OMEdit - OpenModelica Connection Editor

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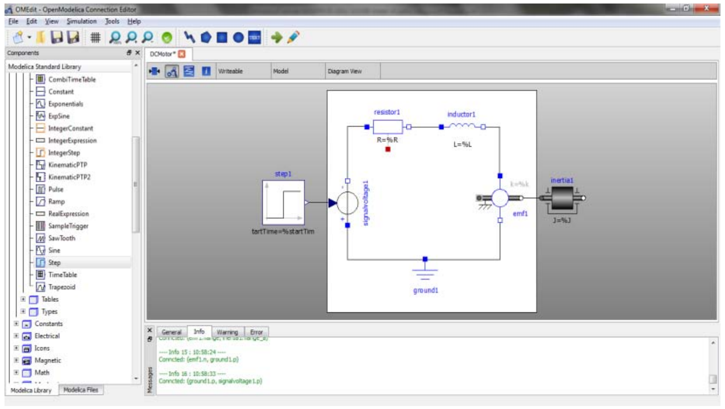
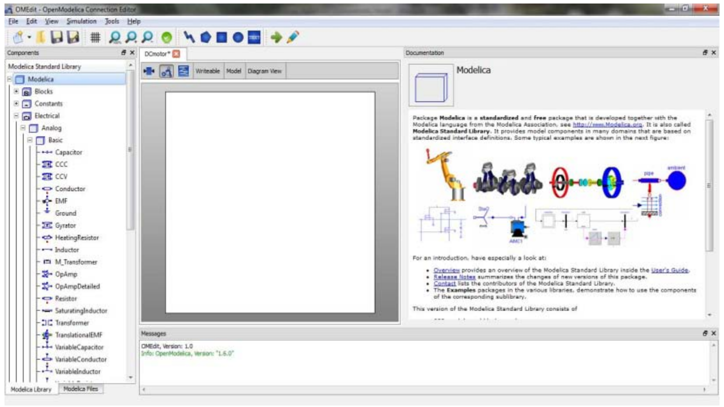
Motivation

- Modelica models were created using;
  - Textual editors
  - SimForge
- New Graphical User Interface was needed,
  - To overcome the deficiencies of SimForge



---- Info 15 : 10:58:24 ----
Conncted: (emf1.n, ground1.p)

---- Info 16 : 10:58:33 ----
Conncted: (ground1.p, signalvoltage1.p)



Package **Modelica** is a **standardized** and **free** package that is developed together with the Modelica language from the Modelica Association, see http://www.Modelica.org. It is also called **Modelica Standard Library**. It provides model components in many domains that are based on standardized interface definitions. Some typical examples are shown in the next figure:

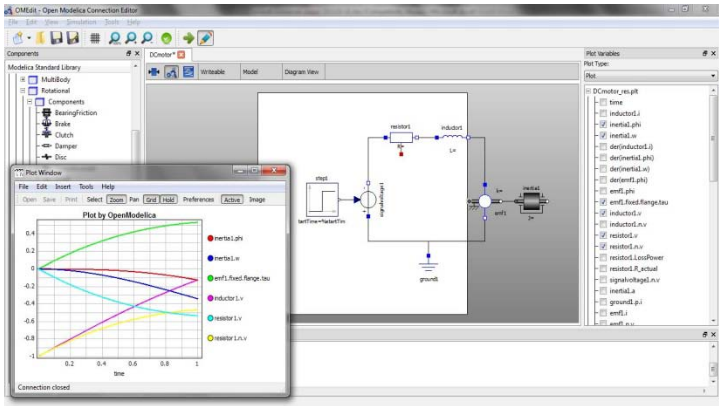
For an introduction, have especially a look at:

- Overview provides an overview of the Modelica Standard Library inside the User's Guide.
- Release Notes summarizes the changes of new versions of this package.
- Contact lists the contributors of the Modelica Standard Library.
- The **Examples** packages in the various libraries, demonstrate how to use the components of the corresponding sublibrary.

This version of the Modelica Standard Library consists of

Messages

OMEdit, Version: 1.0
Info: OpenModelica, Version: "1.6.0"

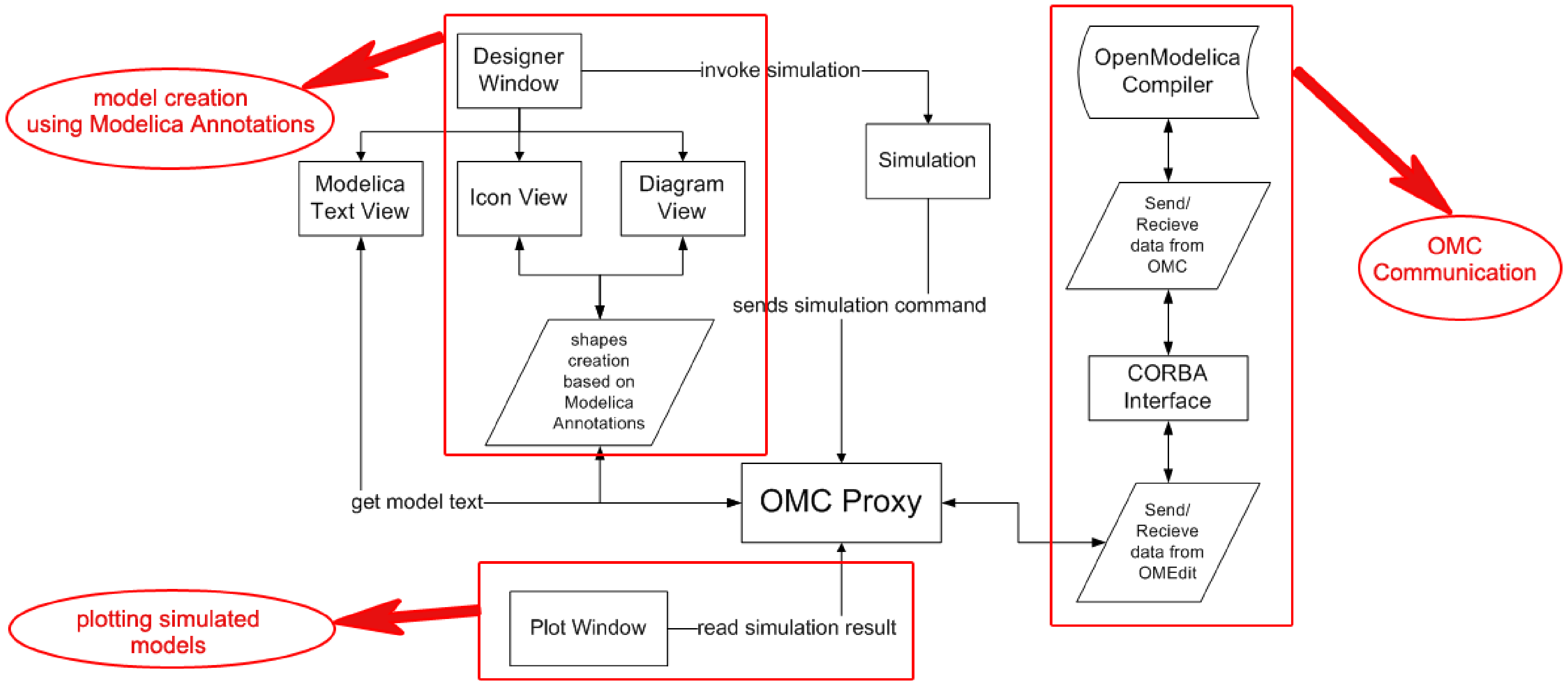


OMEdit – OpenModelica Connection Editor

OMEdit

- OpenModelica Connection Editor
- Features
  - *Modeling* – Easy model creation for Modelica models
  - *Pre-defined models* – Browsing the Modelica Standard library to access the provided models
  - *User defined models* – Users can create their own models for immediate usage and later reuse
  - *Component interfaces* – Smart connection editing for drawing and editing connections between model interfaces
  - *Simulation* – Subsystem for running simulations and specifying simulation parameters start and stop time, etc.
  - *Plotting* – Interface to plot variables from simulated models

OMEdit - Workflow

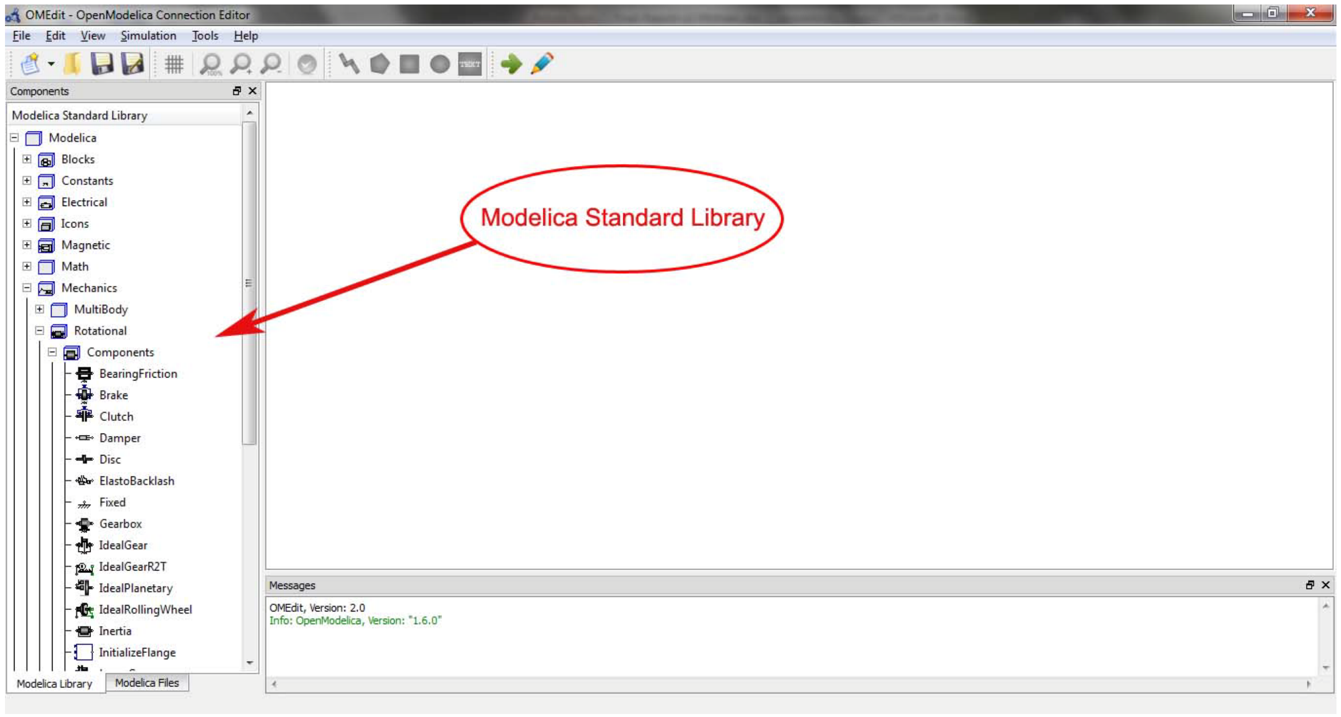


OMEdit - Windows

- Library Window
- Designer Window
- Messages Window
- Documentation Window
- Plot Window

Library Window

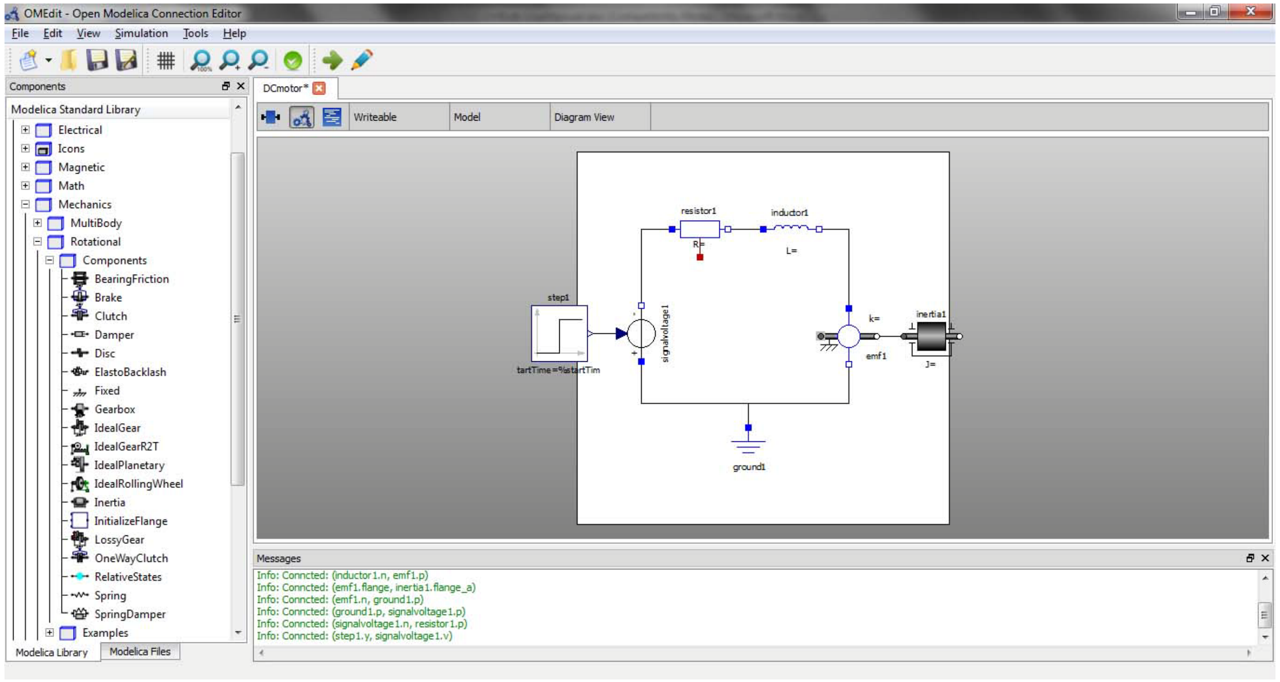
- Contains two tabs,
    - Modelica Standard Library
    - Modelica Files



OMEdit, Version: 2.0
Info: OpenModelica, Version: "1.6.0"

Designer Window

- It consists of three views,
  - *Icon View* - Shows the model icon view
  - *Diagram View* - Shows the diagram of the model created by the user
  - *Modelica Text View* - Shows the Modelica text of the model



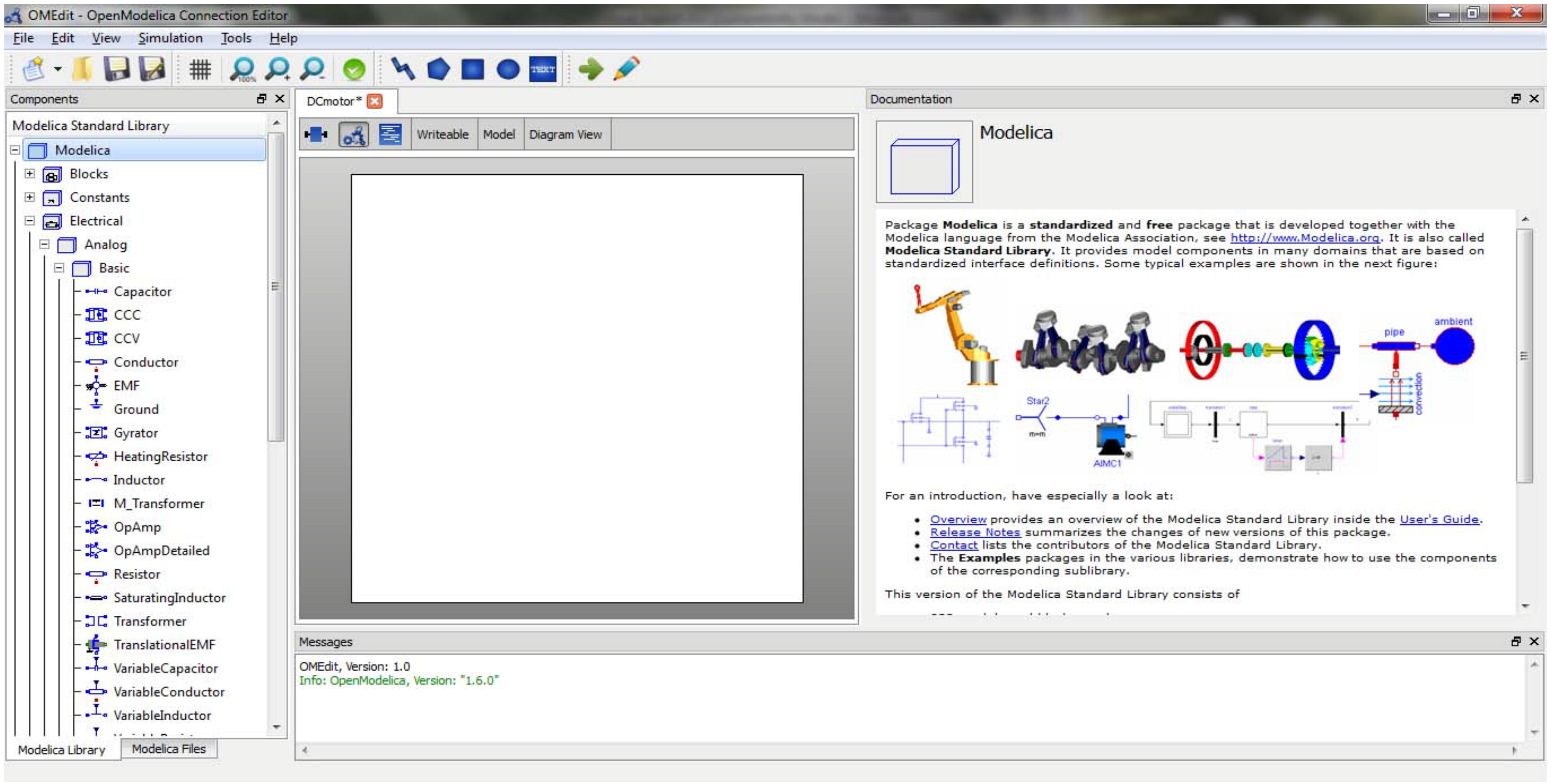
```
Info: Conncted: (inductor1.n, emf1.p)
Info: Conncted: (emf1.flange, inertia1.flange_a)
Info: Conncted: (emf1.n, ground1.p)
Info: Conncted: (ground1.p, signalvoltage1.p)
Info: Conncted: (signalvoltage1.n, resistor1.p)
Info: Conncted: (step1.y, signalvoltage1.v)
```

Messages Window

- Messages Window is located at the bottom in OMEdit. The Messages Window consists of 4 types of messages,
  - *General Messages* – Shown in black color
  - *Informational Messages* – Shown in green color
  - *Warning Messages* – Shown in orange color
  - *Error Messages* – Shown in red color

Documentation Window

- Shows the Modelica documentation of component models/libraries in a web view



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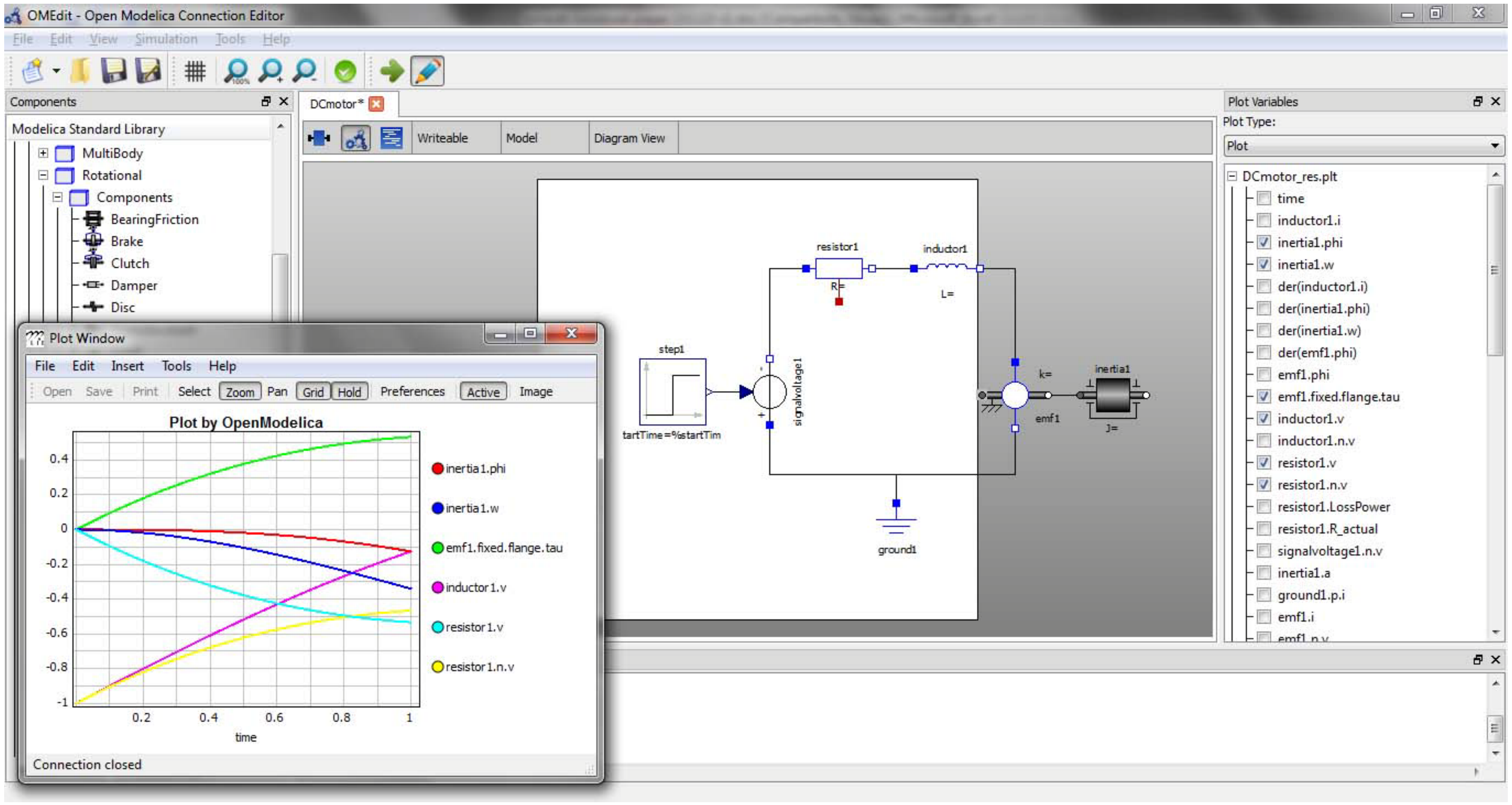
This version of the Modelica Standard Library consists of

```
OMEdit, Version: 1.0
Info: OpenModelica, Version: "1.6.0"
```

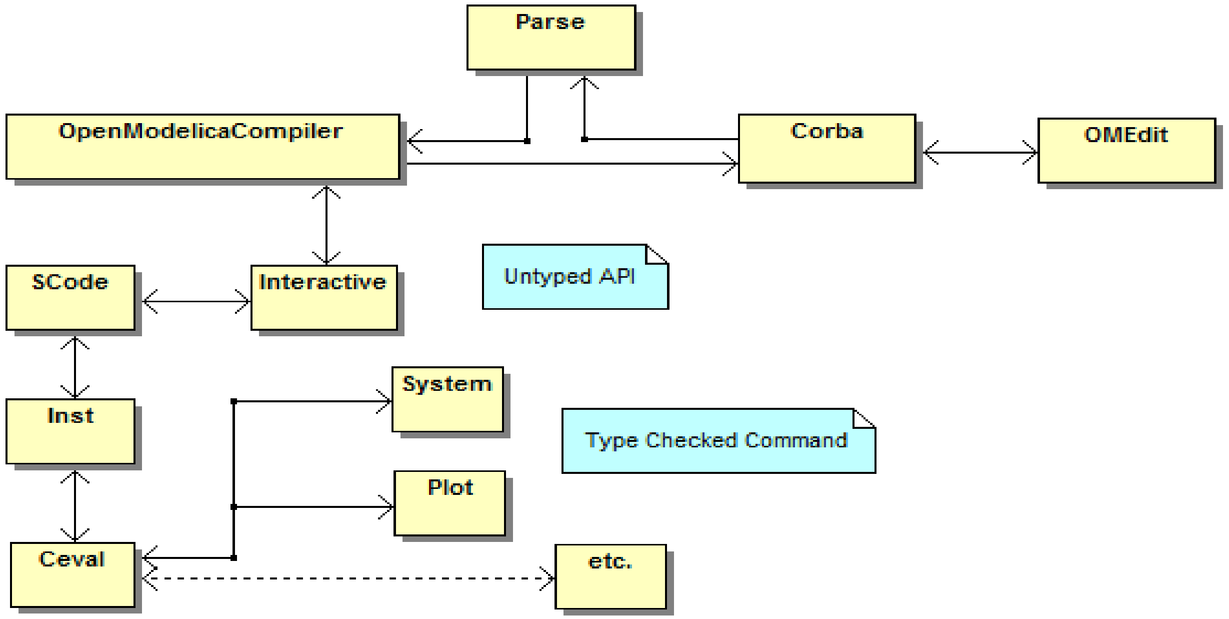
Plot Window

- Shows a tree containing the list of instance variables.



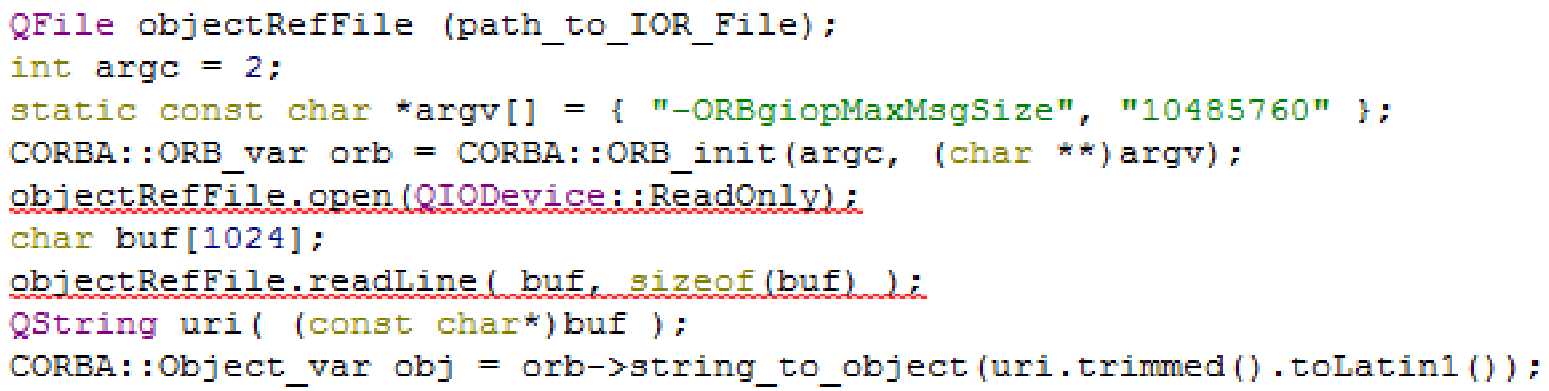
OMC Corba Interface

- OMC is a short name for OpenModelica Compiler
- Two methods to invoke OMC,
  - As a whole program, called at the operating-system level, e.g. as a command.
  - As a server, called via a Corba client-server interface from client applications.



Invoking OMC through Corba

- Start omc.exe with special arguments,
  - +d=interactiveCorba
  - +c=IOR-filename
- A file with name specified in +c argument is created in temp directory.
- Read the Interoperable Object Reference (IOR) written in the file.
- Create the Corba object using the string-to-object method.



```
QFile objectRefFile (path_to_IOR_File);
int argc = 2;
static const char *argv[] = { "-ORBgiopMaxMsgSize", "10485760" };
CORBA::ORB_var orb = CORBA::ORB_init(argc, (char **)argv);
objectRefFile.open(QIODevice::ReadOnly);
char buf[1024];
objectRefFile.readLine( buf, sizeof(buf) );
QString uri( (const char*)buf );
CORBA::Object_var obj = orb->string_to_object(uri.trimmed().toLatin1());
```

OMC API Enhancements

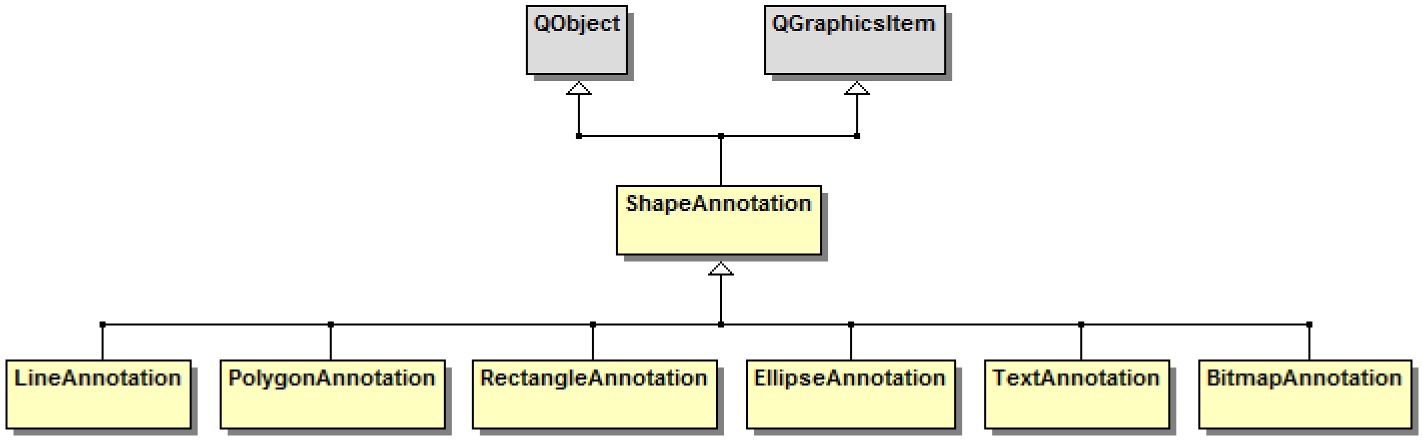
- Problems
  - Annotations for some models could not be retrieved correctly.
  - *renameComponent* command was very slow.
  - Package *Modelica.UsersGuide* does not have any icon/diagram annotation.
- Remedies
  - Instantiating (elaborating) the models.
  - *renameComponent* command goes through all the models and components and do refactoring. A new API command *renameComponentInClass* was introduced.
  - *getNamedAnnotation* command is added in OMC API. Which if returns true a predefined icon is used.

Modelica Annotations

- Annotations are used for storing extra information about a model such as graphics, documentation or versioning etc.
- OMEdit uses three types of Modelica annotations,
  - Graphical Annotations.
  - Connection Annotations.
  - Documentation Annotations.

Graphical Annotations

- Graphical annotation consists of two abstraction layers;
  - Icon Layer
  - Diagram Layer
- Graphical Elements
  - Line
  - Polygon
  - Rectangle
  - Ellipse
  - Text
  - Bitmap



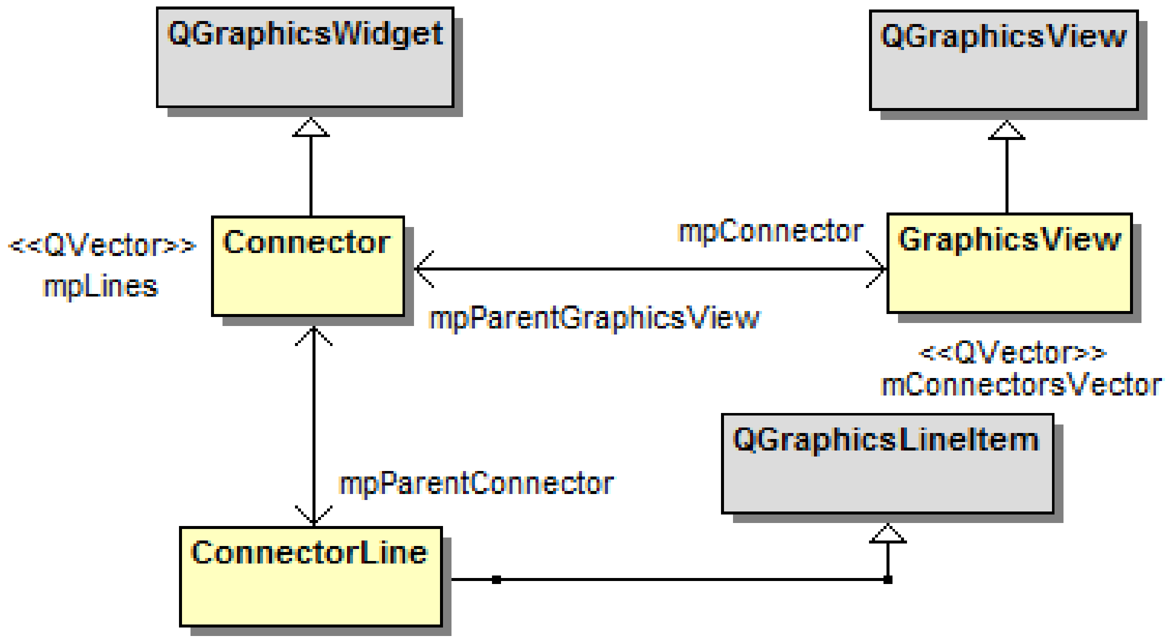
Connection Annotations

- It defines graphical representation of a connection between two component models. An example of connection annotation string is,

  connect (a.x, b.x)
  annotation(Line(points={{-25,30}, {10,30}, {10, -20}, {40,-20}}));

- N points = N – 1 lines
- OMEdit provides,
  - A *Connector* class for each connection.
  - Keeps the track of all connections of a model.
  - Checking for incompatible types of connectors.

Connection Annotations (cont.)



Documentation Annotations

- Documentation annotation is used for textual description. The documentation annotation written as;

  documentation_annotation:

  annotation*"(" Documentation "(" "info" "=" STRING*

  ["," "revisions" "=" STRING] ")" ")"

- OMEdit requests OMC for the documentation of a specific component/library through the *getDocumentationAnnotation* command.
- OMC returns the info annotation contained inside documentation annotation which is a string.
- The tags <*HTML*> and <*/HTML*> defines the start and end of the string.

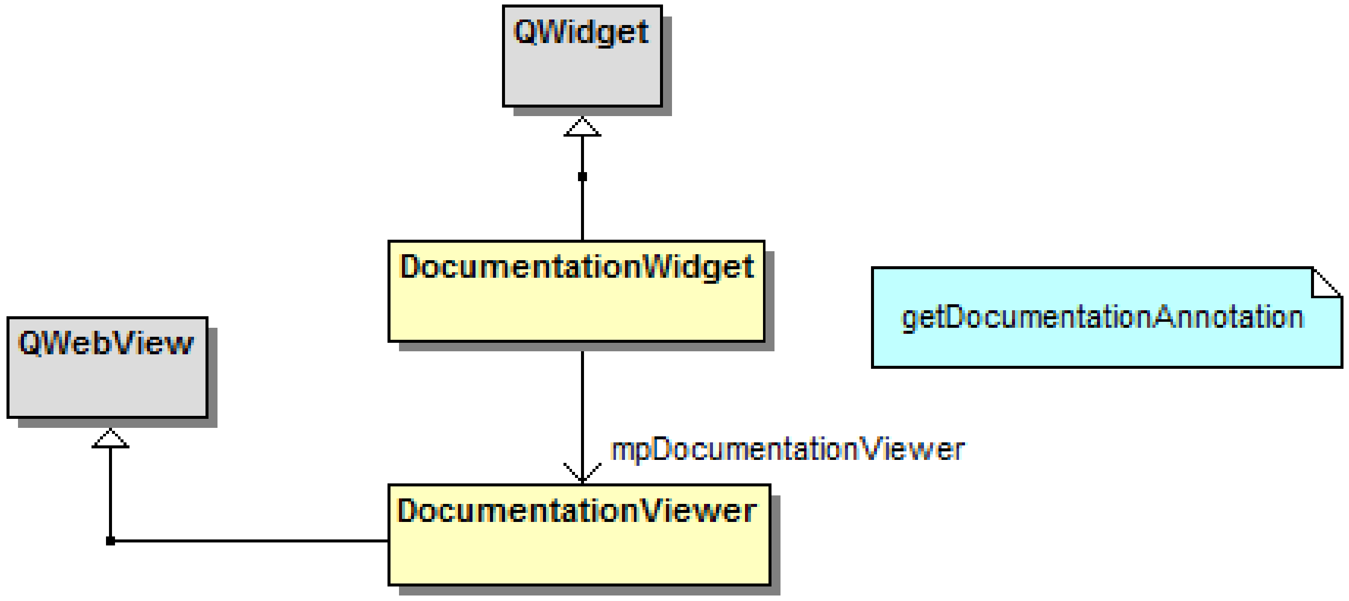
Documentation Annotations (cont.)

- Qt's *QWebView* class is used to display documentation annotation.
- The HTML string of documentation annotation contains four types of links,
  - Hyperlinks – Used to navigate to external websites.
  - Image Links – Used to reference the local image files.
  - Modelica Links – Used for linking to other component models.
  - Mailto Links – Used to display email addresses that can be used for future contacts.
- *QWebView* has built-in support for images.
- Hyperlinks and Mailto links are handled through *QDesktopServices* class.
- The Modelica links are special links which starts with *Modelica://* and reference to some component model or a package.

Documentation Annotations (cont.)

```
// if url contains http or mailto: send it to desktop services
if ((url.toString().startsWith("http")) or (url.toString().startsWith("mailto:")))
{
    QDesktopServices::openUrl(url);
}
// if the user has clicked on some Modelica Links like Modelica://
else if (url.toString().startsWith("Modelica"))
{
    // remove Modelica:// from link
    QString className;
    className = url.toString().mid(10, url.toString().length() - 1);
    // send the new className to DocumentationWidget
    getDocumentationAnnotation(className);
}
```

Documentation Annotations (cont.)



Simulation and Plotting

- OMC API ***simulate*** command.
- Creates a simulation result file.
- The file contains,
    - List of instance variables with values over the time.
- Tree based on simulation result file.
- Existing OpenModelica Plot Window is used.

Thank You
Mahalo
Kiitos
Tack
Thanks
Toda
Grazie
Obrigado
Takk
Gracias
Merci