews that are linked to the updated element get updated.
5. The changes to the in-memory model are applied to the model in the file system or on the server only when the spreadsheet is saved.
6. If the changes were made to the model in the file system or on the server they can be reloaded into the in-memory model by invoking Reload/Update, see *Using MapleMBSE Specific Functions (page 7)*.

Notes:

- Simultaneous operations on the same model by MapleMBSE and other tools are not supported.

- Modifying the model in other tools while being modified by MapleMBSE is not recommended.
- It is possible that the spreadsheet is set as read-only.

Supported Model Formats

MapleMSBE 2024 supports the following version of the UML model format.

- UML® 2.0 <http://www.uml.org>.

The following models are supported if the corresponding adaptors are installed.

- IBM® Rational® Rhapsody® with MapleMBSE Rhapsody Adapter
- Models on CATIA No Magic Server with MapleMBSE Teamwork Cloud Adapter
- Eclipse Capella™ with MapleMBSE Capella Adaptor

1.2 Launching MapleMBSE

Note: For launching with the No Magic Teamwork Cloud Adapter see *Using the No Magic Teamwork Cloud Adaptor* (page 13).

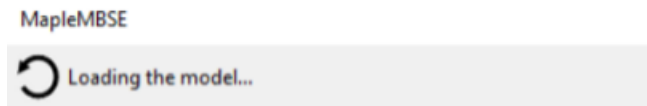
To launch MapleMBSE:

1. From the **Start** menu, select **All Programs > MapleMBSE 2024**.
2. Click **MapleMBSE 2024**.
3. Browse to the location of your MapleMBSE configuration file (configuration files have an *.MSE* file extension), select the configuration file, and then click **Open**.

Tip: If you do not have a configuration file, you can open an appropriate sample configuration file in **<Install Directory>\Example**, where **<Install Directory>** is the install location of **MapleMBSE 2024**.

4. Browse to the location of your model file, select the model file, and then click **Open**.

A progress bar is displayed indicating that the model is loading.



Tip: If you do not have a model file, you can open the sample model file, **<Install Directory>\Example\MechSheet\MechSheet-sample1.tritest**, where **<Install Directory>** is the install location of **MapleMBSE 2024**, or if you are using Capella, you can use the *.melodymodeller* file corresponding to the Inflight Entertainment System model in your *Samples* subdirectory .

Microsoft Excel opens with the model information inserted into the spreadsheet (see **Figure 1.3**). You can edit the models in the spreadsheet by simply modifying cells and inserting rows, unless the spreadsheet is set as read-only. For a detailed description of how MapleMBSE displays the model information in the spreadsheet and how to edit different aspects, see *Editing the Model Spreadsheet MapleMBSE (page 37)*. To save your model you simply save this Excel file. For saving models opened with the No Magic Teamwork Cloud Adapter see *Using the No Magic Teamwork Cloud Adaptor (page 13)*. For more information about saving, see *Saving the Model (page 11)*.

| | (unmapped) | Package | Class | Owner | Desc | Tag | (unmap) | Attribute | Type | (unmapped) |
|----|------------|---------|-------|-------|----------|--------|---------|-----------|-------|------------|
| 5 | | Pkg1 | | | | | | | | |
| 6 | | Pkg1 | Cls1 | Pkg1 | Desc 1-1 | Tag1-1 | | Attr1 | Type1 | |
| 7 | | Pkg1 | Cls1 | Pkg1 | Desc 1-1 | Tag1-1 | | Attr2 | Type2 | |
| 8 | | Pkg1 | Cls1 | Pkg1 | Desc 1-1 | Tag1-1 | | Attr3 | Type3 | |
| 9 | | Pkg1 | Cls1 | Pkg1 | Desc 1-1 | Tag1-1 | | | | |
| 10 | | Pkg1 | Cls2 | Pkg1 | Desc 1-2 | Tag1-2 | | | | |
| 11 | | Pkg1 | Cls2 | Pkg1 | Desc 1-2 | Tag1-2 | | Attr1 | Type1 | |
| 12 | | Pkg1 | Cls2 | Pkg1 | Desc 1-2 | Tag1-2 | | Attr2 | Type2 | |
| 13 | | Pkg1 | Cls3 | Pkg1 | Desc 1-3 | Tag1-3 | | | | |
| 14 | | Pkg1 | Cls3 | Pkg1 | Desc 1-3 | Tag1-3 | | Attr1 | Type1 | |
| 15 | | Pkg1 | Cls3 | Pkg1 | Desc 1-3 | Tag1-3 | | Attr2 | Type2 | |
| 16 | | Pkg1 | Cls4 | Pkg1 | Desc 1-4 | Tag1-4 | | | | |
| 17 | | Pkg1 | Cls4 | Pkg1 | Desc 1-4 | Tag1-4 | | Attr1 | Type1 | |
| 18 | | Pkg1 | Cls4 | Pkg1 | Desc 1-4 | Tag1-4 | | Attr2 | Type2 | |
| 19 | | Pkg1 | Cls5 | Pkg1 | Desc 1-5 | Tag1-5 | | | | |
| 20 | | Pkg1 | Cls5 | Pkg1 | Desc 1-5 | Tag1-5 | | Attr1 | Type1 | |
| 21 | | Pkg1 | Cls5 | Pkg1 | Desc 1-5 | Tag1-5 | | Attr2 | Type2 | |
| 22 | | Pkg2 | | | | | | | | |
| 23 | | Pkg2 | Cls6 | Pkg2 | Desc2-1 | Tag2-1 | | | | |
| 24 | | Pkg2 | Cls6 | Pkg2 | Desc2-1 | Tag2-1 | | Attr1 | Type1 | |
| 25 | | Pkg2 | Cls6 | Pkg2 | Desc2-1 | Tag2-1 | | Attr2 | Type2 | |
| 26 | | Pkg2 | Cls7 | Pkg2 | Desc2-2 | Tag2-2 | | | | |
| 27 | | Pkg2 | Cls7 | Pkg2 | Desc2-2 | Tag2-2 | | Attr1 | Type1 | |
| 28 | | Pkg2 | Cls7 | Pkg2 | Desc2-2 | Tag2-2 | | Attr2 | Type2 | |

Figure 1.3: Model Information Inserted

Note: You can also start MapleMBSE by double-clicking a configuration file from your file manager. This skips the configuration file selection step and takes you directly to the **Open Model File** dialog.

Note: You can only run one instance of MapleMBSE at a time. If you try to open a model while another one is already opened by MapleMBSE you will get the error shown in **Figure 1.4**. You must close the open model before opening a new one.

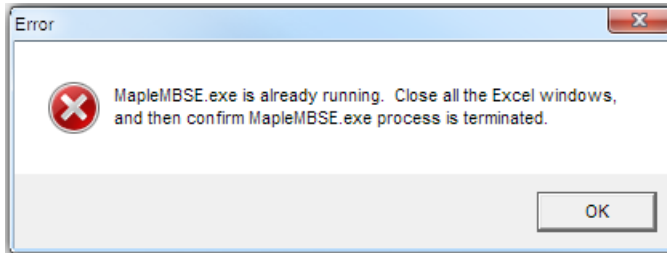


Figure 1.4: Error While Attempting to Run More Than One Model at a Time

Launching from Command Line

MapleMBSE can be launched from the command line by executing the MapleMBSE.exe command in the installation directory. The command has the following syntax.

```
MapleMBSE.exe [/R <memsize>] [/L <logfile>] [/E <excel.exe>] [[/I | CONFIG(*.MSE)]  
[MODEL]]
```

- If you specify **CONFIG** (must be *.MSE) and **MODEL** files, it launches MapleMBSE with these files. If you do not specify a **MODEL** or **CONFIG** file, you will be asked for these files in a subsequent dialog.
- If you specify **/I**, MapleMBSE.exe will always ask for the MSE file in a dialog and regard the first non-slash argument as a model file.
- **MODEL** can be a local file or URI. For example, consider a model file on the Teamwork Cloud server:
= "twc://[SERVER:PORT]/[PROJECT][?][username=USERNAME][&password=PASSWORD][&branch=BRANCHNAME][&revision=REVISION][&cache=true][&ssl=ssl_certificate_name]"

Note: If you omit some items, MapleMBSE will ask for them in the dialog

- If you do not specify any file arguments, it checks if MapleMBSE.xlsm exists in the AddIns directory inside the directory with MapleMBSE.exe. If found, MapleMBSE launches it.
- **/R <memsize>**: (optional, default=905) Memory address space in MB to be reserved for Java VM in the Excel process.
- **/L <logfile>**: (optional, default="MapleMBSE_Launcher.log") Log file name, relative to %USERPROFILE% or in absolute path.

- **/E <excel.exe>**: (optional) Path of EXCEL.EXE
If it's not specified, the registry entries will be used:
 - = HKEY_CLASSES_ROOT\CLSID\<CLSID of "Excel.Application">\LocalServer32
 - = HKEY_CLASSES_ROOT\CLSID\<CLSID of "Excel.Application">\LocalServer
 - = HKEY_CLASSES_ROOT\Wow6432Node\CLSID\<CLSID of "Excel.Application">\LocalServer32
 - = HKEY_CLASSES_ROOT\Wow6432Node\CLSID\<CLSID of "Excel.Application">\LocalServer

Notes:

- After you have launched MapleMBSE successfully from the command line, if you want to restart MapleMBSE, use the shortcut key combination CTRL+Shift+G.
- You can launch MapleMBSE from the command line using `&cache=true`. For example:

```
MapleMBSE.exe "C:\Program Files\MapleMBSE 2024\Example\TWC202X\TWC-Sample.MSE" "twc://teamworkcloud:3579/Model?username=***&password=***&cache=true"
```

1.3 Using MapleMBSE Specific Functions

To access MapleMBSE specific functions, select the **Ribbon** menu, and then expand **MapleMBSE**. Here you will find the following items:

- Reload/Update the Model Spreadsheet
- Restart MapleMBSE
- Save to Model
- Export to Excel file
- Import Excel file
- Save copy as
- Merge all syncviews
- Update merged syncviews
- Evaluate Formulas
- MapleMBSE UserGuide
- About MapleMBSE

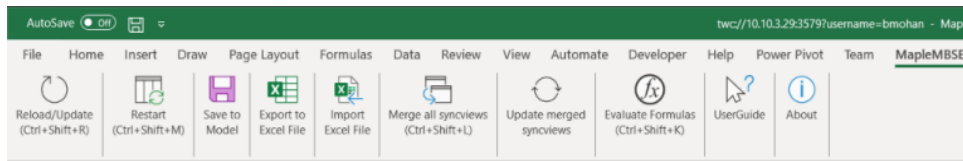


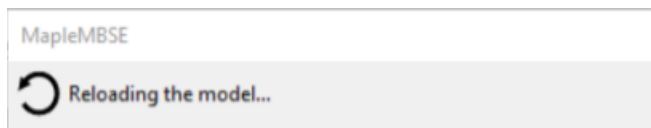
Figure 1.5: MapleMBSE Ribbon Menu

Reload/Update Model Spreadsheet

You can refresh your current model so that it reflects any changes made to the model outside of MapleMBSE.

To reload your model:

1. Select **Add-Ins > MapleMBSE > Reload/Update**.
2. In the **Reload/Update** dialog window, click **OK**. **Note:** Reloading the model may discard any unsaved changes.
3. A progress bar is displayed as the model reloads.



4. The model is reloaded in the Model Spreadsheet.

Notes:

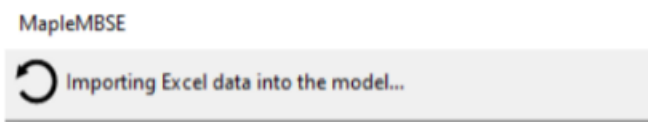
- You can also use the shortcut key combination CTRL+Shift+R to reload your model.
- Simultaneous operations on the same model by MapleMBSE and other tools are not supported. It is recommended not to modify the model in other tools when it is modified by MapleMBSE.

Exporting and Importing Excel Files

Select **Add-Ins > MapleMBSE > Export to Excel file** to save the current worksheet to an Excel file.

Select **Add-Ins > MapleMBSE > Import Excel file** to load an Excel file into the model you currently have open.

A progress bar is displayed as the data is loaded into the model.



Saving a Copy of the Current Model

If you are working with Rhapsody or UML models, you can save the current model to another model file and keep the current model file unchanged. This function allows you to take a snapshot of the model. The in-memory model is still associated with the original model file. Any changes you save after creating the snapshot will only be saved to the original model and not to the snapshot.

To save a copy of the current model:

1. Select **Add-Ins > MapleMBSE > Save Copy As**.
2. Enter a filename and location.
3. Click **Save**.

Merging All Syncviews

The syncview merging feature removes the redundancy of the SyncView and improves readability of the table.

Without merging applied a table looks like this:

| Model | Package | Classifiers | Owned propertes | Associatined blocks |
|-------|---------|---------------|-----------------|---------------------|
| Model | | | | |
| Model | Package | | | |
| Model | Package | InstanceBlock | | |
| Model | Package | InstanceBlock | block1 | |
| Model | Package | InstanceBlock | block1 | Block1 |
| Model | Package | InstanceBlock | block2 | |
| Model | Package | InstanceBlock | block2 | Block2 |
| Model | Package | Block1 | | |
| Model | Package | Block1 | valProp1 | |
| Model | Package | Block1 | valProp2 | |
| Model | Package | Block2 | | |
| Model | Package | Block2 | valProp3 | |
| Model | Package | Block2 | valProp4 | |
| Model | Package | Association1 | | |
| Model | Package | Association1 | instanceblock1 | |
| Model | Package | Association1 | instanceblock1 | InstanceBlock |
| Model | Package | Association2 | | |
| Model | Package | Association2 | instanceblock2 | |
| Model | Package | Association2 | instanceblock2 | InstanceBlock |

Notice every dimension displayed.

With merging applied, the table is recreated in a non-syncview area in a new table and looks like this:

| Model | Package | Classifiers | Owned properties | Associated blocks |
|-------|---------|---------------|------------------|-------------------|
| Model | Package | InstanceBlock | block1 | Block1 |
| | | | block2 | Block2 |
| | | Block1 | valProp1 | |
| | | | valProp2 | |
| | | Block2 | valProp3 | |
| | | | valProp4 | |
| | | Association1 | instanceblock1 | InstanceBlock |
| | | | | |
| | | Association2 | instanceblock2 | InstanceBlock |
| | | | | |

Notes:

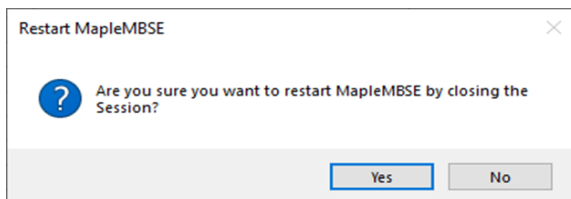
- You can select to merge one worksheet at a time, by right-clicking in the worksheet.
- The shortcut key combination CTRL+Shift+L can be used to invoke the syncview merging feature.

Restart MapleMBSE

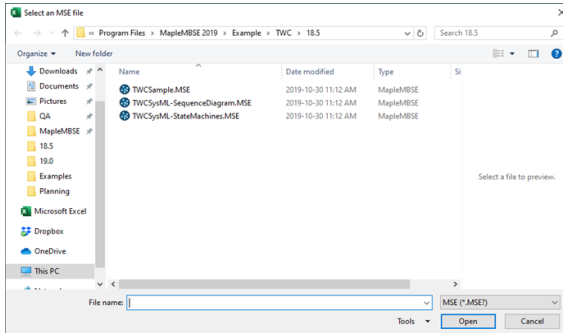
Opens another MSE file without closing the MapleMBSE.

To Restart MapleMBSE:

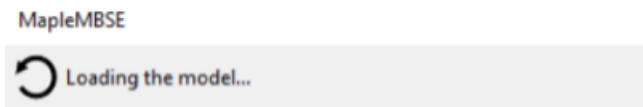
1. Select **Add-ins > MapleMBSE > Restart MapleMBSE**.
2. In the Restart MapleMBSE dialog window, click **Yes**. Note: Restart MapleMBSE will close the current workbook. If you have unsaved changes a dialog will be displayed asking to confirm that you want to save your changes before closing.



3. A dialog box appears where you can browse to the location of your MapleMBSE configuration file (configuration files have a .MSE file extension). Select the configuration file, then click **Open**.



4. Browse to the location of your model file, select the model file, and then click Open. A progress bar is displayed indicating the model is being launched.



Note: For launching with the No Magic Teamwork Cloud Adapter, see *Using the No Magic Teamwork Cloud Adaptor* (page 13).

Note: You can also use the shortcut key combination, Ctrl+Shift+M to restart MapleMBSE.

1.4 Saving the Model

Note: For saving models opened with the No Magic Teamwork Cloud Adapter see *Using the No Magic Teamwork Cloud Adaptor* (page 13).

There are several options for how model data can be saved:

- **Save the in-memory model into the model file.**
The changes done in a spreadsheet are performed on the in-memory model. To save the changes from the in-memory model to the model file use any of the Excel's usual options for Saving.
 - Select **File > Save**
 - Press **Ctrl + S**
 - Click **Save** icon at the top of the window

- **Save the in-memory model as another model file.**
To save the in-memory model into another model, **File > Save As**, enter a filename and location, click **Save**. The in-memory model is then linked to this new model file. Any future save operations will be performed on this file.
- **Save a copy of the model.**
See *Saving a Copy of the Current Model (page 9)* to save a copy of the model and to keep the in-memory model linked with the original file.
- **Save the data as an Excel file.**
To save the model data to an Excel workbook file, select **Add-Ins > MapleMBSE > Export to Excel file**.

1.5 Refreshing the Model

You can refresh all syncviews in your model by using the shortcut key combination CTRL+Shift+F.

A progress bar is displayed as the model refreshes.



1.6 Closing MapleMBSE

When you close a workbook editing the model, MapleMBSE is also closed. If there is no other open workbook, Excel will also quit. The following dialog opens reminding you to close all running instances of Excel before you can use MapleMBSE again.

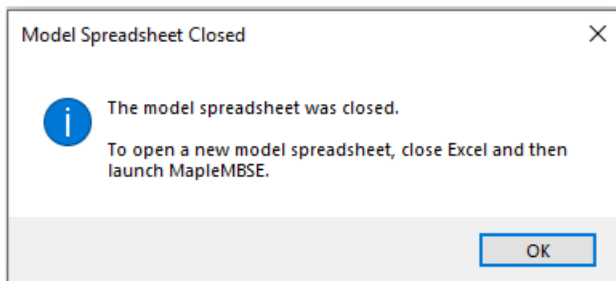


Figure 1.6: Reminder to Close Excel Instances Before Restarting MapleMBSE

All MapleMBSE Excel windows must be closed. The rules for closing Excel windows not related to MapleMBSE are as follows.

- Excel workbooks opened before MapleMBSE was launched can stay open.
- Excel workbooks opened after MapleMBSE was launched must be closed.

1.7 MapleMBSE Version Information

To find information about your version of MapleMBSE, select **Add-Ins > MapleMBSE > About MapleMBSE**

1.8 Using the No Magic Teamwork Cloud Adaptor

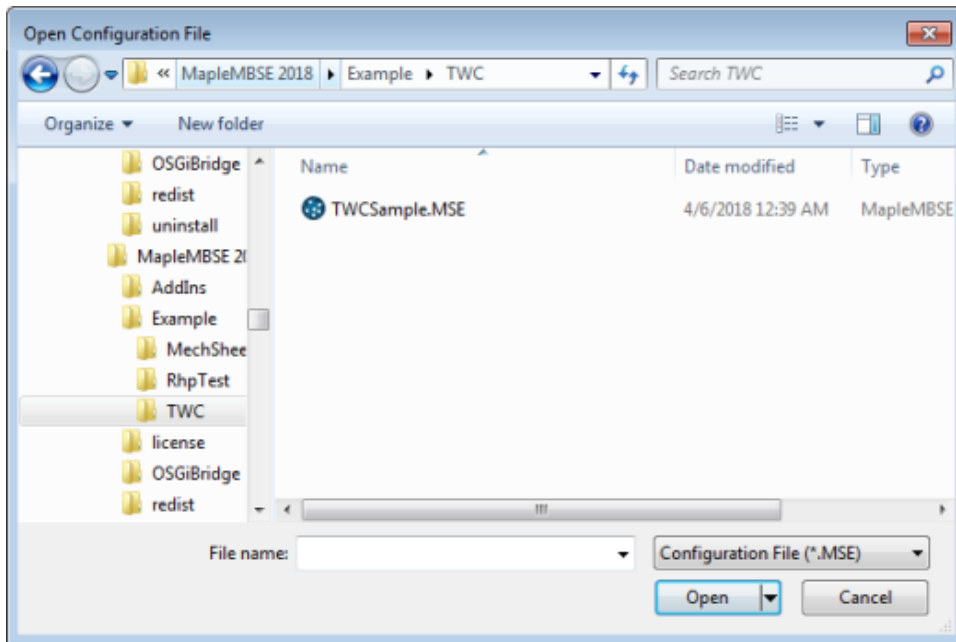
The Teamwork Cloud (TWCloud) Adaptor in MapleMBSE allows you to save changes you have made to your model in the Model Spreadsheet to the CATIA No Magic repository.

Note: The TWC Apdator works with both Teamwork Cloud and Magic Collaboration Studio.

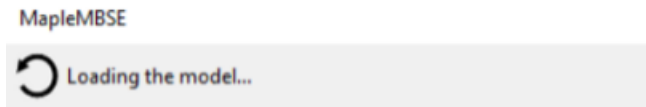
Launching the No Magic Server in MapleMBSE

To launch your TWCloud model in MapleMBSE:

1. From **Start->All Programs->MapleMBSE 2024** select **Open CATIA No Magic Server Model**.
2. Select your TWCloud configuration (.MSE) file.



3. Click **Open**. A progress bar is displayed indicating that the model is being launched.



Installing No Magic Libraries

This step is necessary only when the environment path was not set up during installation.

Before opening your TWCloud model in MapleMBSE, you must install the appropriate TWCloud 202x libraries. There are two ways to provide the No Magic installation path for these libraries:

- 1) Setting an environment variable.
- 2) Selecting the path from a dialog window.

Setting the Installation Path Using an Environment Variable

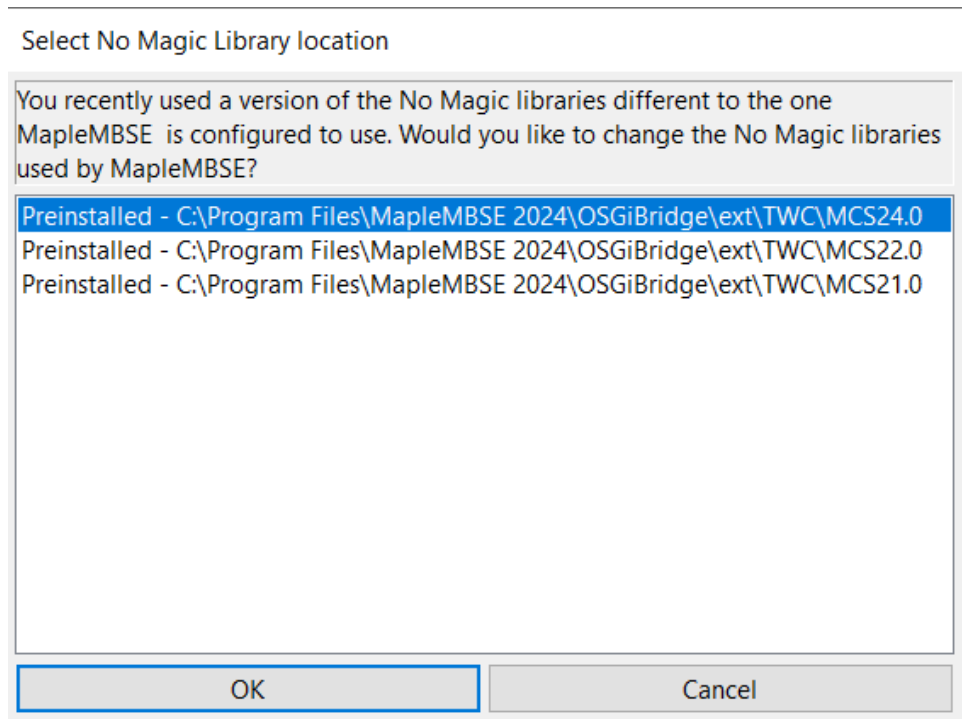
Set the `MAPLEMBSE_MD_INSTALL_ROOT` environment variable for the TWCloud Adapter to find the correct libraries.

When setting the MAPLEMBSE_MD_INSTALL_ROOT environment variable, use your No Magic product install path (for example, "C:\Program Files\MagicDraw"). From this install path, the TWCloud Adapter will find the needed libraries.

Selecting the Installation Path from Dialog Window

To select the installation path from a dialog window:

- 1) Start MapleMBSE. This will display the Select No Magic Library location dialog
- 2) The Select No Magic Library location dialog lists the locations of all No Magic products installed on your machine as well as the pre-installed library provided by MapleMBSE.



- 3) Select the location of the library you want to use from the list.
- 4) Click OK.

Choosing a Library Not Listed in the Dialog Window

If you want to specify a different location for the library, not listed in the dialog window:

- 1) Click Select Directory.
- 2) Browse to, and select, the location of the library you want to add.
- 3) Click OK.

Updating the Configuration file to Ensure Library Compatibility

After installing the necessary No Magic file, you must ensure that MapleMBSE configuration file is importing the correct metamodel framework, since this is version specific.

To do this, open your configuration (.MSE) file in a text editor and inspect the import-ecore statement. Ensure you are using the correct ecore. For example, to inform MapleMBSE that the type of model is a Teamwork Cloud 19.0 model, use the statement import-ecore "http://www.nomagic.com/magicdraw/UML/2.5.1" in the configuration file. Similarly, for a Teamwork Cloud 2021.x model, use the statement import-ecore "http://www.nomagic.com/magicdraw/UML/2.5.1.1".

Logging in to CATIA No Magic server

There are two ways to log in to the CATIA No Magic server: using regular login and using single sign-on.

Logging in to the Teamwork Cloud Server

1. In the **Login to Teamwork Cloud** dialog window, enter your server, username, password, project name and the branch the project is stored in. To use an SSL connection between No Magic Server and MapleMBSE, select **Use SSL**. For more information, see *Setting up SSL Certificates (page 20)*. To download your model files launch them from a local folder, select *Caching Model Files (page 20)*. If you check **Save settings**, MapleMBSE saves the successful login information except for a password and they are automatically filled in the next login.

Log in to Teamwork Cloud

Select Branch if needed.

Server: teamworkcloud2:3579 Use SSL

Username: maplembse

Password: ***** Use Cache

Project: TWCSample

Branch:

Save settings

2. Click **OK**.

Note: The version of the No Magic libraries must be compatible with the version of Teamwork Cloud on the server.

Logging in Using Single Sign-On

1. In the Log in to Teamwork Cloud dialog window, enter your server address then click Single Sign-On.

Log in to Teamwork Cloud

Select Branch if needed.

Server: Use SSL

Username:

Password: Use Cache

Project:

Branch:

Save settings

2. In the Teamwork Cloud browser window, click SAML USER.

Teamwork Cloud

Username

Password

Or sign in with

3. Sign in with your credentials.

4. At the Log in to Teamwork Cloud dialog window, use the Project, Category, Branch and Revision filters to select your model.

Log in to Teamwork Cloud

Select Branch if needed.

Server: Use SSL

Username:

Password: Use Cache

Project:

Branch:

Save settings

5. Click OK.

Note: Similar steps are followed to log in to Magic Collaboration Studio

Using the Category field to filter search results

In No Magic Server you can save each project under different categories. If you don't save a project under a category, by default, it will be labeled as uncategorized.

To filter projects belonging to a category, after providing the credentials, select the desired category. This will filter and display projects belonging to that category first in the Project field. After selecting the project, select the branch if necessary and click Ok to open the project.

Selecting a different browser for single sign-on

You can use single sign-on to CATIA No Magic server through the default browser or you can select a different web browser.

To select a different web browser for single sign-on:

1. Go to the \$MAPLEMBSE\OSGiBridge\ext\SAML_Browser\ directory, where \$MAPLEMBSE is your MapleMBSE 2024.1 install directory.
2. Select the folder for the web browser you want to use for single sign-on.
3. Open the readme.txt file and follow the instructions.

Setting up SSL Certificates

For SSL connections, you need to put JKS and PASS files into <MAPLEMBSE-INSTALLATION-DIRECTORY>\certs. By default, TWC adapter will use cert.jsk and cert.pass. By specifying the "ssl" parameter in TWC URI, you can configure it. For example, if you launch *MapleMBSE TWC Sample.MSE twc://?ssl=cert2*, cert2.jks and cert2.pass are used for SSL connection.

Caching Model Files

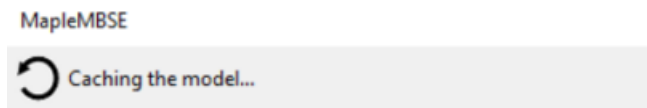
Select the **Use Cache** option to have the MapleMBSE TWC Adapter cache files to a local folder, where the files will be loaded from in the future.

The default location of the cache folder is <user.home>/.twcloud/<version #>/cache/

MapleMBSE will update the cache automatically whenever a user performs any of the following operations:

- Reload or update the model.
- Commit changes to the CATIA No Magic server.

A progress bar is displayed as the model files are cached.



When you close a model, the cache files are deleted from the folder and any associated memory resources are released.

The Commit Number Information in the Workbook Title Bar and Status Bar

Once you have launched your No Magic Server Model in MapleMBSE you will notice that commit information for the model is displayed in the Excel Workbook title bar, as shown in **Figure 1.7**.

The format for the uri displayed in the title bar is:

Title Bar:

Twc://teamworkcloud.example.com?username=maplembsetest

Status Bar:

Model=<ProjectName> ,Branch=<BranchName>,Revision=<CommitNumber>



Figure 1.7: Commit Information Displayed in Title Bar

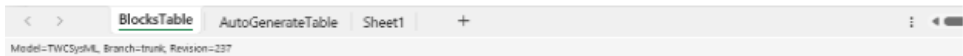


Figure 1.8: Commit Information Displayed in Status Bar

Note:

If the connection URL in the title bar is too long (greater than 255 characters), the information in the URL will be split between a caption in the title bar and a footer at the bottom of the worksheet.

The caption contains the server address and the username, while the footer contains the branch name model name and revision number.

When the caption exceeds the limit of 255 characters or the footer string exceeds the limit 95 characters the string is truncated and "... " is added at the end.

Updating the Commit Number

MapleMBSE updates the commit number using either of these methods:

- If you make changes to the model and commit those changes to the No Magic Server, the commit number is updated.
- If someone else updates the model, and commits their changes to the No Magic Server, then you reload or update the model in MapleMBSE. At this point, MapleMBSE will retrieve the latest resource and update the commit number.

Editing and Saving Changes to Your Model

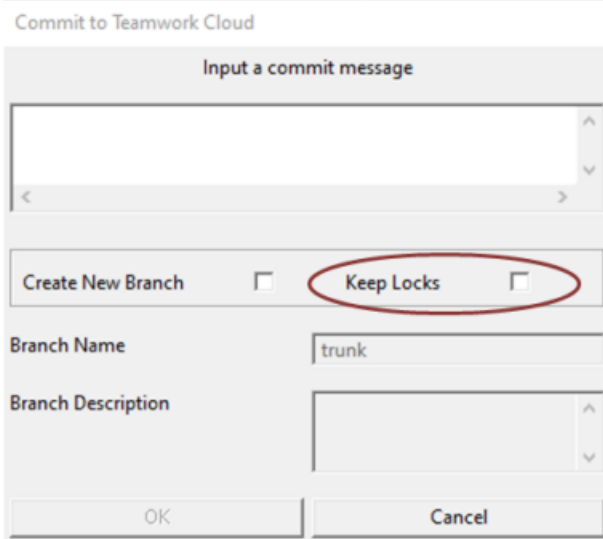
1. Make changes to the model in MapleMBSE.

The screenshot shows the MapleMBSE application window with a spreadsheet view. The spreadsheet contains a table with the following data:

| Requirement ID* | Name | Specification | Derived From ID* | (Name) |
|-----------------|-------------------------|---|------------------|--------|
| R01 | High Performance DCT | The target must support high performance dual-clutch transmission | | |
| R02 | Enable smooth start | The DCT must realize smooth start | | |
| R02 | Enable smooth start | The DCT must realize smooth start | R01 | High / |
| R03 | Emergency Neutral | The DCT must go into neutral in emergencies | | |
| R04 | Support seven gears | The DCT must support seven gears | | |
| R04 | Support seven gears | The DCT must support seven gears | R03 | Emerg |
| R05 | Allow manual gear shift | The DCT allows a driver to select gear manually | | |

The application interface includes a ribbon with tabs for File, Home, Insert, Page Layout, Formulas, Data, Review, View, Add-Ins, and Team. The spreadsheet is currently displaying the 'Requirements' tab, with other tabs like Packages, FRModels, Actors, UseCases, and BlocksTree visible at the bottom.

2. Single-click **Save** to save your changes to a (local) snapshot.
3. Double-click on **Save** to save to the No Magic Server repository. The **Commit to Teamwork Cloud** dialog appears.



Commit to Teamwork Cloud

Input a commit message

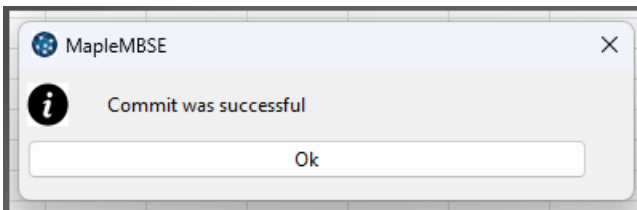
Create New Branch Keep Locks

Branch Name trunk

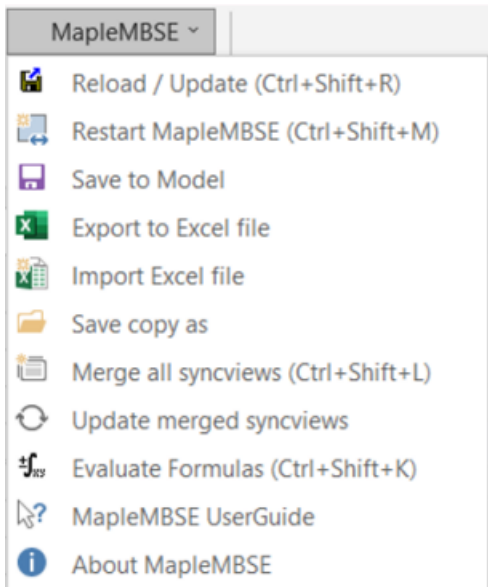
Branch Description

OK Cancel

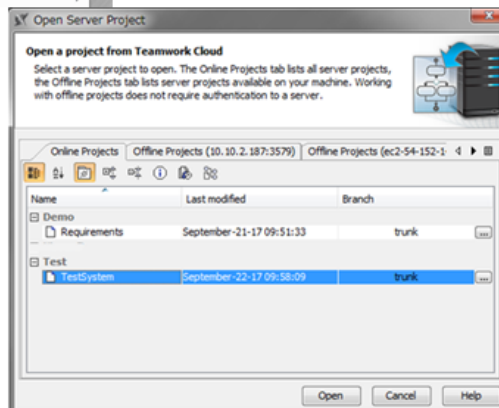
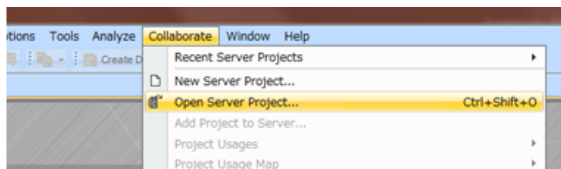
4. Enter a commit message, then click **OK**. The changes will be committed to the No Magic Server repository, to be shared with other users.
5. The following message is displayed when the commit is successful:



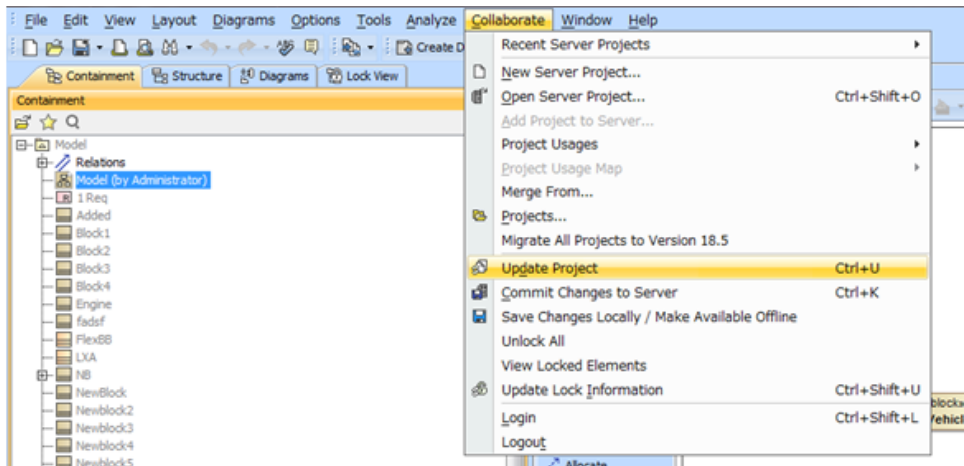
- Note:** By default, MapleMBSE releases locks on files upon commit. If you would like to keep these locks, select **Keep Locks** before clicking **OK**.
6. Reload/Update the model in MapleMBSE.



7. Open the Server Project in MagicDraw™/Cameo Systems Modeler™.



8. Update the Project in MagicDraw/Cameo Systems Modeler.



Automatically Saving Model Changes

The TWCloud Adapter in MapleMBSE automatically creates a snapshot of model changes and uses this snapshot to recover after a MapleMBSE crash.

MapleMBSE will check periodically (every ten minutes) for a one minute period of inactivity. At this time, a snapshot will be automatically created.

Loading Models after a Crash

The model resource that is loaded after a crash depends on the most recent save or sync operation performed just before the crash.

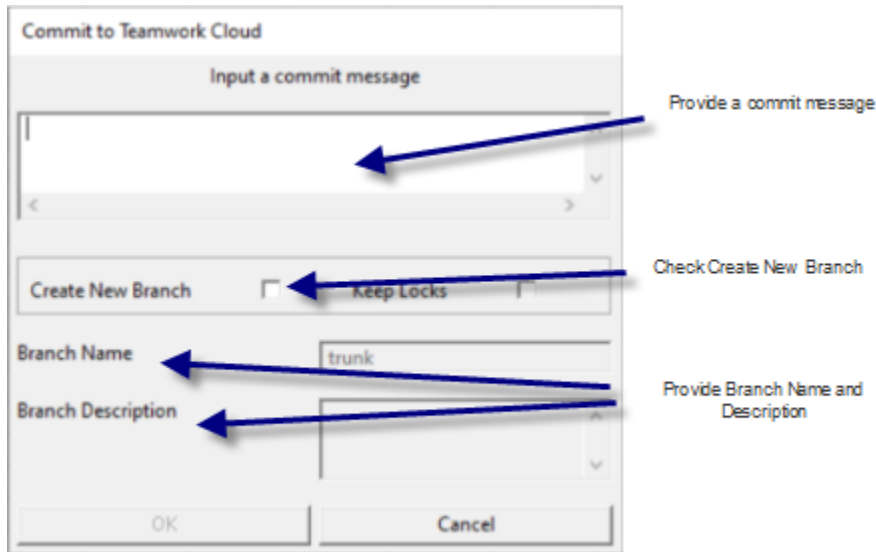
For example, if the last operation before a crash was committing changes to the Teamwork Cloud, MapleMBSE will load the snapshot that resides in the Teamwork Cloud.

However, if the last operation was saving to your local drive, MapleMBSE will load this local snapshot.

Finally, if the autosave has been initiated just before a MapleMBSE crash, a dialog window will be displayed after recovering from the crash letting you select which snapshot to load.

Creating a new No Magic Server Branch

To create a new No Magic Server branch:



1. Double-click the **Save** button. The **Commit** dialog box appears.
2. Enter a commit message.
3. Select **Create New Branch**.
4. Enter the name for the new TWCloud branch in **Branch Name**.
5. Enter a description for the new TWCloud branch in **Description**.
6. Click **OK**.
7. The new branch is created and the resources changes are now committed to this new branch. Any further commits will also be made to the new branch.

Accessing an Arbitrary Commit of a No Magic Server Project

Access any revision of a project without creating a new branch

Log in to Teamwork Cloud

Select Branch if needed.

Server: Use SSL

Username:

Password: Use Cache

Project:

Branch:

Save settings

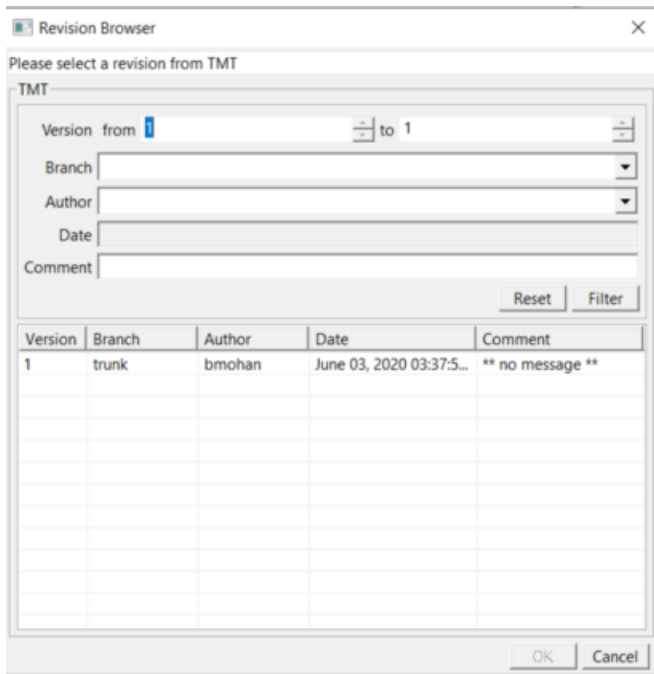
To access a particular revision:

1. Enter your login credentials: **Server**, **Username** and **Password**.
2. Next, enter the name of your No Magic Server Project in **Project**.
3. Enter the name of the branch that contains your file in **Branch**.
4. Enter the file revision that you want to work with.
5. Click **OK**.

Accessing a Specific No Magic Server Revision

You can access a particular revision of your model at login by doing the following:

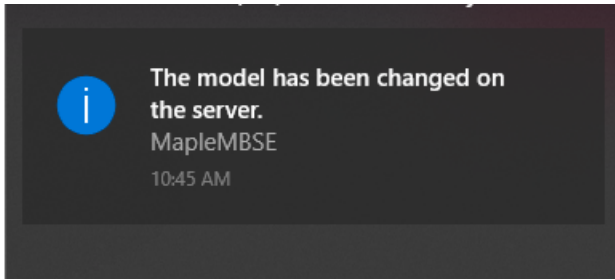
1. Click the revision browser text field from the login window. This will open the Revision Browser window.



2. Use the Version, Branch, Author, Date and Comment fields to filter your results.
3. Click Filter.
4. From the search results, select your revision.
5. Click Select.

No Magic Server Notification

It may happen that as you are working on a model in a specific branch, someone else commits a change to this model in the branch. Your revision will not be the head revision, and you will need to either reload your model or commit your changes to a new branch.



Reloading Your Model from the No Magic Server

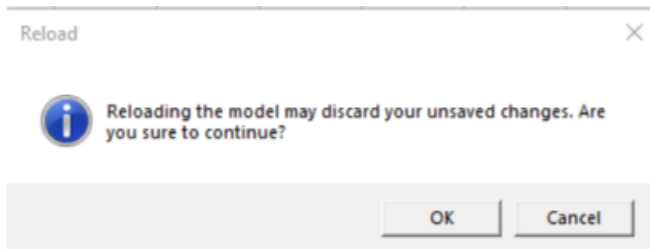
You can refresh your current model so that it reflects any changes made to the model outside of MapleMBSE. This section discusses the different scenarios you might encounter when reloading your TWCloud server model.

To reload your model:

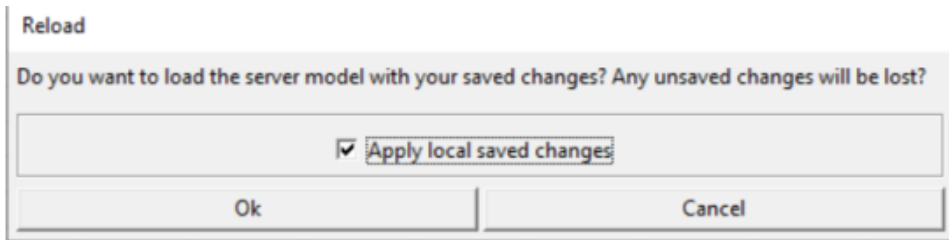
1. Select **Add-Ins > MapleMBSE > Reload/Update**.
2. In the **Reload/Update** dialog window, click **OK**. **Note:** Reloading the model may discard any unsaved changes.
3. The model is reloaded in the Model Spreadsheet.

Notes:

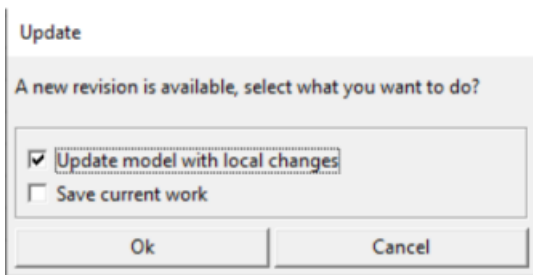
- If you begin at the head revision and there are no other changes to the model (in other words, the only changes to the model are your local changes), a dialog window will appear warning that reloading the model may discard your changes.



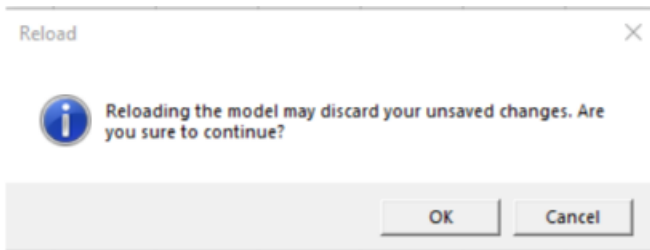
- If you begin with the head revision and there is a snapshot available, you have the option to ignore the snapshot, or add your snapshot to the model. The following dialog window will appear.



- If you begin with the head revision and a new revision is committed while you are working on your revision then the dialog box displayed contains a local save checkbox and a second checkbox for merging your saved local changes.



- If you begin with an arbitrary revision that is not the head revision, then reload, the only option offered is to go to the new revision and not merge any changes. This dialog window is the one that will be displayed.



If Update Model with Snapshot is checked and MapleMBSE detects there is a conflict when trying to merge the new revision with the snapshot, (for example, because both the new revision and the snapshot add a model element of the same name), you will be alerted with another dialog window.

After clicking OK, MapleMBSE will update to the new revision, but any local changes (whether saved or not) will be discarded. The result will be equivalent to the case where a new revision is available; you update to the new revision and discard any local changes (whether saved or unsaved) was originally selected) or the case where a new revision is

available and the snapshot for the previous revision is saved but changes are not applied after switching to the new revision respectively.

If you want to keep the local changes, you have the option to restart MapleMBSE (via the “Restart” button or keyboard shortcut), open the previous revision, apply the snapshot, and then save the local changes into a new branch.

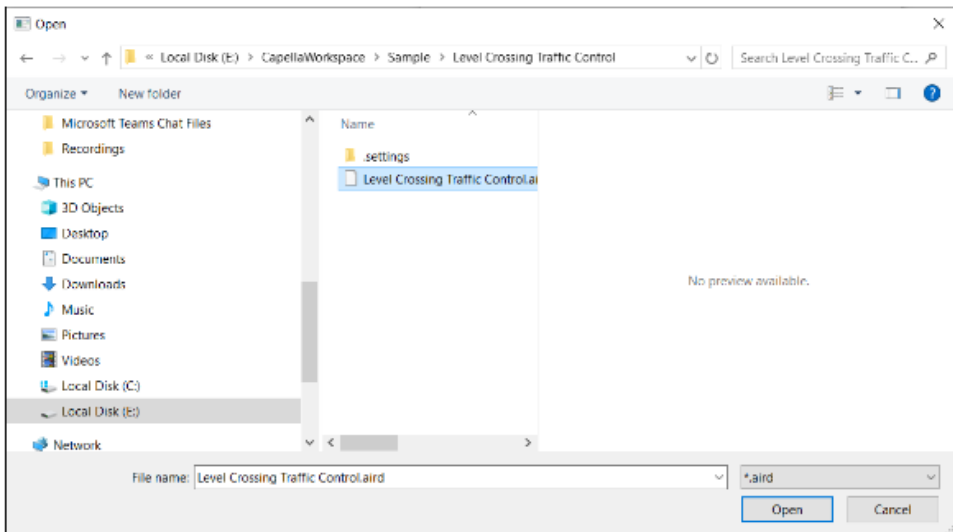
1.9 Using the Eclipse Capella Adaptor

The Capella Adaptor in MapleMBSE allows you to save changes you have made to your model in the Model Spreadsheet to the Capella model file.

Launching the Capella Model in MapleMBSE

To launch your Capella model in MapleMBSE:

1. From **Start->All Programs->MapleMBSE 2024**.
2. Select your Capella configuration (.MSE) file.
3. Click **Open**.
4. In the Open Capella Model dialog box click on Open Local Capella Project
5. Select the Capella Model to Open by selecting the .aird file



6. Edit changes and Click on Save button to add changes to the model.

1.10 Using the Capella Adaptor for Team for a Capella Model

With the Capella Adaptor, you can work with local and sever models in Capella and Team for Capella, respectively.

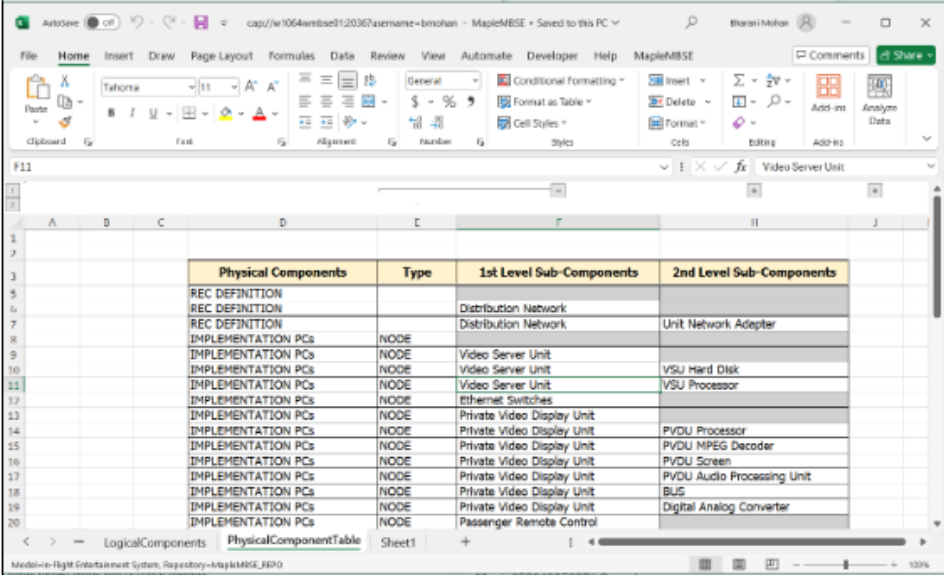
Launching the Team for Capella Model

To Launch your Team for Capella model in MapleMBSE:

1. From Start->All Programs->MapleMBSE 2024.
2. Select your Capella configuration (.MSE) file.
3. Click Open. A progress bar is displayed indicating that the model is being launched
4. In the Login to Team for Capella dialog box, enter your server, repository name, username and password. Once your credentials are validated, select the project to open in MapleMBSE. If you check Save settings, MapleMBSE saves the successful login information except for a password, and they are automatically filled in the next login.
5. Click Ok.

The screenshot shows a dialog box titled "Open Capella Model". At the top, there is a text input field labeled "Enter the username". Below this is a button labeled "Open Local Capella Project". The "Server:" field contains "w1064wmbse01:2036" and has a "Use SSL" checkbox to its right. The "Repository:" field contains "MapleMBSE_REPO". The "Username:" field is empty. The "Password:" field is empty. The "Project:" field is a dropdown menu. At the bottom, there are three buttons: "OK", "Cancel", and "Save settings" (with a checked checkbox).

The model information is displayed in title bar and status bar. Once you have launched it you will see the server details and username in the title bar.

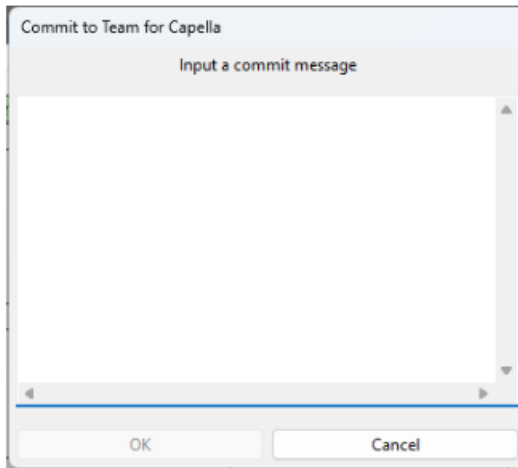


The screenshot shows a Microsoft Excel spreadsheet titled "PhysicalComponentTable" on "Sheet1". The spreadsheet contains a table with the following data:

| Physical Components | Type | 1st Level Sub-Components | 2nd Level Sub-Components |
|---------------------|------|----------------------------|----------------------------|
| REC DEFINITION | | Distribution Network | |
| REC DEFINITION | | Distribution Network | Unit Network Adapter |
| IMPLEMENTATION PCs | NOOE | Video Server Unit | VSU Hard Disk |
| IMPLEMENTATION PCs | NOOE | Video Server Unit | VSU Processor |
| IMPLEMENTATION PCs | NOOE | Ethernet Switches | |
| IMPLEMENTATION PCs | NOOE | Private Video Display Unit | PVDU Processor |
| IMPLEMENTATION PCs | NOOE | Private Video Display Unit | PVDU MPEG Decoder |
| IMPLEMENTATION PCs | NOOE | Private Video Display Unit | PVDU Screen |
| IMPLEMENTATION PCs | NOOE | Private Video Display Unit | PVDU Audio Processing Unit |
| IMPLEMENTATION PCs | NOOE | Private Video Display Unit | BUS |
| IMPLEMENTATION PCs | NOOE | Private Video Display Unit | Digital Analog Converter |
| IMPLEMENTATION PCs | NOOE | Passenger Remote Control | |

Editing and Saving changes to your model

1. Make changes to the model in MapleMBSE.
2. Double-click on Save to save to the Server repository. The Commit to Team for Capella dialog appears.
3. Enter a commit message, then click OK. The changes will be committed to the Team for Capella repository, to be shared with other users.

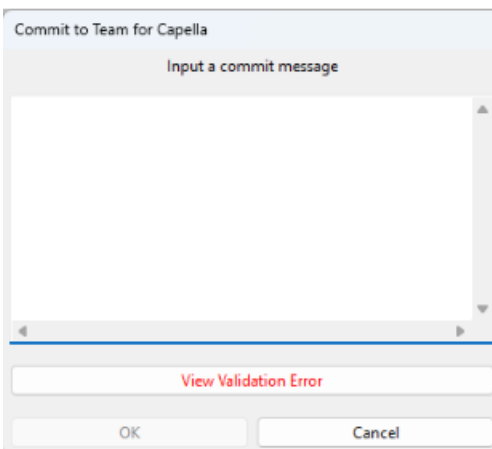


Validation Error during Commit to Team for Capella

When you double-click on the save button and commit to Team for Capella, if there is a validation error when the model is checked, an error message is shown.

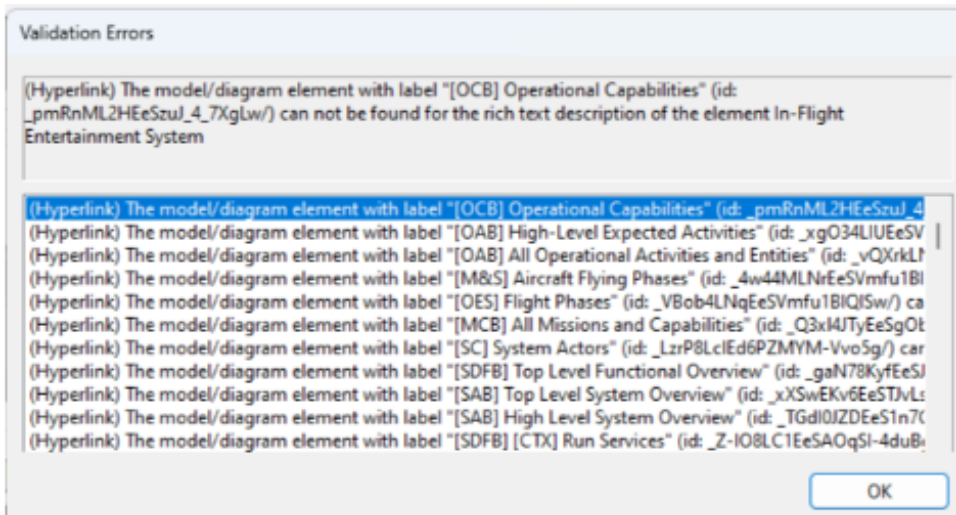
To fix the validation error:

1. Click on View Validation Error dialog box



2. Validation errors are displayed and the respective elements that triggered the issues are listed
3. Click on an item to display the context in message box on the top.
4. Click the OK button and Cancel in the commit dialog box.

5. Resolve the issues and click on Save to Model.
6. Enter a commit message and click OK



2 Editing the Model Spreadsheet MapleMBSE

In this chapter:

- *Workbook and Layout (page 37)*
- *Adding Model Elements (page 43)*
- *Sorting Records (page 55)*
- *Deleting Model Elements (page 58)*
- *Modifying Model Elements (page 60)*
- *Formula Evaluation (page 87)*

2.1 Workbook and Layout

The content of a workbook for a model is controlled by the MSE configuration file. The configuration file specifies the rules for what model data should be displayed in a spreadsheet and how to display this data. The remainder of this chapter reviews how the data can be displayed and what implications it has on user interactions with a spreadsheet. For detailed instructions about the rules governing what model data should be displayed, see the **MapleMBSE Configuration Language Guide**.

The configuration file specifies how many spreadsheets a workbook has and where and how the SyncViews are placed on the spreadsheets. Any user interactions that may change those specifications will result in an error and the actions will not be performed. In particular, the following information is specified for a workbook by the MSE configuration.

- The number of spreadsheets
- The names of the spreadsheets
- The order of the spreadsheets

Adding or deleting, renaming or moving the spreadsheets will result in an error. Note that the order of the spreadsheets is also controlled by the template file. See the **MapleMBSE Configuration Language Guide** for details.

For a SyncView, the MSE configuration specifies the cell in a spreadsheet where the SyncView area starts, the number of fields (see *Operations Overview (page 40)*) and the type of the SyncView placement. Any action that moves the location of the SyncView on the spreadsheet or interferes with the number of fields will be blocked by MapleMBSE. The specific actions that interfere with the number of fields depend on the placement type. There are three types of SyncView placement: a vertical table, a horizontal table, and a matrix.

- **Vertical Table**

A vertical table is a table where elements are arranged vertically: each row represents a model element, and each column represents a particular attribute of that element. The

example is given in the Figure below. The MSE configuration specifies the cell from which the SyncView starts (B3 in the example). Inserting or deleting columns or rows in front of that cell (rows above row 3 or columns to the left of the column B) would shift the SyncView which would contradict the specification and result in an error. The configuration also specifies the number of columns for a vertical table (3 columns starting with column B). Inserting or deleting columns in that area (from B to D) would result in an error. The number of rows is dictated by the number of elements. Adding or deleting rows results in adding new or deleting existing elements.

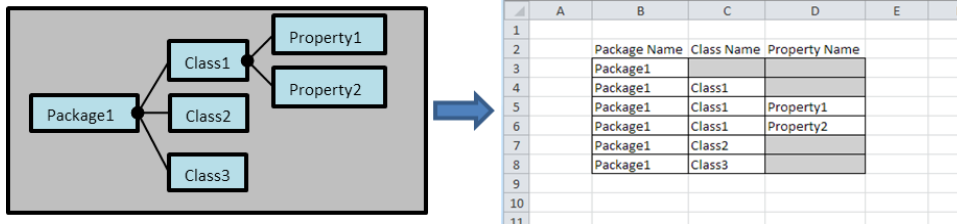


Figure 2.1: Vertical Table

- **Horizontal Table**

A horizontal table is a table where elements are arranged horizontally: each column represents a model element, and each row represents a particular attribute of that element. The example is given in the Figure below. The MSE configuration specifies the cell from which the SyncView starts (C2 in the example). As in the case of the vertical table, inserting or deleting columns or rows in front of that cell (rows above row 2 or columns to the left of the column C) is forbidden. For a horizontal table the configuration specifies the number of rows in the table (3 rows starting with row 2). Inserting or deleting rows in that area (from row 2 to row 4) would result in an error. The number of columns corresponds to the number of elements. Adding or deleting columns results in adding new or deleting existing elements.

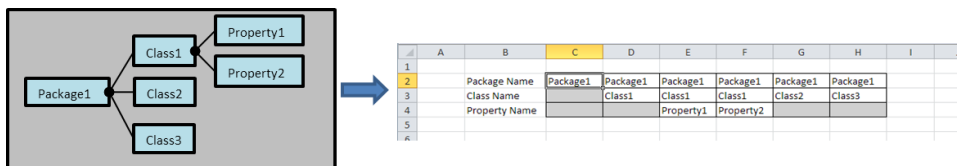


Figure 2.2: Horizontal Table

- **Matrix**

A matrix combines both a vertical and a horizontal table and also provides a matrix form to indicate a relationship between the two tables. It is convenient to use to represent dependencies among model elements. In the example, **Figure 2.3**, the matrix represents the dependency of dependent classes on the supplier classes. The dependent classes are rep-

resented in the vertical table (outlined in green), and their supplier classes are in the horizontal table (blue). The matrix (red) is used to indicate the dependencies. In the example Class1 from Package1 depends on Class2 from Package1 and Class3 from Package1. The MSE configuration specifies the cell where the matrix part starts (D5 in the example). The placements of the vertical and horizontal tables are determined from there. Inserting or deleting rows or columns before that cell (the rows above row 5 or columns to the left of the column D) is not allowed. The numbers of columns and rows in the matrix are determined by the number of elements represented by the vertical and horizontal tables, respectively. Inserting or deleting rows or columns in the region that affects the matrix area (rows between 5 and 7 or columns between D and F) is allowed and results in adding or deleting elements represented by the vertical or horizontal table, respectively.

| | A | B | C | D | E | F | G | H |
|---|---|-------------------|--------------|------------------|----------|----------|---|---|
| 1 | | | | | | | | |
| 2 | | Dependent Classes | | Supplier Classes | | | | |
| 3 | | | Package Name | Package1 | Package1 | Package1 | | |
| 4 | | Package Name | Class Name | Class1 | Class2 | Class3 | | |
| 5 | | Package1 | Class1 | X | X | | | |
| 6 | | Package1 | Class2 | | | | | |
| 7 | | Package1 | Class3 | | | | | |
| 8 | | | | | | | | |
| 9 | | | | | | | | |

Vertical Table
Horizontal Table
Matrix

Figure 2.3: Dependency Matrix

- **Matrix with Multiple Dependencies**

You can have Matrices that display more than one dependency at a time, along with any attached stereotypes. To add a dependency, type the alias of one of the dependency. For example, in the Matrix below, click in a cell and type either "VER" or "SAT".

To remove a dependency, select the dependency in the cell, then press the delete key.

| VER: Verify Relation, SAT: Satisfy Relation | | | | | | | | | | | | | | | | | |
|---|-----------------------|-----------------------|-------------------------------|-------------------------|-----------------------|--------------|-------------------|----------|---------------|--------------------------|--------------------------|------------------|----------------------|---------------|-----------|----------------|------------------------|
| | | ID* --> | | | | | | | | | | | | | | | |
| Components* | Requirement | 6.8.2 | 5.1.1 | 6.6 | 6.2 | 6.7.3 | 6.5.1 | 5 | 5.1.4 | 6.2.4 | 6.8.1 | 5.1.5 | 6.7 | 6.3.3 | 6.3.2 | 5.1 | 5.1.2 |
| | ValueProperty* | Combustion Efficiency | Perform Trade-off Analysis at | Low Pressure Compressor | High Pressure Turbine | ACC MassFlow | Nozzle Efficiency | Analysis | Heating Value | Active Clearance Control | Combustion Pressure Loss | Inlet Efficiency | Low Pressure Turbine | Tip Clearance | Bleed Air | Analysis Specs | Nozzle Exit Conditions |
| Combustor | mf/ma | | | | | | | | | | | | | | | | |
| Combustor | efficiency combustion | VER | | | | | | | | | | | | | | | |
| Combustor | pressure loss | | | | | | | | | VER | | | | | | | |
| Combustor | P0in combustor | | | | | | | | | | | | | | | | |
| Combustor | T0in combustor | | | | | | | | | | | | | | | | |
| Combustor | m incombustor | | | | | | | | | | | | | | | | |
| Combustor | Cp air | | | | | | | | | | | | | | | | |
| Combustor | Cp fuel | | | | | | | | | | | | | | | | |
| Combustor | heating value | | | | | | | | VER | | | | | | | | |
| Combustor | m bleed acc | | | | | | | | | | | | | | | | |
| Combustor | Btair | | | | | | | | | | | | | VER | VER | | |
| Nozzle fan | | | | | | | | | | | | | | | | | SAT |
| Nozzle fan | P02/Pc | | | | | | | | | | | | | | | | |
| Nozzle fan | P02/Pa | | | | | | | | | | | | | | | | |
| Nozzle fan | Tfanexit | | | | | | | | | | | | | | | | |
| Nozzle fan | Pexit | | | | | | | | | | | | | | | | |
| Nozzle fan | Vexit fan | | | | | | | | | | | | | | | | VER |
| Nozzle fan | Aexit | | | | | | | | | | | | | | | | |
| Nozzle fan | F fan | | | | | | | | | | | | | | | | VER |
| Nozzle fan | efficiency nozzle | | | | | | VER | | | | | | | | | | |

2.2 Operations Overview

MapleMBSE allows users to edit the models via tables created inside the SyncView area by translating insertions, deletions, and updates of table rows into additions, removals and updates of model elements, respectively.

The basic elements of data that MapleMBSE displays on a spreadsheet are SyncView, records, and fields. The area on a spreadsheet representing model data is called the SyncView, outlined in red in **Figure 2.4**. For simplicity, the SyncView is a vertical table in this example (see Vertical Table in *Workbook and Layout (page 37)*). Only operations in the SyncView region of a spreadsheet will be transferred to the operations on the model. Operations in other places of a spreadsheet do not affect the model. The empty row (or column) at the end of the vertical (or horizontal) SyncView is used to insert new elements and is called the insertion area (green dashed line in **Figure 2.4**). Each SyncView corresponds to a set of model elements. Each element corresponds to a record, represented by a row in a vertical table (outlined in blue in **Figure 2.4**). Each record is an array of fields, represented by cells in the row. Each field represents some property of the model element.

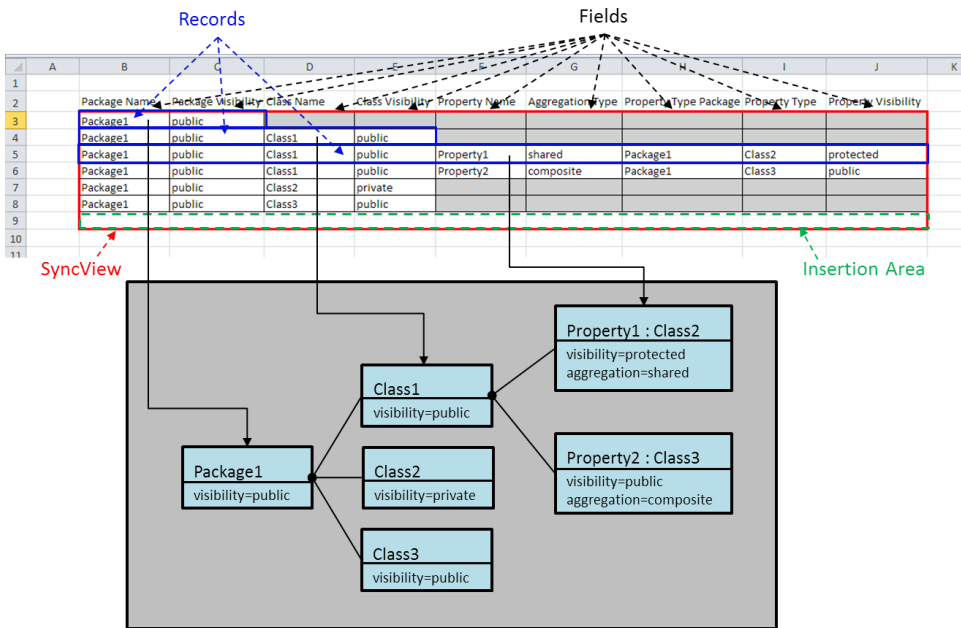


Figure 2.4: Data Elements Displayed By MapleMBSE

The SyncView areas for a workbook can be looked up in the **Name Box** (the box to the left of the formula bar). See **Figure 2.5**. Expanding the list in the **Name Box** gives the list of all SyncView areas on all spreadsheets in the workbook. The names include the names of the spreadsheets and the names of the SyncView areas defined by the MSE configuration.

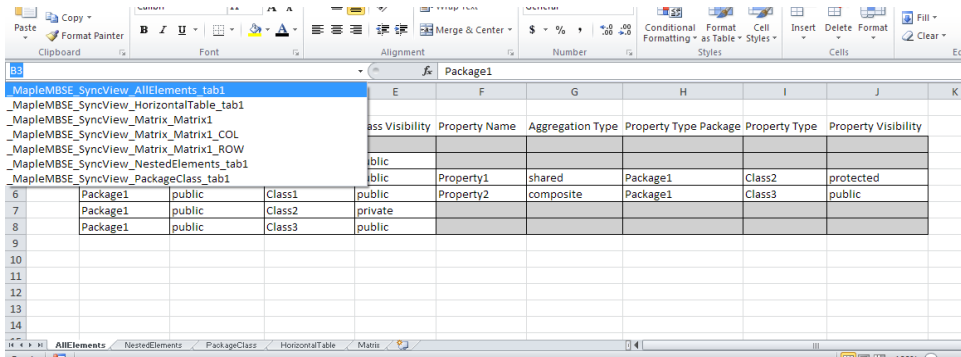


Figure 2.5: SyncView Areas Displayed in Name Box

Selecting one of the names shows the corresponding range of the cells.

| Package Name | Package Visibility | Class Name | Class Visibility | Property Name | Aggregation Type | Property Type Package | Property Type | Property Visibility |
|--------------|--------------------|------------|------------------|---------------|------------------|-----------------------|---------------|---------------------|
| Package1 | public | | | | | | | |
| Package1 | public | Class1 | public | | | | | |
| Package1 | public | Class1 | public | Property1 | shared | Package1 | Class2 | protected |
| Package1 | public | Class1 | public | Property2 | composite | Package1 | Class3 | public |
| Package1 | public | Class2 | private | | | | | |
| Package1 | public | Class3 | public | | | | | |

Figure 2.6: Highlighting SyncView Cell Range

In the remainder of this section we give an overview of the Excel operations on the spreadsheets.

Allowed Operations

The given table assumes that the SyncView is a vertical table. For a horizontal table the operations apply to columns instead of rows.

| Editing Operation | Description |
|--|---|
| Insert a new row into the SyncView table. | Use the Excel context menu to insert a new row anywhere in the table. |
| Insert a new row by typing into a cell directly below the last row of the table. | Type content into the cell directly below (and adjacent to) the table and press Enter. This will add a new row to the table and increase the SyncView area. |
| Insert copied cells as new rows. | Insert rows in the table area by inserting or pasting copied cells (using Insert Copied Cells feature from Excel context menu). |
| Update cell content in an existing row of the table. | Update table cell contents within the SyncView area |
| Delete rows | Delete table rows within the SyncView area. |
| Sort rows in SyncView | Select then sort the entire table in order to replace rows in the table. |

Editing Operations That Will Result in a MapleMBSE Error Message

The editing operations listed in the table below disrupt the structure of the SyncView table, as defined in the MapleMBSE configuration file and will result in an error message being generated and the editing operation being undone:

- Inserting a new row at the top of the spreadsheet, above the SyncView table
- Inserting a column in the spreadsheet to the left of the leftmost column of the table
- Updating across several non-adjacent rectangular areas. That is, copying and attempting to paste cell content into multiple selected areas in the table.
- Deleting rows or columns in the insertion area
- Moving the SyncView area. Note that you must edit the SyncView table schema in the configuration file (.mse) to move the SyncView area.

Operations That Could Negatively Change the Mapping between MapleMBSE and the Model Element

When making edits to the rows and columns in a table, the following operations do not alter the SyncView table layout as defined in the MapleMBSE configuration file. However, if you perform any of these operations there is a risk of breaking the mapping between the rows of the table in the model spreadsheet and the model element itself. This could result in unexpected behavior afterwards.

| Editing Operation | Description |
|--|---|
| Sorting only a portion of the table in the SyncView area. | Sorting only selected rows, cells or columns in the SyncView area |
| Inserting content into the table and then shifting cells up. | Inserting content into the table (for example by right-clicking on a table cell, then selecting Insert), then selecting either: Shift Cells Up or Shift Cells Down. |
| Deleting content from selected table cells. | Similar to inserting content into the table, and then shifting cells up or down. |

2.3 Adding Model Elements

Adding elements is done by adding records to the SyncView areas. How the records are added depends on the SyncView layout. For a vertical table, adding records corresponds to adding rows and for the horizontal table, to adding columns. For simplicity, in the following instructions, assume the SyncView is a vertical table. Adding records to a vertical table can be done in the following two ways.

Tip: You can follow the steps in this example using the *UserGuide.MSE* configuration file, *AddingNewElements.uml* model and the *Packages* spreadsheet. These files can be found in the <MapleMBSE>/Example/UserGuide directory, where <MapleMBSE> is your MapleMBSE installation directory.

1. Type the necessary information in the insertion area.

In **Figure 2.7**, the SyncView is outlined in red and the insertion area in green (cell B4 in a). Type Package2 in the insertion area (b) and press Enter. MapleMSBE checks that no other element with this name exists and adds a new package element with the name Package2 (c). The model is shown in the bottom of the Figure. The SyncView area is grown by one row. The insertion area is the cell B5.

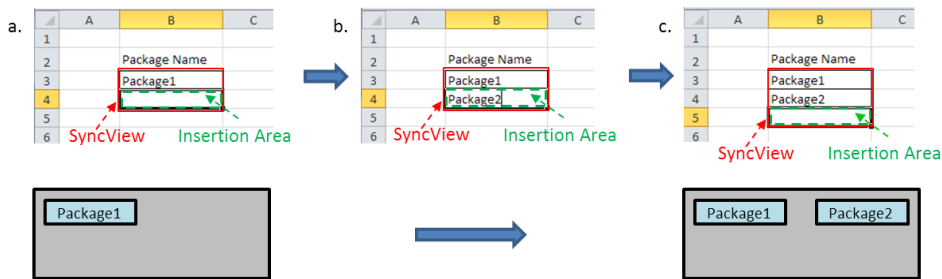


Figure 2.7: Entering Information in Insertion Area

2. Insert a row in the SyncView area and enter the necessary information.

In **Figure 2.8** the SyncView area is outlined in red (a). For example, select row 4 and in the context menu choose **Insert** (b). A row inserted in place of row 4, and the previous row is shifted below (c). The SyncView area is increased by one row. Enter the name of the new package, Package3. MapleMBSE creates a new element with the name Package3.

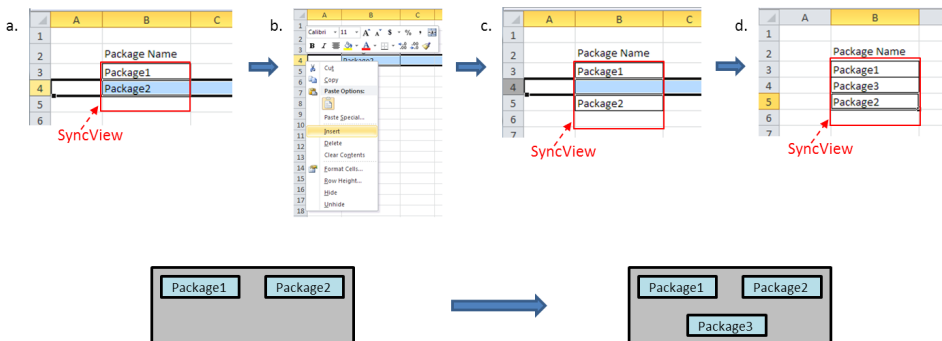


Figure 2.8: Inserting a Row in the SyncArea

The changes are performed on the model in the internal MapleMBSE memory. To make your model changes persist, save the workbook. For details, see *Saving the Model* (page 11).

MapleMBSE does not sort new elements automatically. The sorting can be done manually; for details see *Sorting Records (page 55)*. Adding records will also be reflected in other spreadsheets that refer to the same model elements. In other worksheets, additional records are always added to the last line.

Field Modifiers

Sometimes the end user IS required to input hard-to-remember data or semantically loaded data. In order to improve this user experience MapleMBSE offers Field Modifiers as string replacements. For instance, if previously a Very::long::qualified::name was the expected input, within the MSE file we can configure a mnemonic N that internally will be replace back to the long format.

Field Modifiers can be used as string replacements, in such cases.

In the following Figure you can see an example of long name being replaced by a shorter name . In Figure 3 a), a view of the TurboFan engine parts as they are in the model. Without the Field Modifier shortcuts, the user would see some very cumbersome names, e.g., High Pressure Axial Compressor.

| Aircraft Parts | |
|--------------------------------|-----------------------|
| Aeroplane | Aeroplane |
| airfuel mixture | airfuel mixture |
| Analysis Block | Analysis Block |
| Avionics System | Avionics System |
| BlockWithAVeryLongName | B |
| Cockpit | Cockpit |
| Combustor | Combustor |
| Engine Control System | Engine Control System |
| Fuel | Fuel |
| Fuel System | Fuel System |
| Fuselage | Fuselage |
| High Pressure Axial Compressor | HPA Compressor |
| High Pressure Axial Turbine | HPA Turbine |
| InletConditions | InletConditions |
| Landing Gear | Landing Gear |
| Low Pressure Axial Compressor | LPA Compressor |
| Low Pressure Axial Turbine | LPA Turbine |
| Low Pressure Fan | Low Pressure Fan |
| Nozzle_core | Nozzle_core |
| Nozzle_fan | Nozzle_fan |
| Reduction Gear | Reduction Gear |
| Results | Results |
| Spool | Spool |
| TurboFan Engine | TurboFan Engine |
| Wings | Wings |

a)

b)

By contrast, in Figure 3 b), a view of the TurboFan engine parts, when using Field Modifiers. Often organizations develop jargon and abbreviations that are handy to use. In this case, HPA and LPA could be the accepted short forms for High Pressure Axial and Low Pressure

Axial, respectively, meaning that the old High Pressure Axial Compressor is now displayed as HPA Compressor, and can also be entered as such.

Nested Elements

A model usually has a lot of dependencies which are represented by a tree structure. To reflect that structure in a table a staircase table is used. Consider the example in **Figure 2.9**. Assume we want to define a structure as on the left-hand side of the Figure: Package1 contains Class1, which contains Property1. Each element is represented by one record in the table. We define each element in turn, starting with Package1.

Tip: You can follow this example using these files: `UserGuide.MSE` configuration file, `AddingNewElements.uml` model and the `NestedElements` spreadsheet. These files can be found in the `<MapleMBSE>/Example/UserGuide` directory, where `<MapleMBSE>` is your MapleMBSE installation directory.

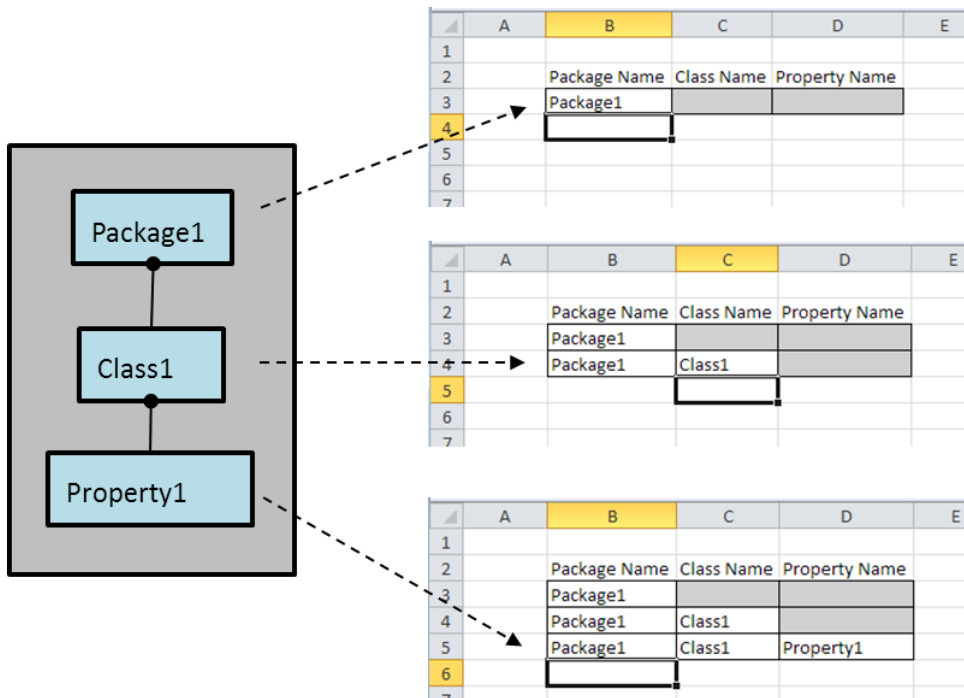


Figure 2.9: Defining a Nested Structure in the `NestedElements` spreadsheet

- *Define Package1*

The steps for defining `Package1` are shown in **Figure 2.10**. In the insertion area in the column corresponding to the package definitions (a) type `Package1` (b) and press Enter. When you press Enter, MapleMBSE checks whether there is an element in the in-memory

model with that name already. It finds that such element does not exist yet, so the row represents a new element. Since one row corresponds to one element we cannot define any additional elements inside it in this row. MapleMBSE indicates that by showing fields corresponding to the nested elements in gray.

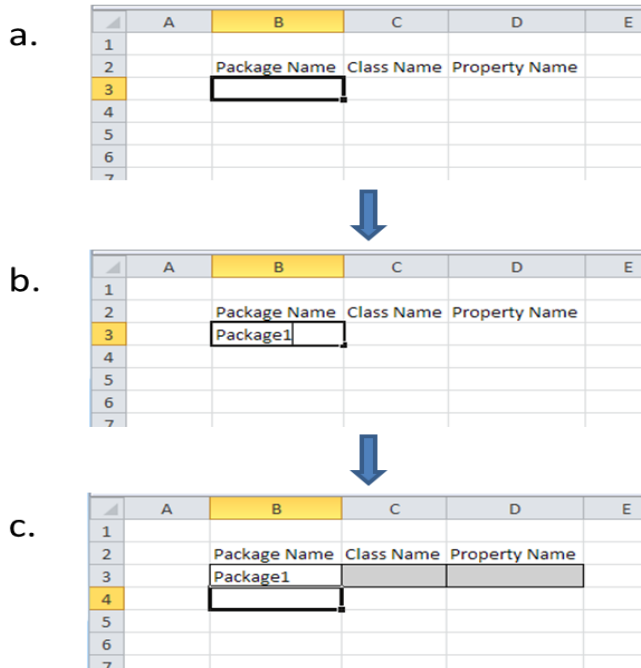


Figure 2.10: Defining Package1

- *Define Class1*

The steps for defining Class1 in Package1 are shown in **Figure 2.11**. To define Class1, you need to first specify the package it belongs to. Type Package1 in the column corresponding to packages and press the right arrow key (a). MapleMBSE checks whether there is an element with this name already in the model. It finds that the element exists and shows the "Duplicated key" warning for this field. Other fields are still white so you can now define nested elements inside Package1. Enter Class1 (b) and press Enter. Again MapleMBSE verifies if Class1 already exists inside Package1, finds that it does not and creates a new element. The warning from the package field is cleared (c). Since one record can correspond only to one element and this record now defines Class1, the same row cannot be used to define any elements inside Class1. MapleMBSE indicates this by showing the Property Name column in gray.

a.

| | A | B | C | D | E |
|---|---|--------------|------------|---------------|---|
| 1 | | | | | |
| 2 | | Package Name | Class Name | Property Name | |
| 3 | | Package1 | | | |
| 4 | | Package1 | | | |
| 5 | | | | | |
| 6 | | | | | |
| 7 | | | | | |

↓

b.

| | A | B | C | D | E |
|---|---|--------------|------------|---------------|---|
| 1 | | | | | |
| 2 | | Package Name | Class Name | Property Name | |
| 3 | | Package1 | | | |
| 4 | | Package1 | Class1 | | |
| 5 | | | | | |
| 6 | | | | | |
| 7 | | | | | |

↓

c.

| | A | B | C | D | E |
|---|---|--------------|------------|---------------|---|
| 1 | | | | | |
| 2 | | Package Name | Class Name | Property Name | |
| 3 | | Package1 | | | |
| 4 | | Package1 | Class1 | | |
| 5 | | | | | |
| 6 | | | | | |
| 7 | | | | | |

Figure 2.11: Defining Class1

- *Define Property1*

The steps for defining Property1 are shown in **Figure 2.12**. To define Property1, you need to specify the package and the class it belongs to. Type "Package1" in the column corresponding to packages and press the right arrow key (a). As in the case above, MapleMBSE identifies that the element, Package1 already exists and adds a warning mark to that cell. Type "Class1" and press the right arrow key (b). This time, Class1 already exists in Package1 so MapleMBSE gives the "Duplicated key" warning for that cell as well. The property field is white and you can now define an element representing a property inside Class1. Type Property1 (c) and press Enter. MapleMBSE verifies that there is no existing property inside Class1 called Property1 and the record represents a new unique element. All warnings from the other fields are cleared (d).

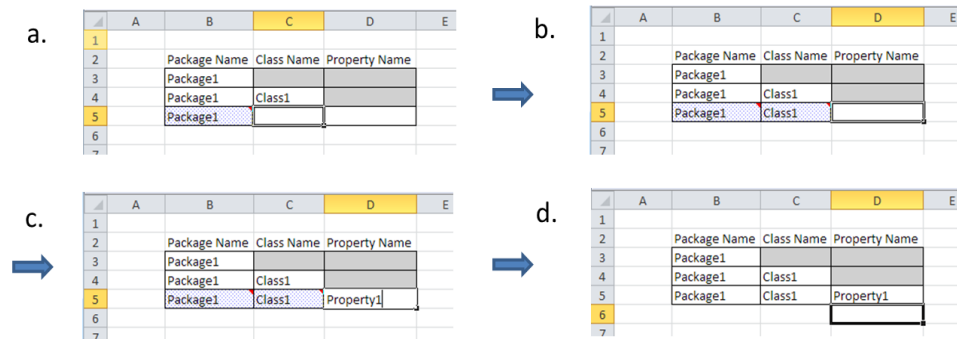


Figure 2.12: Defining Property1

Alternative Groups

In a model, different types of elements may belong to the same parent. For example, a package may contain classes or other packages. An MSE configuration specifies what type the record must have thus specifying the type of the element it defines. In the example in *Nested Elements (page 47)*, the MSE configuration allowed for 3 types of records: packages defined at the top level, classes defined inside top-level packages, properties defined inside classes. It did not allow for defining other packages inside top-level packages or classes inside other classes, for example. To be able to define different types of elements at the same nested level, alternative groups must be defined in the MSE configuration, see *MapleMBSE Configuration Language Guide* for details. Here we consider when such a configuration is used.

Tip: You can follow the steps in this example using the: `UserGuide.MSE` configuration file, `AddingNewElements.uml` model and the `AlternativeGroups` spreadsheet. These files can be found in the `<MapleMBSE>/Example/UserGuide` directory, where `<MapleMBSE>` is your MapleMBSE installation directory.

The MSE configuration in this example allows us to define the following 4 types of elements by defining the corresponding fields in the SyncView.

- Top level packages - **Package Name**
- Classes inside top level packages - **Class Name**
- Packages nested inside the top level packages - **Nested Package Name**
- Classes inside nested packages - **Nested Class Name**

| | A | B | C | D | E | F |
|---|---|--------------|------------|---------------------|-------------------|---|
| 1 | | | | | | |
| 2 | | Package Name | Class Name | Nested Package Name | Nested Class Name | |
| 3 | | | | | | |
| 4 | | | | | | |
| 5 | | | | | | |
| 6 | | | | | | |
| 7 | | | | | | |
| 8 | | | | | | |

The model we are going to define in this example is shown in **Figure 2.13**. A top-level package (Package1) contains two elements: one of class type (Class1) and one of a package type (Package2). The nested package (Package2) has one class defined in it (Class2).

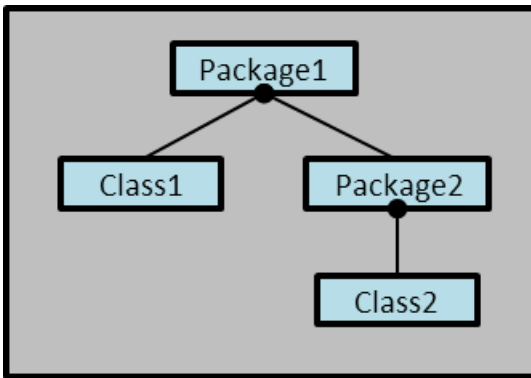


Figure 2.13: Alternative Groups Example Model

- *Define Package1*

The process of defining Package1 is the same as in the examples in *Adding Model Elements* (page 43) and *Nested Elements* (page 47). Enter Package1 in the Package Name column in the insertion area and press Enter.

a.

| | A | B | C | D | E | F |
|---|---|--------------|------------|---------------------|-------------------|---|
| 1 | | | | | | |
| 2 | | Package Name | Class Name | Nested Package Name | Nested Class Name | |
| 3 | | Package1 | | | | |
| 4 | | | | | | |
| 5 | | | | | | |
| 6 | | | | | | |
| 7 | | | | | | |
| 8 | | | | | | |

↓

b.

| | A | B | C | D | E | F |
|---|---|--------------|------------|---------------------|-------------------|---|
| 1 | | | | | | |
| 2 | | Package Name | Class Name | Nested Package Name | Nested Class Name | |
| 3 | | Package1 | | | | |
| 4 | | | | | | |
| 5 | | | | | | |
| 6 | | | | | | |
| 7 | | | | | | |
| 8 | | | | | | |

| |
|----------|
| Package1 |
|----------|

Figure 2.14: Defining Package1

- *Define Class1*

To define Class1, follow the steps in **Figure 2.15**. Type Package1 in the Package Name column on the new line (row 4) and press Enter (a). As in the examples in *Nested Elements* (page 47), *Define Class1*, a warning is added to the cell defining Package1 indicating that it is a duplicated key. Unlike in that example, the background of the other cells in this row is changed to dark gray. This color is different from the lighter gray used to indicate that no more elements can be defined in this row (row 3). The dark gray color is used to indicate the fields represent alternative fields. Type Class1 in the **Class Name** (b) and press Enter. A new class called Class1 is added to Package1 (c). The background of the remaining cells in this row in the SyncView area is changed to light gray indicating that no more elements can be defined in this row.

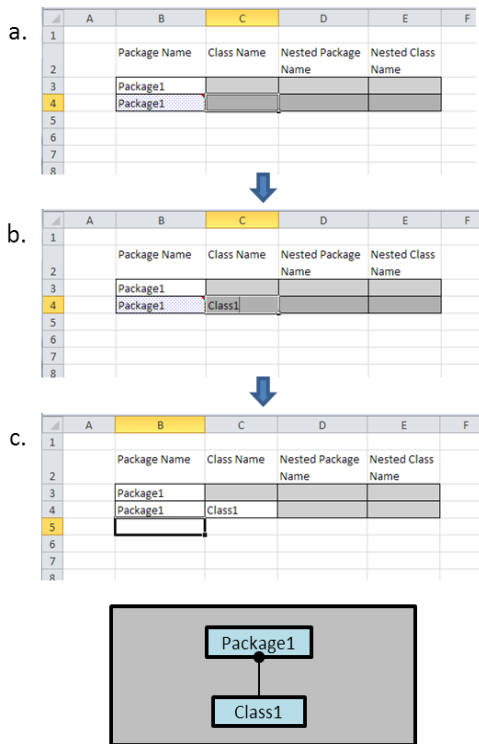


Figure 2.15: Defining Class1

- *Define Package2*

To define Package2 inside Package1, follow the steps in **Figure 2.16**. First, type Package1 on the new line (row 5) and press Enter (a). Again, a duplicated key warning is added to the cell with Package1 and the background of other cells in this row inside the SyncView area is changed to dark gray indicating the rest of the cells represent alternative groups. Leave the **Class Name** column empty and type Package2 in the **Nested Package Name** column (b). Press Enter (c). A new package Package2 is added to the model. The background of the cells representing nested elements inside Package2 (**Nested Class Name**) is changed to light gray indicating that this record cannot be used to define nested classes inside Package2. The background of the cell representing the alternative (**Class Name**) remains dark gray.

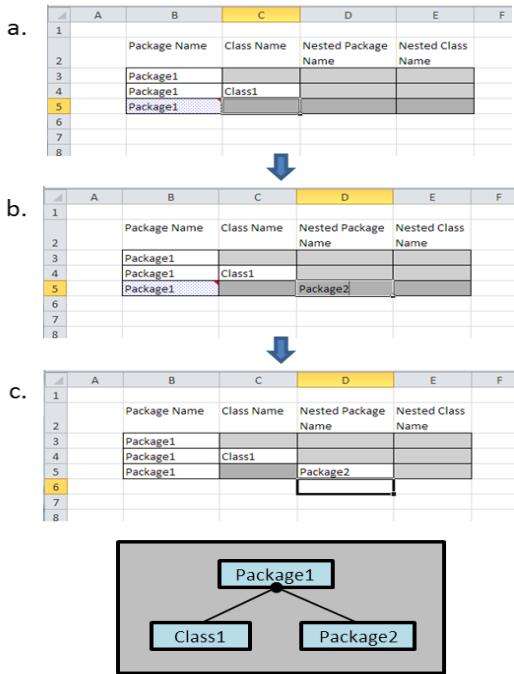


Figure 2.16: Defining Package2

- *Define Class2*

The steps defining Class2 inside Package2 are shown in the Figure below. Type Package1 in the **Package Name** column and press Enter (a). Type Package2 in the **Nested Package Name** (b) and press Enter (c). Now a package called Package2 inside Package1 already exists and a duplicated key warning is added to the cell with Package2. The background of the **Nested Class Name** cell remains dark gray. Type Class2 in the **Nested Class Name** cell (d) and press Enter (e). A class called Class2 is added to Package2 in the model. The warnings are cleared. The background of the **Class Name** cell remains dark gray indicating that it represents an alternative type of elements in Package1. Any valued entered there will be ignored and cleared after Enter is pressed.

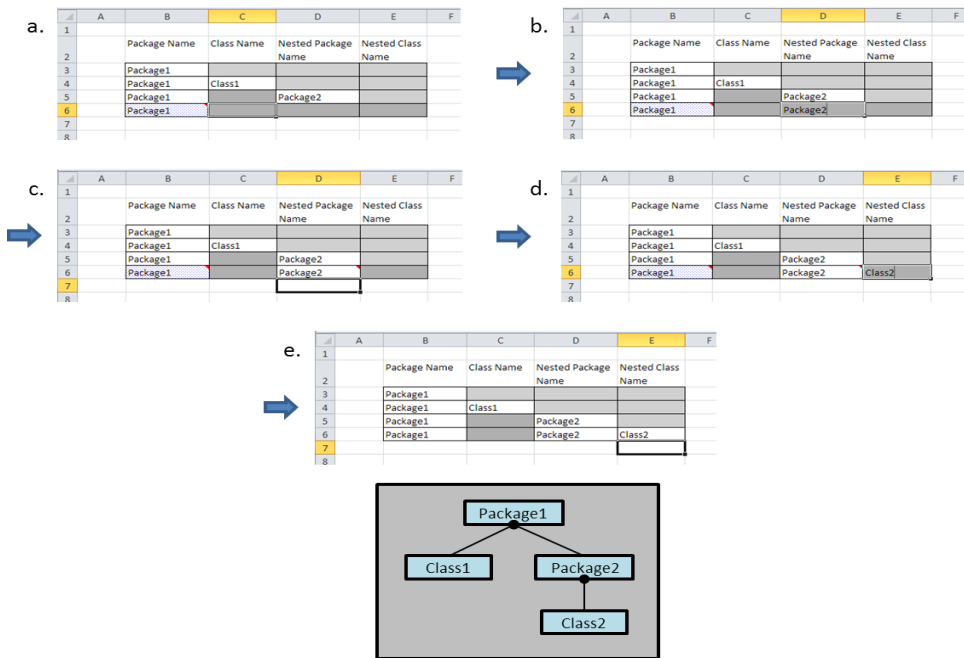


Figure 2.17: Defining Class2

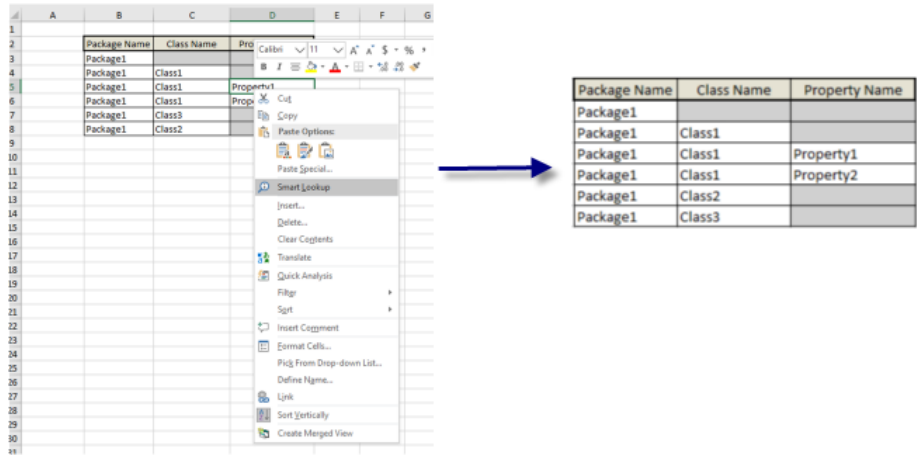
2.4 Sorting Records

The order for sorting is specified in the MSE configuration file. When a model is opened all records are sorted according to these specifications. When new records are added to the tables they are not sorted automatically. You can sort the records manually. Sorting records has no effect on the model.

- **Vertical Table**

To sort the records manually in a vertical table, right-click anywhere in the SyncView

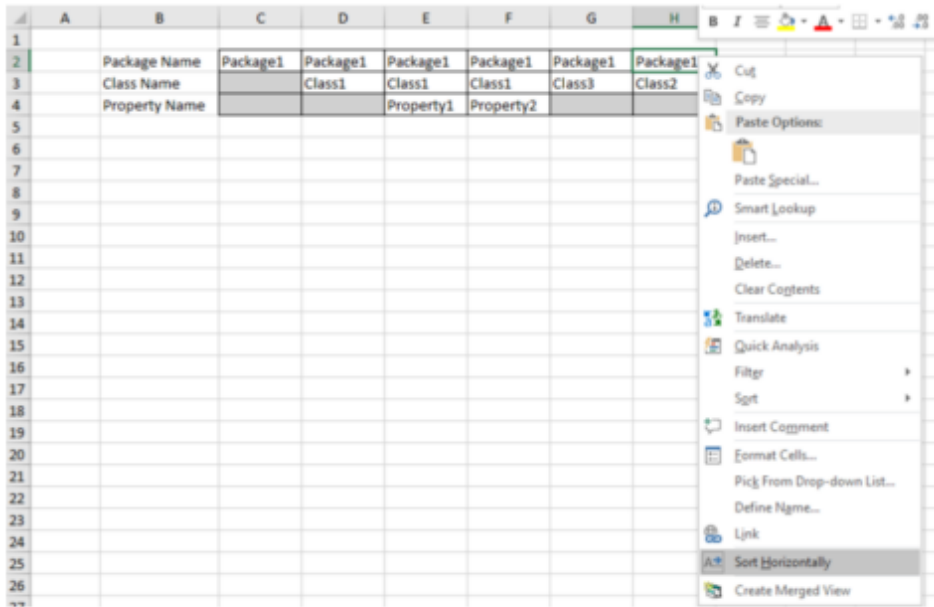
area, and then select **Sort Vertically**.



- **Horizontal Table**

To sort the records in a horizontal table, right-click anywhere in the SyncView area, and

then select **Sort Horizontally**.



| | | | | | | |
|---------------|----------|----------|-----------|-----------|----------|----------|
| Package Name | Package1 | Package1 | Package1 | Package1 | Package1 | Package1 |
| Package Name | Package1 | Package1 | Package1 | Package1 | Package1 | Package1 |
| Class Name | | Class1 | Class1 | Class1 | Class2 | Class3 |
| Property Name | | | Property1 | Property2 | | |

- **Matrix**

To sort the records in a matrix, right-click anywhere in the matrix SyncView area, and

then select **Sort Matrix**.

The image shows a spreadsheet with two tables. The first table, 'Supplier Classes', has columns for Package Name and Class Name, and rows for Package1, Class1, Class2, and Class3. The second table, 'Dependent Classes', has columns for Package Name and Class Name, and rows for Package1, Class1, Class2, and Class3. A context menu is open over the 'Supplier Classes' table, with 'Sort Matrix' selected. An arrow points from the 'Sort Matrix' option to the 'Supplier Class' table.

| Supplier Classes | | Package1 | Package1 | Package1 |
|------------------|------------|----------|----------|----------|
| Package Name | Class Name | Class1 | Class2 | Class3 |
| Package1 | Class1 | X | | |
| Package1 | Class2 | | | |
| Package1 | Class3 | | | |

| Supplier Class | | Package1 | Package1 | Package1 |
|----------------|------------|----------|----------|----------|
| Package Name | Class Name | Class1 | Class2 | Class3 |
| Package1 | Class1 | | X | |
| Package1 | Class2 | | | |
| Package1 | Class3 | | | |

2.5 Deleting Model Elements

Deleting elements is done by deleting the corresponding record in the SyncView area. In a vertical table it corresponds to deleting a row, in a horizontal table - a column. In a matrix, deleting a row or a column also deletes the row or the column in the corresponding vertical or horizontal table, correspondingly, and, thus, the element represented by that row or column. In **Figure 2.18**, the SyncView is a vertical table (a). To delete Class1 in Package1, you need to delete the row representing this element - row 4 (b). The element is deleted from the table and the model (c).

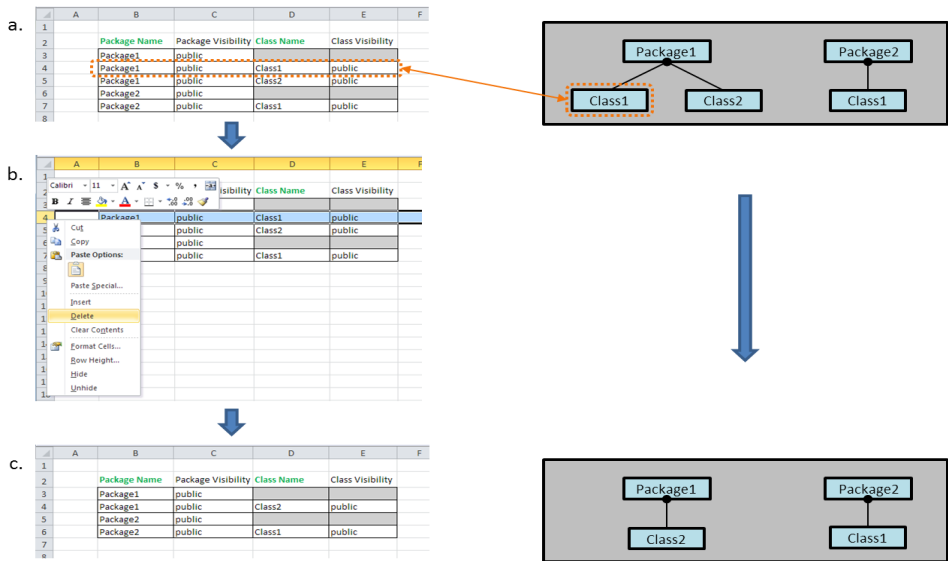


Figure 2.18: Deleting the Class1 Element from the Model

Deleting an element also deletes all elements belonging to it. For example, deleting Package1 in Figure 2.19 (a) also deletes Class1 and Class2 belonging to it.

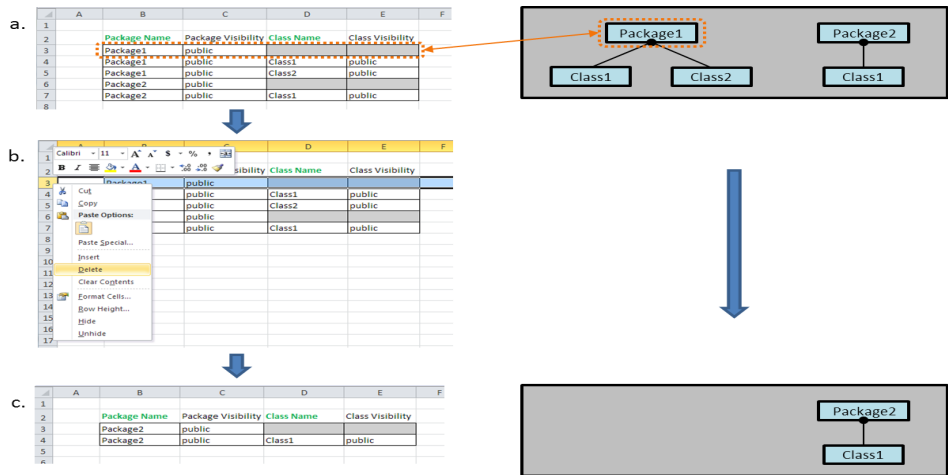


Figure 2.19: Deleting Package1 and Associated Elements

Deleting Records with References

Reference fields in a record point to other elements in the model, see *Field Types (page 60)* for details. When deleting a record that contains reference fields, the corresponding referenced element is not deleted.

2.6 Modifying Model Elements

In the examples we considered in *Adding Model Elements (page 43)* and *Sorting Records (page 55)*, the SyncViews were used to add new elements but they did not allow to edit or view any properties of the elements. In this section we define other characteristics of SyncViews that allow us to work with different properties of the elements.

As discussed in *Operations Overview (page 40)*, model elements are represented in a SyncView by records, and each record consists of one or more fields. The fields represent different properties of the element. By editing the fields in the Excel spreadsheet you modify the corresponding properties of the model elements. What effect editing a field has on the model element depends on the type of the field. The types of the fields are set by the MSE configuration. Here we describe the different types of fields and what effect they have on editing operations.

Field Types

There are three main types of fields in SyncView:

- An attribute field;
- A reference field;
- An unmapped field.

An attribute field points to the value of a property with a primitive type, such as a string or a number. A reference field represents a property with a nonprimitive type, such as another element in the model. An unmapped field is a field that is not mapped to any property of the element. It has no influence on the model but may be useful for comments or performing Excel operations related to other fields. See *Unmapped Fields (page 79)* for details.

In addition, fields can be either **key** or **nonkey** fields. The **key** fields are used to uniquely identify a model element. Therefore, multiple records with the same key fields cannot exist in the same SyncView. One or more key fields exist in one record. Whether a field is key or not is set in the MSE configuration. The **nonkey** fields simply represent the properties of the element defined by the key fields.

Note: There is a distinction between **record key** fields and **reference key** fields. If there are reference fields in a record some of them must be reference key fields that determine which element the reference points to. The record key fields are used to determine the record uniquely. The reference key fields may also be the record key fields.

In **Figure 2.20**, the SyncView is a vertical table. Each row is a record, and different fields are represented by different columns. The record key fields are outlined in green: Package Name, Class Name, and Property Name. They are attribute fields. The record nonkey attribute fields are outlined in blue: Package Visibility, Class Visibility, Property Visibility, and Aggregation Type. Both key and nonkey attribute fields are strings. A property in a class must have a type which is defined by some other class. In other words, a type of a property is another element in a model. So, to represent a type of a property, reference fields must be used. To define a class uniquely in the model, we need to specify the name of the package it belongs to and its name. The fields Property Type Package and Property Type, outlined in orange, are reference key fields. In this example, reference key fields are not record key fields (they are not required to determine the record itself, only the element it refers to). Providing Property Type Package and Property Type is enough information to define the type of a property. However, you might be interested in viewing some information about the type in the same record, for example, the visibility of the type. For that purpose a nonkey reference field is used. The field Type Visibility, outlined in purple, is a nonkey reference field representing the visibility of the class used as a type for the property.

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|--------------|--------------------|------------|------------------|---------------|---------------------|------------------|-----------------------|---------------|-----------------|---|
| 1 | | | | | | | | | | | | |
| 2 | | Package Name | Package Visibility | Class Name | Class Visibility | Property Name | Property Visibility | Aggregation Type | Property Type Package | Property Type | Type Visibility | |
| 3 | | Package1 | public | | | | | | | | | |
| 4 | | Package1 | public | Class1 | public | | | | | | | |
| 5 | | Package1 | public | Class1 | public | Property1 | protected | shared | Package1 | Class2 | private | |
| 6 | | Package1 | public | Class1 | public | Property2 | public | composite | Package1 | Class3 | public | |
| 7 | | Package1 | public | Class2 | private | | | | | | | |
| 8 | | Package1 | public | Class3 | public | | | | | | | |
| 9 | | | | | | | | | | | | |

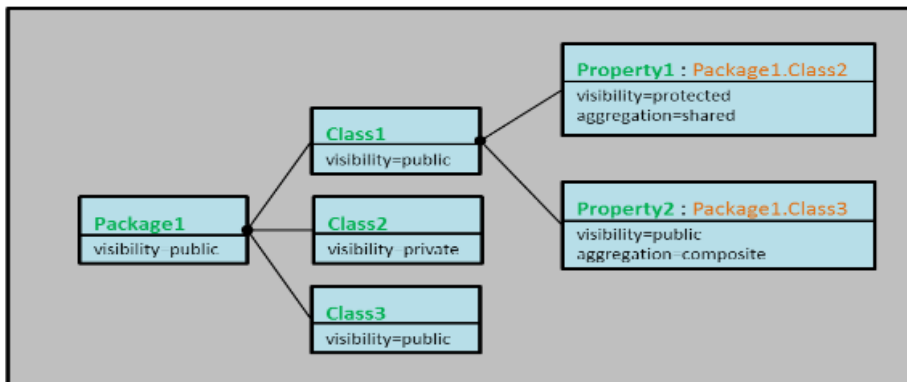


Figure 2.20: Illustration of Main Types of Fields in SyncView

In the examples we considered in *Adding Model Elements* (page 43) and *Sorting Records* (page 55), the records of the SyncViews consisted only of key attribute fields. In the example in *Deleting Model Elements* (page 58), the SyncView had record key attribute

fields (Package Name and Class Name) and nonkey attribute fields (Package Visibility and Class Visibility).

Record State

Another definition important for working with records in SyncViews is the the state of the record. Each record has two states: **bound** and **unbound**, depending on whether it is associated with the model loaded in memory. When a new record is first created it is in an unbound state; it is not associated with the model. Once all record key fields are filled and it is verified that together they represent a unique element the record changes the state to bound, the record is associated with the model in memory. If it represents an existing element, the nonkey fields will be populated with the information from the in-memory model. If the element does not exist it is created in the model. Depending on the modeling tool some of the attributes are given default values to new elements. If any of those attributes are mapped to nonkey fields, the fields will be populated with those values.

Example of Using Different Fields When Adding Elements

As an example of adding elements to a SyncView with several different types of fields we create the model in **Figure 2.21**. The MSE configuration for the SyncView specifies the types of the fields as in the example in *Field Types* (page 60).

Tip: You can follow the steps in this example using the: `UserGuide.MSE` configuration file, `AddingNewElements.uml` model and the `AllElements` spreadsheet. These files can be found in the `<MapleMBSE>/Example/UserGuide` directory, where `<MapleMBSE>` is your MapleMBSE installation directory.

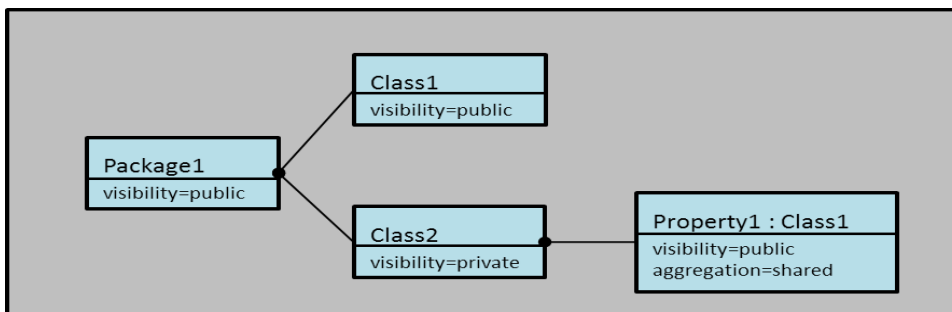


Figure 2.21: Adding Elements to a SyncView with Different Types of Fields

- *Define Package1*

The steps defining `Package1` are shown in **Figure 2.22**. The names of the columns corresponding to the record key fields are shown in green. Type `Package1` in the `Package Name` column (a). The record is unbound. Press Enter. MapleMBSE verifies that the record defines a unique element. The record's status is changed to bound. MapleMBSE creates

a new package in the model with the name Package1. By default, new elements in UML have visibility assigned to public. Since the record is now bound, the value of the Package Visibility field is populated automatically (b).

a.

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|--------------|--------------------|------------|------------------|---------------|---------------------|------------------|---------------|---------------|-----------------|---|
| 1 | | | | | | | | | | | | |
| 2 | | Package Name | Package Visibility | Class Name | Class Visibility | Property Name | Property Visibility | Aggregation Type | Property Type | Property Type | Type Visibility | |
| 3 | | Package1 | | | | | | | | | | |
| 4 | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |

↓

b.

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|--------------|--------------------|------------|------------------|---------------|---------------------|------------------|---------------|---------------|-----------------|---|
| 1 | | | | | | | | | | | | |
| 2 | | Package Name | Package Visibility | Class Name | Class Visibility | Property Name | Property Visibility | Aggregation Type | Property Type | Property Type | Type Visibility | |
| 3 | | Package1 | public | | | | | | | | | |
| 4 | | Package1 | | | | | | | | | | |
| 5 | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |

Figure 2.22: Defining Package1

- *Define Class1*

The steps defining Class1 in Package1 are shown in **Figure 2.23**. To define Class1, you only need to fill out the key fields: Package Name and Class Name (a). When you enter Package1 in the Package Name column, MapleMBSE checks that an element with this name already exists, so the status of the record remains unbound. The Package Visibility remains unpopulated. Enter Class1 in the Class Name column and press Enter.

MapleMBSE verifies that the record now represents a unique element and binds the record to the model. It creates a new class inside Package1 called Class1. The visibility is set to public by default. The nonkey fields for Package and Class Visibility are populated (b).

a.

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|--------------|--------------------|------------|------------------|---------------|---------------------|------------------|---------------|---------------|-----------------|---|
| 1 | | | | | | | | | | | | |
| 2 | | Package Name | Package Visibility | Class Name | Class Visibility | Property Name | Property Visibility | Aggregation Type | Property Type | Property Type | Type Visibility | |
| 3 | | Package1 | public | | | | | | | | | |
| 4 | | Package1 | | Class1 | | | | | | | | |
| 5 | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |

↓

b.

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|--------------|--------------------|------------|------------------|---------------|---------------------|------------------|---------------|---------------|-----------------|---|
| 1 | | | | | | | | | | | | |
| 2 | | Package Name | Package Visibility | Class Name | Class Visibility | Property Name | Property Visibility | Aggregation Type | Property Type | Property Type | Type Visibility | |
| 3 | | Package1 | public | | | | | | | | | |
| 4 | | Package1 | public | Class1 | public | | | | | | | |
| 5 | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |

Figure 2.23: Defining Class1

- *Define Class2*

The first steps defining Class2 in Package1 are the same as defining Class1 (a and b in **Figure 2.24**). The last step is to change the default value for the visibility of Class2 to private (c).

a.

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|--------------|--------------------|------------|------------------|---------------|---------------------|------------------|-----------------------|---------------|------|------------|
| 1 | | | | | | | | | | | | |
| 2 | | Package Name | Package Visibility | Class Name | Class Visibility | Property Name | Property Visibility | Aggregation Type | Property Type Package | Property Type | Type | Visibility |
| 3 | | Package1 | public | | | | | | | | | |
| 4 | | Package1 | public | Class1 | public | | | | | | | |
| 5 | | Package1 | public | Class2 | | | | | | | | |
| 6 | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |

↓

b.

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|--------------|--------------------|------------|------------------|---------------|---------------------|------------------|-----------------------|---------------|------|------------|
| 1 | | | | | | | | | | | | |
| 2 | | Package Name | Package Visibility | Class Name | Class Visibility | Property Name | Property Visibility | Aggregation Type | Property Type Package | Property Type | Type | Visibility |
| 3 | | Package1 | public | | | | | | | | | |
| 4 | | Package1 | public | Class1 | public | | | | | | | |
| 5 | | Package1 | public | Class2 | public | | | | | | | |
| 6 | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |

↓

c.

| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|--------------|--------------------|------------|------------------|---------------|---------------------|------------------|-----------------------|---------------|------|------------|
| 1 | | | | | | | | | | | | |
| 2 | | Package Name | Package Visibility | Class Name | Class Visibility | Property Name | Property Visibility | Aggregation Type | Property Type Package | Property Type | Type | Visibility |
| 3 | | Package1 | public | | | | | | | | | |
| 4 | | Package1 | public | Class1 | public | | | | | | | |
| 5 | | Package1 | public | Class2 | private | | | | | | | |
| 6 | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | |

Figure 2.24: Defining Class2

- *Define Property1*

The steps defining Property1 in Class2 are shown in **Figure 2.25** and **Figure 2.26**. First, only key fields need to be entered. When you enter the package and the class name the record remains unbound because a package and a class with those names already exist. Nonkey fields remain unpopulated. Type Property1 in the Property Name column (a) and press Enter. Now the record represents a new unique element, so MapleMBSE binds it to the model and creates a new element. The nonkey fields are populated (b). The values for the visibilities of the existing elements (Package1 and Class2) are taken from the values defined for these elements (public and private, respectively). Property1 is assigned the default visibility--public. The Property Type Package and the Property Type columns do not have default values. They are defined (in the corresponding configuration file) as references to existing classes.

a.

| Package Name | Package Visibility | Class Name | Class Visibility | Property Name | Property Visibility | Aggregation Type | Property Type Package | Property Type Type | Type Visibility |
|--------------|--------------------|------------|------------------|---------------|---------------------|------------------|-----------------------|--------------------|-----------------|
| Package1 | public | | | | | | | | |
| Package1 | public | Class1 | public | | | | | | |
| Package1 | public | Class2 | private | | | | | | |
| Package1 | | Class2 | | Property1 | | | | | |

b.

| Package Name | Package Visibility | Class Name | Class Visibility | Property Name | Property Visibility | Aggregation Type | Property Type Package | Property Type Type | Type Visibility |
|--------------|--------------------|------------|------------------|---------------|---------------------|------------------|-----------------------|--------------------|-----------------|
| Package1 | public | | | | | | | | |
| Package1 | public | Class1 | public | | | | | | |
| Package1 | public | Class2 | private | | | | | | |
| Package1 | public | Class2 | private | Property1 | public | none | | | |

c.

| Package Name | Package Visibility | Class Name | Class Visibility | Property Name | Property Visibility | Aggregation Type | Property Type Package | Property Type Type | Type Visibility |
|--------------|--------------------|------------|------------------|---------------|---------------------|------------------|-----------------------|--------------------|-----------------|
| Package1 | public | | | | | | | | |
| Package1 | public | Class1 | public | | | | | | |
| Package1 | public | Class2 | private | | | | | | |
| Package1 | public | Class2 | private | Property1 | public | none | | | |

Figure 2.25: Creating New Bound Records

To define the type, you need to specify the full name of the class that property instantiates. The full name includes the name of the package the class belongs to and the name of the class itself (d). Note that just specifying the package name does not resolve the class reference, and so the warnings appear. Only after entering the name of the class and pressing Enter the reference is resolved and the warnings are cleared (e).

Note: The reference target must exist in the model already. This line cannot be used to create the referenced element.

Finally, change the Aggregation Type from its default value (none) to shared (f).

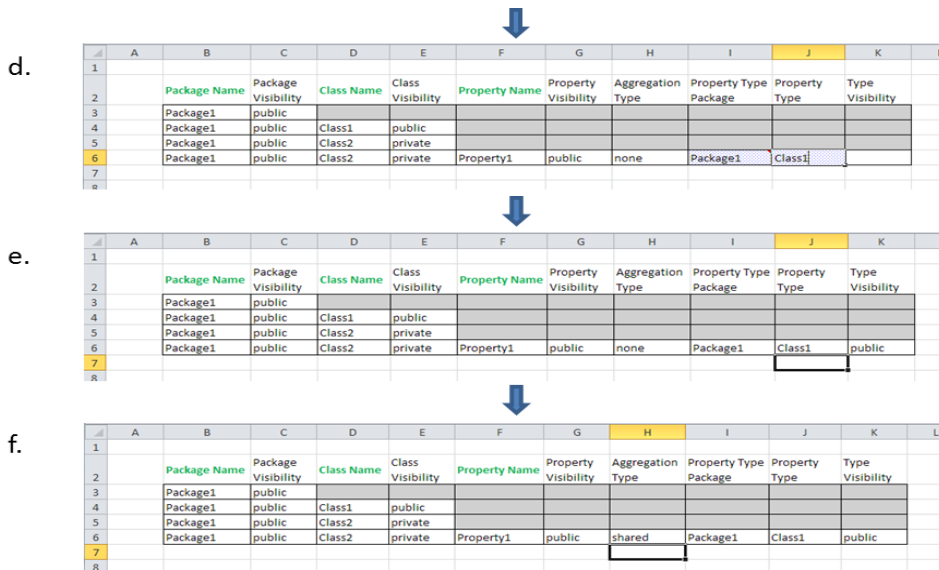


Figure 2.26: Defining the Type

Modifying Attribute Fields in Unbound Records

For definitions of bound and unbound records see *Record State (page 62)*.

- *Modifying key attribute field*
When a new record is defined before it is bound to a model, entering and modifying values in the key fields specifies the new model element the record represents. This is what we have been doing in the examples of adding elements.
- *Modifying nonkey attribute fields*
If any values are entered into the nonkey fields when the record is unbound, the result depends on whether the field represents an existing element or the new element that the record defines.
 - *For existing elements*
The entered value will be ignored and overwritten with the existing value of the element. In the example in **Figure 2.27**, when adding Class1 inside Package1, Package1 already exists and has public visibility. During the definition of the Class1 the visibility of Package1 is set to private while the record is unbound (a). When the input of the class name is finished and Enter is pressed, the record becomes bound, and the visibility of Package1 is set to the value defined in the model--public.

a.

| | A | B | C | D | E | F |
|---|---|--------------|--------------------|------------|------------------|---|
| 1 | | | | | | |
| 2 | | Package Name | Package Visibility | Class Name | Class Visibility | |
| 3 | | Package1 | public | | | |
| 4 | | Package1 | private | Class1 | | |
| 5 | | | | | | |
| 6 | | | | | | |

↓

b.

| | A | B | C | D | E | F |
|---|---|--------------|--------------------|------------|------------------|---|
| 1 | | | | | | |
| 2 | | Package Name | Package Visibility | Class Name | Class Visibility | |
| 3 | | Package1 | public | | | |
| 4 | | Package1 | public | Class1 | public | |
| 5 | | | | | | |
| 6 | | | | | | |

Figure 2.27: Modifying Existing Elements in Unbound Records Results in the Manually Entered Values Being Overwritten

- *For new elements*

The entered value will be assigned to the corresponding property of the new element when the element is created. In the example in **Figure 2.28**, when adding Class1, the visibility for it is entered before all key fields define the element uniquely and the record is unbound (a). The key field for the name of the class is field (b) and entered. The record becomes bound to the model. The visibility of Package1 is determined from the definition of Package1. A new class, Class1 is created in Package1 and its visibility is set to private.

a.

| | A | B | C | D | E | F |
|---|---|--------------|--------------------|------------|------------------|---|
| 1 | | | | | | |
| 2 | | Package Name | Package Visibility | Class Name | Class Visibility | |
| 3 | | Package1 | public | | | |
| 4 | | Package1 | | | private | |
| 5 | | | | | | |
| 6 | | | | | | |

↓

b.

| | A | B | C | D | E | F |
|---|---|--------------|--------------------|------------|------------------|---|
| 1 | | | | | | |
| 2 | | Package Name | Package Visibility | Class Name | Class Visibility | |
| 3 | | Package1 | public | | | |
| 4 | | Package1 | | Class1 | private | |
| 5 | | | | | | |
| 6 | | | | | | |

↓

c.

| | A | B | C | D | E | F |
|---|---|--------------|--------------------|------------|------------------|---|
| 1 | | | | | | |
| 2 | | Package Name | Package Visibility | Class Name | Class Visibility | |
| 3 | | Package1 | public | | | |
| 4 | | Package1 | public | Class1 | private | |
| 5 | | | | | | |
| 6 | | | | | | |

Figure 2.28: Adding New Elements to a Model

Modifying Reference Fields in Unbound Records

For definitions of bound and unbound records see *Record State* (page 62).

- *Modifying reference key field*
When a new record is being added, the reference key fields must be set to an existing element. The reference fields cannot be used to create a new element. If there are multiple keys that define the reference target it is necessary to define all of them and all of them should be pointing to elements that already exist in the model. See step *Define Property1* in *Example of Using Different Fields When Adding Elements* (page 62),
- *Modifying reference nonkey field*
If the values are entered into nonkey reference fields in an unbound record the result depends on whether the reference keys were defined.
- *Reference keys were not defined*
When no key reference fields are defined, the values entered in the nonkey reference fields of an unbound record (a, outlined in purple) are ignored and cleared when the record becomes bound (b).

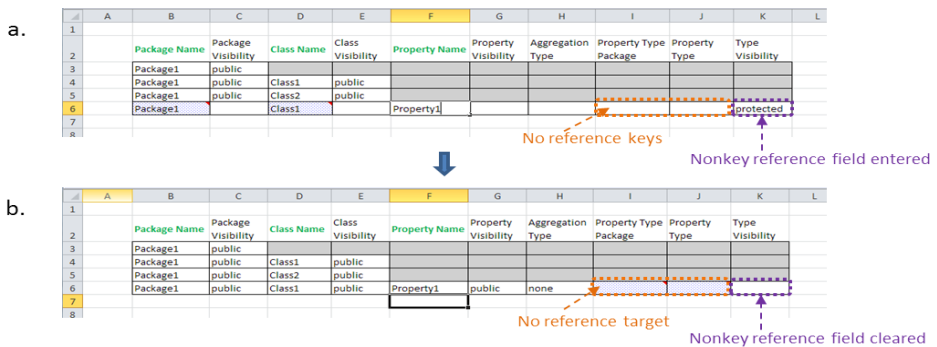


Figure 2.29: Values Entered in Nonkey Reference Fields and No Key Reference Fields Defined

- *Reference keys were defined*

When reference keys are defined and refer to an existing record (a, outlined in orange), the values entered into the nonkey reference fields of an unbound record (outlined in purple in a.) are applied to the element that is being referenced when the record becomes bound. Other fields and SyncViews bound to the same property are also updated (b).

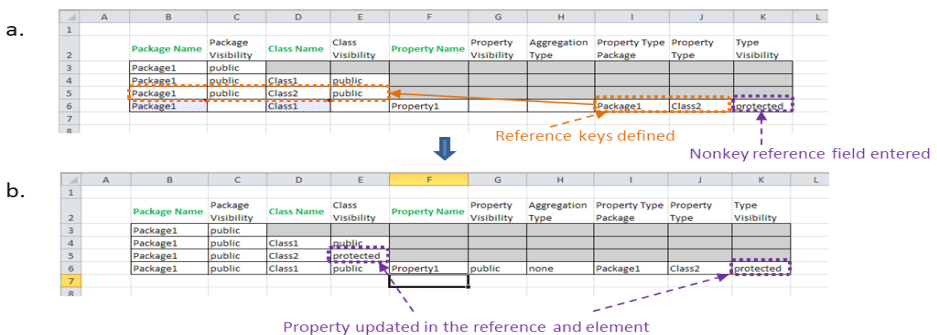


Figure 2.30: Values Entered in Nonkey Reference Fields with Key Reference Fields Defined

Modifying Attribute Fields in Bound Records

For definitions of bound and unbound records see *Record State* (page 62).

A bound record is linked to an element in the model. Changing the value of an attribute field in a bound record modifies the corresponding property of the element. If there are other fields in other records or other SyncViews that show the same attribute of that element they will also be updated.

- *Modifying key attribute field*

When a key attribute is changed, MapleMBSE first performs checks to identify if the new combination of the key fields for the record is unique. If it is, the new value is assigned to the property in the model and in the SyncViews.

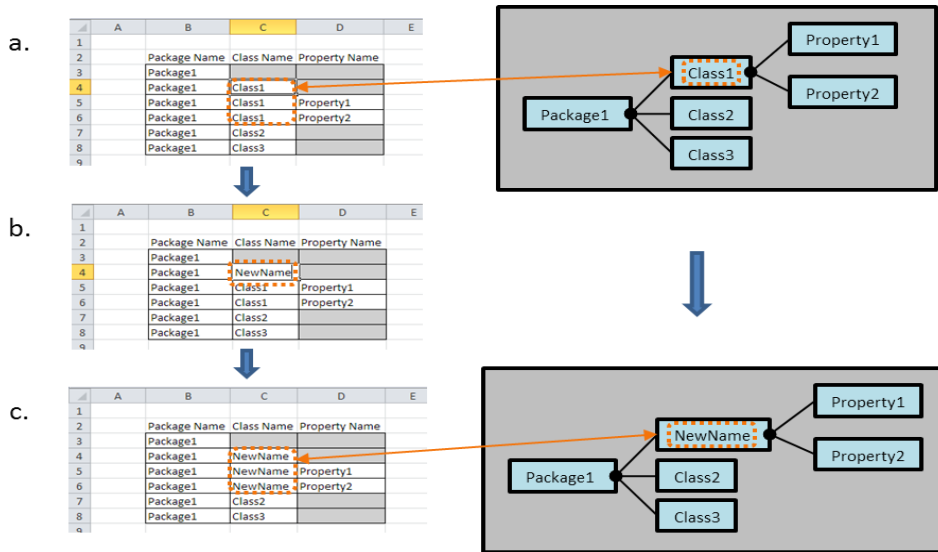


Figure 2.31: Modifying a Key Attribute Field

Note: MapleMBSE can check only that the combination of the keys for the record in which change is performed is unique. For example, if in the example above we changed Class1 to Class2 in the record defining Property1, row 5 (b), the record's key fields would be Package1-Class2-Property1. There is no element with such keys so the change would be applied. The change would then propagate to the model and Class1 would be renamed Class2 where Class2 already exists. MapleMBSE cannot detect this conflict. When the model is saved and opened in the corresponding tool, the tool will perform validation and detect the conflict. For this reason, it is recommended that if the key attribute needs to be changed it should be done in the record where the key is the final key field, like in the example above.

- *Modifying nonkey attribute field*

When a nonkey attribute is changed, the change is applied to the model and is reflected in any fields and SyncViews bound to the changed property of the changed element. The modification can be done in the record that defines the element, like in the example below, or in other fields linked to this property. For example, the same change for Package1 as in the example below could be done in any of the cells outlined in orange in column C (a and c).

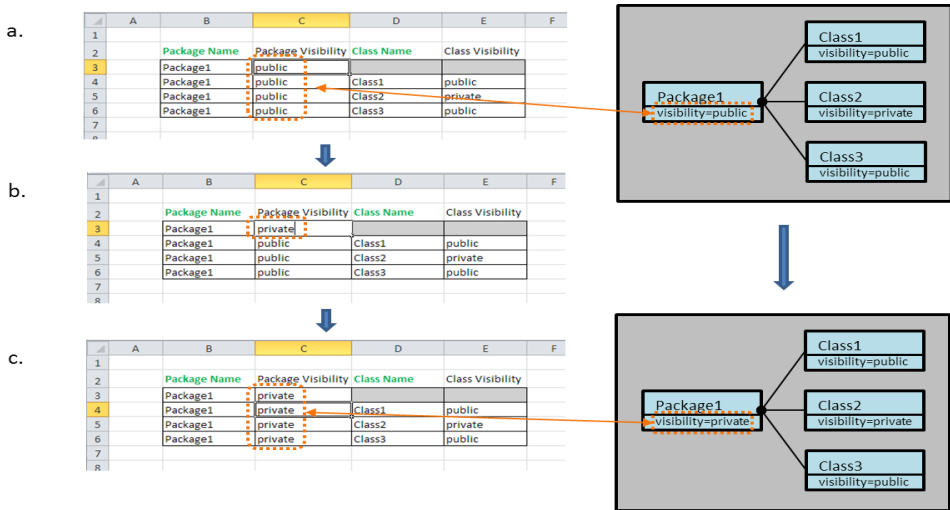


Figure 2.32: Modifying a Nonkey Attribute Field

- *Deleting value of key attribute*

It is an error to delete the value of a key field attribute. Changes are not reflected in the model.

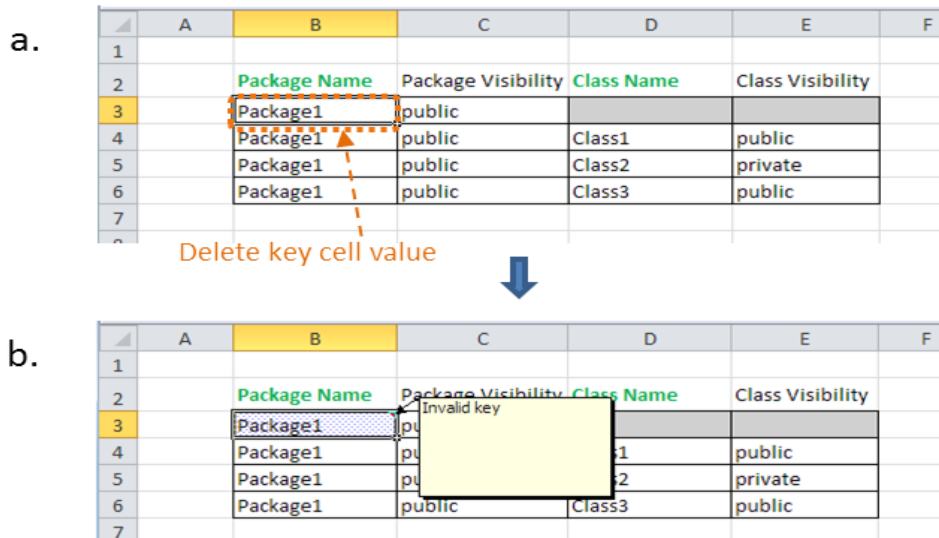


Figure 2.33: Deleting the Value of a Key Field Attribute

- *Deleting value of nonkey attribute*

If you delete the value of a nonkey attribute cell the value will be cleared. However, depending on the model, the value may be reset to a default value.

a.

| | A | B | C | D | E | F |
|---|---|--------------|--------------------|------------|------------------|---|
| 1 | | | | | | |
| 2 | | Package Name | Package Visibility | Class Name | Class Visibility | |
| 3 | | Package1 | public | | | |
| 4 | | Package1 | public | Class1 | public | |
| 5 | | Package1 | public | Class2 | private | |
| 6 | | Package1 | public | Class3 | public | |
| 7 | | | | | | |

Delete cell value

↓

b.

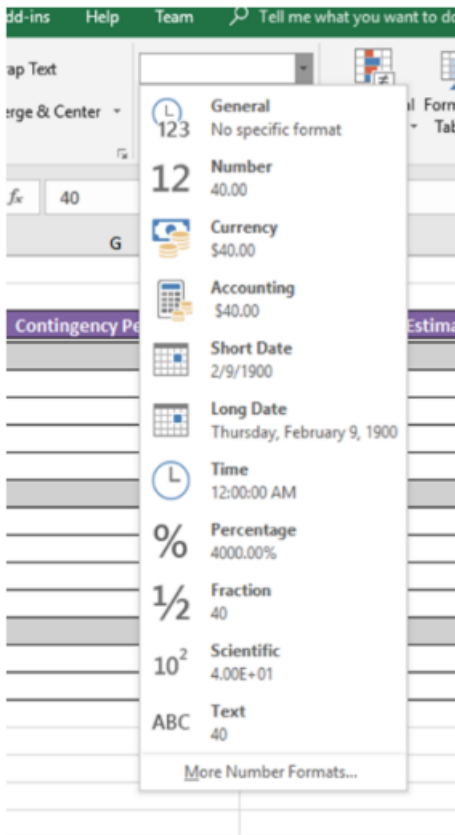
| | A | B | C | D | E | F |
|---|---|--------------|--------------------|------------|------------------|---|
| 1 | | | | | | |
| 2 | | Package Name | Package Visibility | Class Name | Class Visibility | |
| 3 | | Package1 | public | | | |
| 4 | | Package1 | public | Class1 | public | |
| 5 | | Package1 | public | Class2 | public | |
| 6 | | Package1 | public | Class3 | public | |
| 7 | | | | | | |

Value reset to default

Figure 2.34: Deleting the Value of a Nonkey Field Attribute

Data type conversion

Excel cell values and model element values each have associated data types. By default, Excel uses the General number format for worksheet cell values. The number format of a cell can be configured manually through the Format Cells menu. However, depending on the input value, there are cases where Excel will convert cell values to another format (for example, a date).



To avoid a mismatch of number types, MapleMBSE provides implicit data type conversion of cell values to match the values of the target model element.

- String conversion
 - When the target model element type is string, cell values are converted to string.
- Enum conversion
 - When the target model element type is enum, string or integer is converted to enum. If it fails, "Invalid Value" error is annotated to the cell.
- EDataType conversion
 - When the target model element is of other EDataType and the cell value is text, try to convert it to the target EDataType. If it fails, "Invalid Value" error is annotated to the cell.
- Number conversion

- When the target model element is number and the cell value is also number, the cell value is automatically cast to fit with the target model element type. For example, if the model element is of type integer and the cell value is of type double, the cell value is truncated to an integer and set to the value of the model element.

Notes:

- Currently MapleMBSE supports Number, Text, and Date types
- You can put an apostrophe(') to quote a cell value to specify it is a text instead of setting cell format.
- While MapleMBSE does try to convert data types, there can be no guarantee that in all cases MapleMBSE will succeed. The best way to ensure the number type consistency is by manually formatting your Excel template.
- Some MapleMBSE configurations allow you to instantiate arrays of elements within a single cell. Each element must be separated with the delimiter specified by the mse configuration. See the following example.

In the example below (**Figure 2.35**) the column, **opaque expression body** (column D) accepts an array of type, String. To input this kind of data you must know: which cells accept this kind of input, the delimiter used (by default ; semi-colon) and the escape (by default \ back-slash).

To input the array:

```
["a", "b", "c", ";", "\"]
```

First, you need to prepend the escape string to any of the delimiter or escape symbols within your array of string:

```
["a", "b", "c", "\\;", "\\\""]
```

Next, you concatenate the string separated with the delimiter:

```
"a;b;c;\;\""
```

Now, do the same exercise backwards. To understand how to interpret a string as an array of string, use the example provided in cell D6:

```
"formula2\;1;formula2\;2"
```

First, you need to split the string into several strings using the delimiter that are not escaped, in other words those that are not preprend by an odd number of escapes. Notice that `"2\;1"` is not a valid delimiter because it is escaped.

```
["formula2\;1"; "formula2\;2"]
```

Next, remove the escape string within each string in the array. Sometimes this can be tricky to do because `"\\"` should give us `" \"` meaning that the user intended to use the escape string and it is escaping the escape that was needed.

```
["formula2;1"; "formula2;2"].
```

The screenshot displays the MapleMBSE interface. On the left, a tree view shows a model structure with 'constraintBlock1' containing 'rule1' and 'rule2'. A large black arrow points from the tree view towards the table below. Two windows titled 'Specification of Opaque Expression properties' are open, showing configuration for 'opaqueExpression1' and 'opaqueExpression2'. The 'opaqueExpression1' window shows 'Body' as 'formula1; formula2; formula3'. The 'opaqueExpression2' window shows 'Body' as 'formula2;1; formula2;2'. Below these windows is a table summarizing the configuration.

| | A | B | C | D | E |
|---|------------------|------------|------------------------|------------------------------|---|
| 1 | Name of c. block | Owned rule | Opaque expression name | Opaque expression body | |
| 2 | constraintBlock1 | | | | |
| 3 | constraintBlock1 | rule1 | | | |
| 4 | constraintBlock1 | rule1 | opaqueExpression1 | formula1; formula2; formula3 | |
| 5 | constraintBlock1 | rule2 | | | |
| 6 | constraintBlock1 | rule2 | opaqueExpression2 | formula2;1; formula2;2 | |
| 7 | | | | | |

Figure 2.35: Example of a MapleMBSE Configuration that Accepts Arrays of Elements in a Single Cell

Note: There are some virtual features that can have similar effects. Contact the author of the .mse file for your model for further details.

Modifying Reference Fields in Bound Records

For definitions of bound and unbound records see *Record State* (page 62).

- *Modifying reference key field*

If you change the value of a reference key field to a value that represents another element already existing in the model, the element being referenced is changed. An attempt to change to a key value that does not exist in the model will result in an error.



Figure 2.36: Changing Value of Reference Key Field, Property Type

• *Modifying reference nonkey field*

If you change the value of a nonkey reference field the corresponding field in the referenced element is updated. If there is another field in the SyncView that is bound to this property it will also be updated.

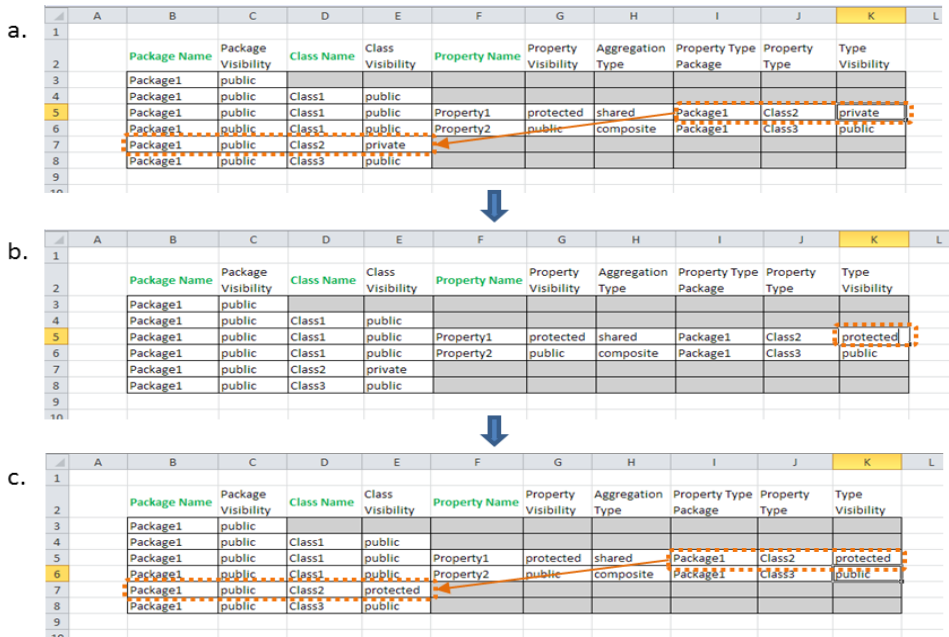


Figure 2.37: Changing Value of Reference Nonkey Field, Type Visibility

- *Deleting value of reference key field*
 Deleting the value of a reference key field is an error.

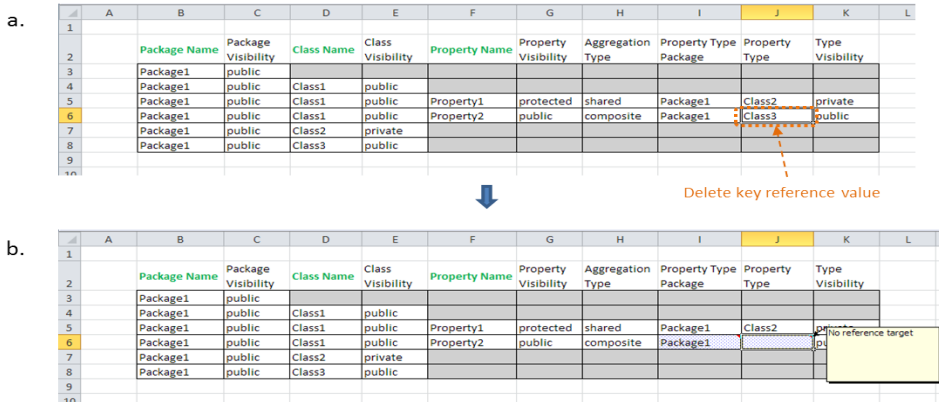


Figure 2.38: Deleting Value of a Reference Key Field

- *Deleting value of reference nonkey field*
 If you delete the value of a nonkey reference field the value is cleared. The changes are reflected in the referenced element. However, depending on the model, the value may be reset to a default value.

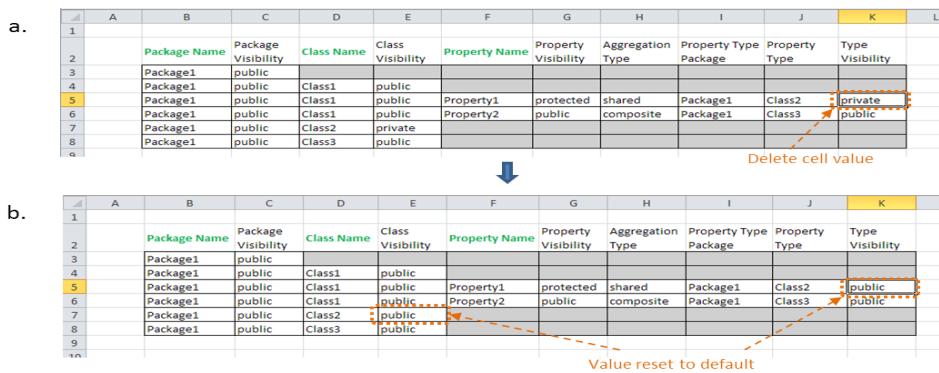


Figure 2.39: Deleting Value of a Reference Key Field

Unmapped Fields

An unmapped field is a field in a record that is not mapped to any property of the element. As such, values entered in unmapped fields have no influence on the model. However, unmapped fields may be useful for comments or performing Excel operations related to other fields. Formulas for unmapped fields can be entered in the template file (see *MapleMBSE Components (page 1)*) to be available whenever a model is opened. The following example is taken from the `UserGuide.MSE` configuration file and the `UnmappedFields` spreadsheet that is used with the `AddingNewElements.uml` model. These files can be found in the `<MapleMBSE>/Example/UserGuide` directory, where `<MapleMBSE>` is your MapleMBSE installation directory.

In **Figure 2.40**, columns B, D, G, and I are unmapped fields. They contain formulas that get updated as you fill out the application. For example, the formula for cell B3 is displayed in the Figure below in the Formula Bar.

| | A | B | C | D | E | F | G | H | I | J |
|---|---|---------------------|--------------|-----------------------------------|------------|---------------------|-------------------|-------------------|----------------------------|---|
| 1 | | Step 1 (unmapped) | Package Name | Step 2 (unmapped) | Class Name | Nested Package Name | Step 3 (unmapped) | Nested Class Name | What is defined (unmapped) | |
| 2 | | | | | | | | | | |
| 3 | | Define Package In C | | Define Class in E or Package in F | | | Define Class in H | | Nothing | |
| 4 | | | | | | | | | | |
| 5 | | | | | | | | | | |
| 6 | | | | | | | | | | |
| 7 | | | | | | | | | | |
| 8 | | | | | | | | | | |

Figure 2.40: Unmapped Fields

As you complete Step 1, filling the package name in column C, the fields get updated.

| | A | B | C | D | E | F | G | H | I | J |
|---|---|-------------------|--------------|-------------------|------------|---------------------|-------------------|-------------------|----------------------------|---|
| 1 | | Step 1 (unmapped) | Package Name | Step 2 (unmapped) | Class Name | Nested Package Name | Step 3 (unmapped) | Nested Class Name | What is defined (unmapped) | |
| 2 | | | | | | | | | | |
| 3 | | Done | Package1 | Done | | | Done | | Package | |
| 4 | | | | | | | | | | |
| 5 | | | | | | | | | | |
| 6 | | | | | | | | | | |
| 7 | | | | | | | | | | |
| 8 | | | | | | | | | | |

Figure 2.41: Entering a Value for Package Name Results in Updated Mapped Fields

The formulas do not get applied to new rows in a SyncView automatically. You can do so manually by clicking on the bottom right corner of the cell with the formula and dragging in down to expand to the number of desired rows.

| | A | B | C | D | E | F | G | H | I | J |
|---|---|---------------------|--------------|-------------------|------------|---------------------|-------------------|-------------------|----------------------------|---|
| 1 | | Step 1 (unmapped) | Package Name | Step 2 (unmapped) | Class Name | Nested Package Name | Step 3 (unmapped) | Nested Class Name | What is defined (unmapped) | |
| 2 | | | | | | | | | | |
| 3 | | Done | Package1 | Done | | | Done | | Package | |
| 4 | | Define Package in C | | | | | | | | |
| 5 | | Define Package in C | | | | | | | | |
| 6 | | Define Package in C | | | | | | | | |
| 7 | | | | | | | | | | |
| 8 | | | | | | | | | | |

Figure 2.42: Formulas Must be Updated Manually

The SyncView area is extended to include those rows. The warnings in the cells in column C indicate that the key field needs to be filled. You can extend the other formulas over the SyncView area as well. The formulas get updated with respect to the rows. For example, the formula for B4 is updated with respect to C4.

B4 fx =IF(ISBLANK(C4),"Define Package in C","Done")

| | A | B | C | D | E | F | G | H | I | J |
|---|---|---------------------|--------------|-----------------------------------|------------|---------------------|-------------------|-------------------|----------------------------|---|
| 1 | | Step 1 (unmapped) | Package Name | Step 2 (unmapped) | Class Name | Nested Package Name | Step 3 (unmapped) | Nested Class Name | What is defined (unmapped) | |
| 2 | | | | | | | | | | |
| 3 | | Done | Package1 | Done | | | Done | | Package | |
| 4 | | Define Package in C | | Define Class in E or Package in F | | | Define Class in H | | Nothing | |
| 5 | | Define Package in C | | Define Class in E or Package in F | | | Define Class in H | | Nothing | |
| 6 | | Define Package in C | | Define Class in E or Package in F | | | Define Class in H | | Nothing | |
| 7 | | | | | | | | | | |
| 8 | | | | | | | | | | |

Figure 2.43: With the SyncView Extended, Key Fields Need to be Filled

Now you can follow Steps specified in in columns B, D, and G to define desired elements.

Tip: This example follows the steps of the example in *Alternative Groups* (page 50).

Define Class1 in Package1.

a.

| | A | B | C | D | E | F | G | H | I | J |
|---|---|---------------------|--------------|-----------------------------------|------------|---------------------|-------------------|-------------------|----------------------------|---|
| 1 | | Step 1 (unmapped) | Package Name | Step 2 (unmapped) | Class Name | Nested Package Name | Step 3 (unmapped) | Nested Class Name | What is defined (unmapped) | |
| 2 | | | | | | | | | | |
| 3 | | Done | Package1 | Done | | | Done | | Package | |
| 4 | | Done | Package1 | Define Class in E or Package in F | Class1 | | Define Class in H | | Package | |
| 5 | | Define Package in C | | Define Class in E or Package in F | | | Define Class in H | | Nothing | |
| 6 | | Define Package in C | | Define Class in E or Package in F | | | Define Class in H | | Nothing | |
| 7 | | | | | | | | | | |
| 8 | | | | | | | | | | |

↓

b.

| | A | B | C | D | E | F | G | H | I | J |
|---|---|---------------------|--------------|-----------------------------------|------------|---------------------|-------------------|-------------------|----------------------------|---|
| 1 | | Step 1 (unmapped) | Package Name | Step 2 (unmapped) | Class Name | Nested Package Name | Step 3 (unmapped) | Nested Class Name | What is defined (unmapped) | |
| 2 | | | | | | | | | | |
| 3 | | Done | Package1 | Done | | | Done | | Package | |
| 4 | | Done | Package1 | | Class1 | | Done | | Class | |
| 5 | | Define Package in C | | Define Class in E or Package in F | | | Define Class in H | | Nothing | |
| 6 | | Define Package in C | | Define Class in E or Package in F | | | Define Class in H | | Nothing | |
| 7 | | | | | | | | | | |
| 8 | | | | | | | | | | |

Figure 2.44: Defining Class1 Inside of Package1

Define Package2 in Package1.

a.

| | A | B | C | D | E | F | G | H | I | J |
|---|---|---------------------|--------------|-----------------------------------|------------|---------------------|-------------------|-------------------|----------------------------|---|
| 1 | | Step 1 (unmapped) | Package Name | Step 2 (unmapped) | Class Name | Nested Package Name | Step 3 (unmapped) | Nested Class Name | What is defined (unmapped) | |
| 2 | | | | | | | | | | |
| 3 | | Done | Package1 | Done | | | Done | | Package | |
| 4 | | Done | Package1 | Done | Class1 | | Done | | Class | |
| 5 | | Done | Package1 | Done | | Package2 | Done | | Package | |
| 6 | | Define Package in C | | Define Class in E or Package in F | | | Define Class in H | | Package | |
| 7 | | | | Define Class in E or Package in F | | | Define Class in H | | Nothing | |
| 8 | | | | | | | | | | |

↓

b.

| | A | B | C | D | E | F | G | H | I | J |
|---|---|---------------------|--------------|-----------------------------------|------------|---------------------|-------------------|-------------------|----------------------------|---|
| 1 | | Step 1 (unmapped) | Package Name | Step 2 (unmapped) | Class Name | Nested Package Name | Step 3 (unmapped) | Nested Class Name | What is defined (unmapped) | |
| 2 | | | | | | | | | | |
| 3 | | Done | Package1 | Done | | | Done | | Package | |
| 4 | | Done | Package1 | Done | Class1 | | Done | | Class | |
| 5 | | Done | Package1 | Done | | Package2 | Done | | Nested Package | |
| 6 | | Define Package in C | | Define Class in E or Package in F | | | Define Class in H | | Nothing | |
| 7 | | | | | | | | | | |
| 8 | | | | | | | | | | |

Figure 2.45: Defining Package2 Inside of Package1

Define Class2 in Package2.

a.

| | A | B | C | D | E | F | G | H | I | J |
|---|---|-------------------|--------------|-------------------|------------|---------------------|-------------------|-------------------|----------------------------|----------------|
| 1 | | Step 1 (unmapped) | Package Name | Step 2 (unmapped) | Class Name | Nested Package Name | Step 3 (unmapped) | Nested Class Name | What is defined (unmapped) | |
| 2 | | | | | | | | | | |
| 3 | | Done | Package1 | Done | | | Done | | Package | |
| 4 | | Done | Package1 | Done | Class1 | | Done | | Class | |
| 5 | | Done | Package1 | Done | | Package2 | Done | | Nested Package | |
| 6 | | Done | Package1 | Done | | Package2 | Done | Define Class in H | Class2 | Nested Package |
| 7 | | | | | | | | | | |
| 8 | | | | | | | | | | |

↓

b.

| | A | B | C | D | E | F | G | H | I | J |
|---|---|-------------------|--------------|-------------------|------------|---------------------|-------------------|-------------------|----------------------------|--------------|
| 1 | | Step 1 (unmapped) | Package Name | Step 2 (unmapped) | Class Name | Nested Package Name | Step 3 (unmapped) | Nested Class Name | What is defined (unmapped) | |
| 2 | | | | | | | | | | |
| 3 | | Done | Package1 | Done | | | Done | | Package | |
| 4 | | Done | Package1 | Done | Class1 | | Done | | Class | |
| 5 | | Done | Package1 | Done | | Package2 | Done | | Nested Package | |
| 6 | | Done | Package1 | Done | | Package2 | Done | | Class2 | Nested Class |
| 7 | | | | | | | | | | |
| 8 | | | | | | | | | | |

Figure 2.46: Defining Class2 Inside of Package2

2.7 Locking Elements in a Worksheet

The locking features available in MapleMBSE provide a means of controlling simultaneous editing of model elements so that one user's changes are not overwritten.

When users edit models, MapleMBSE attempts to lock the specific model element being changed. If successful, the locks are kept by MapleMBSE and the models will be changed. Otherwise, if unsuccessful, MapleMBSE will report errors and the changes will be reverted.

All the locks automatically acquired by MapleMBSE will be released when:

- Users commit their changes;
- Users reload the model; or
- MapleMBSE terminates.

Notes:

- When you attempt to edit a model element that has been locked an error message is displayed that also displays the id of the user who has the locked the model element.
- If MapleMBSE crashes the locks on the elements will remain.
- Locking success is not guaranteed (for example, if you are using an older version of MapleMBSE that does not support element locking).

Acquiring Locks While Editing

If you change something in MapleMBSE, it tries to acquire locks of model elements to be changed.

In the image below, the name of requirement, X02 is changed to "New Requirement-Under-Edit".

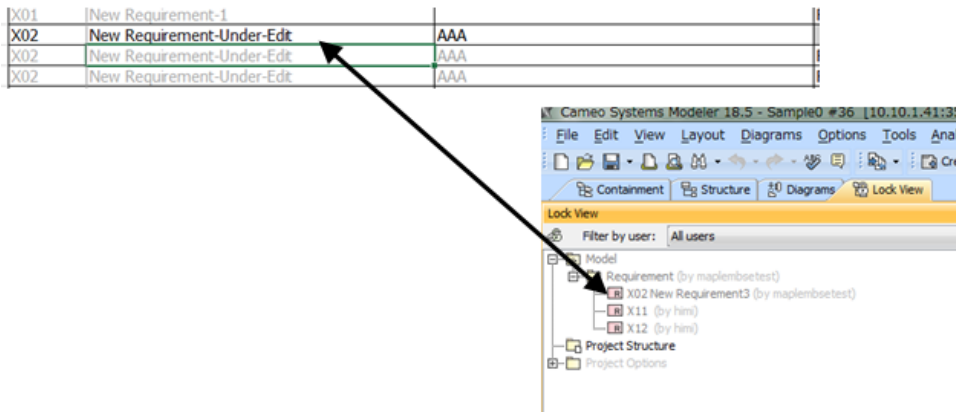


Figure 2.47: MapleMBSE Attempts to Acquire Locks When Element is Being Changed

Failure to Acquire Locks

MapleMBSE shows error message in Excel as "Unable to lock the model elements". MapleMBSE will revert user's changes.

| Requirement 2nd Level | | |
|-----------------------|----------------------|---|
| ID* | Name | Specification |
| 8.1.2 | WaterProof | 5 ft water resistance |
| 8.1.3 | Message Notification | Notify of any incoming message or calls |
| 8.1.4 | Ease of Use | Unable to lock element Locked by: maplembose Settings should be d use. |
| 8.1.5 | Alarm Notification | N Information |
| 8.1.6 | Style | a Colors and compact |

Figure 2.48: Failure to Lock Model Elements Error Message

Committing Changes and Cleaning Up Code

When MapleMBSE commits the changes, terminates, or reloads the models, it automatically releases all of the locks automatically acquired while the user edits the model. Other locks, already acquired by other applications, remain in place.

Note: If MapleMBSE is abnormally terminated (crashes) the locks it has set will remain. Users will have to manually remove these locks through: Cameo Systems Modeler, MagicDraw, or through the Teamwork Cloud Web UI.

Figure 2.49: Manually Releasing Locked Element

Working with Other Dependencies

If there are additional dependencies or requirements, then they are locked.

2.8 Other Editing Operations in Excel

CutCopy Mode

The CutCopy mode in Excel is a mode in which the area selected for cutting/copying is surrounded by a dotted line as shown in the Figure below. Normally in Excel, the CutCopy mode is maintained after pasting is performed. In MapleMBSE the CutCopy mode is cancelled after pasting and processing is done.

| | A | B | C | D | E | F |
|---|---|--------------|------------|---------------------|-------------------|---|
| 1 | | | | | | |
| 2 | | Package Name | Class Name | Nested Package Name | Nested Class Name | |
| 3 | | Package1 | | | | |
| 4 | | Package1 | Class1 | | | |
| 5 | | Package1 | | Package2 | | |
| 6 | | Package1 | | Package2 | Class2 | |
| 7 | | | | | | |

Figure 2.50: CutCopy Mode

Cell Formatting

- Only the value of the cell is saved in the model. The style and formatting of the cell is not saved and is not reflected in the model.

Undo/Redo

Use CTRL+Shift+Z to undo the previous action. For example, deleting a list of Actors from a table, would be one action. Pressing CTRL+Shift+Z will undo this one action.

Use CTRL+Shift+Y to reapply (redo) the changes undone by the undo feature.

Notes:

- If the action has an error, if the user performs an undo, the row in the table containing the error will not be removed, however the previously completed action will be undone.

2.9 File Attachments in the SyncView Area of a Worksheet

File attachments in the table cells of a SyncView area are displayed as hyperlinks.

| Package Name | Files |
|-----------------|--|
| Profile | |
| Enum | |
| File Attachment | |
| File Attachment | Capture.JPG |
| File Attachment | InstanceExport.xlsx |
| File Attachment | MapleMBSEUserGuide.pdf |
| Unit Imports | |
| SysML-Sample | |
| Structure | |

When you click the hyperlink, the file is opened in its native application.



Note: The files displayed in table cells are read-only.

2.10 Opening a Model Diagram

You can use the hyperlinks in the spreadsheet (for example, see the Diagram column in the example spreadsheet below) to open a model diagram that represents the sysML model.

| Diagram | Diagram Type |
|---|--------------------------------|
| Diagram TurboFan Engine | SysML Internal Block Diagram |
| Diagram TurboFan Engine | SysML Block Definition Diagram |
| Diagram TurboFan Operating Domain | SysML Block Definition Diagram |
| Diagram TurboFan Engine | SysML Package Diagram |
| Diagram Turbojet | SysML Block Definition Diagram |
| Diagram Turbojet Cycle Analysis | SysML Parametric Diagram |
| Diagram UAV Blackbox | SysML Block Definition Diagram |
| Diagram UAV Blackbox | SysML State Machine Diagram |
| Diagram UAV System | SysML Use Case Diagram |
| Diagram UseCase | SysML Use Case Diagram |
| Diagram UseCase1 | SysML Use Case Diagram |
| Diagram Values | SysML Block Definition Diagram |
| Diagram ValueTypes | SysML Block Definition Diagram |
| Diagram Variant model | SysML Block Definition Diagram |
| Diagram Weight Estimation | SysML State Machine Diagram |
| Diagram WeightEstimation | SysML Parametric Diagram |
| Diagram WindowsCommandLine | Activity Diagram |
| Diagram WindowsCommandPrompt | Activity Diagram |
| Diagram Wing Area Estimation | SysML Block Definition Diagram |
| Diagram Wing Area Estimation | SysML Activity Diagram |

Notes:

- To view the diagrams, you must have either MagicDraw or Cameo Systems Modeler open.
- If you did not install the MapleMBSE sysML Diagram plugin when you installed MapleMBSE, see the **Getting Started with the MapleMBSE sysML Diagram Plugin** section of the **MapleMBSE Installation and Licensing Guide** for instructions on how to load the plugin, after installation.

Viewing SVG Files

MapleMBSE offers a feature that creates SVG files of various model layouts. For Windows users, the the default program for SVG files may be set to something other than the system's

default browser.

For more information, see

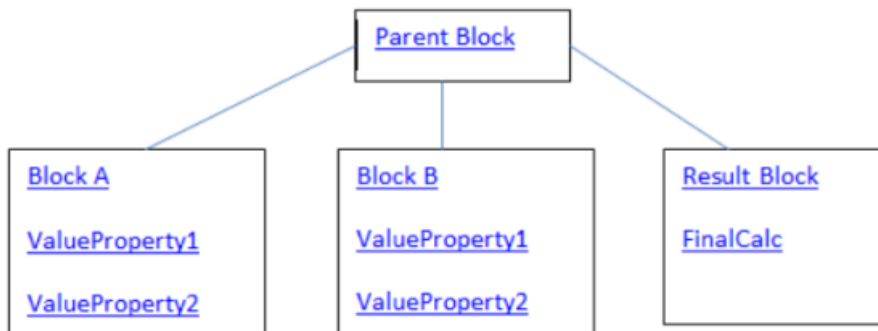
2.11 Formula Evaluation

Formula evaluation is a feature that works in the context of an InstanceMatrix. It is used to evaluate constraint properties defined in SysML-based Parametric Diagrams in an Excel worksheet. The formula evaluation feature allows the user to edit, manipulate and save these values to the worksheet and commit these values to the CATIA No Magic server.

The Instance Matrix

The instance matrix comprised of instance specifications (columns), the blocks and value properties (rows) where they intersect is the data (slot values). The instance is a representation of a block, with values. These values are stored in the slots. Slots are placeholders for values. Slot values are linked to a specific property. Properties become slots in the instance specification.

For example, consider a simple model with the following relationship between the Blocks:



In MapleMBSE, this corresponds to the following two worksheets:

An InstanceTemplate (Instance of Parent Block):

| |
|-----------------------------|
| Instance of Parent Block |
| |
| |

A BlockTemplate:

| | |
|--------|----------------|
| BlockA | ValueProperty1 |
| BlockB | ValueProperty2 |
| BlockA | ValueProperty1 |
| BlockB | ValueProperty2 |

These two worksheets are combined in the InstanceTableTemplate to create a matrix, where the rows of the matrix are Blocks and Value Properties and the columns of the matrix are the instance specifications of the Parent Block. The cells where the rows and columns intersect hold the data and these cells are known as slots.

| Block | ValueProperty | Instance Specification of Parent Block |
|-------------|----------------|--|
| BlockA | ValueProperty1 | Slot Value |
| BlockA | ValueProperty2 | Slot Value |
| BlockB | ValueProperty1 | Slot Value |
| BlockB | ValueProperty2 | Slot Value |
| ResultBlock | FinalCalc | Slot Value |

Parametric Diagrams and Constraint Properties

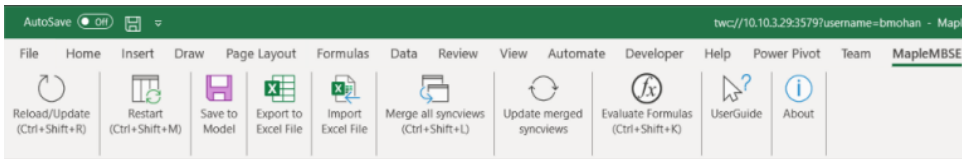
While Block Definition Diagrams describe the hierarchy of a model and inform the user of the value properties that each block in the model owns, it is the Parametric Diagram that describes how formulas are being connected through the use of constraint properties.

It is these constraint properties that the Formula Evaluation feature evaluates and which are displayed as slot values.

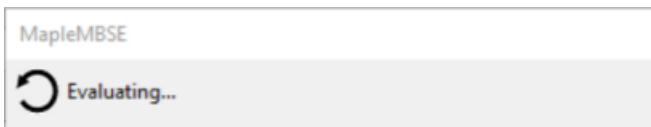
Executing Calculations in the Worksheet

To execute the instance matrix calculations in the worksheet:

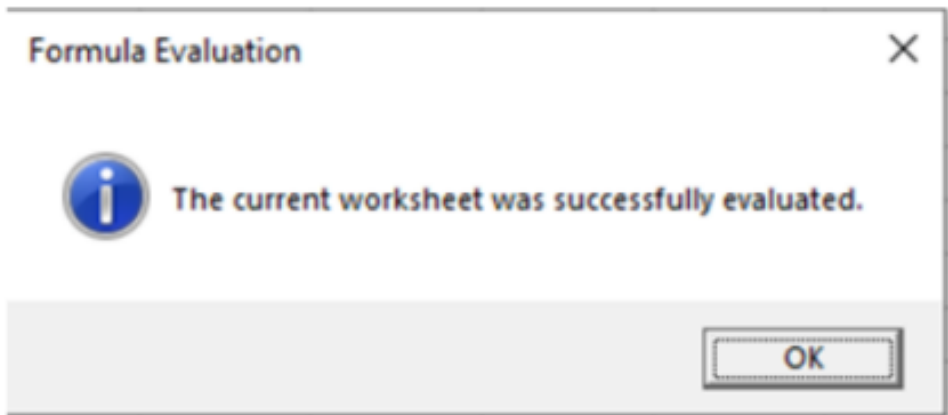
1. Open the worksheet that contains the instance table in the SyncView.
2. Do one of the following:
 - Press CTRL+Shift+K.
 - Click **Evaluate Formulas**, from the MapleMBSE Ribbon menu



A progress bar is displayed as the calculations in the instance table are executed.



The following message will be displayed if the calculations were completed successfully:



Changing the Value of the Inputs in the Instance Matrix:

Drop-down list boxes in the instance table provide the opportunity to change input values in the instance table.

| | | | | | | |
|-------|-------|-------|-------|-----------|-----------|--------|
| | | | | type1 | t1_md | md_ins |
| Type1 | Type2 | Type3 | vp3 | | df3.1 | df3_11 |
| Type1 | Type2 | | Type3 | | | |
| Type1 | Type2 | | vp2 | md_ins.t2 | df2.1 | df2 |
| Type1 | Type2 | | vp4 | | df4 | df4 |
| Type1 | Type2 | | vp4e2 | e2 | | e2 |
| Type1 | Type2 | | vp4e1 | e1 | | e1 |
| Type1 | Type2 | | vp4e3 | | | e3 |
| Type1 | Type3 | | vp3 | df3 | fromDiffp | |

Once you have selected the value you want to use from the list, all other values are automatically updated.

Adding Additional Instance Specifications to the Instance Matrix

Adding additional instance specifications allow you to change slot values, re-run simulations and compare results side-by-side.

To add additional scenarios do the following:

1. In the adjacent cell to the right of the instance Column, start typing a name for the new instance specification.

| Block | ValueProperty | Instance Specification of Parent Block | New Instance Specification |
|-------------|----------------|--|----------------------------|
| BlockA | ValueProperty1 | Slot Value | |
| BlockA | ValueProperty2 | Slot Value | |
| BlockB | ValueProperty1 | Slot Value | |
| BlockB | ValueProperty2 | Slot Value | |
| ResultBlock | FinalCalc | Slot Value | |

2. The rest of the cells in the column will populate automatically.

| Block | ValueProperty | Instance Specification of Parent Block | New Instance Specification |
|--------|----------------|--|----------------------------|
| BlockA | ValueProperty1 | Slot Value | Slot Value |
| BlockA | ValueProperty2 | Slot Value | Slot Value |
| BlockB | ValueProperty1 | Slot Value | Slot Value |
| BlockB | ValueProperty2 | Slot Value | Slot Value |

3. Repeat Step 1 for as many scenarios you want to simulate.

| Block | ValueProperty | Instance Specification of Parent Block | New Instance Specification | Another New Instance Specification |
|--------|----------------|--|----------------------------|------------------------------------|
| BlockA | ValueProperty1 | Slot Value | Slot Value | |
| BlockA | ValueProperty2 | Slot Value | Slot Value | |
| BlockB | ValueProperty1 | Slot Value | Slot Value | |
| BlockB | ValueProperty2 | Slot Value | Slot Value | |

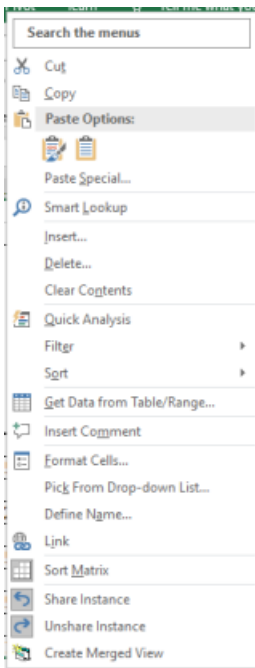
4. Select **Evaluate Formulas**, from the MapleMBSE Ribbon menu, or press CTRL+Shift K to run the simulations.

Sharing Instances

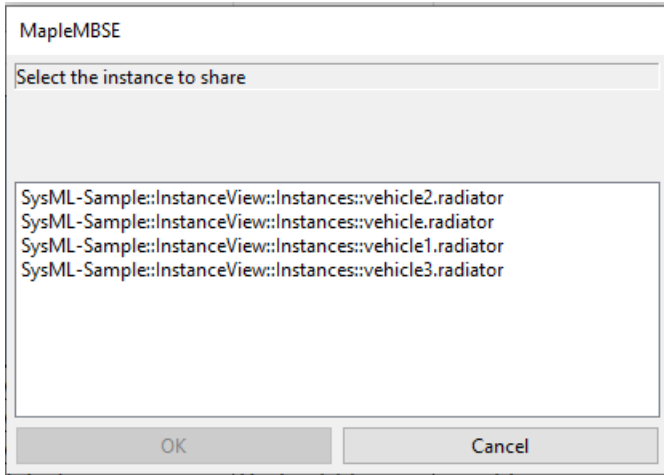
You can choose to share or unshare instances in the Instance Matrix.

To share an instance value:

1. Select the target cell where the instance will be shared.
2. Next, right click on the instance that you want to share.



3. From the context menu, select Share Instance.
4. In the dialog box, click the instance you want to share and click Ok.



Note: Any changes you make to the original instance are automatically made to the shared instances as well.

3 Default Value Generation in a Column

3.1 Introduction

The default value column is used to generate a value for the model element that you want to auto-generate. For example, if you enter the Class and want to auto-generate the Property column. You can generate 4 type of values with the help of default value generation:

- Text
- Sequence number
- Universally unique identifier (UUID)
- Text with Sequence number

3.2 Default Value Generation and Requirements IDs

When you create Requirements for your project they are numbered automatically with unique IDs. The number system for the unique IDs must be setup in your modeling tool. There are special validation rules used to make sure that each of the Requirement IDs in your project are unique.

If you want a different Requirement numbering than the default, you can customize it manually by using the Element Numbering dialog.

MapleMBSE extends default value generation to include Requirement ID generation. This means that MapleMBSE is able to continue with the numbering conventions that you have assigned to your project through your modeling tool. Even for custom numbering.

If you enter the requirement name and want MapleMBSE to create the ID, leave the ID column blank. MapleMBSE will calculate the latest ID available in the model and assign that ID for the requirement.

3.3 Limitations

Default value generation column doesn't work in the following cases:

- In root dimension key column
- In alternative, group, optional key columns

Appendix A Log Files

A.1 Description of Log Files

The table below describes the log files created by MapleMBSE.

In the table, <InstallDir> refers to the installation folder of MapleMBSE and %USERPROFILE% refers to the value of environment variable, USERPROFILE.

Normally the value USERPROFILE is set to the following:

- In Windows 11 and 10: C:\Users\

| Log File | Description |
|--|---|
| %USERPROFILE%\MapleMBSE_Launcher.log | Log data from MapleMBSE.exe |
| %USERPROFILE%\MapleMBSE_OSGiBridge.log | <ul style="list-style-type: none">• Log data from a module (OSGiBridge) which is used to load a module of MapleMBSE in Excel.• You can specify a log level in <InstallDir>\OSGiBridge.ini. |
| %USERPROFILE%\Documents\MapleMBSE.log | <ul style="list-style-type: none">• The MapleMBSE.log file is located in the My Documents folder• Log data from MapleMBSE itself• You can specify a log level in <InstallDir>\OSGiBridge\log4j.properties.• The MapleMBSE.log file will be overwritten whenever starting MapleMBSE. |

A.2 Using a Log File to Identify a Problem

In the MapleMBSE.log file, the values in cells updated in the worksheet are recorded.

Note that your computer will run slow due to the large volume of data logged and the size of MapleMBSE.log file will be tens of MB or more.

1. Rename <InstallDir>\OSGiBridge\log4j.properties. Name it **log4j-orig.properties**.
2. Rename <InstallDir>\OSGiBridge\log4j-debug.properties. Name it **log4j.properties**.
3. Restart MapleMBSE.
4. Reproduce your problem in MapleMBSE.
5. After you have completed the above steps, copy **MapleMBSE.log** located in %USERPROFILE%\Documents in an appropriate location.

6. Return the logging properties to the original settings by renaming **<InstallDir>\OS-GiBridge\log4j-orig.properties** to **log4j.properties**.

A.3 VBA Logging

VBA logging is available to record information about the vba methods that are executed because of user action. By default, VBA logging is enabled.

To disable VBA logging, you must create an environment variable, **MapleMBSE_VBA_LOGGER** and set the value of this environment variable to **false**.

The location of the VBA logs is **C:\Users\<username>\AppData\Local\MapleMBSE\MapleMBSE_VBA.log**.

Appendix B Error Messages and Troubleshooting

B.1 Error Messages When Starting MapleMBSE

| Error Message | Description | Resolution |
|--|---|--|
| MapleMBSE.exe is already running. Close all Excel Windows, and then confirm MapleMBSE.exe process is terminated. | An attempt was made to start another instance of MapleMBSE but failed because only one instance of MapleMBSE can run at a time. | Close all Excel windows, then confirm that the Excel process (MapleMBSE.exe) has terminated before attempting to launch MapleMBSE again. |
| File Open Error. | A model file or SyncModel file cannot be opened. | Follow the instructions in the error message dialog. |

B.2 Error Messages Displayed When Attempting to Alter the SyncView Table

Messages that will be displayed in a message box when editing are as follows.

These errors were handled in MapleMBSE. If these errors were caused by user, the operation will be cancelled.

| Error Message | Description | Resolution |
|---|--|---|
| Can't overwrite in the leftmost column across several rows. | Attempted to overwrite in the leftmost column across several rows but ID is specified in the property of the leftmost cells so that MapleMBSE can manage data - you cannot overwrite in the leftmost column across several rows. | The editing operation that resulted in the displayed error message will be cancelled. Restart MapleMBSE without saving a model. |
| Insertion to the top row is currently prohibited. | Attempted to insert a row above the top row of the SyncView table but the operation is not permitted. | Same as above |
| Can't delete the insertion row or column. | Attempted to delete the insertion row or column but the operation is not permitted. | Same as above |
| Can't move the table. | Attempted to move SyncView table but the operation is not permitted. | Same as above |
| Can't update across several rectangular areas at one time. | Attempted to update across several rectangular areas. For | Same as above |

| | | |
|-----------------------------------|--|---------------|
| | example, copying content into several, nonadjacent areas selected in the table. This operation is not permitted. | |
| Can't delete overall editing area | Attempted to delete entire SyncView table but the operation is not permitted. | Same as above |
| Can't delete the column. | Attempted to delete a column in the SyncView table but the operation is not permitted. | Same as above |
| Can't insert the column. | Attempted to insert the column in SyncView but the operation is not permitted. | Same as above |

B.3 Error Messages Displayed When Editing the Model Spreadsheet

Messages that will be displayed by a comment in cell when editing are as follows.

| Error Message | Description | Resolution |
|-----------------------------|---|---|
| The key is duplicated. | An existing key name was specified. | Specify other key name or specify including an end key if the key is not end key. |
| The key has not been input. | The key has not been input. | Input the key. |
| No link can be found. | No link shown in the link field exists. | Input a correct value in the link field. |
| The value is invalid. | The value in the cell is invalid. | Input a correct value. |
| The cell cannot be changed. | Attempted to change a cell which cannot be changed. | When this error occurs after inserting a row, you may have inserted an invalid feature to the model so delete the row inserted. In addition, when this error occurs after changing the cell value, you may change a feature which cannot be changed in the model so return to the original value. In either case, the change is not reflected on the model. |

B.4 Error Messages When Editing (Unhandled Exception/An Internal Error Occurred)

When the error of Unhandled Exception occurs, name the model and save, and then close MapleMBSE.

B.5 Warning Messages for Remaining Memory

MapleMBSE checks the remaining memory usage whenever you operate. When the available memory becomes insufficient, a warning message will appear. Follow the instructions in the message.

If the warning about the remaining memory reappears frequently, your memory (the heap size of Java) may be insufficient for the model you are editing. Consider expanding the heap size of Java by following the instructions in "Changing the Java Heap Size".

B.6 Troubleshooting

- *Changing the Java Heap Size (page 99)*

Changing the Java Heap Size

An error dialog related to insufficient memory may appear when starting or editing MapleMBSE. If this problem occurs adjust the java heap size:

1. Right-click on the MapleMBSE shortcut on your desktop (or the folder of the application) and select Properties.
2. In the **Target:** field add the command line option, /R <memsize> to the end of the shortcut link target (for example, "C:\Program Files\MapleMBSE 2024\MapleMBSE.exe"), where <memsize> is a value, between 800MB to 1100MB, of continuous memory reserved for the Java Virtual Machine, some of this memory will be used for the Java heap, some for the JVM itself. For more information, including other options you can specify, see *Launching from Command Line (page 6)*.
3. Click **OK** or **Apply**.
4. Double-click the shortcut to start MapleMBSE.
5. If an error message appears, increase the value of <memsize> specified in step 2 above. Repeat this until you find a value large enough so that the error message is no longer displayed when starting MapleMBSE.
6. Open OSGiBridge.ini, located in the MapleMBSE installation folder, in Notepad to change the maximum heap size of JVM.
7. Find the entry "-Xmx512m" in this file. Replace "512" with the value of <memsize> from step 2.
8. If MapleMBSE fails to launch, replace -Xmx<memsize>m, set in step 7 with a smaller value for the Java heap, between 150MB to 200MB smaller than <memsize>. This will leave some memory space required for the JVM itself.

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