Graphical NED Editor

1 Overview

When you double-click a .ned file in the IDE, it will open in the NED editor. Like its predecessor *gned* from OMNeT++ 2.x and 3.x, the new NED editor is a dual-mode editor: in the graphical mode you can edit the network using the mouse, and the textual mode allows you to work directly on the NED source.

The syntax of NED files has changed from the 3.x version. The new syntax accommodates many more languages features such as inheritance and properties, and it is also more consistent, making NED source files easier to read and write. The NED editor primarily supports the new syntax: it is still possible to read and display NED files with the old syntax, many of the advanced features, however, (syntax highlighting, content assistance etc.) will not work. There is automatic conversion from the old syntax to the new, available both from the NED editor and as an external utility program (*nedtool*).

The *gned* program from OMNeT++ 3.x and 2.x viewed NED files in isolation. In contrast, the OMNeT++ IDE gathers information from all .ned files in all open OMNeT++ projects, and makes this information available to the NED editor. This is necessary because in OMNeT++ 4.0, modules may inherit parameters, visual appearance or even submodules and connections from other modules, so it is only possible to display a compound module correctly if all related NED definitions are available.

> **NOTE**: As a side effect, currently if there are two modules with the same name anywhere in the workspace, they will collide, and both will be marked with an error. Furthermore, the name will be treated as undefined, and any other modules depending on it will also generate an error. (Thus, a *"no such module type"* error may mean that actually there are more than one definitions which nullify each other.) This issue will be addressed before the final 4.0 release by introducing packages or namespaces into the NED language.

When the IDE detects errors in a NED file, the problem will be flagged with an error marker in the Navigation View, and the Problems View will be updated to show the description and location of the problem.

2 Creating new NED files

In Eclipse, all files are within projects, so first you need a suitable project. The project needs to be one designated as an OMNeT++ Project. (In Eclipse lingo, it should have the "OMNeT++ Nature".) The easiest way to create such a project is to use a wizard: just choose File|New|OMNEST/ OMNeT++ Project... from the menu, specify a project name, and click the Finish button.

Once you have an empty OMNeT++ project, you can create new NED files. Choosing File|New| Network Description File… from the menu will bring up a wizard where you can specify the target directory and the file/module name. You may choose to create an empty NED file, or a simple/compound module, or a network. Once you press the Finish button, a new NED file will be created with the requested content.

It is a good practice that the NED file and the contained module have the same name. For example, a compound module named Wireless42 should be defined within its own Wireless42.ned file.

3 Using the NED editor

If you want to open a NED file, just double-click its icon in the Navigator View. If the NED file can be parsed without an error, the graphical representation of the file will be opened, otherwise (errors in the file) the text view will be opened, and annotated with error markers.

You can switch between graphical and source editing mode using the tabs at the bottom of the editor. The editor will try to keep the selection during the switch: selecting an element in a graphical view and then switching to text view will move the cursor to the related element in the NED file. When switching back to graphical view, the graphical editor will try to select the element that corresponds to the cursor location in the NED source. This allows you to keep the context even if you switch back and forth regularly.

3.1 Views

There are several views related to the NED editor. These views can be displayed (if not already open) by choosing Window|Show View in the menu.

The **Outline View** allows an overview of the current NED file. Clicking on an element will focus the corresponding element in the text or graphical view. In graphical view, it has limited editing functionality. You can delete an object here (right click/delete), and the order of elements can be rearranged by dragging them.

The **Property View c**ontains all properties of the selected graphical element. Visual appearance, name, type and other properties can be changed in this view.

The **Palette** is normally displayed on the left or right side of the editor area, and contains tools to create various NED elements. It is possible to hide it by clicking on the little arrow in the corner, and to detach it from the editor and display it as a normal Eclipse view (Window|Show View| Other…|General|Palette).

The **Problems View** contains error and warning messages generated by the parser. Double-clicking a line will open the problematic file and move to the appropriate marker.

The **Module Hierarchy View** (not activated in the current build) shows the contained submodules, several levels deep.

The **Parameters View** (not activated in the current build) shows parameters of the selected module, including inherited parameters.

The latter two views have their main uses with the Inifile Editor (also not included in the current build.)

3.2 Editing in graphical mode

The graphical editor is based on the Eclipse Graphical Editing Framework (GEF), and offers all functionality normally available in GEF editors (plus more).

The palette is normally at the right of the editor area. The upper part of the palette contains the basic tools: selector, connection selector, and the connection creator tool. Click a palette item and then just click into the module where you want to place/activate it. The mouse pointer will give you feedback whether the requested operation is allowed. The lower part of the toolbox contains the basic elements that can be placed at the top level in a NED file (simple module, compound module, interface, channel etc.) and a "generic" submodule. Click on any of these and then click into the editor area to create an instance. The lower part of the palette contains all module types that can be instantiated as a submodule. They are shortcuts for creating a generic submodule and the modifying its type. They will display the default icon (if any) and a short documentation if you hover the mouse over them. You may configure the Palette by right clicking on a button and selecting Settings...

Right-clicking any element in the edited NED file will bring up a context menu allowing several actions like changing the icon, pinning/unpinning a submodule, re-layouting a compound module, or deleting/renaming the element. There are also items to activate various views, for example the Properties View where you can edit properties of the element.

Hovering an element will display its documentation (the comment in the NED source above the definition) in a "tooltip" if it has one. Pressing F2 will make the tooltip window persistent, so that it can be resized and scrolled for more convenient reading.

Creating modules

To create a module or a submodule, click on the appropriate palette item, and then click where you want to place the new element.

Creating and changing connections

Select the connection tool (if there are channels defined in the project, you can use the drop down to select which channel type the connection should have). First click the source module, then the destination. A pop-up menu will appear, asking which gates should be connected on the two selected modules. The tool will offer only valid connections (for example, it will not offer connecting two output gates.)

Reconnecting modules

Clicking and dragging a connection endpoint to another module will reconnect it.

Selecting elements

Selecting an element is done by clicking on it. Compound modules can be selected by clicking on their border or title. The CTRL and SHIFT key can be used to add/remove to/from the current selection. Note that the keyboard (arrow keys) can also be used to navigate between submodules.

Undo, redo, deleting elements

Use CTRL-Z, CTRL-Y for undo/redo, and the DEL key for deletion. These functions are also available in the Edit menu.

Moving and resizing elements

You can move/resize the selected elements with the mouse. Holding down SHIFT during move will perform a constrained (horizontal, diagonal or vertical) move operation. CTRL + resize will resize around the object's center. SHIFT + resize will keep the aspect ratio of the element.

If you turn on Snap to Geometry in the View menu, helper lines will appear to allow you to align to other modules. Selecting more than one submodule activates the Alignment menu (found both in the View menu and in the context menu).

Copying elements

Holding down CTRL while dragging will clone the module(s). Copy/Paste does not work yet, but it will be implemented until the 4.0 release.

Zoom

Zooming in and out is possible from the View menu, or using CTRL+- or CTRL+=, or holding down CTRL and using the mouse wheel.

Pinning and unpinning, re-layouting

A submodule display string may or may not contain explicit coordinates for the submodule; if it does not, then the location of the submodule will be determined by the layouting algorithm. A submodule with explicit coordinates is *pinned*; one without is *unpinned*. The Pin action inserts the current coordinates into the display string, and the Unpin action removes them. Moving a submodule also automatically pins it. The position of an unpinned module is undetermined, and may change every time the layouting algorithm runs. For convenience, the layouter does *not* run when a submodule gets unpinned (so that the submodule does not jump away on unpinning), but this also means that unpinned submodules may appear at different locations next time the same NED file gets opened.

Navigation

Double-clicking a submodule will open the corresponding module type in a NED editor. Bookmarks and navigation history do not work (yet).

Opening a NED type

If you know only the name of a type of a module or other NED element, you can use the Open

NED Type dialog (CTRL-SHIFT-N). Type the name, or search with wildcards. The requested type will be opened in an editor. This feature is not tied to the graphical editor: the Open NED Type dialog is available from anywhere in the IDE.

Elements of the display string can be edited in the Properties View. Main display string improvements are

3.3 Editing in text mode

The NED source editor supports all functionality that one can expect from an Eclipse-based text editor, such as syntax highlighting (for the new NED syntax), clipboard cut/copy/paste and unlimited undo/redo. A summary of these features:

- Undo (CTRL+Z), Redo (CTRL+Y)

- Indenting/unindenting code blocks with TAB / SHIFT+TAB

- Correct indentation (NED syntax aware) (CTRL+I)

- Find (CTRL+F), incremental search (CTRL+J)

- Moving lines with ALT+UP/DOWN

- Folding regions can be manually defined (Automatic folding according to the NED syntax is not yet implemented)

CTRL+SHIFT+L pops up a window with all keyboard bindings listed.

The NED source is continually parsed as you type, and errors and warnings are displayed as error markers on the editor rulers. At times when the NED text is syntactically correct, the editor has full knowledge of "what is what" in the text buffer.

Hovering the mouse over a NED type name will display the documentation in a "tooltip" window, which can be made persistent by hitting F2.

Converting from old to new NED format

If you have a NED file with older syntax, you still can open it. A context menu item allows you to convert it to the new syntax.

Content assist

If you need help, just press CTRL-SPACE. The editor will offer possible words or templates. This is context sensitive, so it will offer only valid ones. Content assist is also a good way of exploring the new NED syntax and features.

Navigation

Holding the CTRL key and clicking on an HTTP link or on a module type will jump to the type definition.

If you switch to graphical mode from text mode, the editor will try to locate the NED element under the cursor and select it in the graphical editor.

Bookmarks and navigation history fully work as well.

3.4 Other features

Printing

Printing and Print Preview functionality are available in the File menu..

Exporting images

To export a compound module as a picture, select the compound module and bring up its context menu, select Export Image... and choose file name and type. The module will be exported to the file system. BMP, PNG, JPEG, SVG and PDF formats are supported.

It is also possible to export images from all (or selected) NED files; the corresponding wizard can be found under File|Export… in the menu.