Scenargie®2.1 Visual Lab

User Guide

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Contents

Preface

This document describes how to use Scenargie 2.1 Visual Lab, a GUI of Scenargie 2.1.

Scenargie is a system simulation framework. It consists of a user interface, Scenargie Visual Lab, and a simulation engine, Scenargie Base Simulator. By using Scenargie Visual Lab, users can configure settings needed for simulations, such as maps, the layouts of communication nodes, and their parameters such as mobility patterns, etc. The scenario creating and editing functions of Scenargie Visual Lab greatly reduces the load of engineers engaged in system design, analysis and evaluation because scenario creation and edit have been the most time consuming tasks in the process of modeling and simulation (M&S). Scenargie Base Simulator is a C++ based program architecture framework and its source code of all communication models is provided with the product package.

Scenargie enables realistic simulations by integrating functional elements that have been offered by multiple stand-alone tools. Following integrations are examples realized by Scenargie.

- Integration of radio frequency planning and packet-level simulation.
- Integration of the configuration of simulation scenarios and geographical information systems (GIS).
- Integration of multi-agent simulation (user behavior modeling including pedestrians, vehicles, etc.) and network system simulation.

Related documents

Installation Guide
Programmer's Guide
Base Simulator User Guide
Base Simulator Model Reference
Dot Eleven Module User Guide
LTE Module User Guide
ITS Extension Module User Guide
Multi-Agent Extension Module User Guide
Multi-Agent Extension Module Model Reference
Fast Urban Propagation Module User Guide
High Fidelity Propagation Module User Guide
Trace Analyzer User Guide

1. Overview

1.1. System structure

Scenargie Visual Lab (Visual Lab) constitutes Scenargie with Scenargie Base Simulator and other extension modules as shown by a blue round box  in Fig. 1-1. Visual Lab provides graphical interfaces for editing simulation scenario, executing simulations, playback of simulation logs, and various sorts of analysis work.

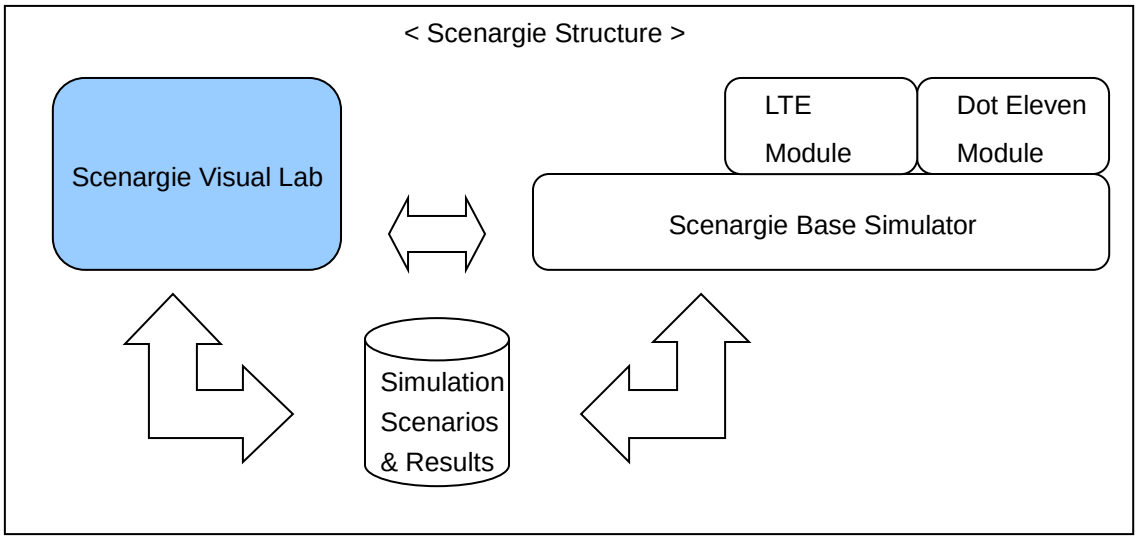


Fig. 1-1 Scenargie System Structure

1.2. Operation in Visual Lab

Visual Lab is designed so that users can conduct various operations, editing scenarios, execution of simulations, and playback of simulation logs using a map and a control panel in the main window. For detailed configurations and analysis, dialog box based interfaces are provided.

1.2.1. Starting Visual Lab

To start Visual Lab, follow the instructions below.

For installing Visual Lab, refer the “Scenargie Installation Guide”.

On Linux

Run the execution script “Scenargie” in “visuallab” directory created by extracting the Visual Lab package.

Example:

```
$ cd visuallab
$ ./Scenargie
```

To quit the program, click [File]-[Quit] or the "X" icon at the top right of the window.

On Windows

Use the shortcut icon created by the installer to start Visual Lab.

To quit the program, click [File]-[Quit] or the "X" icon at the top right of the window.

On Mac OS

Use the icon of Scenargie in the Application folder to start Visual Lab.

To quit the program, click [File]-[Quit] or the "X" icon at the top left of the window.

1.2.2. Main window

This section describes the components on the main window of Visual Lab.

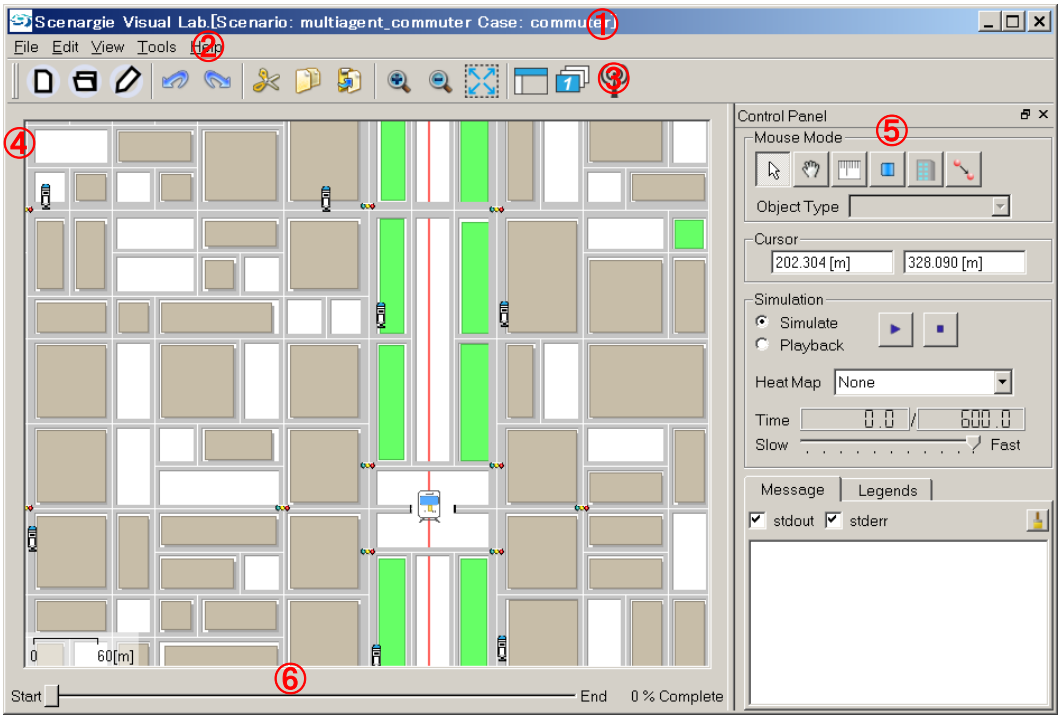


Fig. 1-2 Visual Lab Main Window

Title bar: (1)

Names of loaded scenario and case are displayed on the title bar.

Menu bar: (2)

Menu bar provides access to functions of Visual Lab.

Tool bar: (3)

Following buttons are included in the tool bar.

New/Open/Save/Undo/Redo/Cut/Copy/Paste/Zoom In/Zoom Out/Fit To Window /Object Properties/Object Layer Editor/RF Propagation Analyzer etc.

Main map：(4)

The loaded map is shown here. When editing a scenario, user can arrange communication object on the map shown in the main map area. When a simulation is running, the movement and the status of communication objects is shown. The map can be zoomed-in and zoomed-out.

Control panel: (5)

The control panel is placed at the right of the main map. It can be removed from the main window and placed as an independent window. It also can be hidden.

Progress bar: (6)

The progress bar placed at the bottom of the main window shows the progress of the simulation or the playback of a simulation log.

1.3. Scenarios

This section describes the overview of the management of scenarios in Visual Lab.

1.3.1. Scenarios and cases

In Visual Lab, a scenario means a group of files needed for executing simulation. The files constituting a scenario can be saved in any directory. Visual Lab allows that a scenario has its multiple variations. Each of the variations is called a case. Files constituting a case are one file that has a file name extension ".case", property files, map information files, and some optional files.

1.3.2. Objects

Buildings, roads, parks, communication equipment, etc. that are configured as a part of scenario are called "objects".

The followings describe the structure of objects.

Object	One of parts that make up a scenario.
Property	A value describing one of the characteristics of an object. Example) Transmission power, X-coordinate, etc.
Component	A group of properties for describing a function. Example) Dot11Mac, a group of properties related to IEEE 802.11 MAC.
Model Instance	A group of components that defines an instance of a communication model.
Object type	A set of components which defines a type of an object. Example) "dot11g", one of communication node types that use the IEEE 802.11g protocol. "dot11g" consists of the following components, Common, Position, CommunicationObject, SimulationObject, Mobility, Transport, Network, Antenna/Propagation (Interface), Routing, Network (interface), Dot11Mac, and Dot11Phy.

[Tools]-[Object Properties…] provides the function for showing and editing properties.

2. Managing scenario files

For managing scenario files, such as making a new scenario, use [File] menu. This section describes the functions related to management of scenario files.

2.1. Making a new scenario (New)

To make a new scenario, choose [File]-[New...] or click <New> toolbar button.

2.2. Opening a scenario (Open)

To open an existing scenario, select [File]-[Open...] menu or click <Open> toolbar button.

Select a file that has a filename extension ".case" to load a scenario.

The scenario name is displayed on the title bar.

2.3. Scenario Wizard

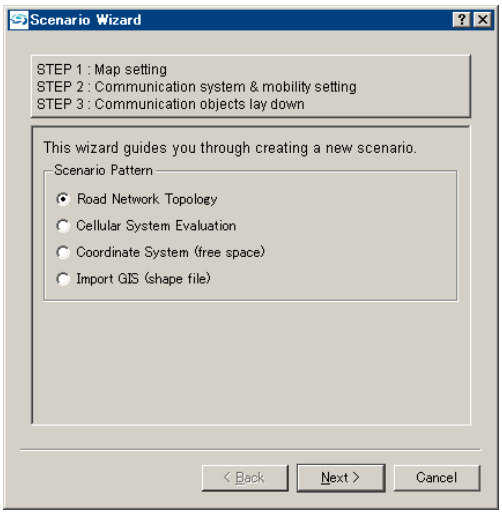
Scenario wizard is a function to make a scenario through an interactive interface. To start the scenario wizard, choose [File]-[Wizard].

Scenario Wizard provides an interactive interface for i) Map setting, ii) Communication systems and mobility setting, and iii) Communication objects lay down.

STEP1: Map setting

Select a geographical pattern from the followings.

a) Road Network Topology
b) Cellular System Evaluation
c) Coordinate System (free space)
d) Import GIS (shape file)



a) Road Network Topology

Select a type of road network topology from Regular Grid, Cross Road, and Straight Road.

- Regular Grid

  Creates a grid-based road network topology.

- Cross Road

  Creates a road network topology consisting of one or more intersections.

- Straight Road

  Creates a straight road topology that does not have intersections.

b) Cellular System Evaluation

Creates a cellular network topology consisting of 7 or 19 cells.

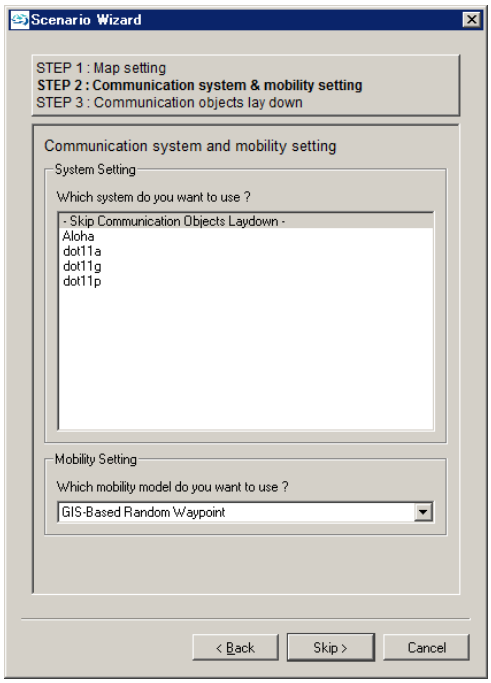
c) Coordinate System (free space)

Creates an area by specifying the area size with x and y coordinates and placing GIS objects.

d) Import GIS (shape file)

Creates map information by importing shape format map data.

STEP2: Communication system & mobility setting



Select a communication system to use from the list. The communication systems in the list depend on the installed extension modules.

Example: If the Dot Eleven Module is installed, in addition to Aloha, the following systems are listed.

- dot11a
- dot11g
- dot11p

Select a mobility model from the list.

Mobility models:

Visual Lab provides the following mobility models to assist users to create simulation scenarios that have moving objects. You can configure mobility models through the "Object Properties" dialog box (See Section 5).

1) Random Waypoint

   Each node moves between randomly selected waypoints. Users give the system a moving area (rectangle) and the range of moving speed (min. and max.). The waypoints and the moving speed are calculated by the simulator.

2) GIS-Based Random Waypoint

Each node moves between randomly selected waypoints on roads. Users give the system a moving area as GIS layer (roads) and the range of moving speed (min. and max.). The waypoints and the moving speed are calculated by the simulator.

3) Trace File

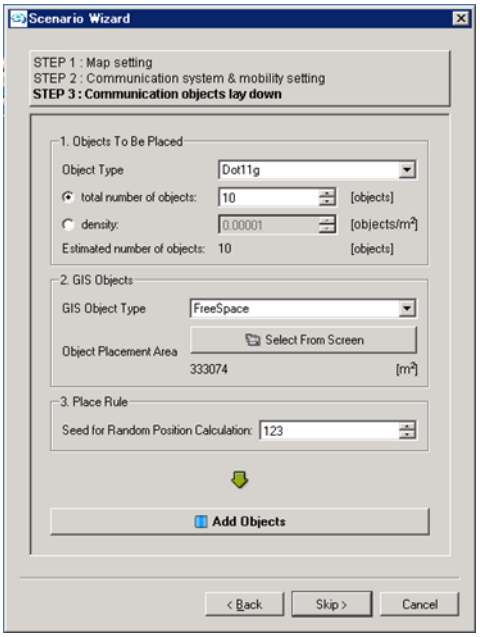
Each node moves according to a trace log file which includes a timestamp, node ID and a position.

When using "Trace File", you have to specify the file name through the "Object Properties" dialog box after the operation of Scenario Wizard.

4) Stationary

All nodes do not move.

STEP3: Communication objects lay down



1) In the "Objects To Be Placed" block, specify a type of an object to be placed. Then specify the number or the density of the objects.
2) In the "GIS Objects" block, specify a GIS Object where communication objects will be placed.
3) Click "Select From Screen" to specify an area where communication objects will be placed.
4) In the "Place Rule" block, you can specify a seed for generating random numbers for randomly placing communication objects.
5) Click "Add Objects" to place communication objects on the main map. After adding objects, Skip button turns to Next button.

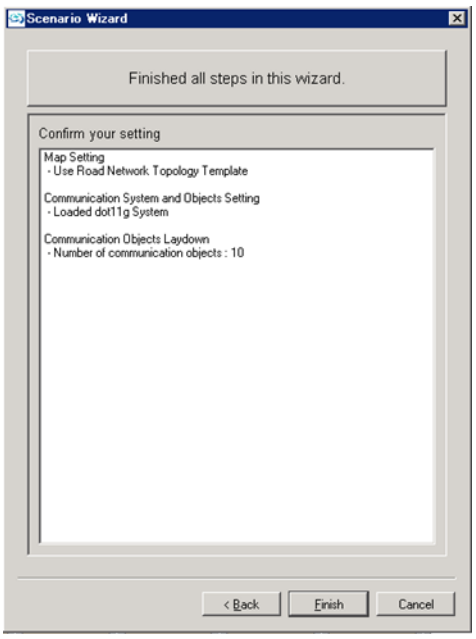
Completing the wizard

When placement of communication objects has finished, the Scenario Wizard shows the overview of the setting that you have given to the wizard.

Click "Finish" button to finish the wizard.

If you want to change the setting, click "Back" button to go back to the previous step.

Click "Cancel" button to cancel the setting.



2.4. Saving a scenario (Save / Save As)

To save the current scenario, choose [File]-[Save] or [File]-[Save As…].

Save:

Saves the changes to the current scenario.

Save As...:

Saves the scenario with a different name or location.

2.5. Importing external data

To import external data to your scenario, choose [File]-[Import].

Visual Lab supports the following file types.

- Simulation Configuration File (.config)
- Shape Files (.shp) – Geospatial vector data format for GIS software
- OpenStreet Map XML (.osm, .xml)
- Background Image Files (.png, .jpeg, .gif, .tiff, .bmp)
- Chart File (.chart) – Chart data file created by Visual Lab
- Wavefront.obj File (.obj) – Common 3D object data file

2.5.1. Using OpenStreetMap data with Visual Lab

Visual Lab supports OpenStreetMap data. OpenStreetMap is a collaborative project to create a free editable map of the world. Anybody can browse and download map data provided by OpenStreetMap web page. The map data are provided in an XML format that has a filename extension .osm.

Downloading OpenStreepMap data

1) Visit OpenStreetMap web page (http://www.openstreetmap.org)

   You can find area of the map that you want to download through browsing or searching function of OpenStreetMap web page.

2) Specifying the area of the map to export

   Click the “Export” button at the top of the page. Then, a map is displayed at the right part of the page and the longitude and latitude of the area to be exported are shown at the left part of the page. Click “Manually select a different area” to select the area to be exported by dragging on the map.

3) Download .osm file

   After selecting the area to be exported, click “Export” button in the left part of the page to download the map file "map.osm". The size of the data is about 1.5-2.0MB for a square area with 1km aside.

Importing the map into Visual Lab

Start Visual Lab and make a new scenario by clicking "New" button, [File]-[New] menu command or other means. Then, [File]-[Import] menu command is enabled. Choose [File]-[Import]-[Open Street Map XML] and select the OSM file you have downloaded through a dialog box.

Note) if you are using Safari on Mac OS, the suffix of the file name of the downloaded OSM file is ".osm.xml". You need to change the suffix from ".osm.xml" to ".osm" to import the data into Visual Lab.

2.6. Exporting data

Visual Lab can export various data in a scenario. To use this function, choose [File]-[Export] menu command.

Following data can be exported.

- Simulation Configuration File (.config)
- Simulation Configuration File with Initialized Values (.config) – The values which are initialized at the beginning of simulation such as the initial locations of agents and the locations of the acutomatically created entrances are set as an input of the scenario. This feature is available only for Multi-Agent Extension Module.
- Screen Capture (.png) - Screenshot of the main map
- Video Clip (.mp4) - Movie of the playback of a simulation

3. Editing a scenario

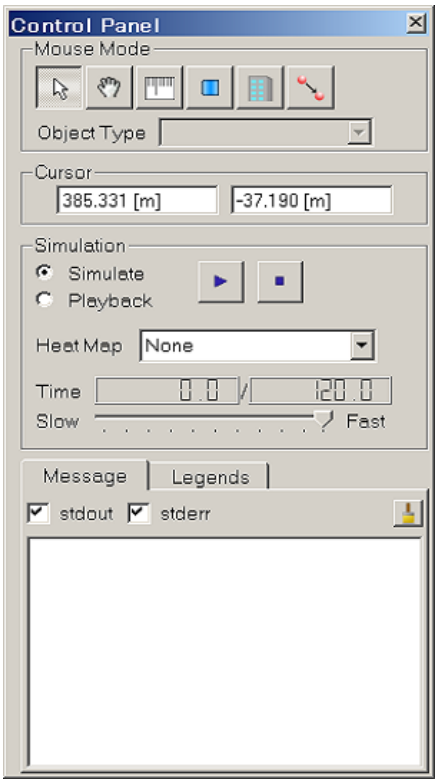
You can place GIS objects and communication objects on an imported map and configure them with Visual Lab. To edit the scenario, use buttons on the toolbar and buttons in "Mouse Mode" block in the Control Panel.

Control Panel

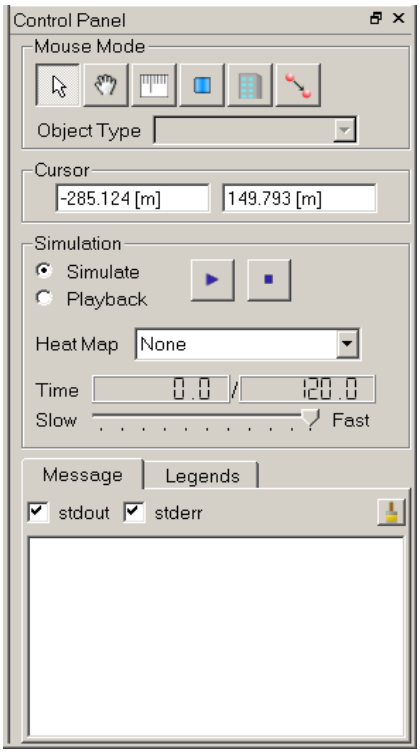
In the control panel, control buttons and display are categorized into the following four groups.

- Mouse Mode
- Cursor
- Simulation
- Message

You can remove the control panel from the main window by clicking button. Double click the title bar of the removed control panel to put it back to the main window. You can hide and show the control panel by [View]-[Control Panel] menu command. You can also hide it by clicking button.



Control panel removed from the main window



Control panel included in the main

3.1.1. Mouse Mode

The following six buttons are included in Mouse Mode group. You can switch the mouse mode for the operation on the main map.

 <Select>:

Use this mode to select objects on the main map. In this mode, you can select an object by clicking on it. The selected objects are indicated by the bordered edge of the icon. Drag on the main map to select all objects that are partly or entirely included in the selection rectangle. You can also select multiple objects by clicking with holding down Ctrl key.

After adding an application to a node, you can show the application-level connection between nodes by clicking the label of the application. You can change the color of arrows representing the application-level connections by [Tool]-[Options] menu command.

 <Grab>:

Use this mode to move the position of the map displayed on the main map window. Click any point on the map and drag to move the map.

 <Measure>:

This mode is for measuring the distance between points on the main map. Click at the start point of the measurement, then move the mouse cursor to the point to measure the distance from the start point. The distance from the start point and the position of the mouse cursor is displayed on the screen. If you click on some points on the screen, the sum of the total distance along the edges connecting the points, distance between the current mouse cursor position and the start point, and the angle between the edge connecting the current mouse cursor position and the last clicked point and the edge connecting the last two clicked points are displayed.

 <Place a New Communication Object>:

Use this mode to place communication objects. Select an object type from the "Object Type" combo box, then, click on the map to place the selected communication object.

 <Place a New GIS Object>:

This mode is for draw and placing GIS objects. Before drawing a GIS object, choose one of object types from "Object type" combo box.

To draw a line-shaped GIS object such as railways and roads, click at the start point on the main map and click at the end point.

To draw a polygon-shaped GIS object such as buildings, click at one of the vertices of the polygon, and then click the rest of vertices to draw the polygon, and finally click at the start point that is marked with a red circle.

 <Add a New Application>:

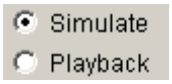
Use this mode to assign an application on communication objects. Before assigning an application, choose one of applications from the "Application" combo box. Click a communication object that works as a source node to assign the application. If the application needs to specify the destination node like CBR, VoIP, etc., click a communication object that works as the destination node.

3.1.2. Cursor

The X and Y coordinates of the mouse cursor on the map are displayed.

3.1.3. Simulation

Controls for executing simulation and playing back simulation logs are in the "Simulation" group.



selects simulation or playback of a simulation log

 starts simulation or playback of a simulation log. Once  is clicked, it changes to  .

 pauses simulation or playback of a simulation log. If this button is clicked, it changes to  .

 stops simulation or playback of a simulation log.

Select "Propagation" from the combo box, you can show the heatmap of radio propagation when running simulation or playing back a simulation log.

Note: Setting in the RF Propagation Analyzer is required to use this function.

shows the current time in simulation or playback.

changes the simulation/playback speed.

3.1.4. Message

In this area, messages from the simulator are displayed. You can toggle each of output to standard output and standard error with the check boxes.

Click  to clear the messages.

3.2. Toolbar

There are button for editing object on the main map and for controlling displays in the toolbar. You can use commands in [Edit] menu for editing objects.


<New>: makes a new scenario


<Open>: opens an existing scenario


<Save>: saves changes to the current scenario


<Undo>: erases the last change done to the scenario


<Redo>: redoes the last undone action


<Cut>: remove selected object(s) and store them into an internal buffer


<Copy>: save the selected object(s) into the internal buffer


<Paste>: pastes objects saved in the internal buffer. The position where they are pasted is close to the original position of the pasted object(s).


<Zoom In>: zooms in on the center of the main map


<Zoom Out>: zooms out

 <Fix to Window >: zooms in/out to show all objects in the current scenario.

 <Object Properties>: opens the "Object Properties" dialog box

 <Object Layer Editor>: opens the "Object Layer Editor"

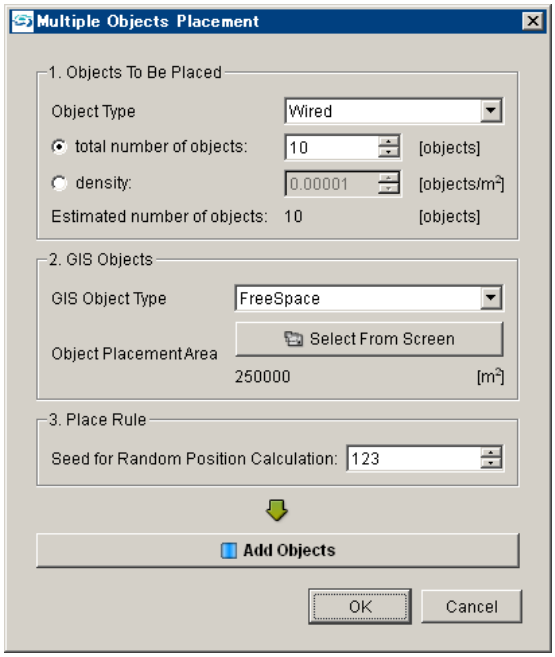
 <RF Propagation Analyzer>: opens the "RF Propagation Analyzer"

3.3. Placing multiple objects (Multiple Objects Placement)

To place multiple objects on the main map, choose [Tools]-[Multiple Objects Placement…]. Then edit parameters in the "Multiple Objects Placement" dialog box.

3.3.1. Placing multiple communication objects

1) Select the type of communication objects to be placed in the "Objects To Be Placed". Then specify the total number of the objects or the density.
2) Select the type of a GIS object where the communication objects are placed in "GIS Objects" block.
3) You can configure the area where communication objects are placed by clicking "Select From Screen" button.
4) Set the seed for generating random numbers that are used for calculating the position of communication objects at the "Place Rule" block.
5) Click "Add Objects" button to place communication objects on the main map.

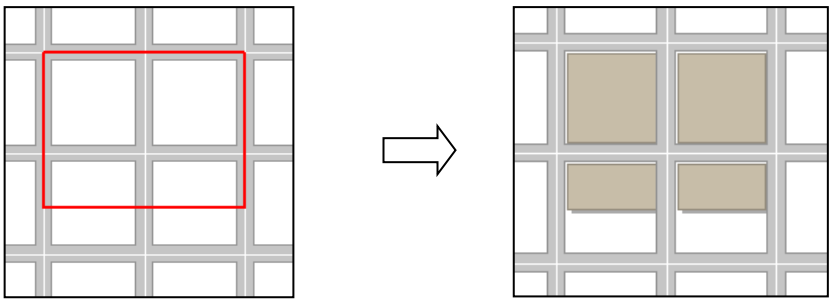


3.3.2. Placing multiple buildings

You can place buildings so that they fill regions surrounded by roads by selecting "Building" for "Object type"

1) Click 

in the GIS Objects block to place the area where the buildings are placed.
2) Click "Add Objects" button to place buildings.



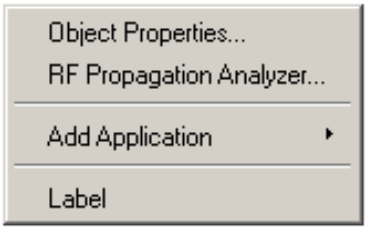
Area where communication objects are placed is selected.

Buildings are placed.

3.4. Right click-menu

If you right-click at the main map, a special processing menu (right-click menu) appears. The right-click menu contains the following commands. If you have not selected any objects when you click, only the "Object Properties" command is available. If you have selected object(s), all commands are available.

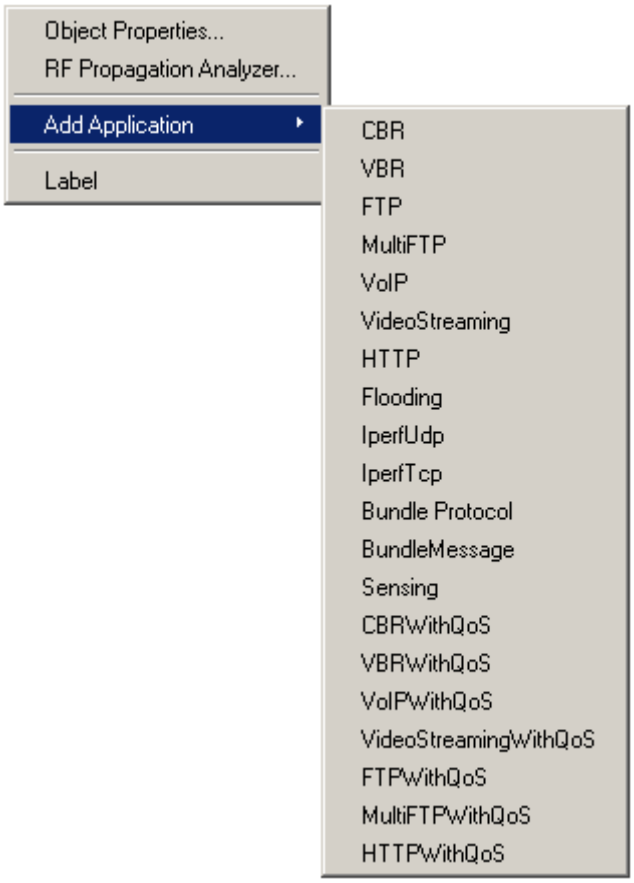
- Object Properties...
- RF Propagation Analyzer...
- Add Application
- Label



Refer to "Chapter 6. Object Properties" for the "Object Properties..." command and "Chapter 7. RF propagation analyzer" for the "RF Propagation Analyze..." command.

Add Application:

You can add an application to a communication object via this command.



In this case, you need to specify the destination node via the "Object Properties..." command if the application is not a broadcast-based application such as Flooding, Bundle Protocol, and BundleMessage. Just after the addition of an application to a communication object, the destination of the application is to "* (Any Objects)". Note that if you add an application using the "Place a New Application" mode that can be selected from Control Panel, you can specify a destination node when you add an application to a communication object.

Label:

Use this command to show/hide a label of the selected object.

4. Controlling Displays

You can zoom in or out of the map and configure the color used in the heatmap function.

4.1. Zooming in/out with mouse operation

You can zoom in by dragging with holding the right-button on the main map. The rectangle area selected by the drag is zoomed in so that the area fits to the main map window. By left-click during the drag, you can cancel the zooming operation. If the mouse cursor is in the main map, you can zoom in or out of the map with the mouse wheel. If Ctrl key is pressed when spinning the mouse wheel, the granularity of the zoom becomes small.

4.2. Controlling display via menu bar commands

Zoom in: Choose [View]-[Zoom In]

Zoom out: Choose [View]-[Zoom Out]

Showing all objects on the map:

Choose [View]-[Fit to Window] to show all objects on the map.

User can do the same operations via toolbar buttons, Zoom In/Zoom Out/Fit to Window.

Controlling display of grids, toolbar, and control panel.

Grid:

Choose [View]-[Grid] to show/hide grids on the main map. When grids are shown, you can place GIS objects along the grids. You can change the grid interval via [Tools]-[Options…] menu command.

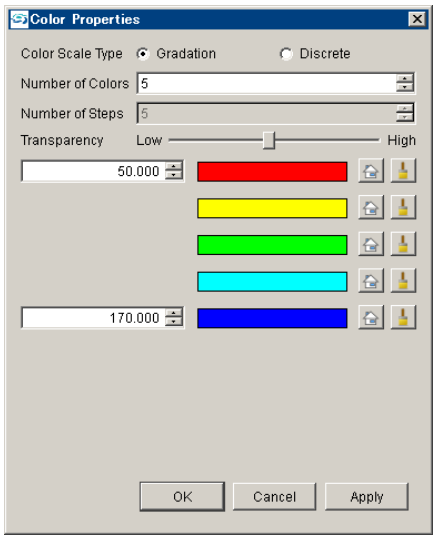
Toolbar, Control Panel: Choose [View]-[Tool bar] or [Control Panel] to show/hide the toolbar or the control panel.

4.3. Changing the appearances of the heatmap

The appearances of the heatmap can be changed via "Color Properties" dialog box.

You can show the "Color Properties" dialog box by double clicking on anywhere on the heatmap.

This function becomes available after executing the RF Propagation Analyzer.



Following items are configurable.

Color Scale Type:

You can choose Gradation or Discrete for the way to change the color on the heat map.

Number of Colors:

Number of colors you specify for the heat map. Choose the number from 1-10.

Number of Steps:

Number of steps of colors used in the Discrete mode for interpolating colors between the specified colors. Choose the number from 1-30.

Transparency:

You can configure the transparency of the heat map with a slide bar.

Upper limit:

The upper limit of values corresponding to the range of colors. If a given value to display is larger than the upper limit, the color specified for the limit is used for the value.

Lower limit:

The lower limit of values corresponding to the range of colors. If a given value to display is less than the limit, gray is used for displaying the value.

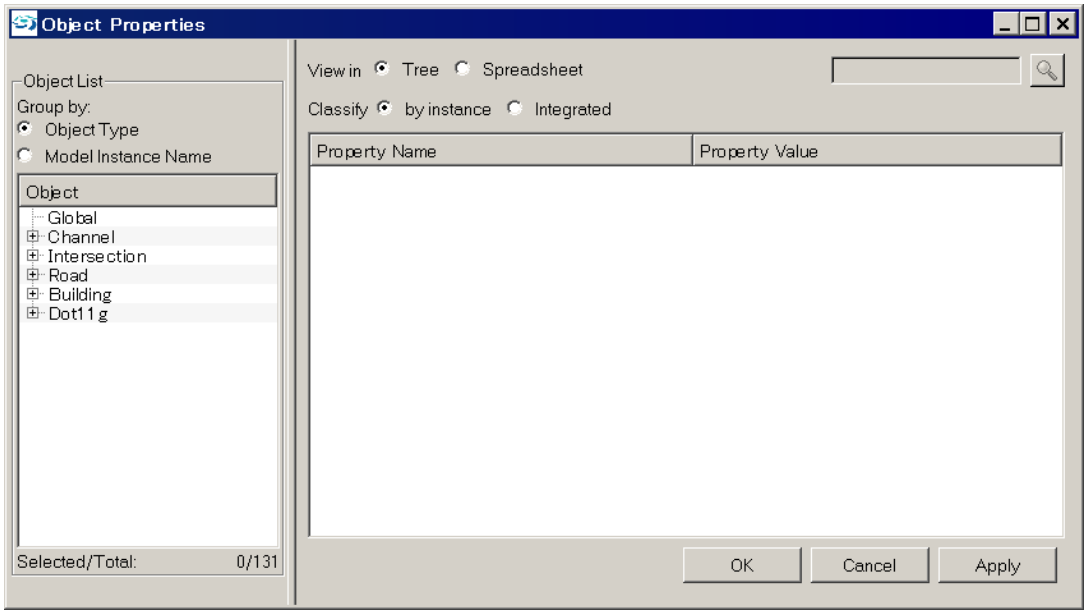
Colors:

You can specify colors used in the heat map by clicking colored boxes like  . Click  to restore the default setting. Click  to change the color into transparent.

5. Object Properties

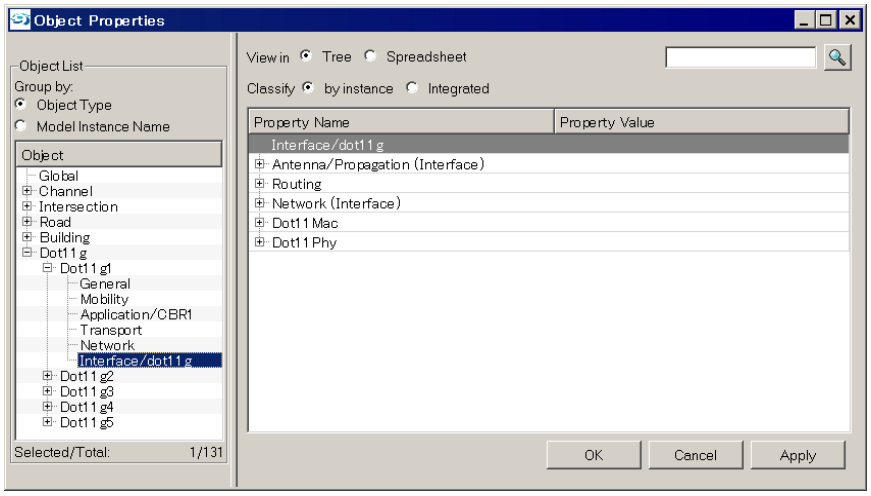
5.1. Confirming and editing object properties

You can confirm and edit object properties via the Object Properties dialog box. To show Object Properties dialog box, choose [Tools]-[Object Properties…] menu command, right-click on the main map and choose [Object Properties...], or click  <Object Properties> toolbar button.

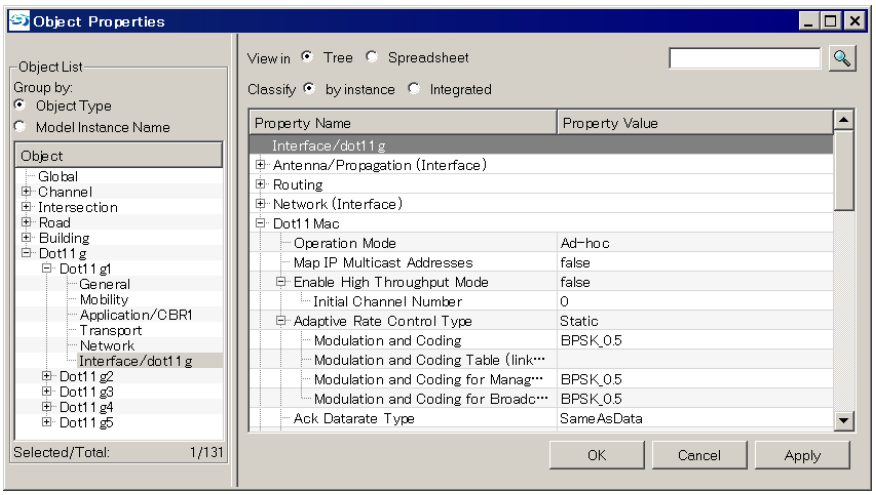


Follow the instructions below to operate in the Object Properties dialog box.

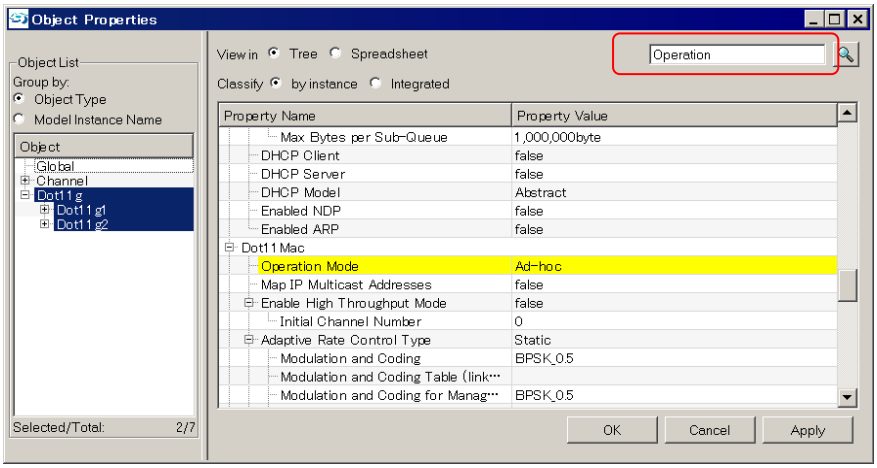
1) Select an object from the list on the left side.



2) Select a component from the list of properties on the right side, and click '+' mark to unfold the component and confirm the values of properties.



You can search object properties by putting property name or simulation parameter name into the box at the top right of the dialog box and click  .



Click  again or press F3 to find the next occurrence of the item previously found. Press Shift+F3 to find the previous occurrence.

3) Click the box of the property value you want to change.

Click  to apply the change and close the dialog box.

Click  to cancel the change and close the dialog box.

Click  to apply the change without closing the dialog box.

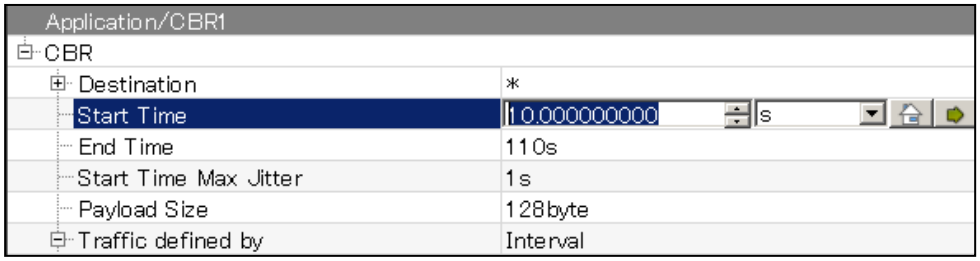
4) If you click the box for a property value, buttons appear at the right-hand edge of the box.

 shows "Select Object" dialog box.

 shows File Browser.

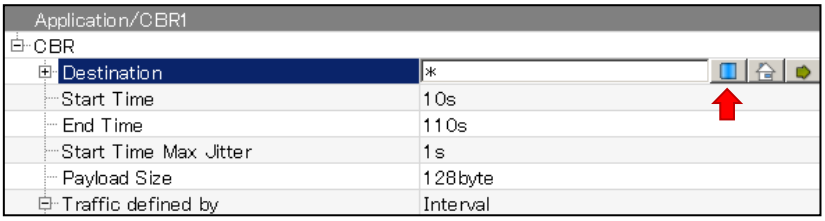
 restores the default value.

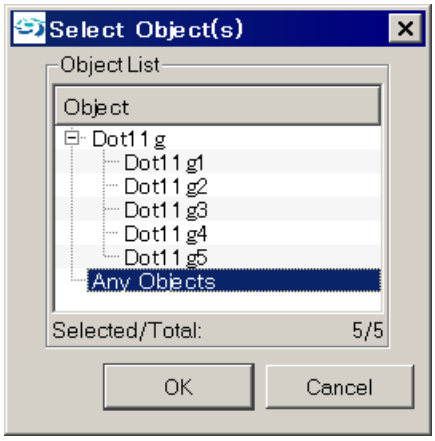
 shows "Property Details" dialog box. In this dialog box, you can confirm the parameter name of the property in the simulator. You can also add the property to the list of parameters that are changed in batch executions if the property is applicable.



Buttons for a property value box

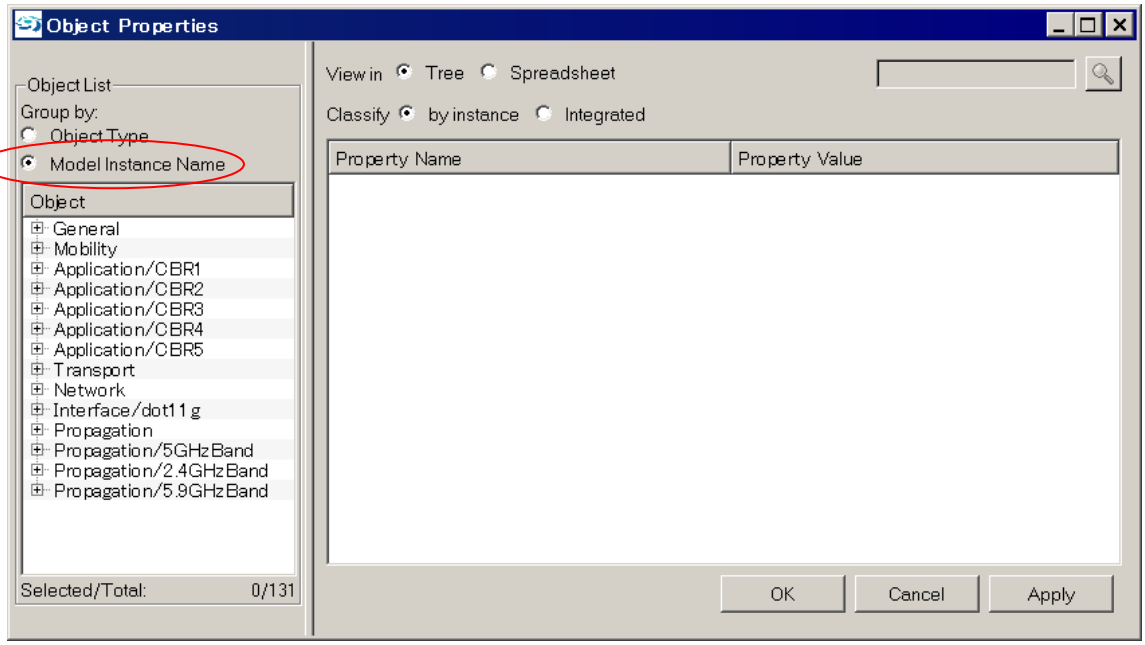
5) To change the destination of an application, use "Select Object" dialog box. Click the box for the Destination property of an application to show  button, then click the button to show "Select Object" dialog box. Then a list of communication objects appears. Select one of the communication objects and click OK.





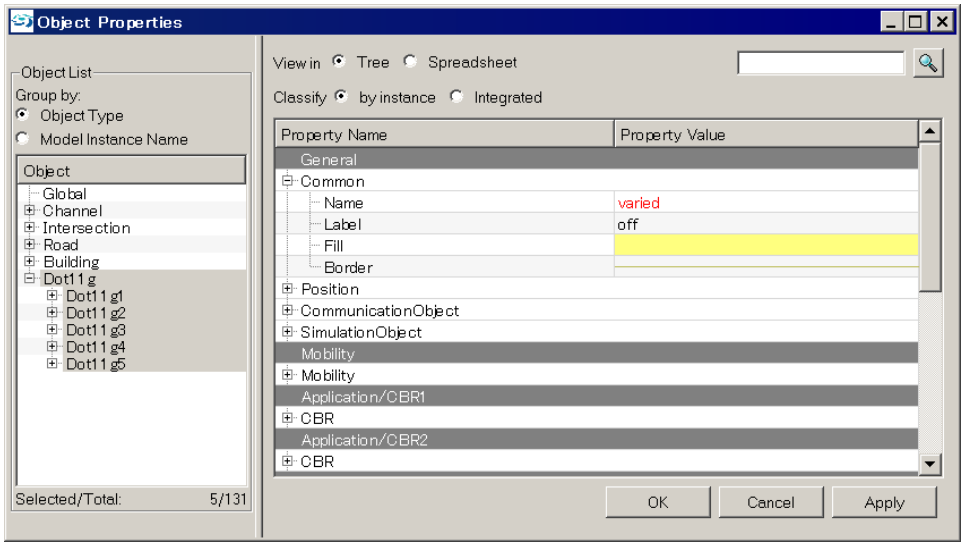
In this example, "Any Object", which corresponds to broadcast, is selected. If "Any Object" is selected, '*' is displayed in the property value box.

Items in the object list are grouped by object type or model instance name. You can toggle these grouping modes with radio buttons at the left top of the dialog box.

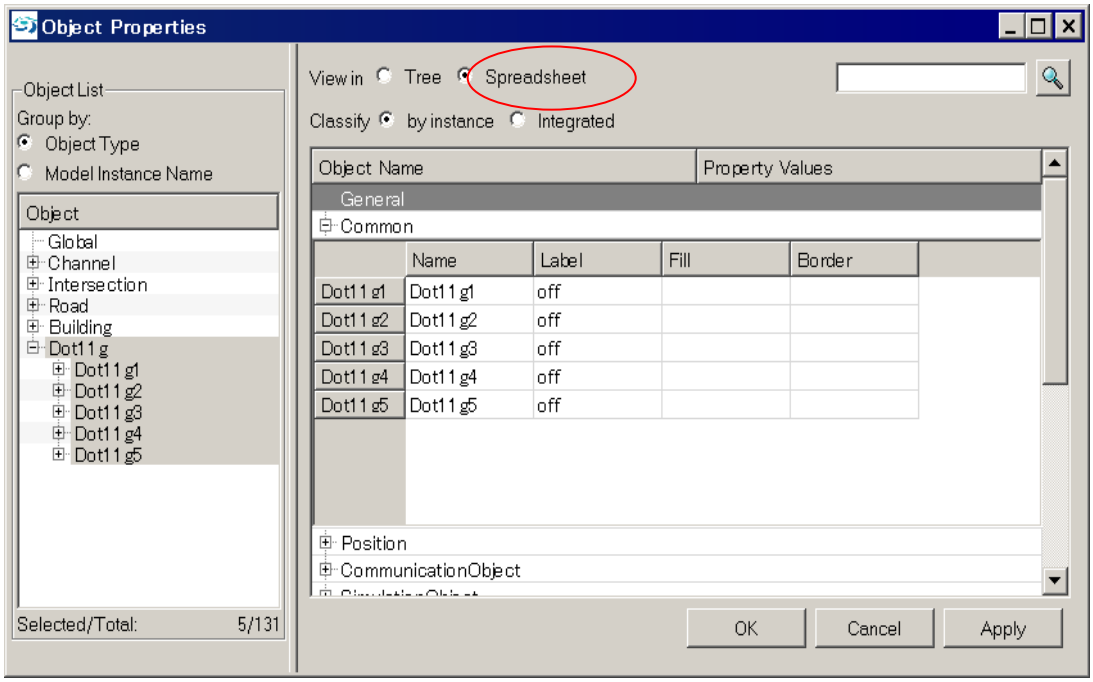


5.2. View in spreadsheet

The default view in the Object Properties dialog box is Tree View. You can also use Spreadsheet View. In the Spreadsheet View, you can confirm and edit all properties of multiple objects all together.



Tree View (Default)



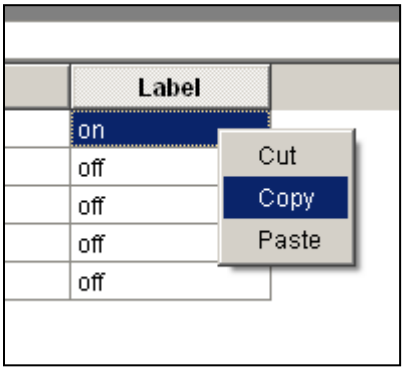
Spreadsheet View

In the Spreadsheet View, you can edit properties with cut, copy, and paste operation of cell(s) like in MS Excel.

You can change values in multiple cells into the same value easily as described below.

Let assume you want to change "off" in the multiple cells in the figure below into "on".

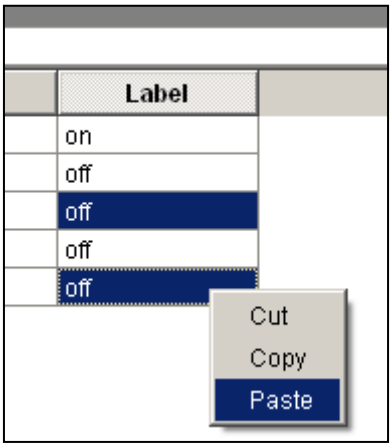
1) Right-click on a cell whose value is "on" and choose "Copy" from the pop-up menu.

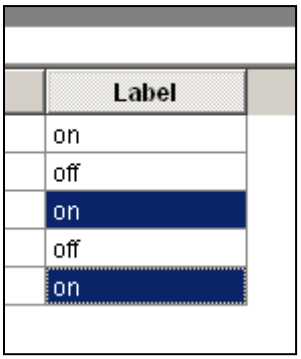


You can use the following shortcuts.

Cut	Ctrl + x
Copy	Ctrl + c
Paste	Ctrl + v

2) Click multiple cells you want to change the value into "off" and right-click. Then choose "Paste" from the pop-up menu.

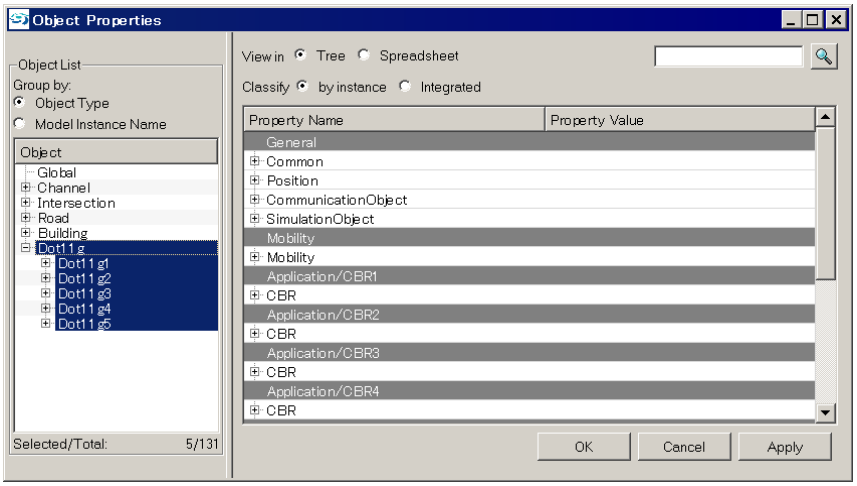




The values in the selected cells change to ″on″.

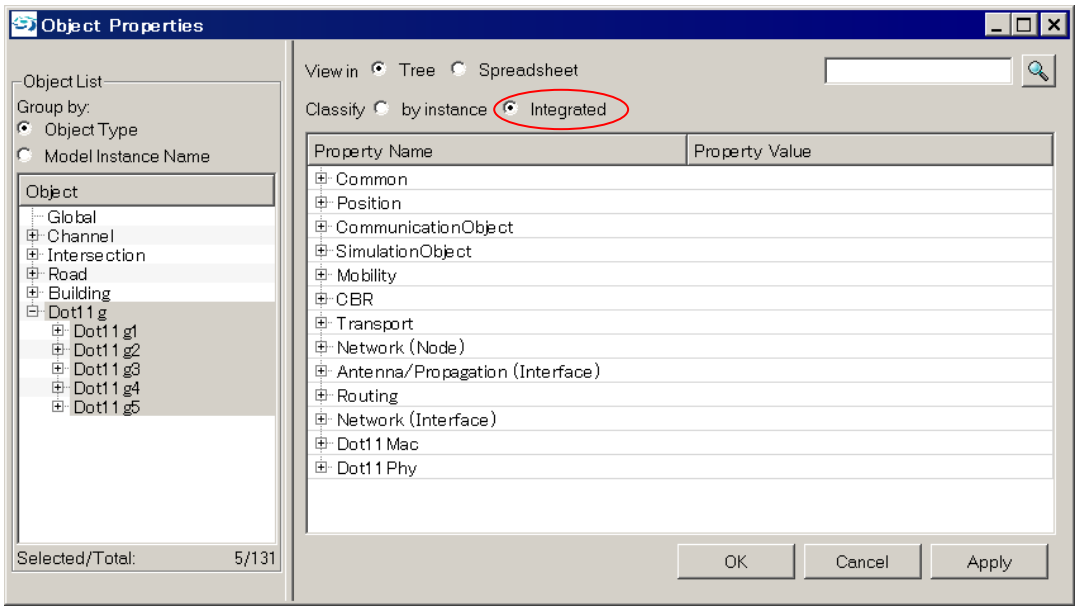
5.3. Confirming and editing multiple instances all together

Properties of objects are classified by instance in the default setting of the Object Properties dialog box. If you want to edit the properties of multiple model instances all together, change the setting of "Classify" in the Object Properties dialog box to "Integrated". This mode is useful for giving the same property value to multiple model instances of application. If a communication object has multiple model instances of applications, say two different CBR applications that have different destination nodes, you can give the same property value to them in this mode.



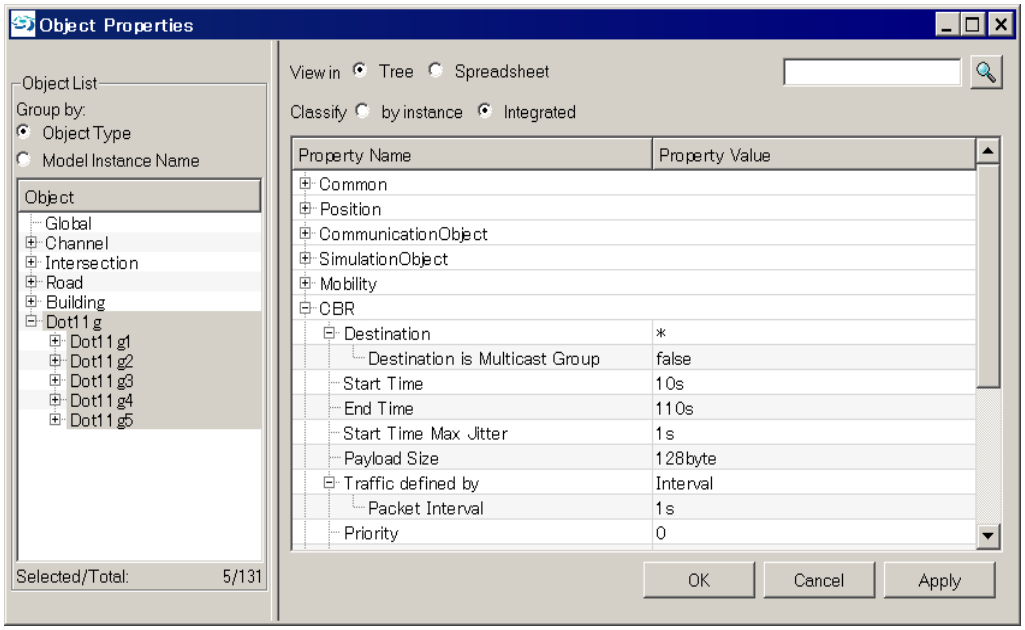
Classify is "by instance" (Default) – Multiple model instances of CBR on the same communication object are displayed on different lines.

Click "Integrated" of "Classify" at the top center of the dialog box to confirm and edit multiple instances all together.



Classify is "Integrated" - Multiple model instances of CBR are integrated in this mode.

In case Classify is "Integrated," you can change property value, such as End Time, of multiple CBR model instances all together.



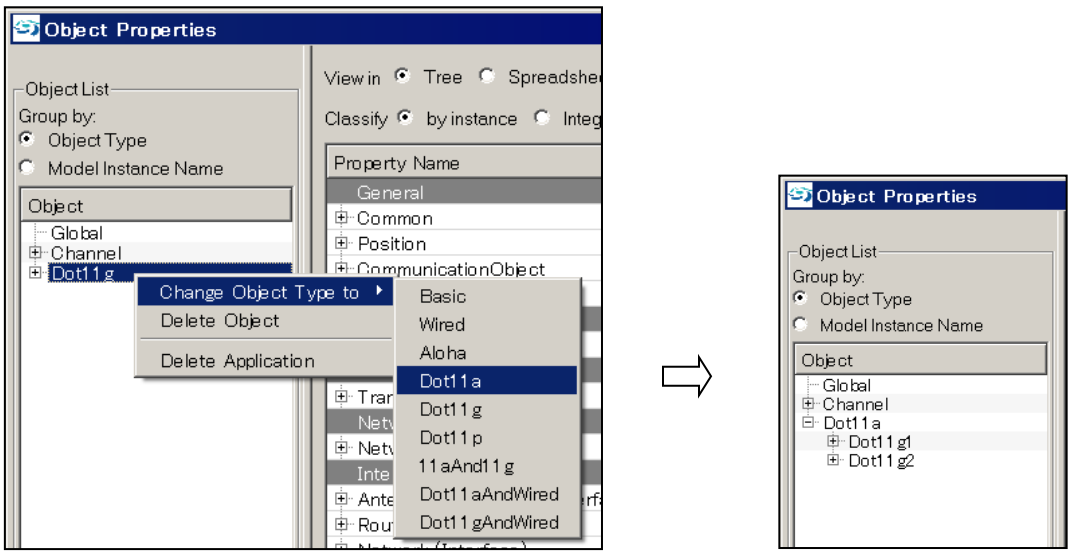
5.4. Editing objects in the Object Properties dialog box

You can change the type of objects and remove objects, applications, etc. with the Object Properties dialog box. Note that you cannot remove the Global object and the Channel objects.

5.4.1. Changing object type

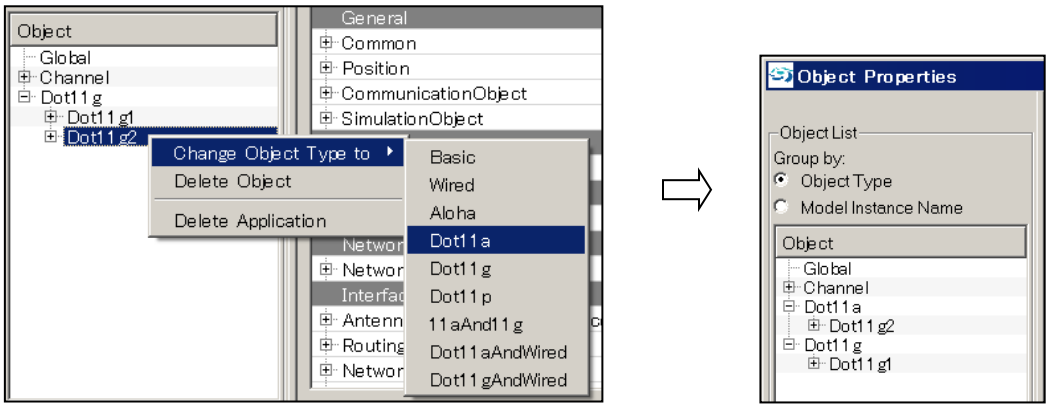
To change the object type of objects, select object(s) and use right-click menu. If you change the type of an object from Dot11g to Dot11a, follow the instructions below.

1) Right-click "Dot11g" and choose "Change Object Type to" from the pop-up menu.
2) Choose the new object type "Dot11a". Then the type of all objects of "Dot11g" is changed into "Dot11a".



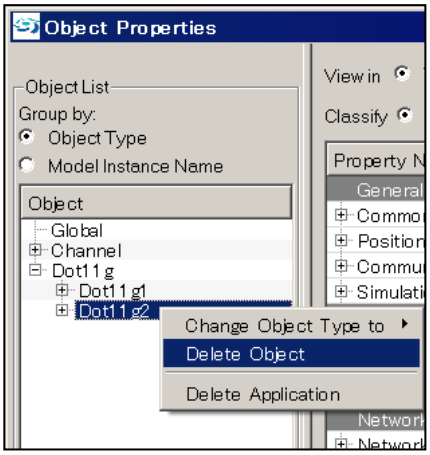
Note) Even the object type of objects is changed, the name of objects are not changed.

If you do the same operation after selecting an object not selecting the type of objects, the type of the selected object is changed.



5.4.2. Deleting objects

To delete object(s), use right-click menu command after selecting object(s).



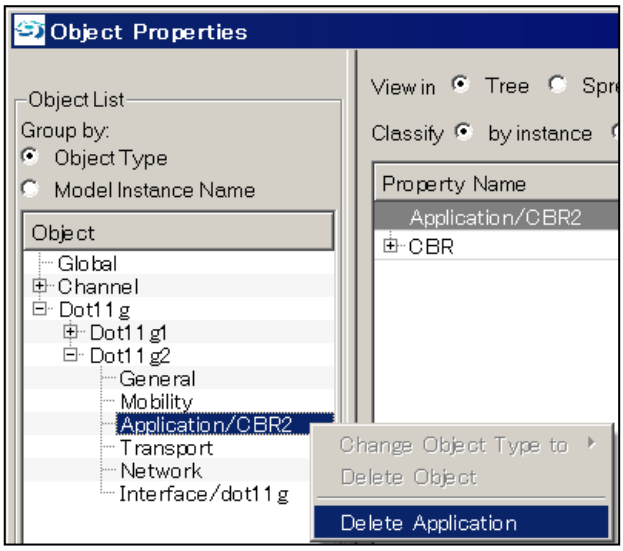
For example, if you delete an object "Dot11g2" in the figure below, follow the instructions below.

1) Select the object "Dot11g2" in the object list.
2) Right-click on the object name and choose "Delete Object" from the pop-up menu.

5.4.3. Deleting applications

To delete applications from communication objects, select object type(s), object(s), or application(s), and choose right-click menu "Delete Application". If you have selected object type(s), all applications that are assigned to the objects included in the selected object type(s) will be deleted. If you have selected object(s), all applications assigned to the object(s) will be deleted. If you have selected applications, only the selected applications will be deleted.

Example: Deleting an application CBR on an object "Dot11g2".



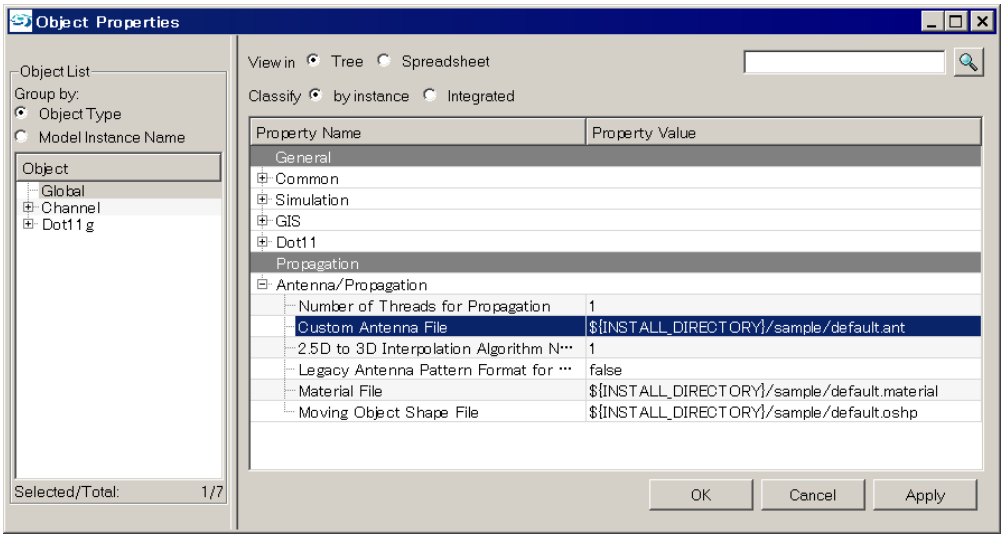
1) Select the object named "Dot11g2" from the Object List. If the model instances of the object are not listed displayed in the Object List, double chick on the name of the object.
2) Right-click on "Application/CBR2". Note that "Application/CBR2" is the name of the model instance of a CBR application.
3) Choose "Delete Application" from the pop-up menu.

5.5. Configuring antenna models

Scenargie can utilize antenna models given by an antenna file. To specify an antenna file in Visual Lab, use the Object Properties dialog box as follows. For the details of the format of antenna files, refer to "Scenargie Base Simulator User Guide."

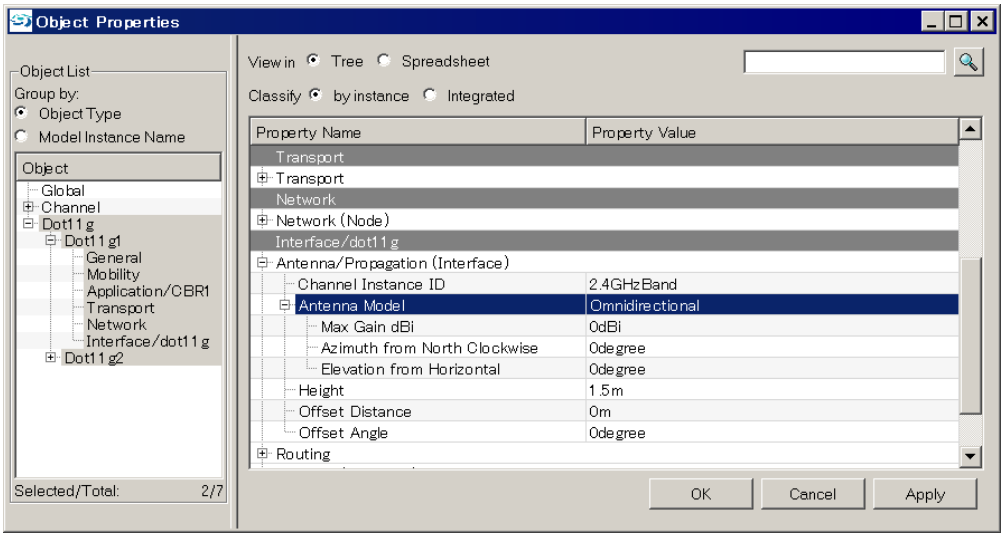
1) Specifying an antenna file

Select "Global" from the Object List. Then edit "Custom Antenna File" property of "Antenna/Propagation" component to specify an antenna file.

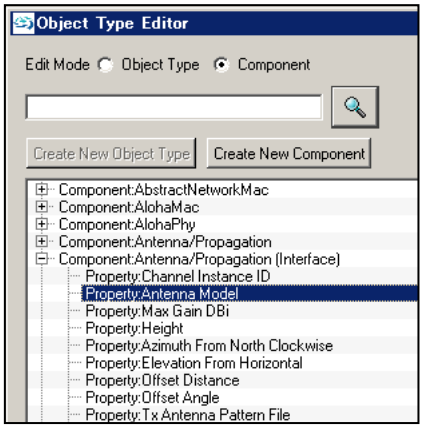


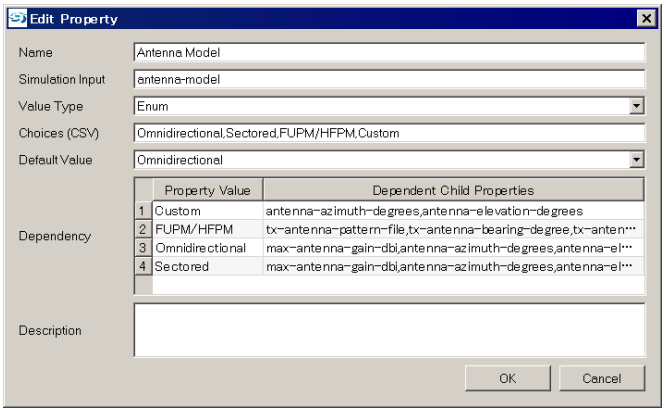
2) Specifying an antenna model

To specify an antenna model used by each radio interface, edit "Antenna Model" property of "Antenna/Propagation (Interface)" property of a communication object. The default value of "Antenna Model" is "Omnidirectional".



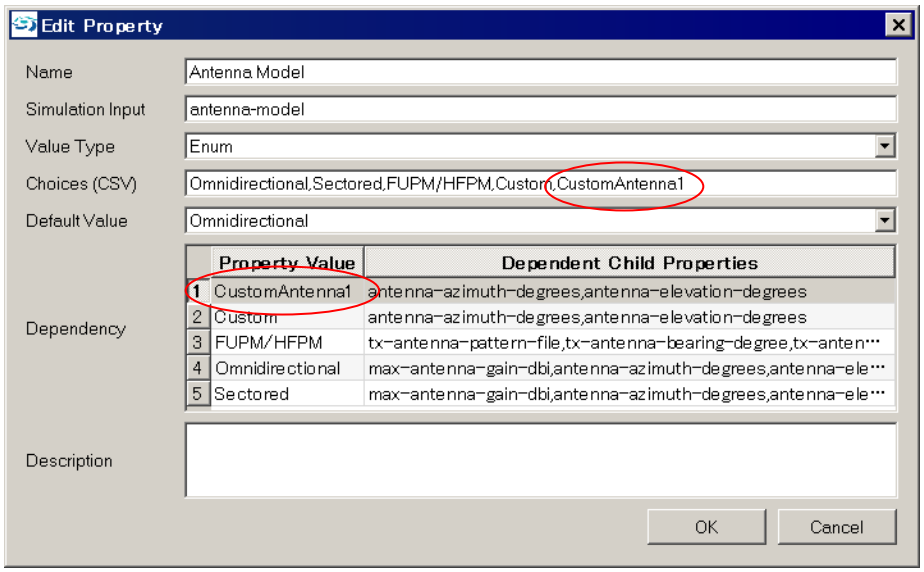
To add a new antenna model, use the Object Type Editor. You can find "Antenna Model" property in "Component: Antenna/Propagation (Interface)". For the details of the Object Type Editor, refer "Chapter 11. Editing Object Type."



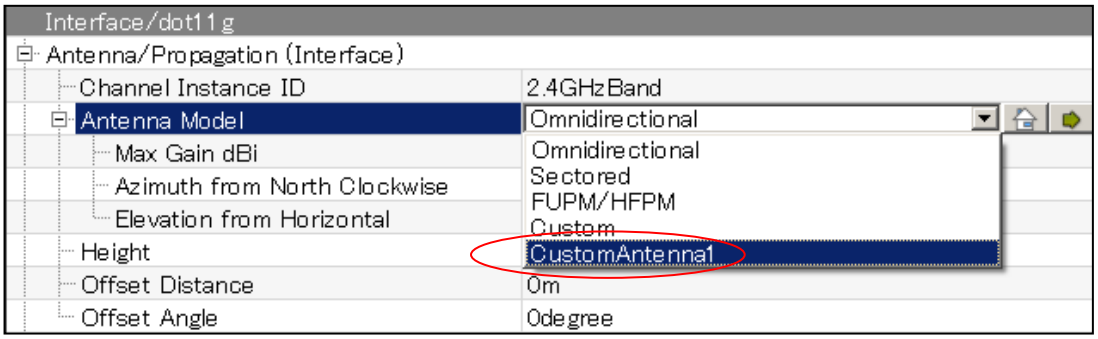


Add a comma to the end of the text value of "Choices (CSV)" Field, and add the name of the new antenna model. The name has to be the same as the name used in the antenna file.

Add a new entry in the Dependency field via right-click menu command "Add Dependency." Then, select the name of the new antenna for the "property value" field of the entry. For the "Dependent Child Properties", select the same value used in the same field of "Custom" entry. Finally click "OK" to register the new antenna model.



After the above operation, the added antenna model is included into the list of antenna models. You can select it in the Object Properties dialog box.

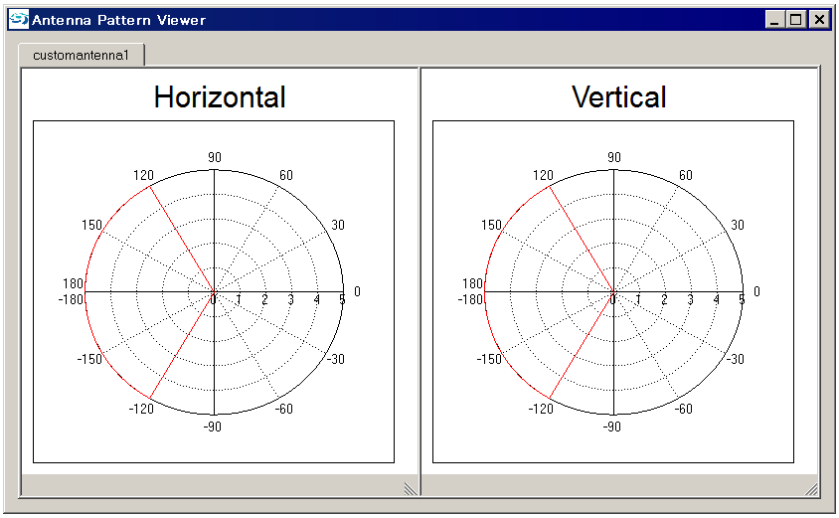


Example of Antenna File

```
# Custom antenna format


# Format type: Scenargie
NAME CustomAntenna1
GAIN 8.00 dBi
HORIZONTAL 360
-179 5.0
-178 5.0
...
179 5.0
180 5.0
VERTICAL 360
-179 5.0
-178 5.0
...
179 5.0
180 5.0
```

You can confirm the created antenna pattern by using the Antenna Pattern Viewer. Choose [Tools]-[File Viewer]-[Antenna Pattern Viewer] to start the Antenna Pattern Viewer.



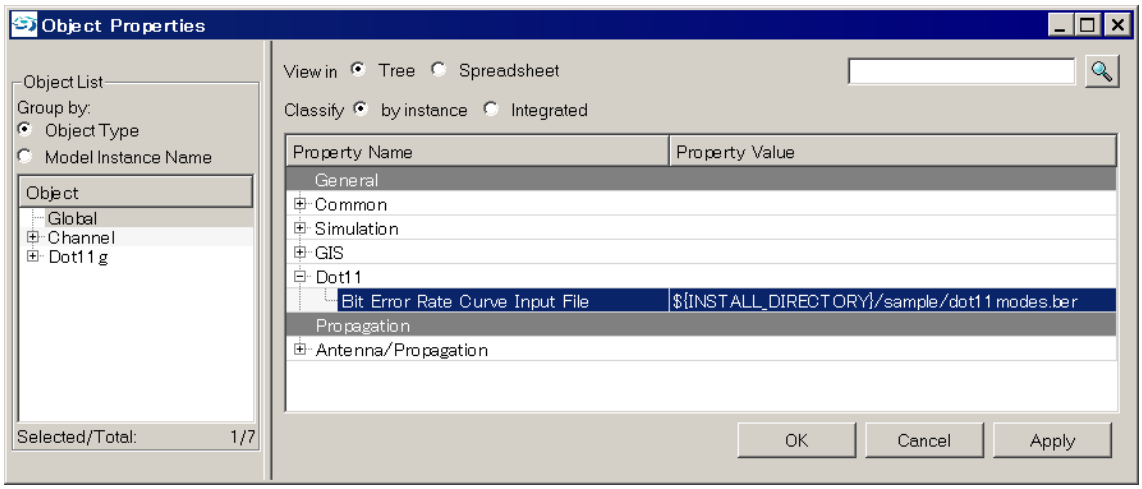
Screenshot of Antenna Pattern Viewer

5.6. Configuring Bit Error Table/Block Error Table

To specify a Bit Error Table or a Block Error Table used in simulations, use the Object Properties dialog box. Scenargie uses Bit Error Tables and Block Error Tables to simulate occurrence of bit errors and block errors. For the details of the format of Bit Error Tables and Block Error Tables, refer to "Scenargie Base Simulator User Guide".

- Specifying Bit Error Table/Block Error Table

  Find a component of the Global object, <Communication System Name (ex. Dot11) >, and select its property "Bit Error Rate Curve Input File" or "Block Error Rate Curve Input File." Then, write the name of a Bit Error Table File or a Block Error Table File as the property value. Whether a Bit Error Table File or a Block Error Table File should be specified depends on the type of a communication system



You can find sample Bit Error Tables in visuallab/sample directory of extension modules or sample scenario directories. The file name formats of Bit Error Table Files and Block Error Table files are <Communication System Name>.ber and <Communication System Name>.bler respectively.

Example) dot11modes.ber, ltemodes.bler

For the details of Bit Error Tables and Block Error Tables, refer to the User Guides of the extension module you use.

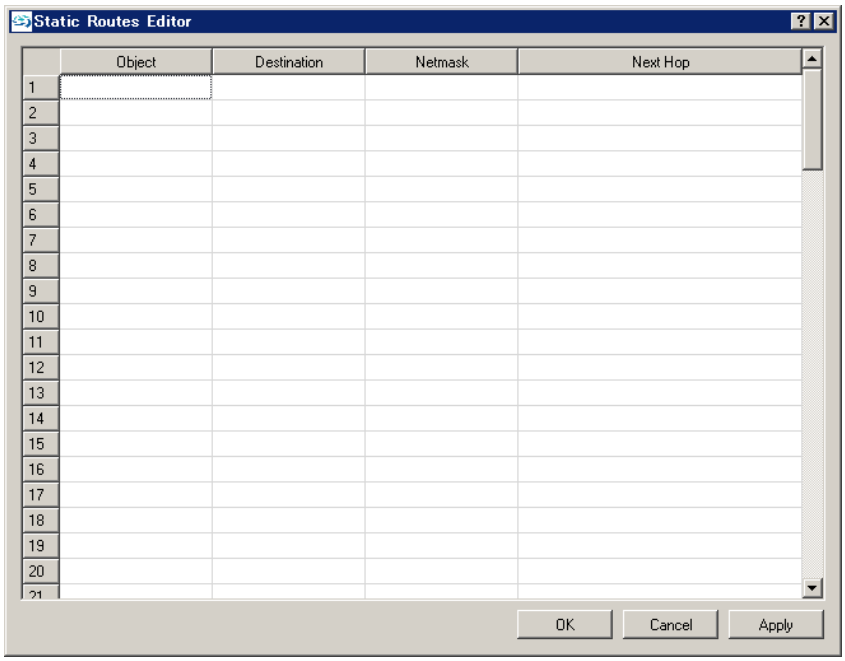
You can show the graph of the configured Bit Error Table/Block Error Table with the BER/BLER Curve Viewer that is started by choosing [Tools]-[File Viewer]-[BER/BLER Curve Viewer].

6. Confirming and Editing Static Routes

You can confirm and edit a static routing configuration file on Visual Lab.

6.1. Operation overview

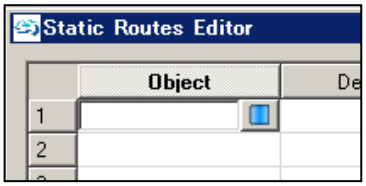
Choose [Tools]-[Static Routes Editor...] to start Static Routes Editor.



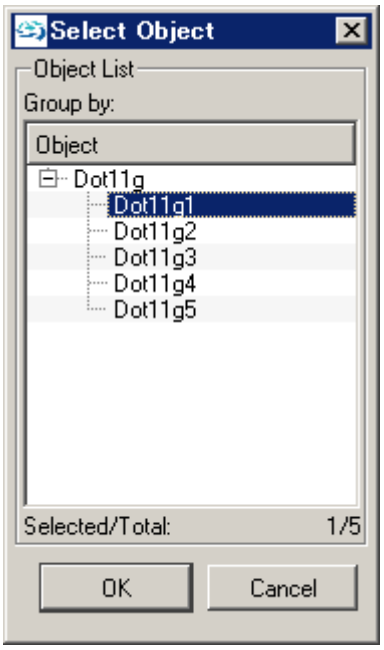
Each line of the window of the Static Routes Editor has an entry of a static route from a communication object. It has four fields, Object, Destination, Netmask, and Next Hop.

Object: Node ID of a Communication Object

You can edit the value in this field by double-clicking on the field. Then, a blue button  appears in the field.



Click the button to show the list of communication objects. By selecting a communication object from the list and click "OK".



The selected communication object appears in the field. It is shown like "<Node ID> (<Communication Object name>), " while only the node ID is written in the static routing configuration file.

(Note: Node ID is a unique number assigned to each Communication Object and GIS Object in Scenargie.)

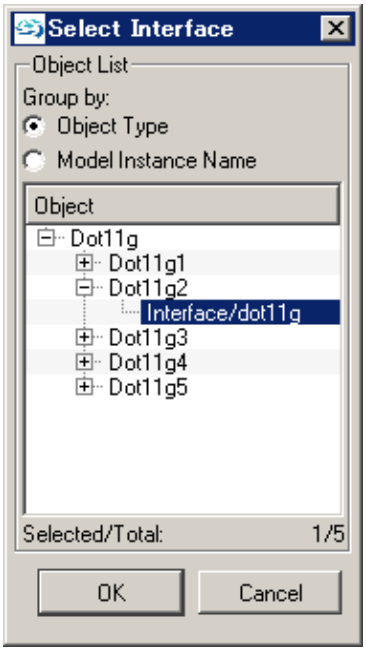
Destination: Destination IP address

Netmask: Netmask

Next Hop:Net hop IP address

You can edit the value in this field by double-clicking on the field.

Then, a blue button  appears. Click the button to show the list of Communication Objects and their interfaces, and select an interface of a communication object from the list.

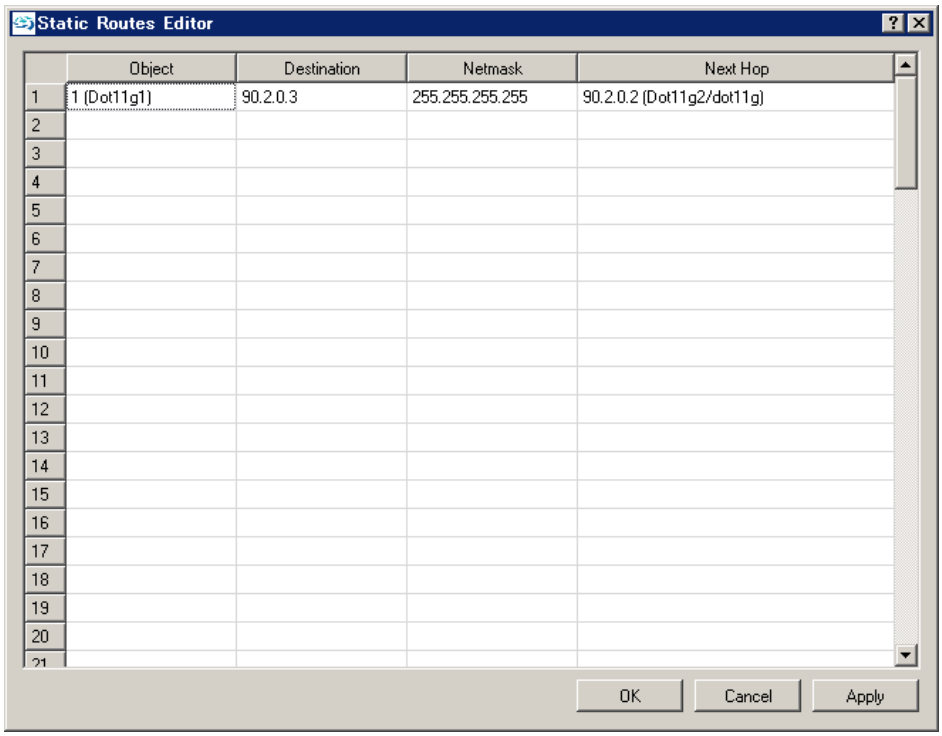


If you select an interface from the list, the IP address of the interface is automatically calculated and displayed as "<IP Address> (<Interface Name>)" in the field.

For example, if the IP address of an object is defined as "90.2.0.0 + $n" and n

which mean node ID is 2, "90.2.0.2" is displayed in the field. Note that only the IP address is written in the static routing table configuration file.

Click "OK" to close the Static Routes Editor.



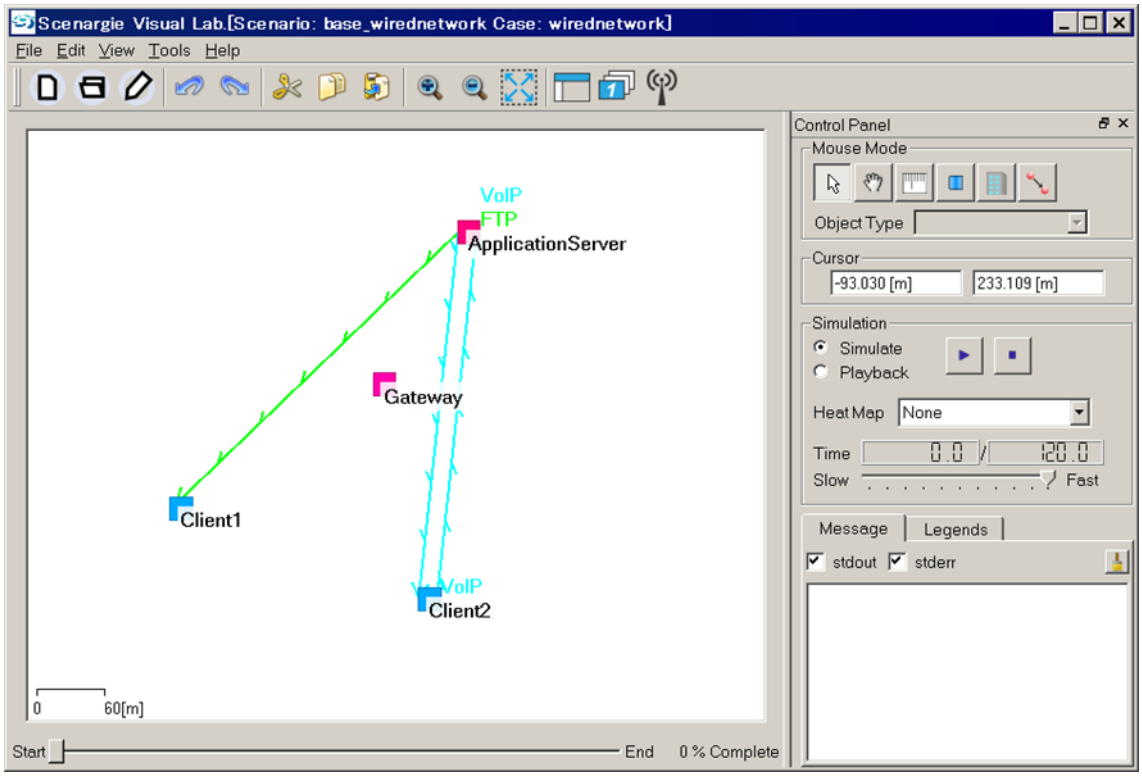
6.2. Example: creating a scenario with static routes

This section describes an example procedure of creating a scenario with static routes. In this scenario, a static routing table gives routes between computers in different networks. This scenario is included in the sample scenario set of the Base Simulator.

Communication objects included in the sample scenario

Application Server x 1
Client x 2
Gateway x 1

1) Placing communication objects and adding applications



ApplictionServer and Client displayed in the window of this example are Wired objects. They have been renamed after being placed. Gateway is a new object created with the Object Type Editor so that it has two interface/wired interfaces.

After placing the communication objects and editing the names, add applications so that ApplicationServer sends a file to Client1 with FTP and ApplicationServer and Client2 communicate with each other with VoIP.

2) Configuring the network

Configure the property of Interface/wired interface of each node using the Object Properties dialog box ([Tools]-[Object Properties…]). In this example, there are two networks. The first network consists of Interface/wired1 of ApplicationServer and Interface/wired1 of Gateway. The second network consists of Interface/wired1 of Client and Interface/wired2 of Gateway.

ApplicationServer, Client

Object Name	Property Values						
⊞ Routing							
⊟ Network (Interface)							
	Interface Network Address	Network Addre	Subnet Addres	Network Addre	Allow Routing E	Ignore Unregist	Gateway Addre
ApplicationServer	10.0.0.0 + $n	16	false	false	true	false	
Client1	192.168.0.0 + $n	16	false	false	true	false	192.168.0.2
Client2	192.168.0.0 + $n	16	false	false	true	false	192.168.0.2

Gateway

Interface/wired1							
⊞ Routing							
⊟ Network (Interface)							
	Interface Netwc	Network Addre	Subnet Addres	Network Addre	Allow Routing E	Ignore Unregist	Gateway Addre
Gateway	10.0.0.0 + $n	16	false	false	true	false	

Interface/wired2							
⊞ Routing							
⊟ Network (Interface)							
	Interface Netwc	Network Addre	Subnet Addres	Network Addre	Allow Routing E	Ignore Unregist	Gateway Addre
Gateway	192.168.0.0 + $n	16	false	false	true	false	

3) Configuring static routes

Configure the static routing table so that ApplicationServer and Client can communicate with each other via Gateway.

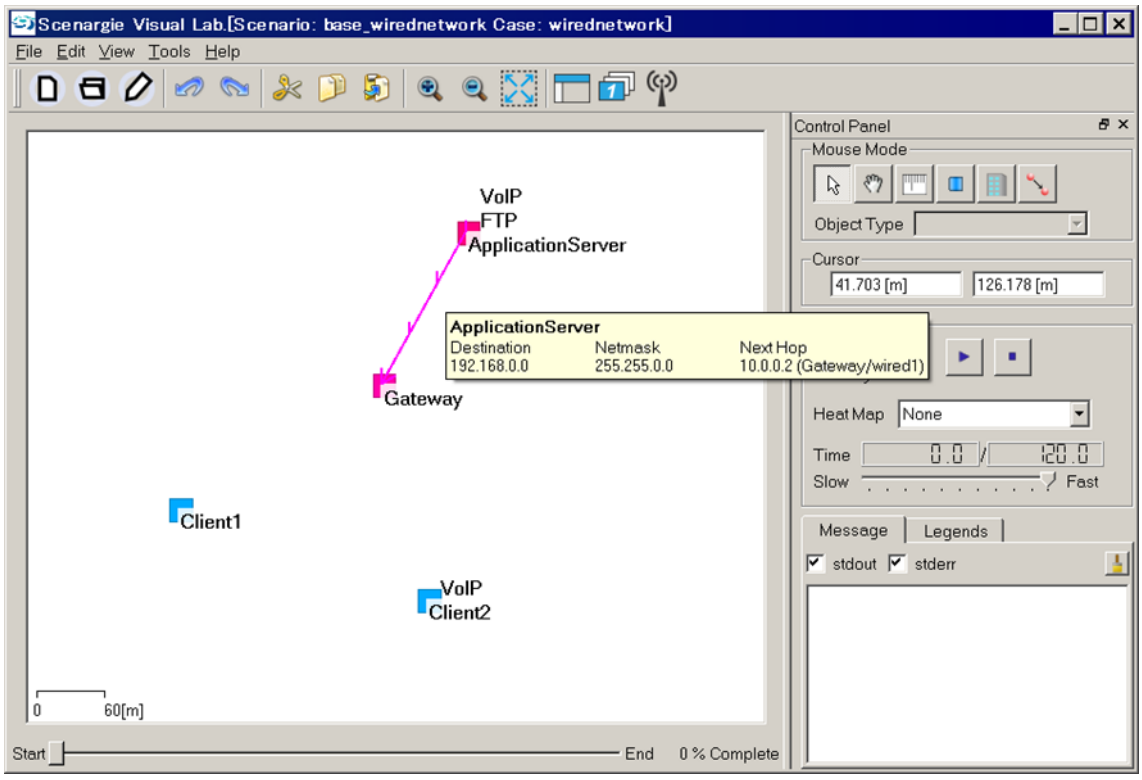
Static Routes Editor

	Object	Destination	Netmask	Next Hop
1	1 (ApplicationServer)	192.168.0.0	255.255.0.0	10.0.0.2 (Gateway/wired1)
2				

OK Cancel Apply

Select ApplicationServer as the value of the Object field, and fill the Destination and the Netmask field to specify the network that the two clients (Client1 and Client2) are connected. Set interface/wired1 of Gateway as the Next Hop field.

Click OK to close the Static Routes Editor. After that you can see the route configuration by placing the mouse pointer on an arrow showing a route.



7. Configuring Multi-Agent Settings

You can edit the following setting files used by Scenargie Multi-Agent Extension Module with Visual Lab.

- Agent profile file
- Agent behavior file
- Vehicle time table file

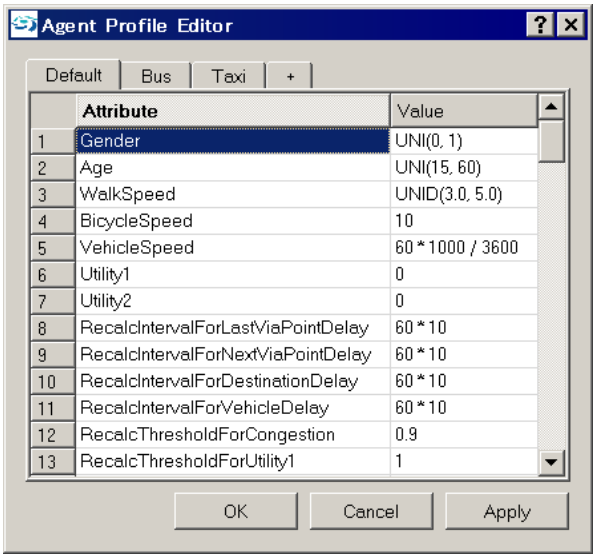
7.1. Configuring agent profiles

Choose [Tools]-[Multi-Agent Settings] to start the Agent Profile Editor.

In the window of the Agent Profile Editor, Profile Types are shown as the names of tabs. You can rename and delete each profile type via right-click menu on the tab. Click "+" tab to add a new Profile Type. "Bus" and "Taxi" are reserved Profile Types.

You can edit a value in each cell by double-click on the cell or pressing F2 key after clicking the cell.

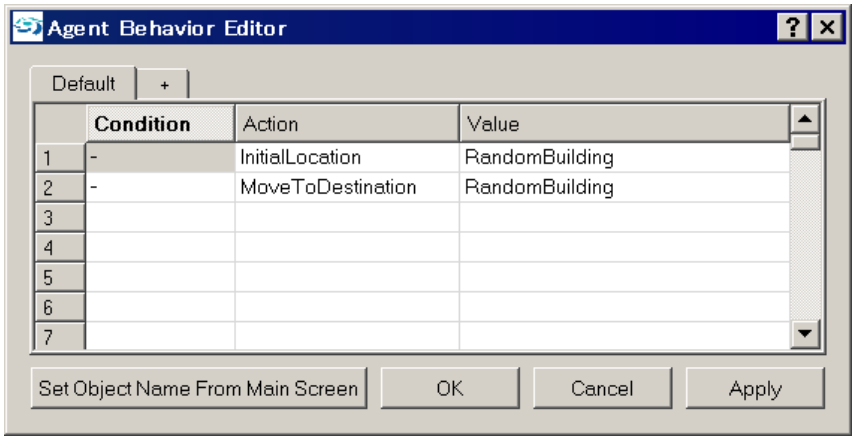
Click "OK" or "Apply" to apply the configuration.



For the details of the attributes of Agent Profiles, refer to “Multi-Agent Extension Module Model Reference”.

7.2. Configuring agent behaviors

Choose [Tools]-[Multi-Agent Settings]-[Agent Behavior Editor...] to start the Agent Behavior Editor.



In the window of the Agent Behavior Editor, Behavior Types are shown as the names of tabs.

An empty cell of "Condition" column means that the line including the cell is continued from the previous line. Only lines that have values in both "Action" and "Value" fields are valid.

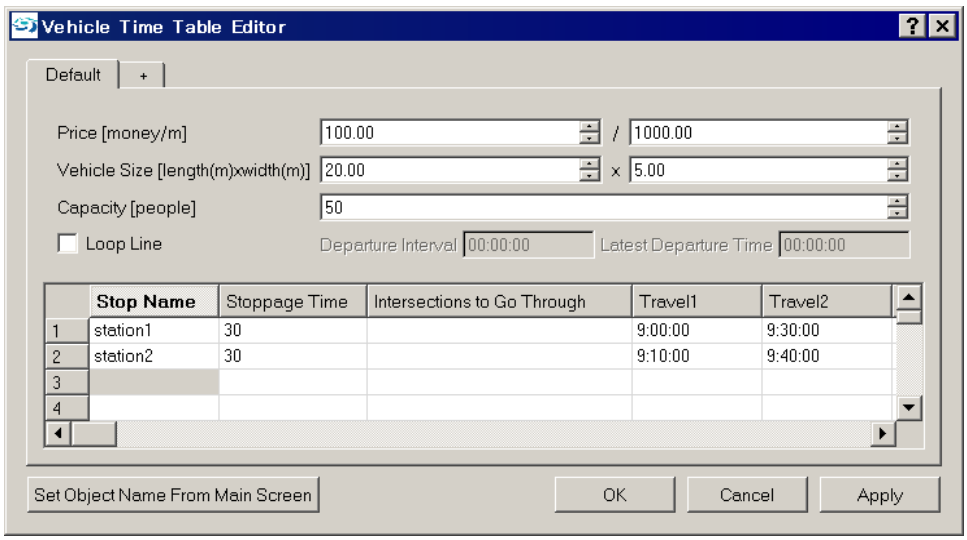
You can edit a value in each cell by double-click on the cell or pressing F2 key after clicking the cell. You can input the name of a Building or an Area Object into a "Value" field by clicking the object on the main map after clicking  button.

Click "OK" or "Apply" button to apply the configuration.

For the details of agent attributes, refer to “Multi-Agent Extension Module Model Reference”.

7.3. Configuring vehicle time tables

Choose [Tools]-[Multi-Agent Settings]-[Vehicle Time Table Editor...] to start the Vehicle Time Table Editor.



In the window of the Vehicle Time Table Editor, the names of routes are shown as the names of tabs.

For the value of a cell of "Stop Name" field, input the label name of a "Station" or a "Bus Stop".

The unit of values in the "Stoppage Time" field is seconds. You cannot use colons for writing the time.

For the value of a cell of "Intersections to Go Through," input the label names of "Intersections".

For the values of "Travel1" and "Travel2" fields, write time lengths in seconds or time with colons.

You can edit a value in each cell by double-click on the cell or pressing F2 key after clicking the cell. You can input the name of a Station or a Bus Stop into a "Stop Name" field by clicking the object on the main map after clicking 

button. You can also input the names of Intersections into an "Intersections to Go Through" field by clicking Intersection objects after clicking 

button.

Click "OK" or "Apply" to apply the configuration.

For the details of configuration of Agent Time Table, refer to “Multi-Agent Extension Module Model Reference”.

8. Analyzing RF Propagation

The RF Propagation Analyzer on Visual Lab analyzes the radio wave propagation originating from communication objects in a scenario and shows the results with heat map, ray paths, etc.

8.1. Selecting a pathloss model

To select a pathloss model used in each radio communication channel, use the Object Properties dialog box ([Tools]-[Object Properties…]) and select a model from a list. Set needed property values according to the selected model.

To use the following models, extension modules are required.

- LTE_Macro requires LTE Module
- LTE_Pico requires LTE Module
- FUPM requires Fast Urban Propagation Module
- HFPM requires High Fidelity Propagation Module

8.2. Using RF Propagation Analyzer

1) Starting the RF Propagation Analyzer

You can start the RF Propagation Analyzer by one of the following ways.

- Click [Tools]-[RF Propagation Analyzer...]
- After selecting a communication object, then choose [RF Propagation Analyzer...] from the right-click menu on the main map.
- Click toolbar button  <RF Propagation Analyzer>.

2) Selecting analysis type

Select the analysis type from the dropdown list at the top of the window of the RF Propagation Analyzer.

This version of Scenargie supports the following analysis types.

- Path loss
- RSSI : Received Signal Strength Indicator
- Estimated PER : Estimated Packet Error Ratio
- Interference : Interference Strength
- SIR : Signal-to-Interference Ratio
- SINR : Signal-t-Interference-plus-Noise Ratio

3) Configuring transmitters and receiving points

Specify the transmitters (Tx) and the type of receiving points (Rx).

Select one or more communication objects as transmitters. There are two types of transmitters. One is the source of desired signal (Signal) and another is the source of interference (Interference). Select suitable communication objects for each type according to the type of analysis.

You can choose one of four types as receiving points, "Horizontal Grid", "Vertical Grid", "Line", and "Object".

Horizontal Grid: The horizontal analysis area on the main map is divided into a grid of cells. The center points of each cell are used as receiving points.

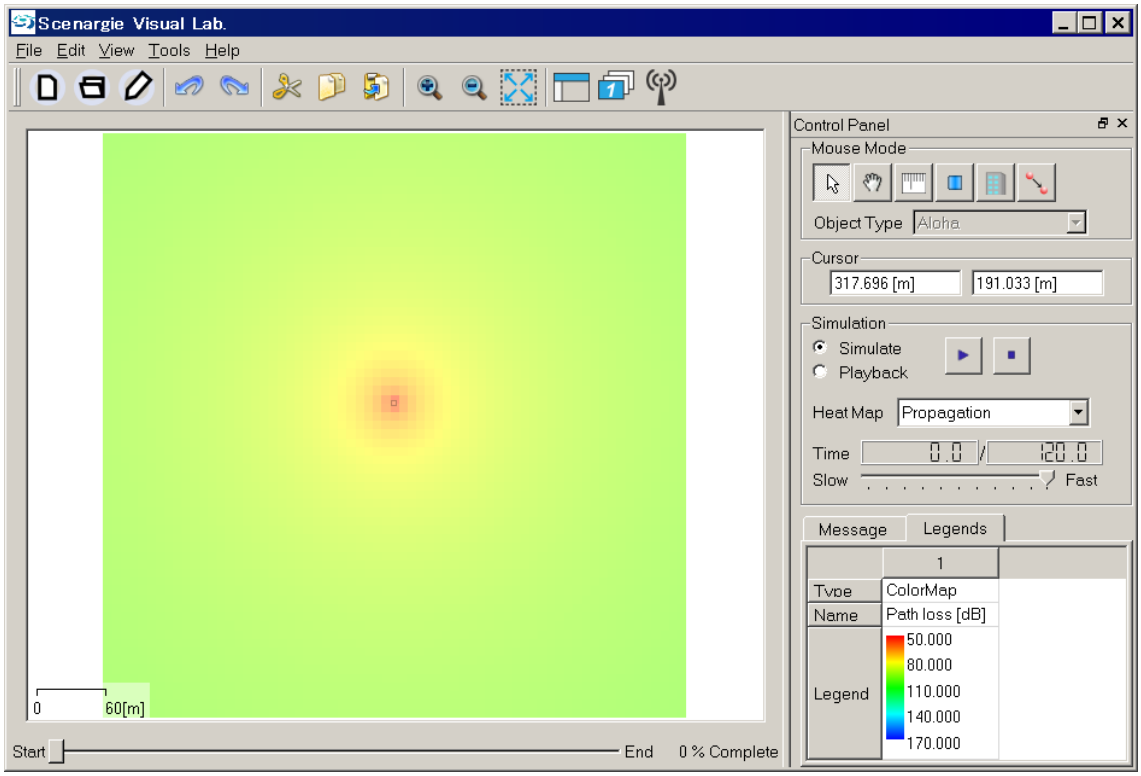
Vertical Grid: A vertical cut plane given by a line connecting two points on the main map is treated as the target area of the analysis. The area is divided into a grid of cells. The enter points of each cell are used as receiving points.

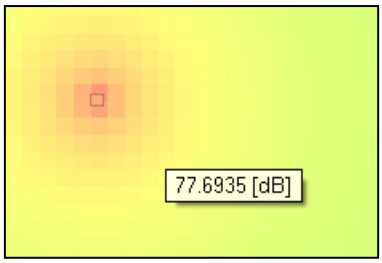
Line: Points on a line connecting two points on the main map are treated as receiving points.

Object: One or more selected communication objects are treated as receiving points. Select communication objects that work as receivers for the receiving points. The configurations of the selected communications are used in the radio wave propagation analysis.

4) Observing the result of the analysis

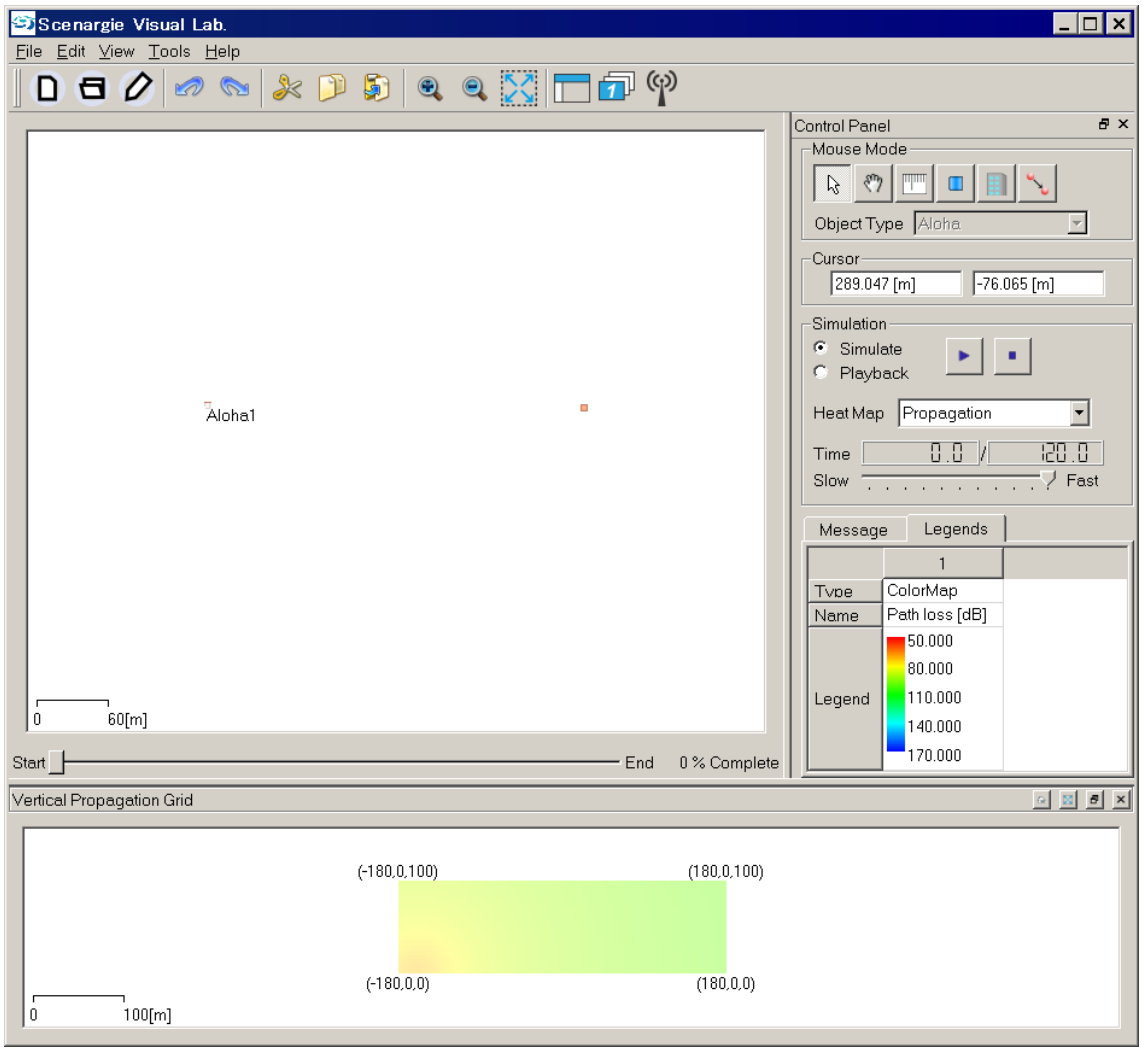
The following pictures show the examples of the results of pass loss analysis in the RF Propagation Analyzer. In this example, the communication object at the center of the main map is used as a transmitter. The type of receiving points is Horizontal Grid.





By clicking a point on the heat map, you can see the calculated value of the clicked point.

If the setting of receiving points is "Vertical Grid", the result is displayed in the Vertical Propagation Grid. The following example shows a result of Pathloss analysis in a case where two communication objects are placed and a vertical plane connecting the positions of the objects is specified as the analysis area. The left communication object named "Aloha1" is specified as a transmitter.



The Vertical Propagation Grid has the following buttons.

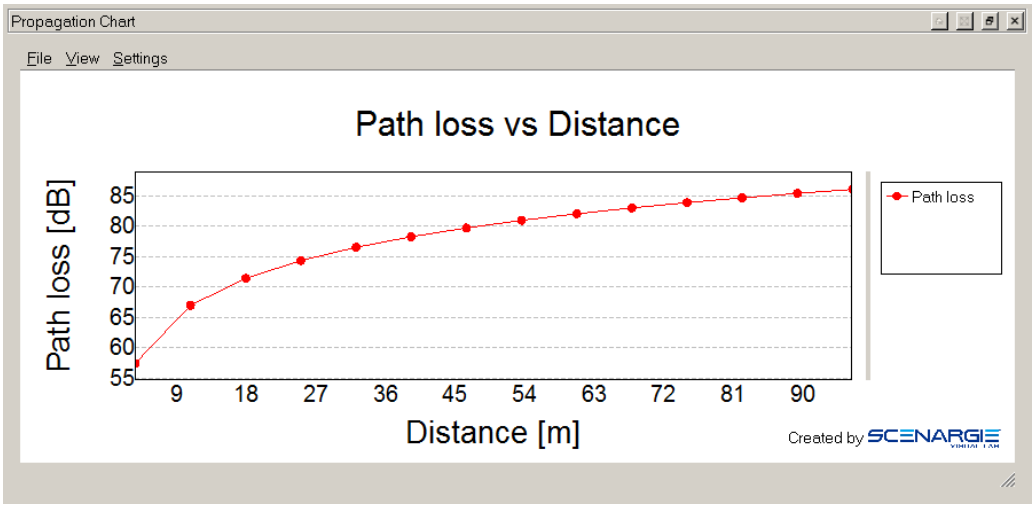
adjusts the zoom-level of the Vertical Propagation Window to the same zoom level of the main map.

adjusts the zoom-level of the Vertical Propagation Window to fit the heat map to the window size.

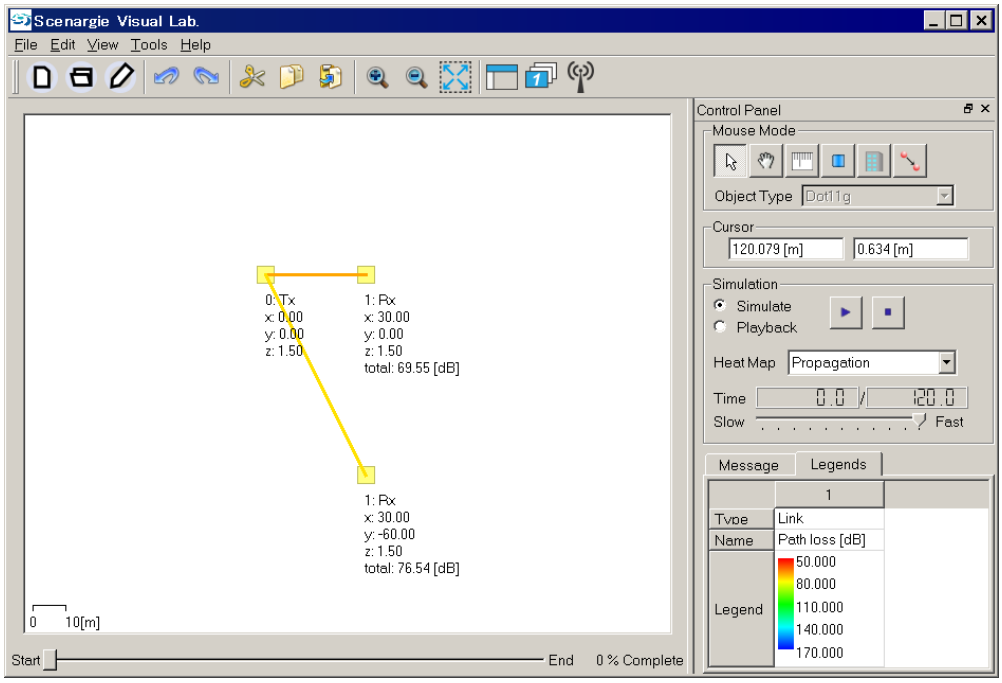
detaches the Vertical Propagation Grid window from the main window.

closes the Vertical Propagation Grid. To show the window again, select "Vertical Grid" from the result list of the RF Propagation Analyzer.

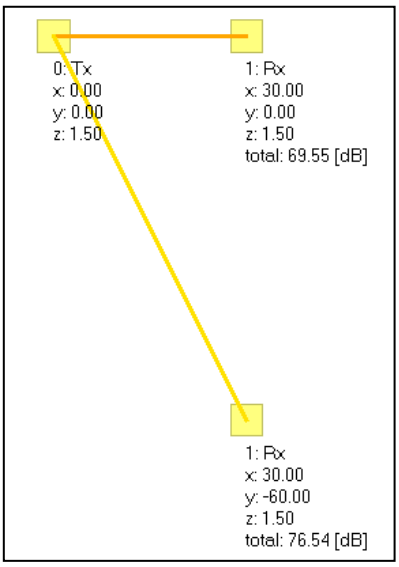
If the setting of receiving points is "Line," the result is displayed in the Propagation Chart window. The following example shows the result of Path loss analysis of a case where one communication object as a transmitter is placed and the path loss at points on a line connecting the transmitter and a point 100 m away.



The following example shows the result of a case where "Object" is selected as the receiving points type. In this example, a communication object at the left side is a transmitter and two communication objects at the light are receivers.



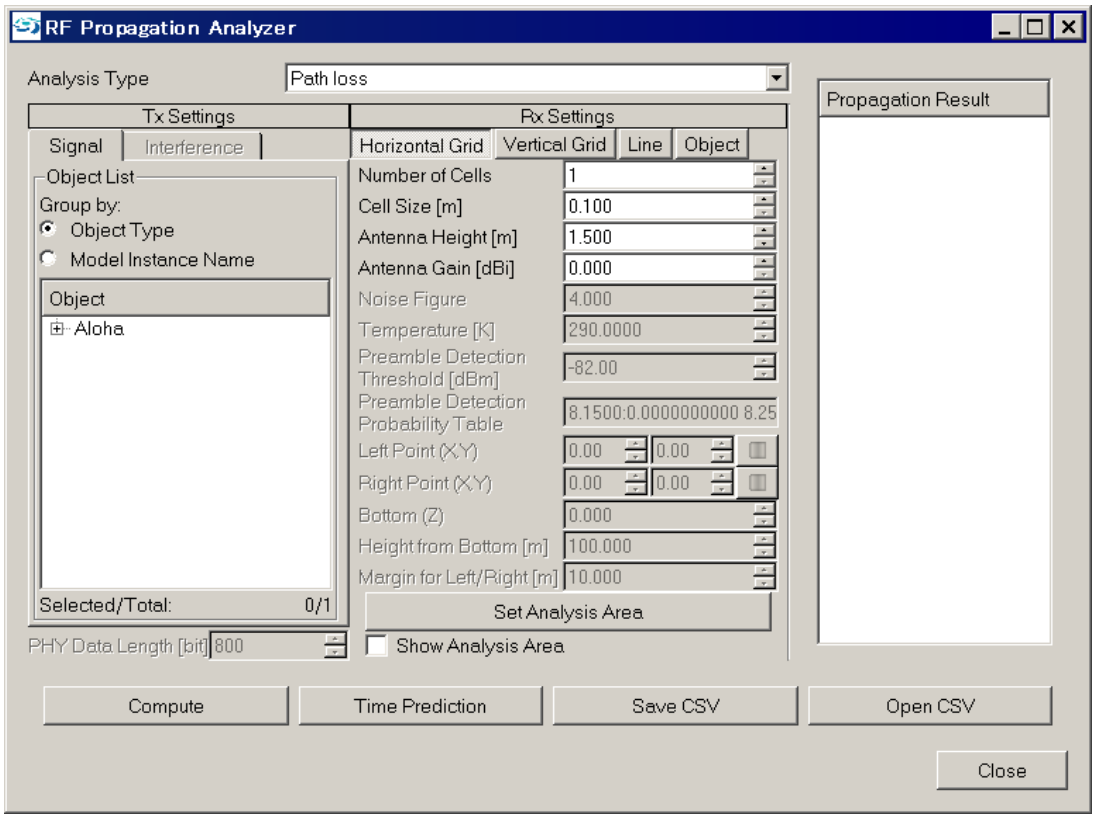
If you click on the propagation path, the information of the transmitters and receivers, points of reflection and diffraction, etc. is hidden. Click the path again to show the information. The content of the information depends on the propagation model.



This is the list of information displayed with each point.

- Sequence number of the point counting from the transmitter; 0 indicates the transmitter
- Type of the point : Tx, Rx, Reflection, or Diffraction
- X-, Y-, and Z-coordinates
- Result of the analysis (Path loss, SINR, etc.)

RF Propagation Analyzer



Analysis Type : Select one of analysis type from the list in this field.

Tx Settings

Object (in Signal/Interference tab)

Select communication objects that work as transmitters from the list in this field.

When analyzing Interference, SIR, or SINR, select communication objects in the Interference tab as well as in the Signal tab. Communication objects selected in the Interference tab are treated as the source of interference.

If the Analysis Type is "Estimated PER", configure the followings items as well.

PHY Data Length (in bits)

Rx Settings:

Horizontal Grid/Vertical Grid/Line/Object

Select a type of receiving points setting from Horizontal Grid, Vertical Grid, Line, and Object.

If the type of receiving points setting is "Horizontal Grid", configure the following items.

Number of Cells : The number of cells in the analysis area

Cell Size : The length of the side of each square cell in meters

Antenna Height : The height of the receivers' antennas in meters

Antenna Gain : The gain of receivers' antennas in dBi

Noise Figure : Nose figure

Temperature : The temperature of the thermal noise source in K

If the type of receiving points setting is "Vertical Grid", configure the following items.

Number of Cells : The number of cells in the analysis area

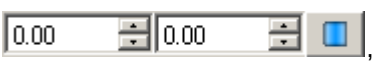
Cell Size : The length of the side of each square cell in meters

Antenna Gain : The gain of receivers' antennas in dBi

Noise Figure : Noise figure

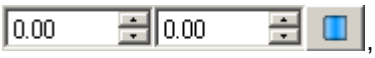
Temperature : The temperature of the thermal noise source in K

Left Point : The X- and Y-coordinates of the left edge of the analysis area

Input values in meters into the fields, 

, or click  and select a communication object to input the coordinates of the object to the fields.

Right Point : The X- and Y-coordinates of the right edge of the analysis area

Input values in meters into the fields,  , or click  and select a communication object to input the coordinates of the object to the fields.

Bottom : The height of the base of the analysis area in meters

Height from Bottom : The height of the analysis area in meters from the base of the area

Margin for Left/Right : The size of the margins at the left/right of the analysis area in meters

If the type of receiving points setting is "Line", configure the following items.

Number of Cells : The number of cells in the analysis area

Cell Size : The length of the side of each square cell in meters

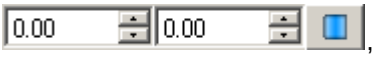
Antenna Height : The height of the receivers' antennas in meters

Antenna Gain : The gain of receivers' antennas in dBi

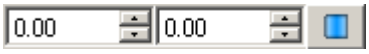
Noise Figure : Noise figure

Temperature : The temperature of the thermal noise source in K

Left Point : The X- and Y-coordinates of the left edge of the analysis area

Input values in meters into the fields,  , or click  and select a communication object to input the coordinates of the object to the fields.

Right Poin : The X- and Y-coordinates of the right edge of the analysis area

Input values in meters into the fields,  , or click  and select a communication object to input the coordinates of the object to the fields.

If the Analysis Type is "Estimated PER", configure the followings items as well.

Preamble Detection Threshold [dBm] :

Threshold of the received signal strength to detect the preamble of frames in dBm

Preamble Detection Probability Table :

Table data including the possibility to detect preamble of each frame

Set Analysis Area

Click this button to configure the analysis area. If you click the button, "Set Analysis Area" dialog box appears. There are three ways to configure the analysis area.

1) Selecting a rectangle with the mouse

With the Select Analysis Area dialog box open, select the mouse mode "Selection" and drag the mouse on the main screen to draw a rectangle. The rectangle is drawn in red

and it is set to the analysis area.

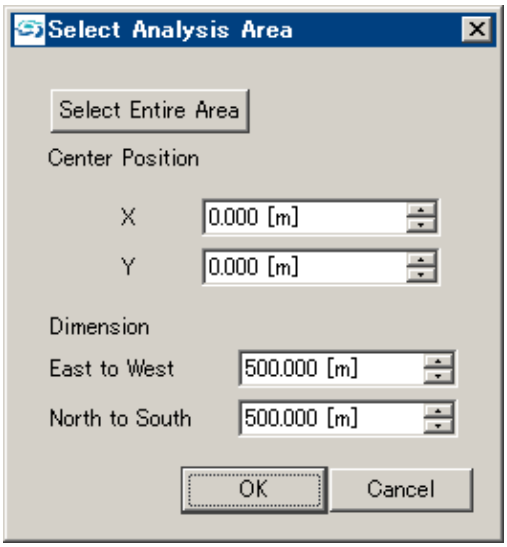
2) Entire area

Click 

button to select the entire area on the main map as the analysis area.

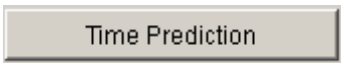
3) Setting the coordinates of the center and size of the area

Input the X- and Y-coordinates of the center of the analysis area, and its width (East to West) and height (North to South).



Show Analysis Area ： Check this box to show the border of the analysis area.

starts the computation.



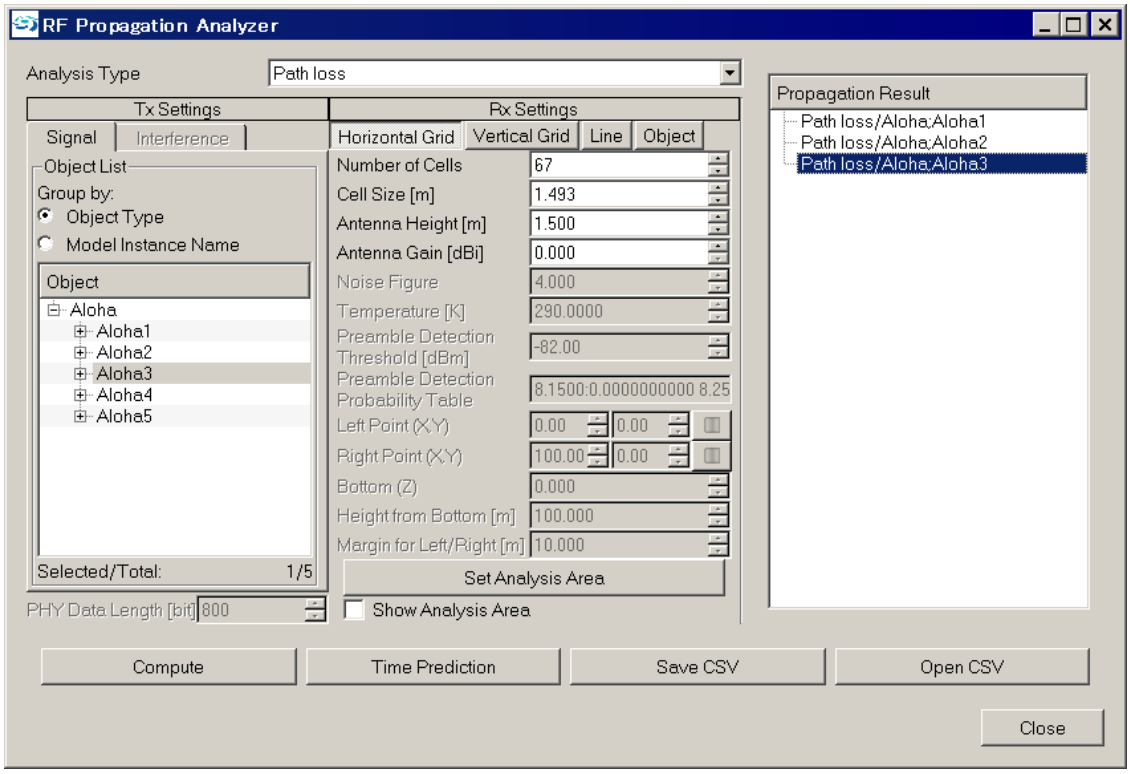
shows the expected time needed to finish the analysis.

saves result of the analysis to a CSV file.

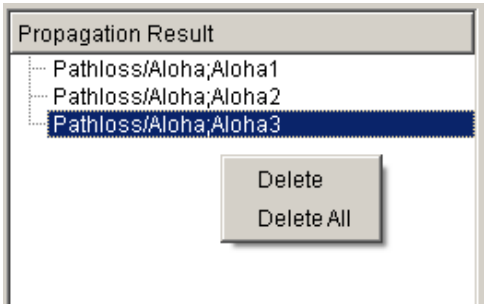
reads and shows the result of RF propagation analysis in a CSV file.

Propagation Result

The results of all runs of RF propagation analysis are stored in the system. They are listed in the Propagation Result at the right of the window. The result selected from the list is shown on the window.



You can delete items listed in the Propagation Result via right-click menu commands, Delete or Delete All.



If you click on the blank area in the Propagation Result, no item is selected and the heat map on the main windows is hidden.

Note:

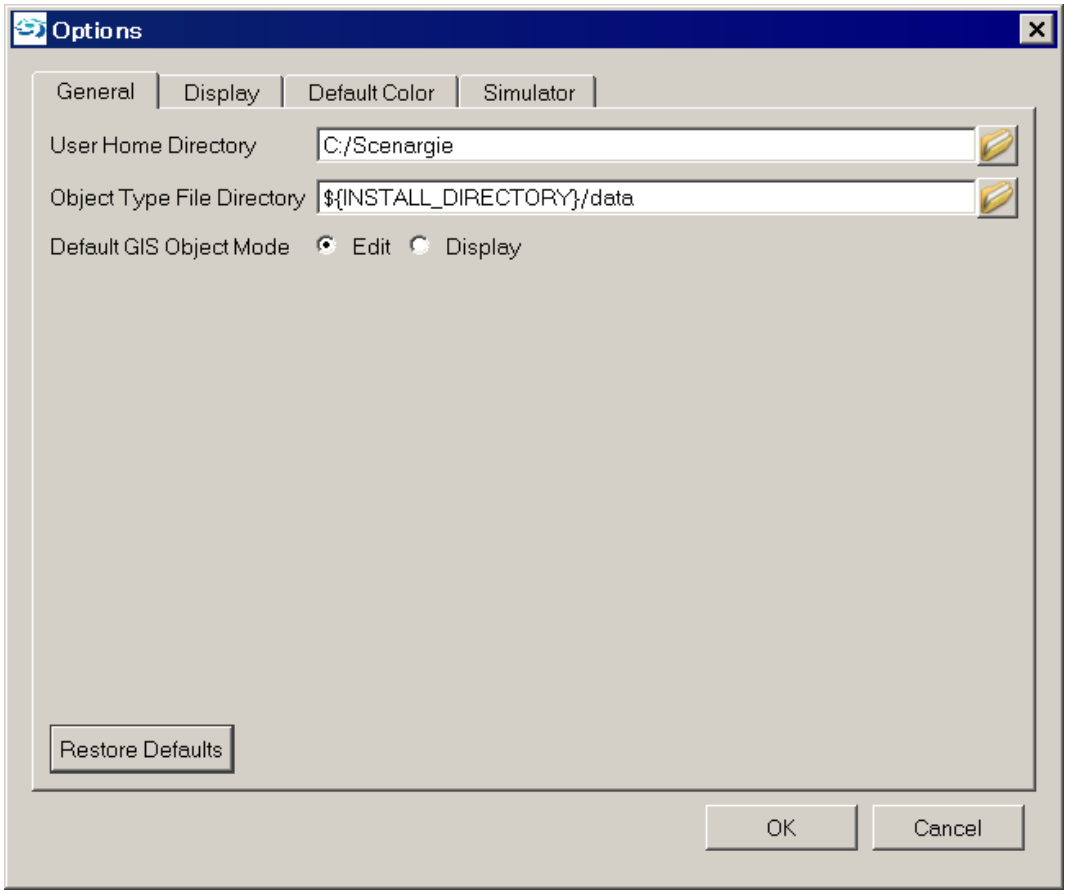
If communication object(s) that have the Dot11Phy component are used as transmitter(s), the RF Propagation analyzer treats the transmission power as written below.

When the setting of "Tx Power Specified By" is "PhyLayer" (This is the default setting of communication	The value specified by "Tx Power" is used.

objects that have the Dot11Phy component except Wave and GeoNet.)	
When the setting of "Tx Power Specified By" is "UpperLayer." (This is the default setting of Wave and GeoNet.)	The value specified by "Default Tx Power When Not Specified" is used.

9. Options

To configure options of Visual Lab, choose [Tools]-[Options...].



General

You can configure general system settings of Visual Lab.

- User Home Directory ： Path to the home directory of Visual Lab.
  Visual Lab firstly uses this directory for opening/saving files.
- Object Type File Directory ： Path to the directory containing object type files
- Default GIS Object Mode ： Default GIS object mode: Choose Edit or Display.
- Restore Defaults ： Click this button to restore the default settings of the options in this tab.

Display

You can configure display settings in this tab.

- Display Update Interval [Sec.] ： Display update interval in seconds.
- Time View ： Style of displaying simulation time
- Grid Interval [m] ： Interval of grid lines in meters

- Label Fonts : Fonts used for showing object names
- Application Labe : shows/hides the names of applications attached to communication objects
- Static Routes : show/hides the static routes
- Building Shadow : how/hides the shadows of buildings and controls the directions of the shadows

Default Color

You can configure default colors of communication objects, GIS objects, and graphs.

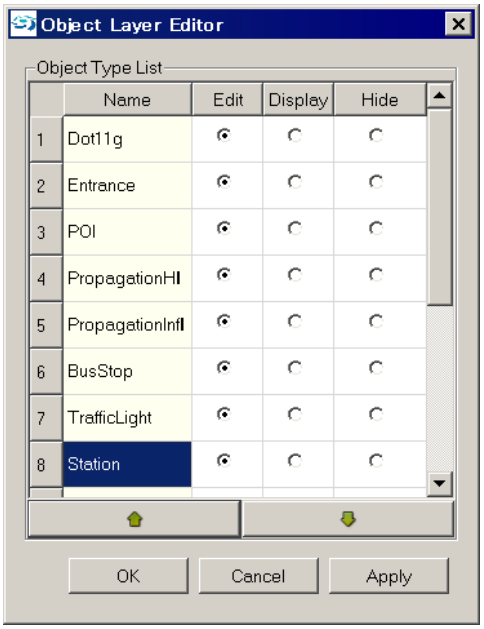
Simulator

- Simulator Port Number 1 : Port number used for communication with the simulator #1
- Simulator Port Number 2 : Port number used for communication with the simulator #2

10. Configuring Layers

The simulation field of Visual Lab consists of multiple transparent layers. Each object (communication object and GIS object) is placed to a layer according to its object type. What you see in the main map is the picture taken from the top of the overlapped layers. You can configure the order of the layers, enable/disable to edit objects on each layer, and toggle the visibility of each layer.

To configure layers, choose [Tools]-[Object Layer Editor...] or <Object Layer Editor> toolbar button. Then Object Layer Editor dialog box appears.



Object Type List : All object types defined in Visual Lab are listed in this section. The order in the list corresponds to the order of display in the main map. Objects in a lower layer could be hidden by objects in an upper layer at the same position.

Name : Name of an object type

Edit/Display/Hide : Disables/enables to edit objects on the layer and toggle the visibility of the layer

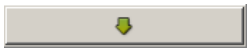
Edit : You can edit objects. You can select, cut, copy, paste, and delete them. If object(s) are selected on the main map, they are shown at front regardless of the position of the layer containing the objects.

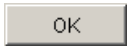
Display : Objects are shown on the main map. You cannot edit the objects.

Hide : Objects are hidden.

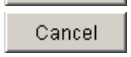
These buttons at the top of the columns are used for changing the mode of all layers to Edit, Display or Hide.


Moves the selected layer to the upper position.


Moves the selected layer to the lower position.



Saves the current change and close the Object Layer Editor.



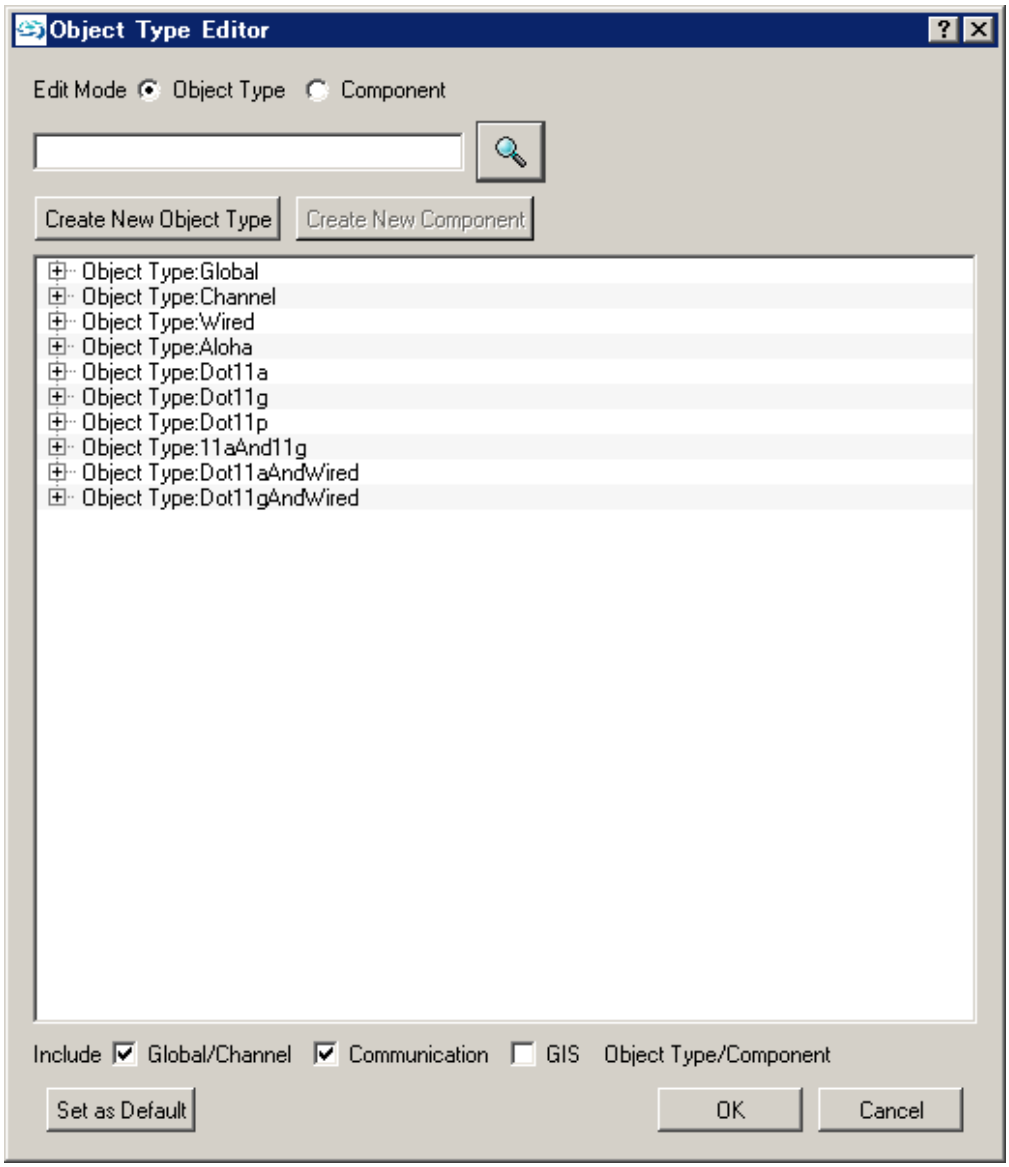
Cancels the current change and close the Object Layer Editor.

Applies the current change without closing the Object Layer Editor.

You can undo/redo of the change in the Object Layer Editor.

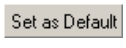
11. Editing Object Types

You can edit the definitions of object types using the Object Type Editor dialog box. To start the Object Type Editor dialog box, choose [Tools]-[Object Type Editor...]. You can create new object types and copy, change, and delete object types and model instances provided by Visual Lab. You can also create new components and properties, and change and delete them. You can assign default values to properties of each object type. Newly added communication objects are shown when you select "Add a New Communication Object" of the Control Panel.

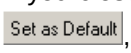


11.1. Operation Overview

The Object Type Editor consists of the following controls.

Edit Mode:	Selects the edit mode, "Object Type" or "Component"
Search:	Used for searching an object type or a component. Type-in one or more characters into the input field and click the button at the right of the field.
 	Used for adding a new object type or a new component. If the edit mode is "Object Type", only the "Create New Object" button is enabled. If the edit mode is "Component", only the "Create New Component" button is enabled.
Tree	Object types or components are displayed in the tree format. You can unfold/fold the details by clicking +/- or double-clicking the item name. If the edit mode is "Object Type," the tree is shown in the following format. Object Type Model Instance Component Property If the edit mode is "Component," the tree is shown in the following format. Component Property Click an item you want to edit and choose a right-click menu command. The contents of the right-click menu depend on the condition of the selection.
Check boxes	The check boxes ("Global/Channel", "Communication", and "GIS") below the tree are used for selecting the category of items displayed.
"OK", "Cancel", and "Set as Default"	 saves the change and closes the dialog box.  cancels the change and closes the dialog box.  saves the change as the default setting.

Note)

- If you close the dialog box with  without saving the change as the default with  , the change is available only in the scenario.
- If you add extension modules such as Dot Eleven Module (that is copying data file for Visual Lab provided with the extension module to the Visual Lab's data directory) after saving changes as default, the contents of the new extension module are not available in Visual Lab. To use the new extension module, click the "Restore Defaults" button in the

"General" tab of the Options dialog box ([Tools]-[Options...]), then edit object types and click Set as Default button.

- The changes in this dialog box do not affect the communication objects placed before the changes.
- If you have edited components provided with Visual Lab and extension modules, the changes to the components affects all object types that use the changed components.

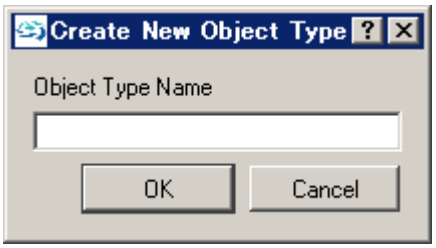
11.2. Editing Object Types

Select "Object Type" edit mode to edit Object Types.

Adding a new Object Type :

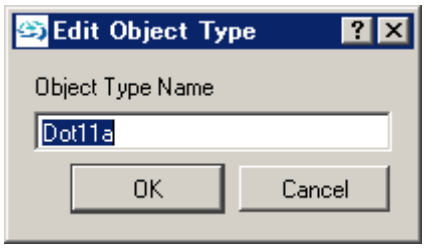
Click 

button and set the name of the object type in the "Create New Object Type" dialog box.



Changing the name of an Object Type :

Select an object type, and choose "Edit Object Type" right-click menu command. Then input the new name of the object in the "Edit Object Type" dialog box.



Duplicating an Object Type :

Select an object type, and choose "Duplicate Object Type" right-click menu command. The copied object name is like "<Object Type Name>(2)".

Deleting Object Types :

Select an object type, and choose "Delete Object Type" right-click menu command.

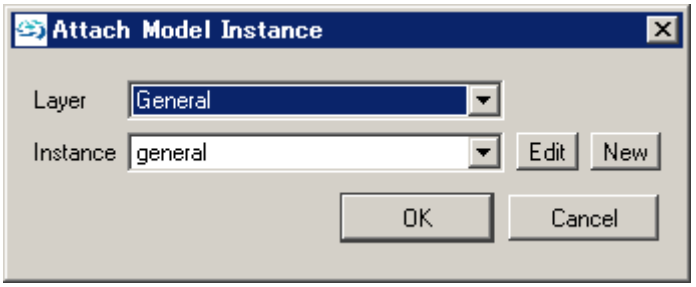
Only communication object types can be deleted.

11.3. Editing Model Instances

Select "Object Type" edit mode to edit Model Instances.

Adding a new Model Instance :

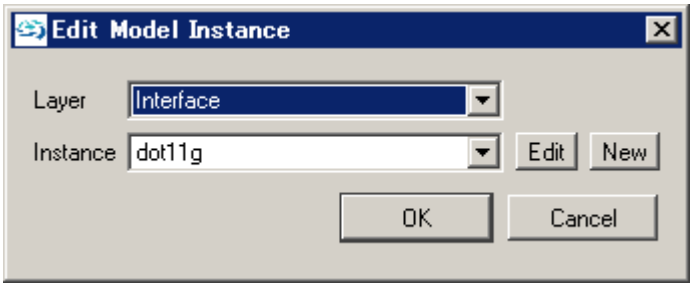
Select an object type, and then choose "Attach Model Instance" right-click menu command to show the "Attach Model Instance" dialog box. Select names of the layer and the instance for the new instance from the lists in the dialog box. If you change an existing instance name, click "Edit" button. If you add a new instance, click "New" button to set a new name.



Note) if you have added a new model instance, you have to attach one or more components to the model instance. If you close the Object Type Editor dialog box before attaching at least one component to a new model instance, the model instance is not saved.

Editing a Model Instance:

Select a model instance, and then choose "Edit Model Instance" right-click menu command to show the Edit Model Instance dialog box.



Select an instance name or click "Edit" or "New" button to set an arbitrary name. If you change an existing instance name, click "Edit" button. If you add a new instance, click "New" button.

Duplicating a Model Instance :

Select a model instance, and then choose "Duplicate Model Instance" right-click menu command. The copied instance name is like "<Instance Name>(2)".

If duplication is not allowed to the model instance, the "Duplicate Model Instance" menu command is disabled.

Deleting a Model Instance :

Select a model instance, and then choose "Delete Model Instance" right-click menu command.

Attaching/Detaching a Component :

If the Edit Mode is "Object Type," you can attach a component to a model instance and remove a component from a model instance. To attach a component to a model instance, select a model instance, and then choose "Attach Component" right-click menu command. To detach a component from a model instance, select a component and choose "Detach Component" right-click menu command.

Confirming a Component :

If the Edit Mode is "Object Type," you can confirm the contents of components.

To view the contents of a component, select a component, and choose "View Component" right-click menu command.

Editing default values of Properties ：

If the Edit Mode is "Object Type," you can change the default values of properties. Click a property and "Edit Default Value" right-click menu command.

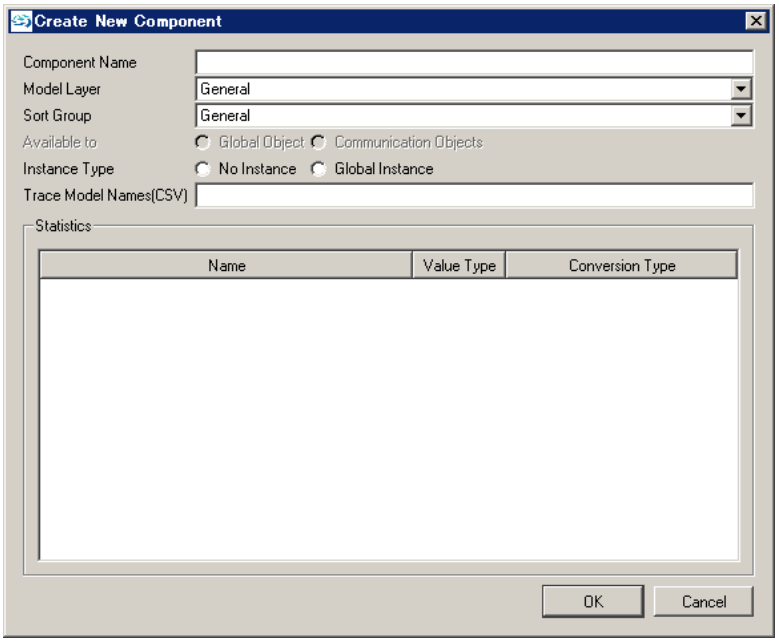
11.4. Editing Components

To edit components, select "Component" edit mode.

Adding a Component :

Click 

button to open the "Create New Component."



Editing a Component :

Select a component and choose "Edit Component" right-click menu command to open the "Modify Component" dialog box.

Deleting a Component :

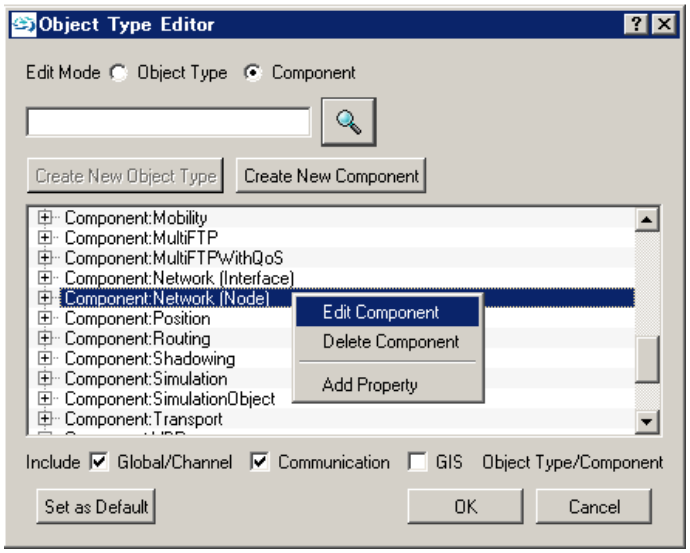
Select a component, and choose "Delete Component" right-click menu command.

Adding User-defined Statistics to a Component :

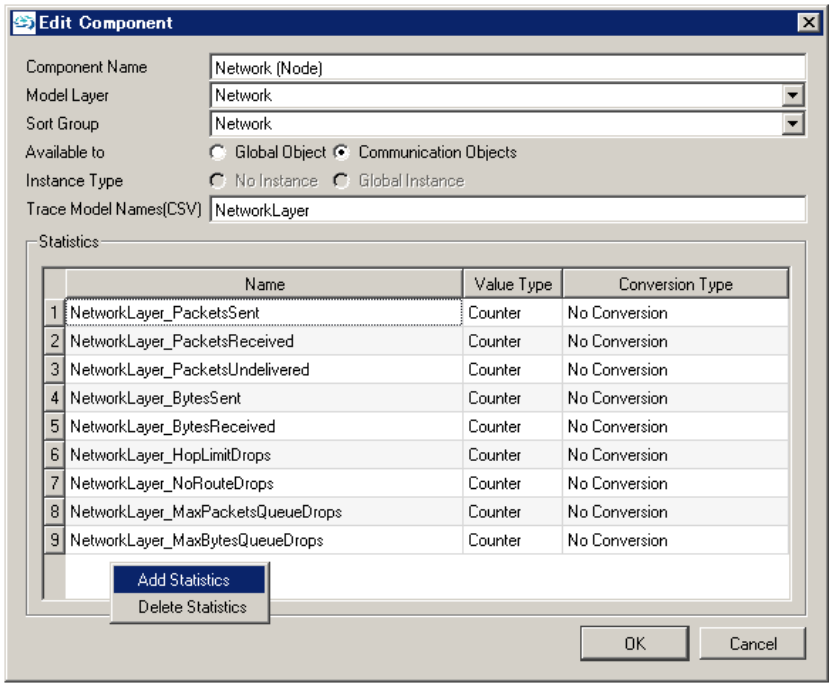
You can add user-defined statistics to a Component using the Object Type Editor dialog box. The added statistics can be used from the Statistics Settings dialog box.

The following example shows the way to add user-defined statistics named "NetworkLayer_New".

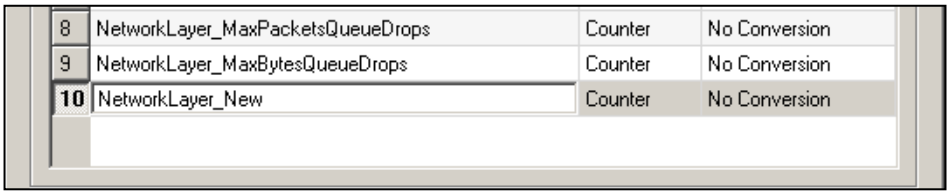
1) Select "Component" edit mode in the Object Type Editor dialog box. Then select "Network (Node)" component, and then choose "Edit Component" right-click menu command.



2) Right-click in the Statistics field in the "Edit Component" dialog box, and choose "Add Statistics" right-click menu command. Then a new line is added to the Statistics field.



3) Input "NetworkLayer_New" to the "Name" column of the new line.

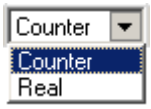


4) Select a value type.

Select a value type from "Counter" or "Real".

Counter ： An integer that is accumulated. e.g. Number of received packets

Real ： Value that changes every time an event occurs. e.g. received signal power.



This figure shows a case where "Counter" is selected.

5) Select a conversion type.

Select a conversion type from "No Conversion" or "Conversion."

No Conversion： Output the value without conversion.

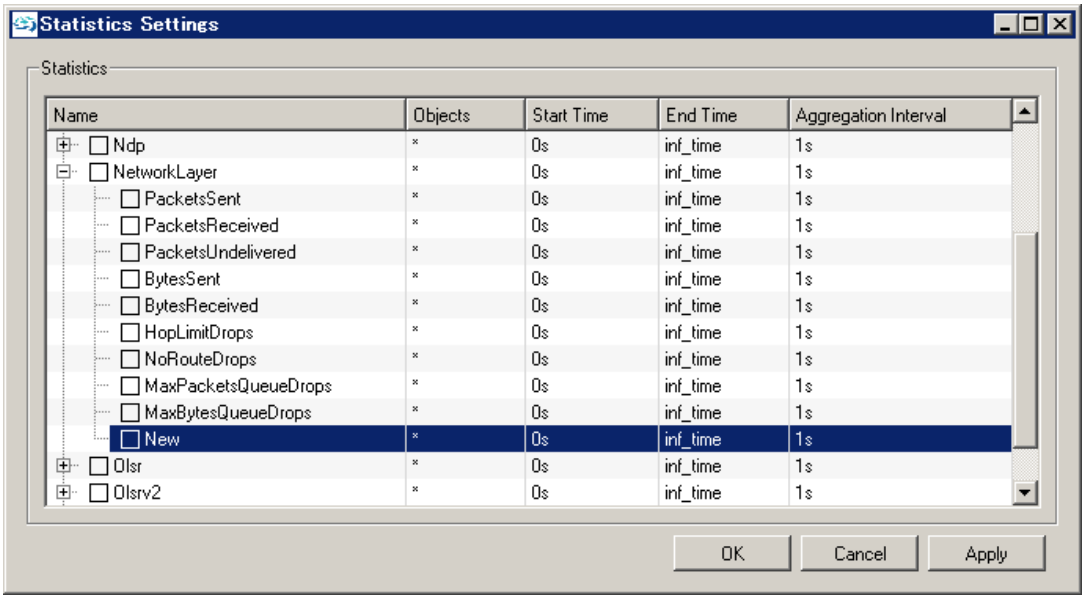
dB: Output the value after converting it to dB.

This figure shows a case where "No Conversion" is selected.

6) Click "OK" button to close the Edit Component dialog box.

7) Click "OK" button to close the Object Type Editor dialog box. If you use the change as the default value, click "Save as Default" before clicking "OK" button.

8) Confirm the added statistics in the "Statistics Settings" dialog box.



11.5. Editing Properties

Adding a Property ：

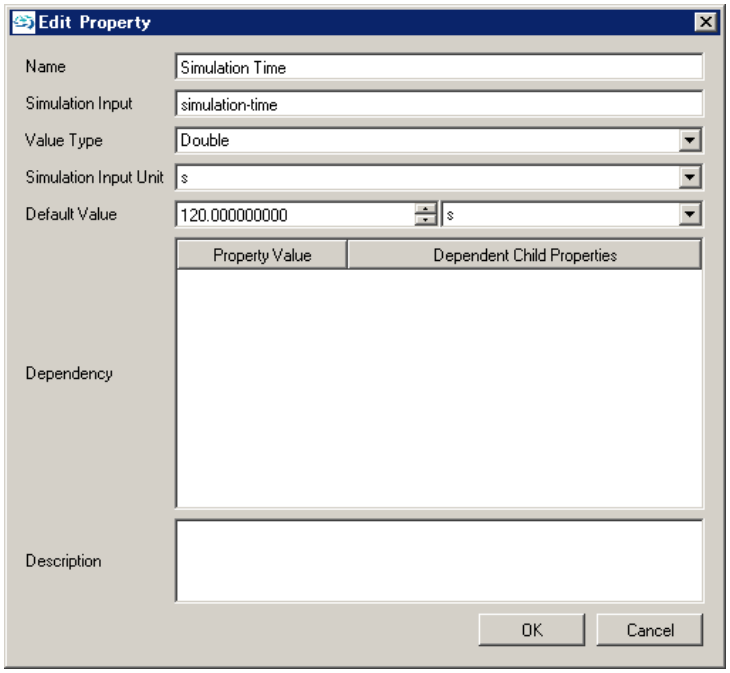
Select a component, and choose "Add Property" right-click menu command to open "Add Property" dialog box.

Editing a Property：

Select a property, and choose "Edit Property" right-click menu command to open the "Edit Property" dialog box.

Deleting a Property：

Select a property and choose "Delete Property" right-click menu command.



Following items are required for the setting of each property.

Common

Name:	Property's name displayed in the Object Properties dialog box
Simulation Input:	Parameter's name used in the simulator
Value Type:	Value type - Select one from the following types. Integer, Double, Bool, String, Enum, Input File, Output File, Object Type, Object, Object Name, Instance, Check List, Brush, or Pen
Default Value:	Default value

Setting item depending on the value type

Value Type:	Integer
Simulation Input Unit:	Select one from the following units. None, Distance (cm, m, km), Speed (m/s, m/h, km/s, km/h), Power (dBm, mW, W),

	Size (bit, byte, KB, MB), Rate (bps, Kbps, Mbps), Frequency (Hz, MHz, GHz), Time (ns, us, ms, s, inf_time), or Angle (degree, rad.)

Value Type:	Double
Simulation Input Unit:	Select one for the following units. None, Distance (cm, m, km), Speed (m/s, m/h, km/s, km/h), Power (dBm, mW, W), Size (bit, byte, KB, MB), Rate (bps, Kbps, Mbps), Frequency (Hz, MHz, GHz), Time (ns, us, ms, s, inf_time), or Angle (degree, rad.)

Value Type:	Bool
Bool Type:	True/False, Yes/No, or On/Off

Value Type:	Enum
Candidates (CSV):	List of candidates in the comma separated format (CSV).

Value Type:	Object Type
Object Feature:	Communication, GIS, or System

Value Type:	Object
Object Feature:	Communication, GIS, or System

Value Type:	Check List
Cheek List Items:	List of checklist items in the space separated format.

12. Batch Execution

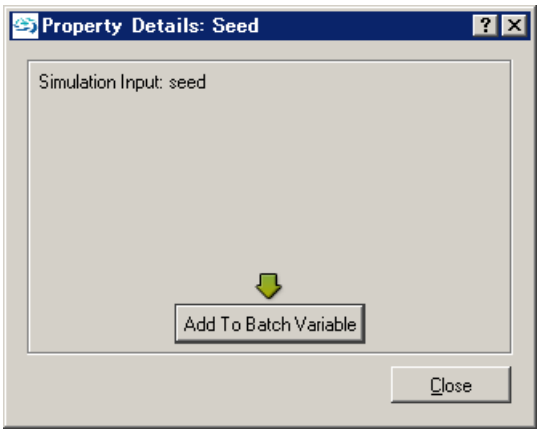
This feature of Visual Lab allows you to run simulations of multiple cases with different parameter values automatically. You can select one or more batch variables (property values that can be changed for batch execution) and run simulation of multiple cases with different value of the batch variables continuously.

For running your simulation scenario in the batch execution mode, follow the procedure shown below, 1) Registering batch variables, 2) Setting up batch execution, and 3) Run simulation in the batch execution mode.

12.1. Registering batch variables

1) In the Object Properties dialog box ([Tools]-[Object Properties...]), select a property that you want to change in the batch execution. Click the property value field.
2) Click  button at the right of the property value field to show the Property Details dialog box. If you change the same property of multiple objects, select multiple objects, select the property value, and click  button.
3) Click 

in the Property Details dialog box to add the selected property to the set of batch variables. Only number-type properties are allowed to be used as batch variables in the current version of Visual Lab.

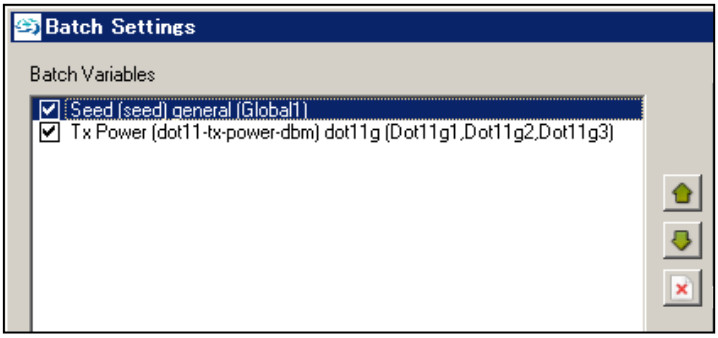


12.2. Setting up batch execution

In the Batch Settings dialog box, you can set up the way to assign values to the batch variables and create a bunch of cases for batch execution.

1) Choose [Tools]-[Batch Processing]-[Batch Settings...] to open the Batch Settings dialog box.
2) Check the check boxes of the batch variables you want to change in the batch execution. If multiple batch variables are checked, you can run simulation with all the combinations of values of batch variables. The order of batch variables in the list affects the structure of the

directory tree of scenario files. To change the order the batch variables in the list, use arrow icons at the right of the list.



If two properties Seed and Tx Power are registered as batch variables, they are displayed as the following example.

You can move the position of the selected batch variable by clicking  or  .

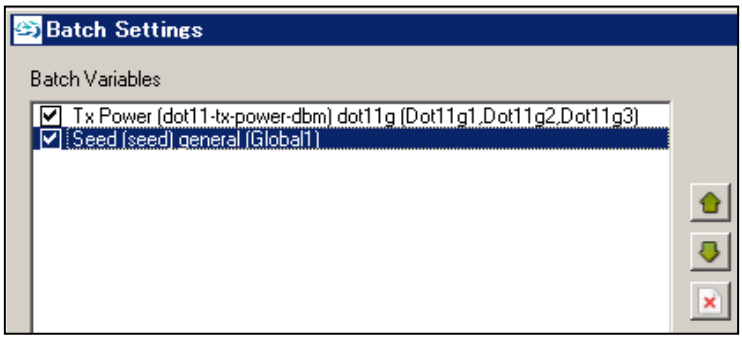
If the order of the batch variables in the list is Seed and Tx Power, the following directory tree is created. In this example, we assume that values 123, 124, 125 are used for Seed and 0 and 1 are used for Tx Power.

```
seed-txpower
  seed_123
    dot11-tx-power-dbm_0
    dot11-tx-power-dbm_1
  seed_124
    dot11-tx-power-dbm_0
    dot11-tx-power-dbm_1
  seed_125
    dot11-tx-power-dbm_0
    dot11-tx-power-dbm_1
```

If the order of the batch variables is reverse to the previous example, the following directory tree is created.

```
txpower-seed
  dot11-tx-power-dbm_0
    seed_123
    seed_124
    seed_125
```

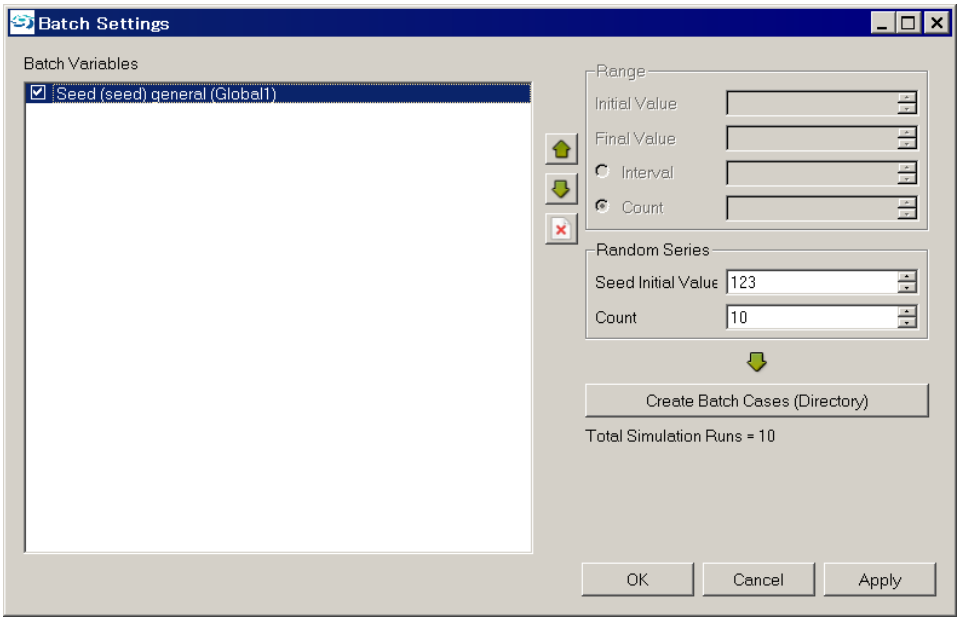
```
dot11-tx-power-dbm_1
  seed_123
  seed_124
  seed_125
```



To specify the values used for each batch variable, use "Range" or "Random Series" blocks at the right area of the window. For specifying values for Seed, set the Seed Initial Value and the Count in the "Random Series" block. For other variables, use the "Range" block to specify the range of the values and the interval or the count of them.

3) Click 

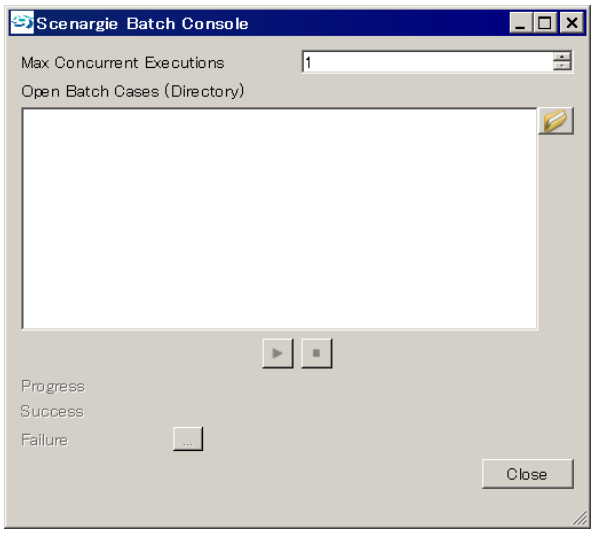
to create batch cases. A directory tree is made according to the selected variables, and one case file is saved in each directory.



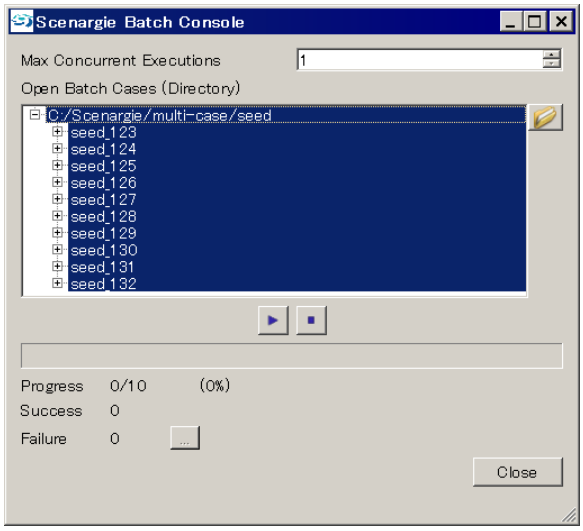
12.3. Starting batch execution

To start batch execution, follow the following instructions.

1) Choose [Tools]-[Batch Processing]-[Batch Console...] to open the Scenargie Batch Console.

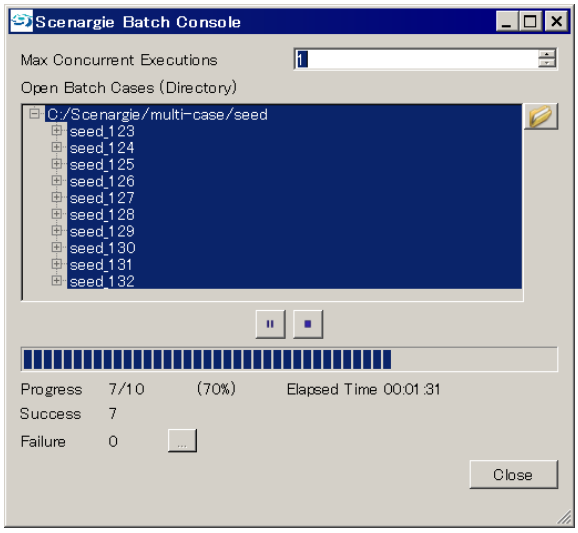


Click  to select one or more directories that contain cases for batch execution. If multiple directories selected, simulations of selected directories are executed in the order of the list.



2) Specify the number of simulations that concurrently run in the "Number of Concurrent Execution" field. This number has to be less than or equal to the number of the licenses of Base Simulator and extension modules used in the scenario.

3) Click  button to start batch execution. Click  to pause it, and click  to stop it.



The number of failures of execution is shown at the left bottom of the Batch Console dialog box. You can identify the scenario that has failed by clicking the button "..." at the right of the number of failures.

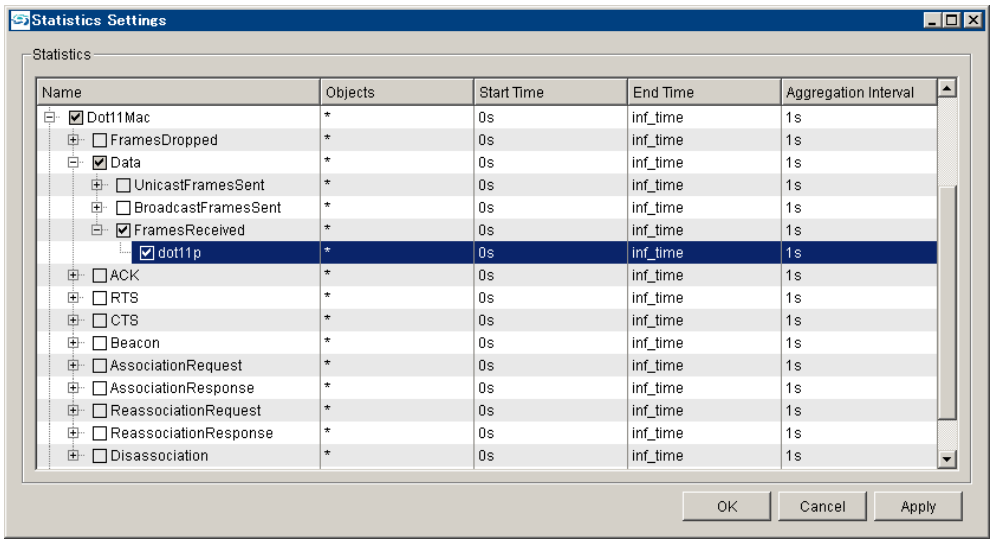
13. Analyzing Statistics

This section describes how to configure statistics obtained from simulation results and how to make charts using new simulation results and saves simulation results.

13.1. Configuring Statistics

"Statistics Settings" dialog box provides functions to configure statistics.

Choose [Tools]-[Statistics Setting...] to open the "Statistics Settings" dialog box.



Name :

Name of the statistic. Check the check box at the left of the name of the statistic to be collected.

Objects :

Objects of the target of data collection. Specify individual objects or "* (Any Objects)" to collect data of all the objects.

Start Time :

Start time to collect data to obtain the statistic.

End Time :

End time of the data collection for the statistic. If "inf_time" is specified here, data are collected until the end of the simulation.

Aggregation Interval :

Interval of timings to record data of the statistic. If "inf_time" is specified, only the last value is recorded. If 0 is specified, the value of the statistic is recorded every time an event occurs.

13.2. Creating charts

Visual Lab can show the value of statistics of communication objects during the simulation execution and draw a chart. The values of the statistics and the chart are updated with the progress of the simulation. In addition, it can create charts using the results of simulations saved in "stat (.stat)" files.

To create charts, open the "Chart Creator" wizard by choosing [Tools]-[Chart Creator...].

13.2.1. Creating an online chart

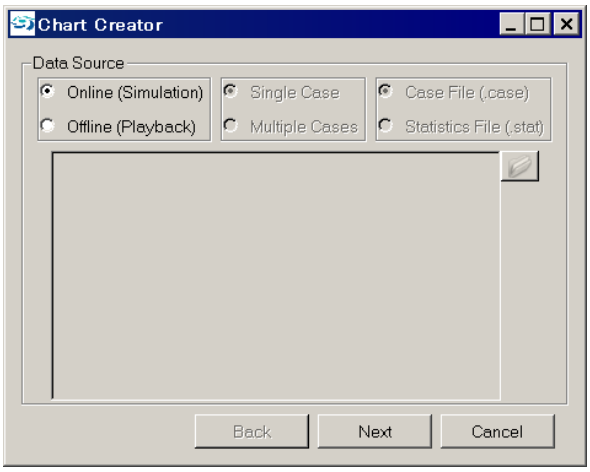
This section describes how to create an online chart, a chart of the results of ongoing simulation.

1) Specifying data source

In the first stage of the Chart Creator, specify the data source.

Data Source Block

You can choose Online or Offline as the source of the chart. Select Online (Simulation) to create an online chart.



Online (Simulation) : creates an online chart. The result of the ongoing simulation is plotted.

Offline (Playback) : creates charts based on stat file storing the result of the past simulation results.

Single Case : the result of a single case is used for creating a chart.

Multiple Cases : the results of multiple cases are used for creating a chart.

Case File : creates a chart by specifying case file(s) (.case) to run simulation or to read statistics file(s)

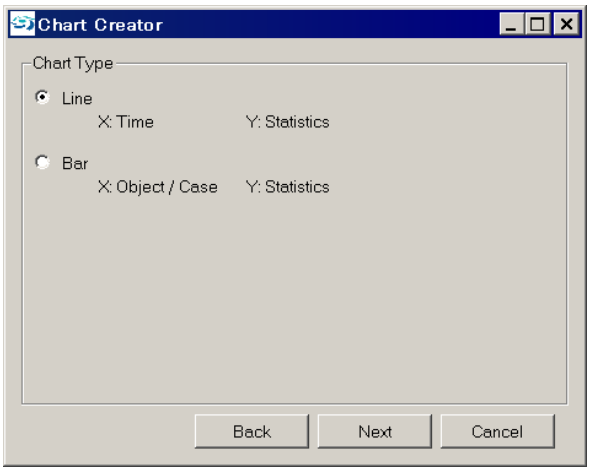
Statistic File: creates a chart by directly specifying statistics file(s) (.stat) as the data source. This option is used when a case file is missing; for example, simulation was executed from command line interface.

In this example, choose Online (Simulation).

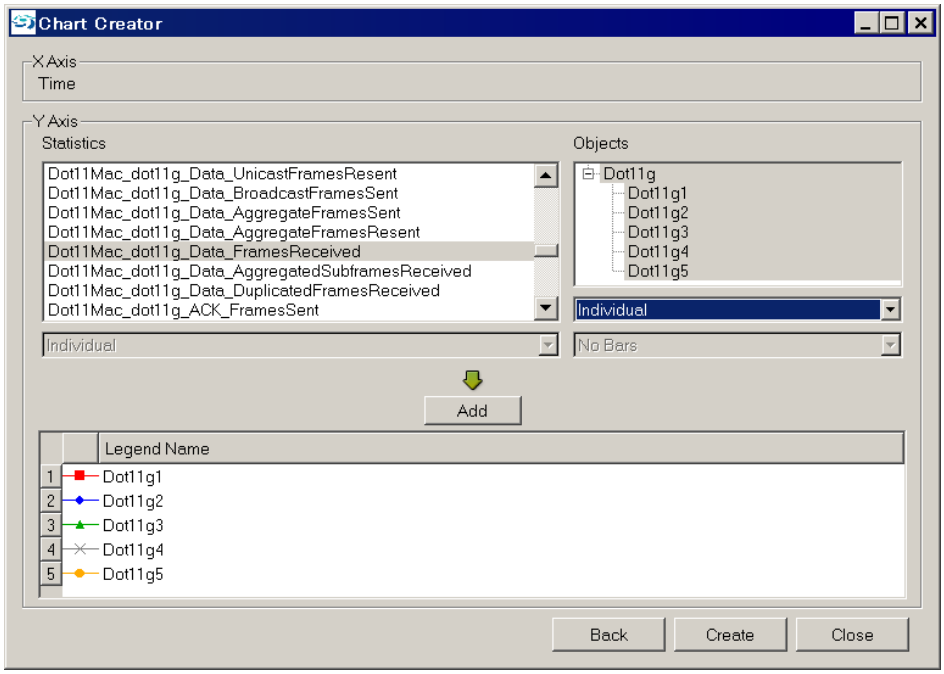
2) Selecting a chart type

Select a type of the chart from "Line" or "Bar".

In this example, choose "Line."



3) Selecting a statistic and an aggregation type



Statistics : Select a statistic to plot from the list.

Objects :

Select one or more communication objects from the list.

By pressing Ctrl key when clicking on a communication object, you can select multiple communication objects.

If multiple objects are selected, you can select the way to aggregate the statistics of the multiple objects.

Aggregation Type :

By using the dropdown list under the list of objects, you can select an aggregation type from the following ones.

Individual:

Statistics of the individual selected objects are plotted.

Average:

The average of the statistics of the selected objects is plotted.

Median:

The median of the statistics of the selected objects is plotted.

Total:

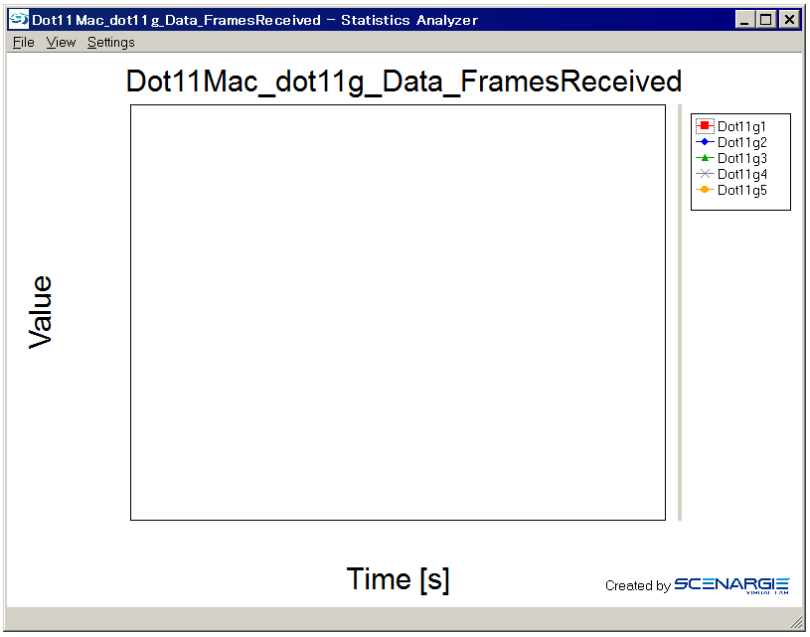
The sum of the statistics of the selected objects is plotted.

Type of Error Bar :

Select the type of error bars from "Upper and Lower Limits," "95% Confidence Limits," or "99% Confidence Limits." Error bar is available only if the chart type is "Bar" and the aggregation type is "Average" or "Medium".

Add Click this button to add the selected statistics setting to the chart. The added statistics setting is displayed the list at the bottom of the window. You can change the color and the line type of the plot and delete the plot from the right-click menu on the item in the list.

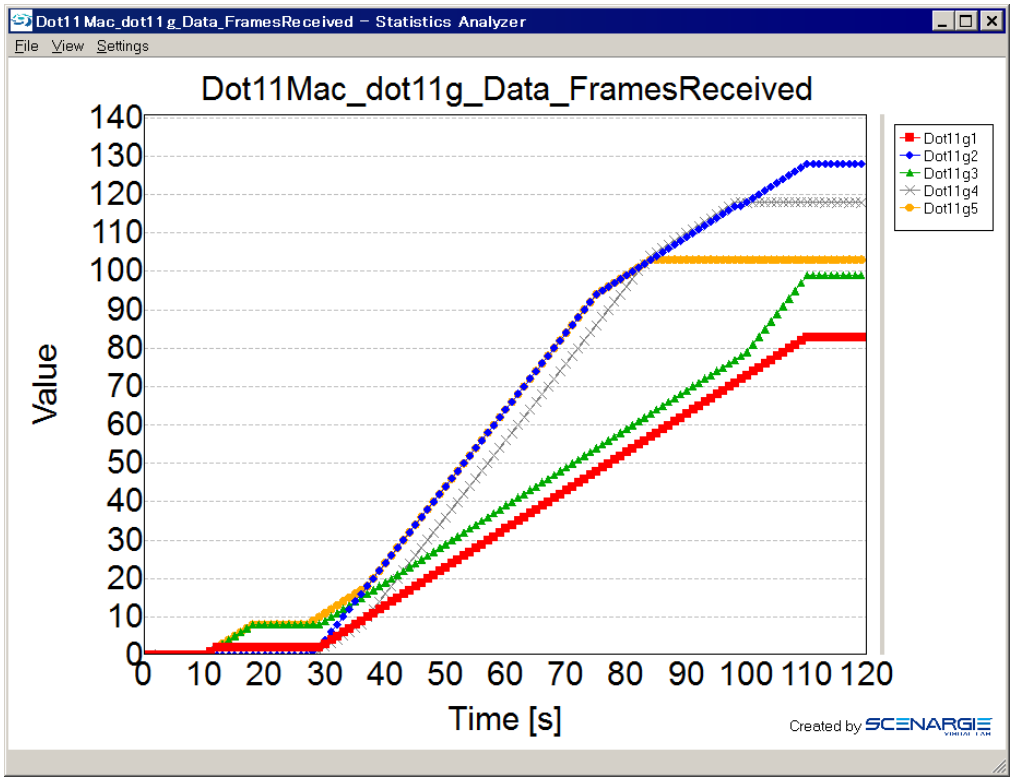
Create Click this button to create a chart and show the chart.



To create another chart, repeat the procedure of selecting statistics and objects.

You can go back to the stage for selecting data sources by clicking Back button. Click Close button to finish the Chart Creator.

After finishing the Chart Creator wizard, by running the simulation, the charts are plotted.



This is an example of a chart updated during a simulation.

For a displayed chart, following commands are available

Saving the chart in data ： saves the chart's data ([File]-[Save As])

The chart's data is saved with a suffix .chart. You can import the .chart file to show in Visual Lab via [File]-[Import]-[Chart File (.chart)...] in the main window of Visual Lab.

Saving the chart as picture ： saves the chat as a picture file. Choose [File]-[Save As Picture]. The format of the picture file is PNG (.png).

Configuring the chart properties ： Choose [Settings]-[Chart Properties...] to show the "Chart Properties" dialog box. You can configure the title of the chart, Axes, etc. You can also open the "Chart Properties" dialog box by right-click menu command on the chart. You can edit the

type of plot, line type, and the name in the legend using right-click menu commands on legends.

13.2.2. Creating a chart with a statistics file

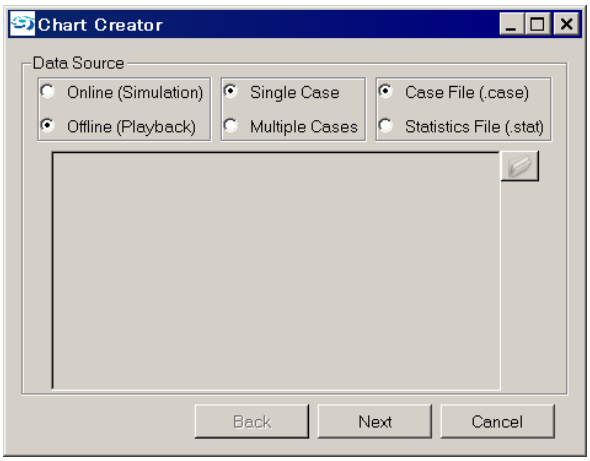
You can create charts with statistics files that have been created as the result of simulations with the Chart Creator. This section describes how to create a chart using the results of one simulation scenario (one case file). Note that you have to configure statistics that are collected through Statistics Settings before running the simulation.

1) Specifying data source

In the first stage of the Chart Creator, specify the data source.

Data Source Block

You can choose Online or Offline as the source of the chart. To create a chart using the simulation result of one simulation scenario, select Offline (Playback), and select options, "Single Case" and "Case File (.case)".



Online (Simulation) : creates an online chart. The result of the ongoing simulation is plotted.

Offline (Playback) : creates charts based on stat file storing the result of the past simulation results.

Single Case : the result of a single case is used for creating a chart.

Multiple Cases : the results of multiple cases are used for creating a chart.

Case File : creates a chart by specifying case file(s) (.case) to run simulation or to read statistics file(s)

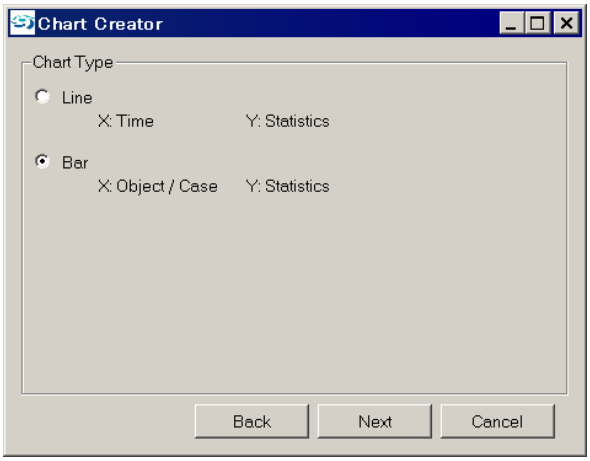
Statistic File: creates a chart by directly specifying statistics file(s) (.stat) as the data source. This option is used when a case file is missing; for example, simulation was executed from command line interface.

In this example, choose Offline (Playback), Single Case, Case File (.case).

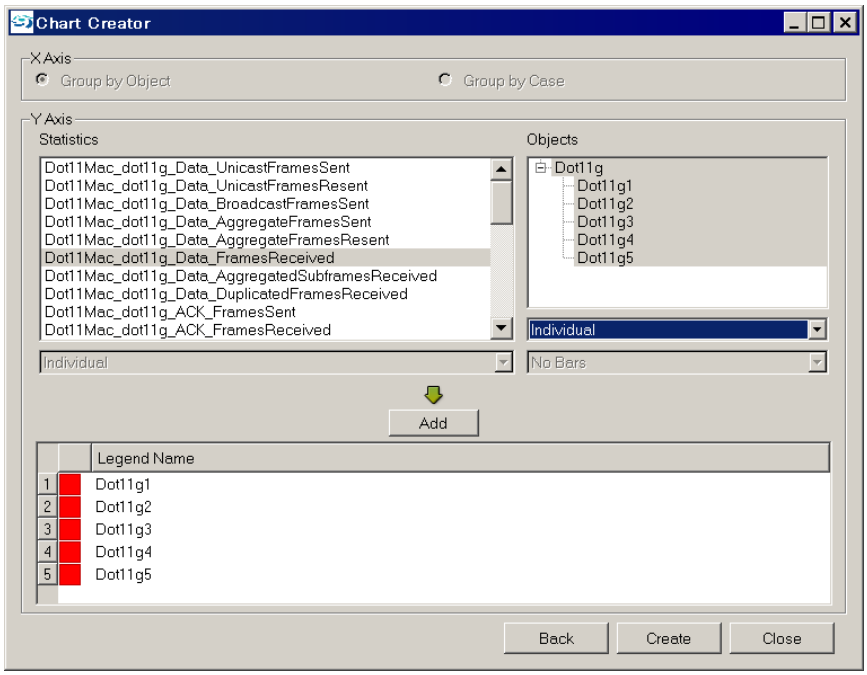
2) Selecting a chart type

Select a type of the chart from "Line" or "Bar".

In this example, choose "Bar."



3) Selecting a statistic and an aggregation type



Statistics : Select a statistic to plot from the list.

Objects : Select one or more communication objects from the list.

By pressing Ctrl key when clicking on a communication object, you can select multiple communication objects.

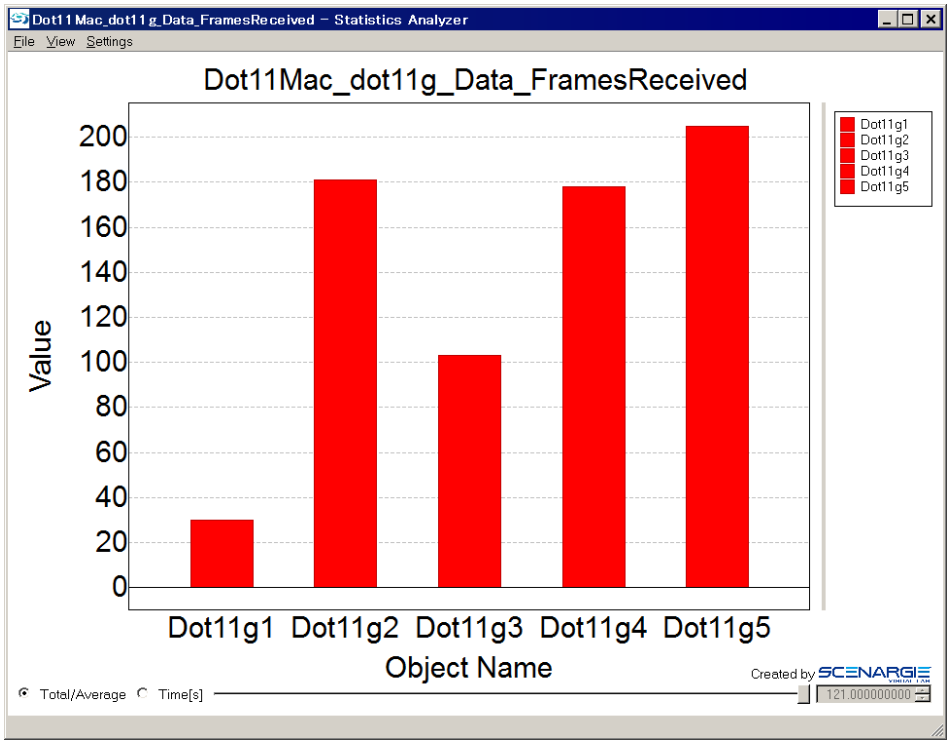
If multiple objects are selected, you can select the way to aggregate the statistics of the multiple objects.

Aggregation Type : Select an aggregation type from Individual, Average, Median, or Total.

Type of Error Bar : Select the type of error bars from "Upper and Lower Limits," "95% Confidence Limits," or "99% Confidence Limits." Error bar is available only if the chart type is "Bar" and the aggregation type is "Average" or "Medium".

Add Click this button to add the selected statistics setting to the chart. The added statistics setting is displayed the list at the bottom of the window. You can change the color and the line type of the plot and delete the plot from the right-click menu on the item in the list.

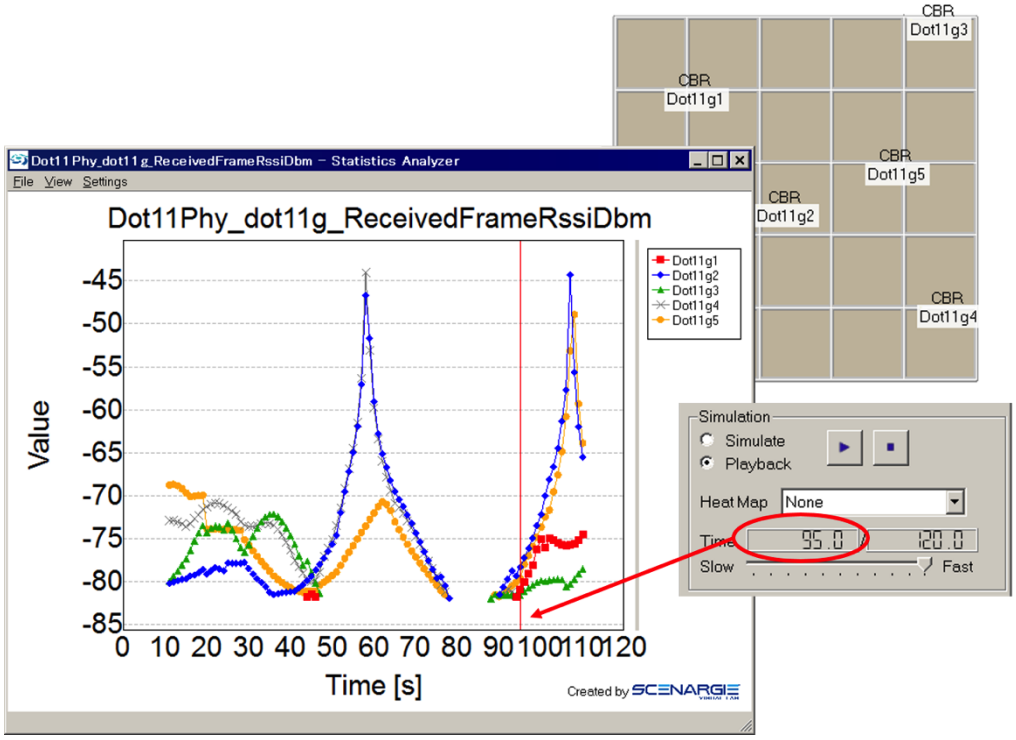
Create Click this button to create a chart and show the chart.



You can show the values of the statistics at given time by selecting "Time[s]" of radio buttons under the chart.

Move the slider to show the time point you want to see.

If you playback a simulation log with a chart window being shown, the chart is updated with time. The following screenshot is an example of playing back a simulation log with showing a line chart. You can see a red vertical line moves right with time.



Example of a chart on playing back a simulation log.

13.2.3. Creating a chart with multiple statistics

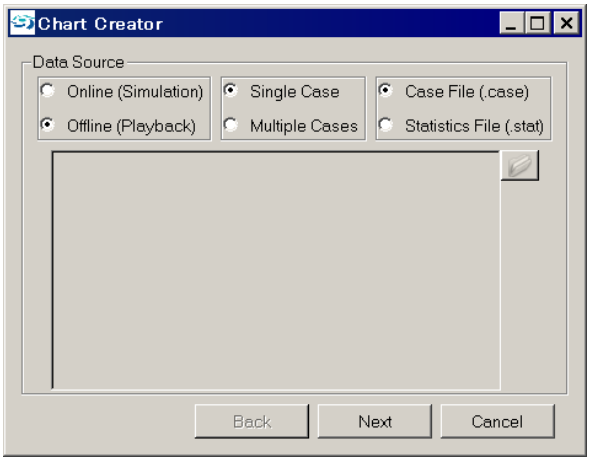
This section describes how to create a chart with multiple statistics using the results of one simulation scenario (one case file). Note that you have to configure statistics that are collected through Statistics Settings before running the simulation.

1) Specifying data source

In the first stage of the Chart Creator, specify the data source.

Data Source Block

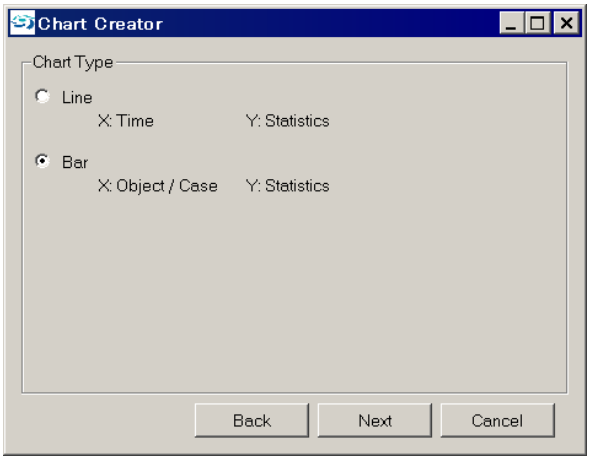
To make a chart using the simulation result of one simulation scenario, select Offline (Playback), and select options, "Single Case" and "Case File (.case)".



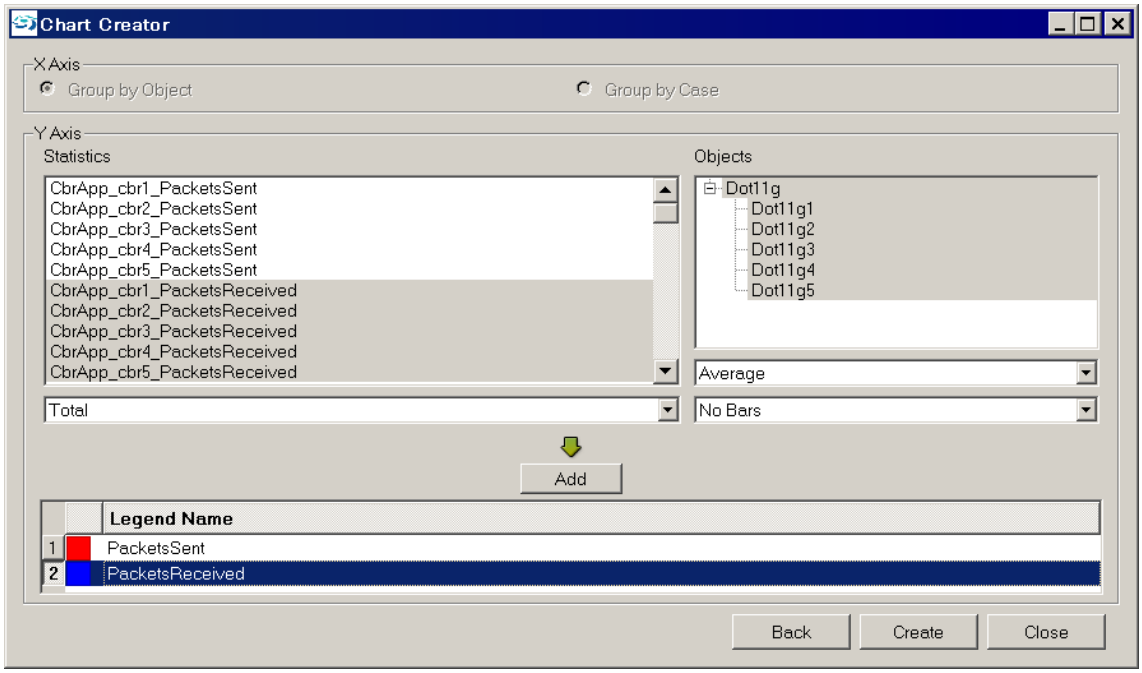
2) Selecting a chart type

Select a type of the chart from "Line" or "Bar".

In this example, choose "Bar."



3) Selecting Statistics and an Aggregation Type



Statistics : Select statistics to plot from the list.

Press Ctrl key when clicking on a statistic to select multiple statistics.

Select the type of aggregation used for the selected multiple statistics from the dropdown list under the list of statistics. Individual and Total (sum of selected multiple statistics) are available.

Objects : Select one or more communication objects from the list.

By pressing Ctrl key when clicking on a communication object, you can select multiple communication objects.

If multiple objects are selected, you can select the way to aggregate the statistics of the multiple objects from the list under the figure. Select one of the aggregation types, Individual, Average, Median, or Total.

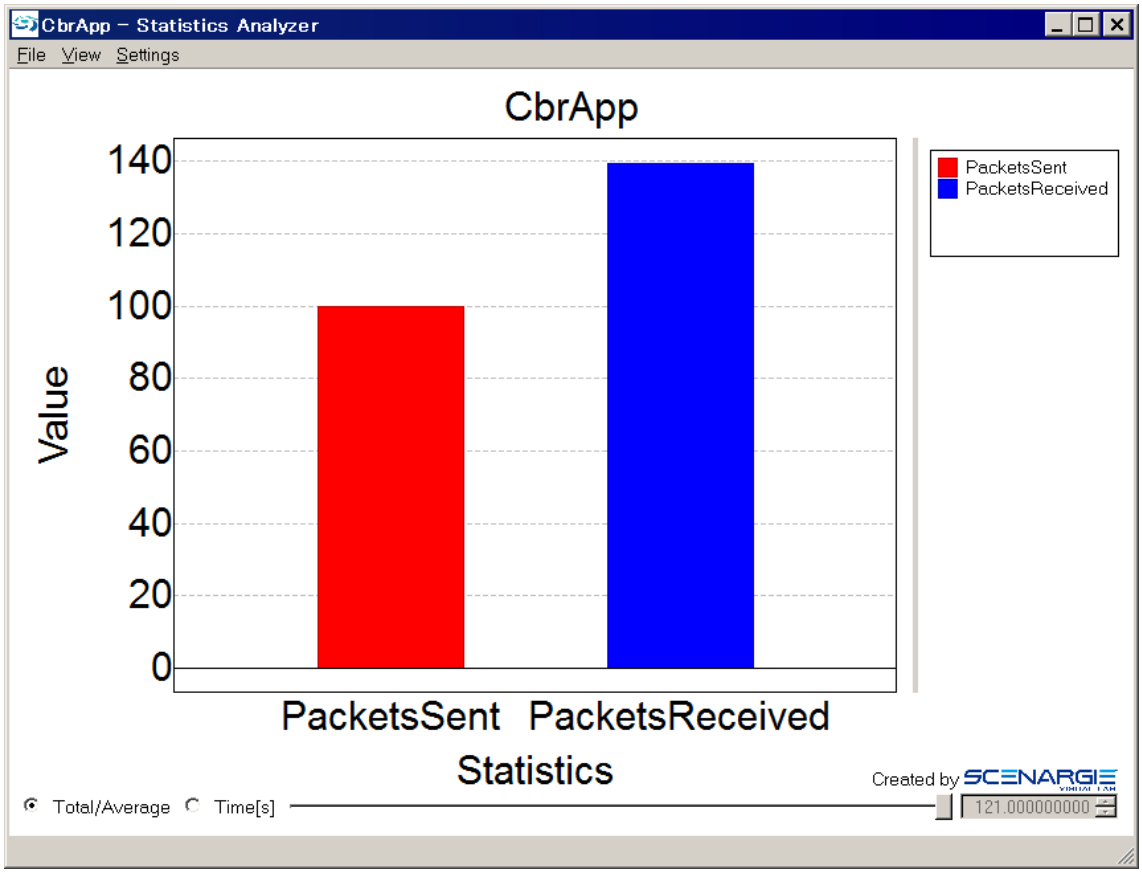
Type of Error Bar :

Select the type of error bars from "Upper and Lower Limits," "95% Confidence Limits," or "99% Confidence Limits." Error bar is available only if the chart type is "Bar" and the aggregation type is "Average" or "Medium".

In this example, Total is selected for the type of aggregation of statistics, and Average is selected for the type of aggregation of communication objects.

Add Click this button to add the selected statistics setting to the chart. The added statistics setting is displayed the list at the bottom of the window. You can change the color and the line type of the plot and delete the plot from the right-click menu on the item in the list.

Add Click this button to create a chart and show the chart.



Configuring the chart properties : Choose [Settings]-[Chart Properties...] to show the "Chart Properties" dialog box. You can configure the title of the chart, Axes, etc. You can also open the "Chart Properties" dialog box by right-click menu command on the chart. You can edit the type of plot, line type, and the name in the legend using right-click menu commands on legends.

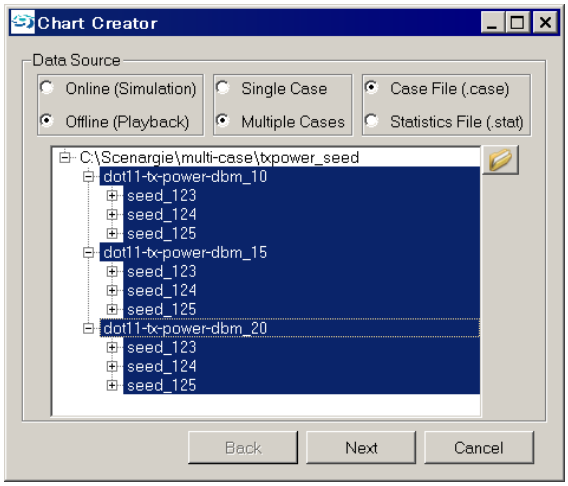
13.2.4. Creating a chart from the simulation results of multiple cases

This section describes how to create a chart with the simulation results of multiple cases. The configurations of the chart we assume in this section are as follows.

- Bar graph of the number of frames received in an IEEE802.11g wireless network consisting of Dot11g communication modules.
- The results are obtained by a batch execution using two batch variables, the transmission power (dot11-tx-power-dbm) and the random seed (seed).
  - dot11-tx-power-dbm takes values 10, 15, and 20dBm.
  - seed takes three values for each value of dot11-txpower-dbm.

1) Specifying Data Source

In the first stage of the Chart Creator, specify the data source.



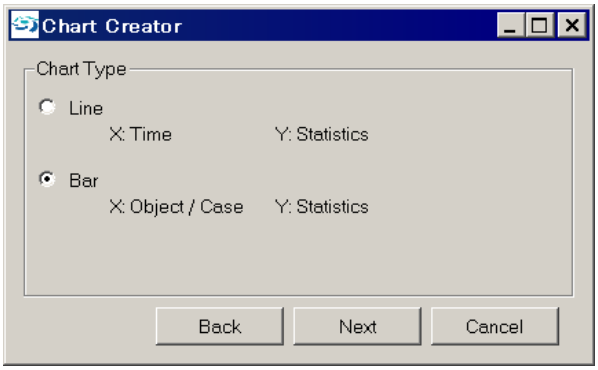
In this example, select Offline (Playback), Multiple Cases, and Case File (.case).

Click  button to select the top directory of a directory tree that contain cases of the batch execution.

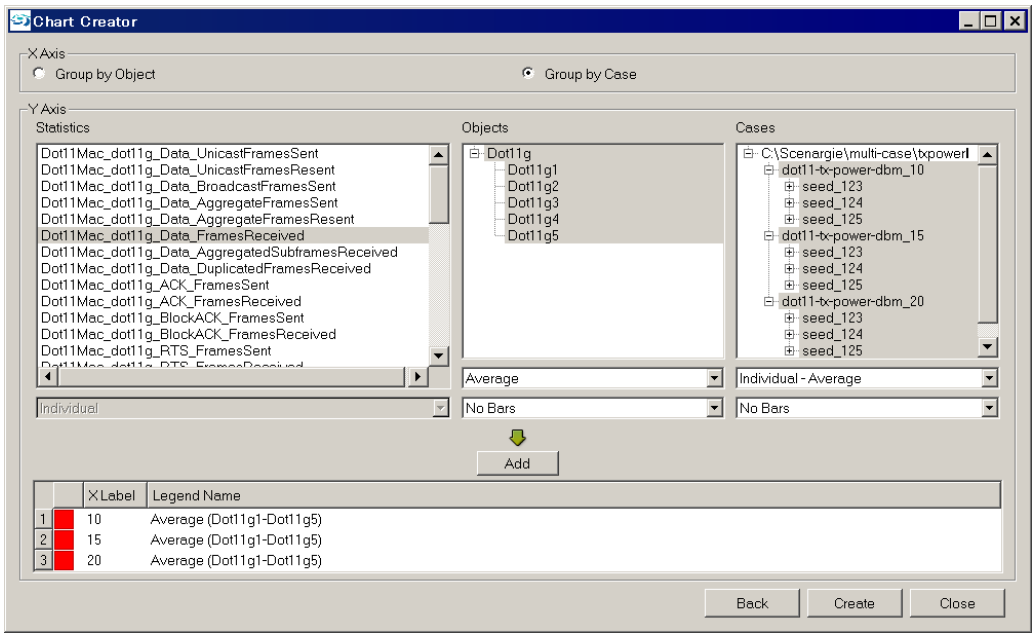
You can select multiple directories by repeating the procedure to select a directory.

2) Selecting a Chart Type

Select a type of the chart form "Line" or "Bar". In this example, select "Bar".



3) Configuring the Details of the Chart



X Axis : Select the way of grouping plots, "Group by Object" or "Group by Case". Select "Group by Case" in this example.

Statistics :

Select one or more statistics to plot from the list. To select multiple statistics, press Ctrl key when clicking on a statistic.

Objects :

Select one or more communication objects from the list.

Cases :

Select multiple cases from the list.

Select the type of aggregation from the dropdown box under the list of objects and cases.

For objects : Select one from Individual, Average, Median, and Total.

For cases : Select one from Individual, Average, Median, Individual-Average, and Individual-Median

Individual-Average and Individual-Median are for being used with the results of batch execution with multiple layers (that is, multiple batch variables are changed in the series of the simulation). For the variable in the top layer (that is, the variable used to name the directories closest to the root of the directory tree of the batch simulation scenarios) Individual is used. For the other batch variables, Average or Median is used.

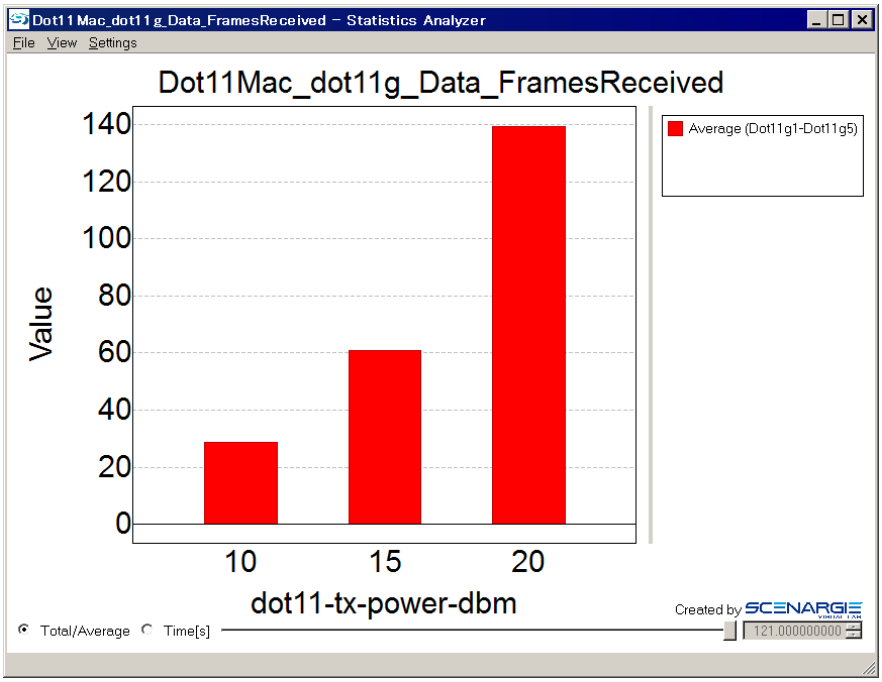
In this example, Individual-Average is selected to show the average value for each transmission power value.

Type of Error Bar :

Select the type of error bars from "Upper and Lower Limits," "95% Confidence Limits," or "99% Confidence Limits" for objects and cases. Error bar is available only when the chart type is "Bar" and the aggregation type is "Average" or "Medium".

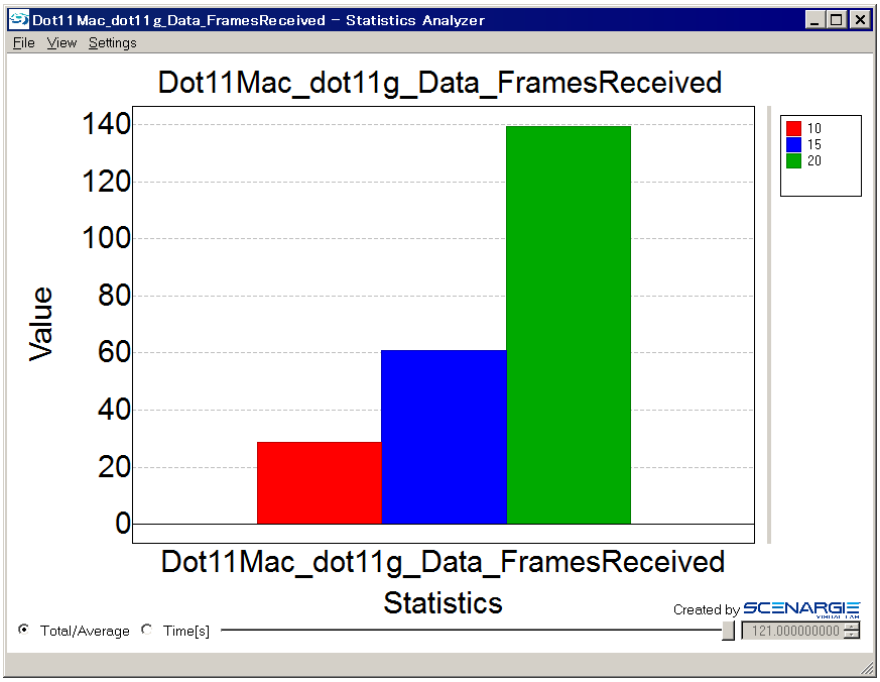
Add Click this button to add the selected statistics setting to the chart. You can change the color and the line type of the plot and delete the plot from the right-click menu on the item in the list.

Create Click this button to create a chart and show the chart.

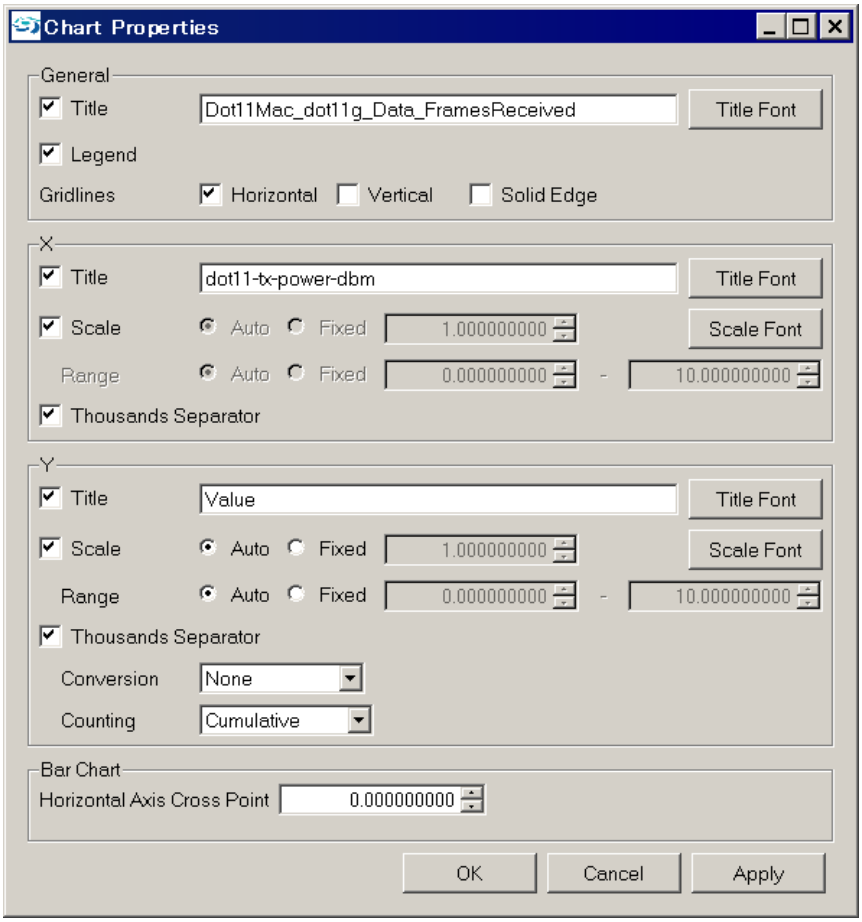


You can save the chart as a picture file by choosing [File]-[Save As Picture].

If you select "Group by Object" for the option of grouping of X Axis, the chart is created like the following example.



You can configure the chart properties such as the title of the chart and label of the axes after creating the chart by using the Chart Properties dialog box that is opened by a right-click menu command on the chart.



Thousands Separator ：

Puts comma to the numbers on the chart.

Conversion ：

Converts the value for display. Choose from None (x1), x1000, 1/1000, x8, and 1/8.

If the type of the statistic is Real, you can choose dB→Non-dB, Non-dB→dB, and Log10 as well.

Counting ：

If the type of the statistic is Counter, you can choose the type of counting.

Choose one from Cumulative and Average (Average of the previous unit period).

Horizontal Axis Cross Point ：

Y-coordinate of the cross point of the horizontal and vertical axes

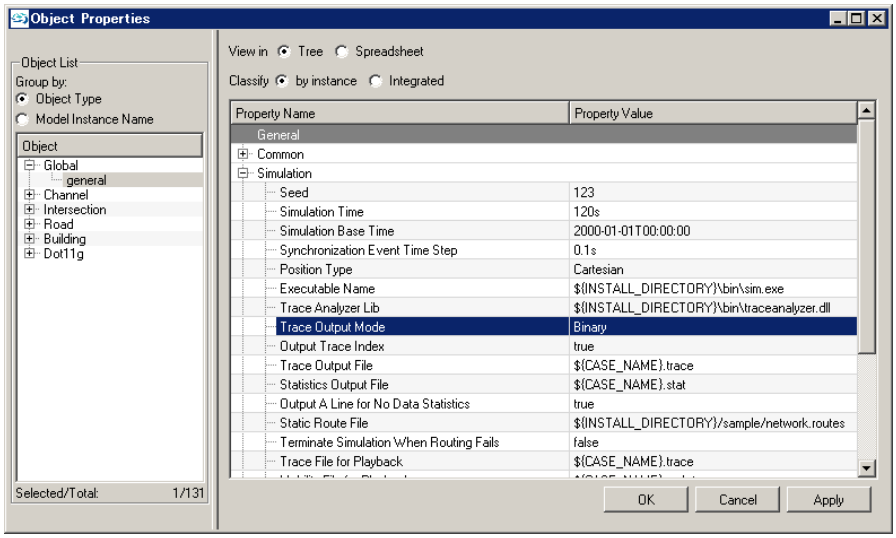
14. Configuring and visualizing Trace

You can configure the setting of trace (text or graphics) that the simulator outputs.

14.1. Configuring trace output setting for simulation

Trace Output Mode

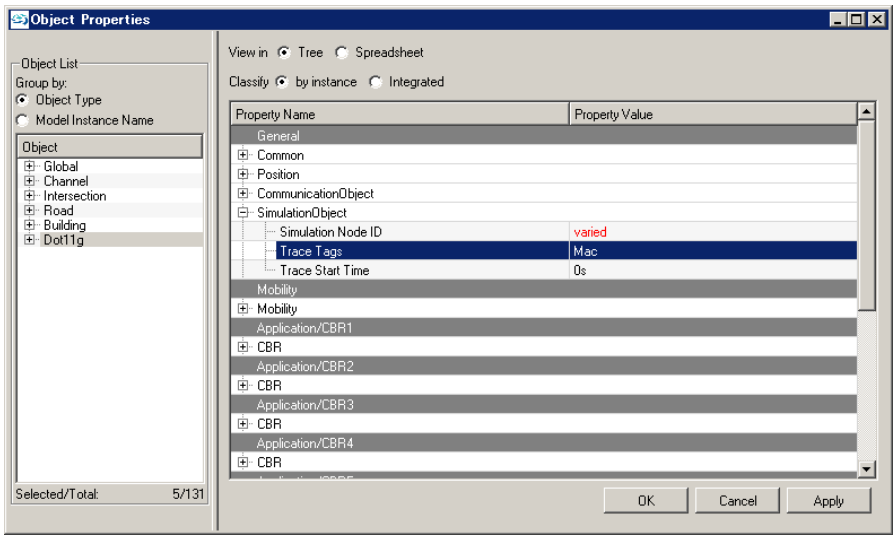
Scenargie supports two types of trace files, "Text" and "Binary". You can choose of one of them. The default value is "Binary". For using visualization of the trace in Visual Lab, you have to select the "Binary".



Trace Tags

The Scenargie simulator outputs trace with a tag that is specified by the Trace Tags property of the Simulation Object for communication objects and GIS objects. To enable/disable trace tags in your simulation, use the Object Properties dialog box. For the details of trace tag, refer to "Scenargie Base Simulator User Guide".

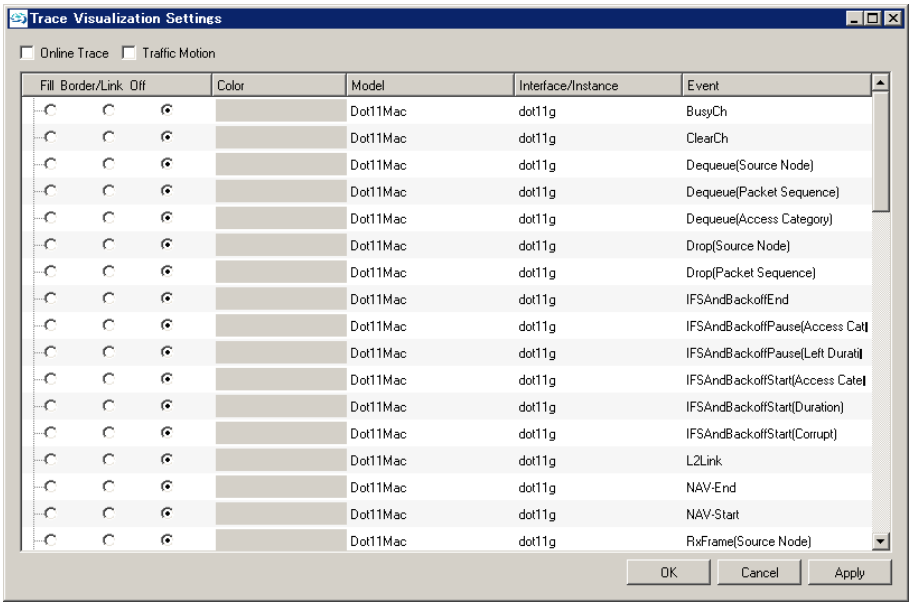
Note that no trace is outputted if you do not enable any trace tags.



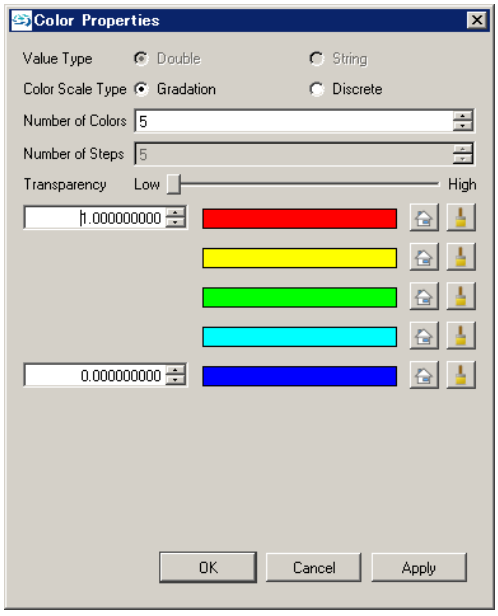
14.2. Visualizing trace

Visual Lab has a function to visualize the trace events with colors when running a simulation or playing back a simulation log. The fill color and the border color of objects and the color of links between objects can be changed according to trace information. By configuring trace visualization for traffic events of application, network, mac layers, you can visualize the data transmission on links between the sender and the receiver objects. To visualize the running simulation, choose "Online Trace" of the Trace Visualize Settings dialog box.

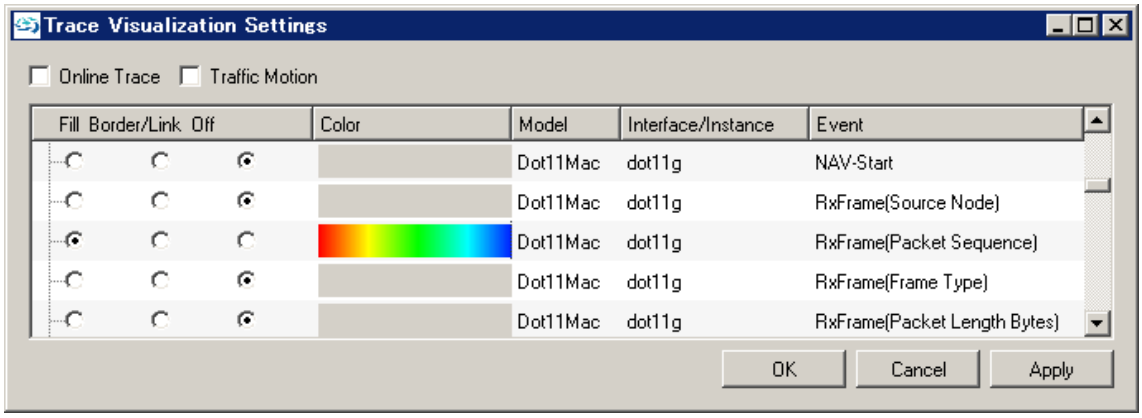
To configure the trace visualization, choose [Tools]-[Trace Visualization Settings...] to open "Trace visualization Setting" dialog box.

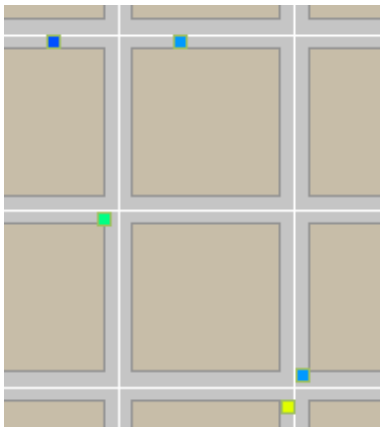


To specify colors used to show objects on the screen, choose Fill or Border/Link in the line corresponding to the trace event you want to visualize. If you choose Fill or Border/Link, the "Color Properties" dialog shows up. Then, set colors and range of values corresponding to the colors. If the value is out of the range, the color corresponding to the upper or lower limit of the rage is used. Once you have configured colors for an event type, you can open the "Color Properties" dialog box by clicking the "Color" field.



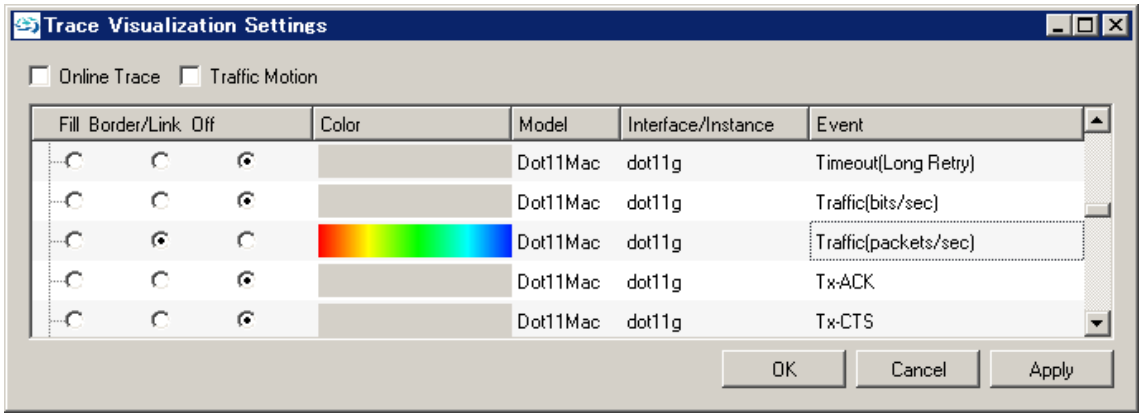
Example 1: Setting Fill Color to RxFrame (Packet Sequence) Event

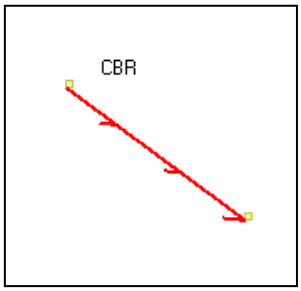




Boxes representing communication objects are filled with the color corresponding to the sequence number of each received frame when it arrives.

Example 2: Setting Link Color to Traffic (packets/sec) of Dot11Mac

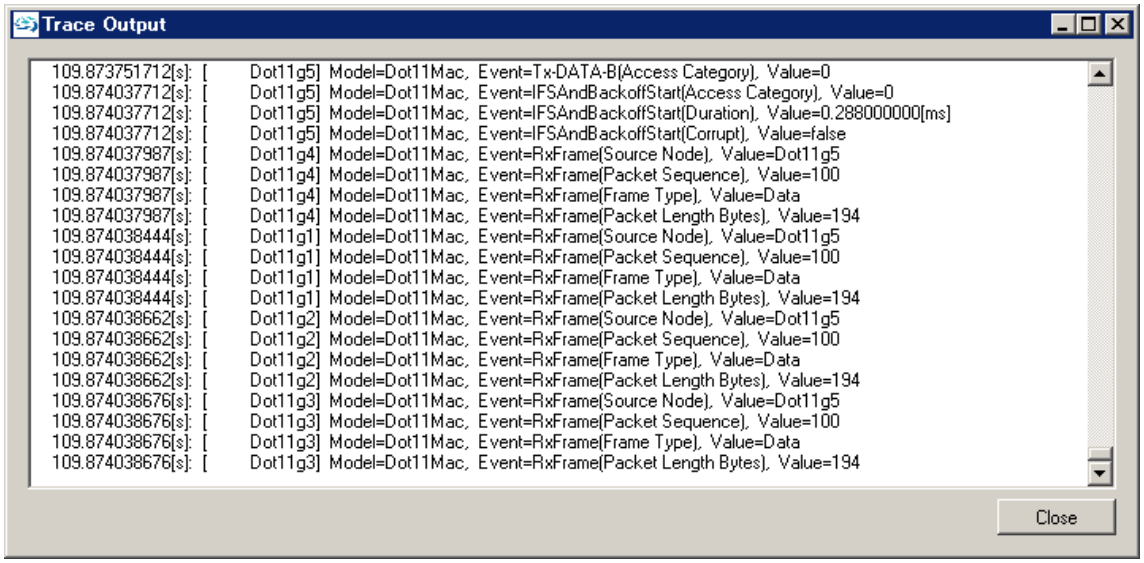




Arrows representing the traffic between communication objects are drawn with a color corresponding to the amount of the traffic.

Trace Output Dialog Box

You can see all trace outputted by the simulator using "Trace Output" dialog box. Choose [Tools]-[Trace Output...] to open the "Trace Output" dialog box. You can see the trace in the text format in this dialog box when the "Trace Output Mode" property is "Binary".



15. Creating Video Clips

Visual Lab has function to create video clips of the visualized simulation results. You can create a video clip by running a simulation or playing back a simulation log. The format of the video clip files is MPEG4.

To create a video clip, choose [File]-[Export]-[Video Clip (mp4)] and open the "Video Clip Creator" dialog box.

1) Input the file name of the output file into "Output File" field.
2) Specify the resolution of the video clip by putting the width and the height of video frames in "Resolution (width, height)" field.
3) Input frame rate of the video in "Frame Rate" field.
4) Set the quality of the video by using the "Quality" slide bar. The higher the video quality is, the larger the file size is.
5) Click on the "OK" button to start simulation or playback of a simulation log and creating the video clip.
6) When the video clip is successfully created, a message "Completed video clip creation." is displayed.

Note: If you are running Visual Lab on 64bit version of Linux and use the Video Clip Creator, you need install required 32bit libraries according to "Scenargie Installation Guide."

16. Scenario Files

A simulation scenario in Visual Lab consists of a case file and several files which are needed to define the scenario and will be saved in the same directory. These files are called “scenario files”, and a directory where the scenario files for a simulation scenario is called a “scenario directory”. Visual Lab outputs several simulation result files such as a statistics file, a trace file into the scenario directory.

16.1. Scenario directory

When saving a new scenario, you are asked to specify a directory to save the scenario. This directory is treated as the scenario directory for the scenario. The following files are saved in the scenario directory.

Contents of a Scenario Directory

ScenarioDirectory/

<Case name>.case <Case name>. property <Case name> _<Object type name>.layer	Scenario files
<Case name>.mob.trace.bin <Case name>trace[.bin] <Case name>.stat <Case name>_SimOutput.log <Case name>_GuiNodeMap.txt	Simulation result files

Visual Lab makes a temporary directory and saves files into it when a scenario is edited and simulation is executed.

The format of the name of a temporary directory is as follows.

scentemp<YYYY-MM-DDThh-mm-ss-[pid]>

e.g. scentmp2012-01-01T12-10-04-4308

The temporary directories are saved in a directory specified by the "User Home Directory" option. The default value of the "User Home Directory" option is as follows.

Linux ： The directory where Visual Lab package was extracted.

Windows ： Visual Lab installation folder (or directory)

MacOS ： Desktop folder (or directory)

16.2. List of scenario files

File type	File name	Description
Case file	<Case name>.case	Scenario case file
Layer file	<Case name>_<Object type name>.layer	Definitions of object types.
Property file	<Case name >. property	Definitions of object properties

16.3. List of simulation result files

File type	File name	Description
Mobility trace file	<Case name>.mob.trace.bin	Mobility trace of objects
Trace file	<Case name>.trace[.bin]	Trace output file. Only trace information enabled by Trace Tags is included.
Statistics file	<Case name>.stat	Statistics data
Simulation log	<Case name>_SimOutput.log	Simulation log outputted to standard output.
Node map file	<Case name>_GuiNodeMap.txt	List of the pairs of the name of a communication object and the node ID, which is used in the simulator.
Agent profile	<Case name>_AgentProfileValues.txt	Agent profile values used in the simulation (outputted only if the Multi Agent Extension Module is used)

16.4. List of exportable simulation configuration files

Followings are the list of configuration files that are exported by [File]-[Export]-[Simulation Configuration File (.config)] menu command.

File type	File name	Description
Configuration file	<Arbitrary name>.config	Simulation parameters. The contents of the file correspond to the properties configured with the Object Properties dialog box.
Antenna file	<Arbitrary Name>.ant	Antenna definitions. This file is specified by Global; Antenna/Propagation; Custom Antenna File property.
Material file	<Arbitrary Name>.material	Material definitions. This file is specified by Global; Antenna/Propagation; Material File property.
Positions file	<Arbitrary Name>.pos	Initial positions of communication objects
Statistics configuration file	<Arbitrary Name>.statconfig	Configuration given by [Tools]-[Statistics Setting]
BER/BLER curve file	<Arbitrary Name>.ber/.bler	Bit error table/block error table. This file is specified by Global; <Communication system name>; Bit/Block Error Rate Curve Input File property.
Static route file	<Arbitrary Name>.routes	Static route table. This file is specified by Global; Simulation; Static Route File property.
Shape file	shapes/ *.shp, *.shx, *.dbf	GIS files in the shapefile

		format

17. Properties

17.1. List of properties

17.1.1. Common

Property	Type	Description
Name	String	Object name
Label	Bool	Visibility of the label of the object
Fill	Brush	Fill color of the object
Border	Pen	Border color of the object

17.1.2. Simulation

Property	Type	Description
Seed	Integer	Random seed
Mobility Seed	Integer	Random seed used for mobility
Simulation Time	Time	Simulation time
Simulation Base Time		Simulation base time
Synchronization Event Time Step	Time	Interval of synchronization events that are used by time-step based models such as interactions between agents in the Multi-Agent Extension Module and updating of positions of mobile objects in the Fast Urban Propagation Module.
Position Type	Enum	Type of Coordinate for representing positions (Cartesian or Longitude/Latitude)
Executable Name	Input File	Simulation executable file
Trace Analyzer Lib	Input File	Trace Analyzer's library file. This file is used for treating binary trace data.
Trace Output Mode	Enum	Trace output mode (Binary/Text)
Output Trace Index	Bool	Enables/disables output of trace index
Trace Output File	Output File	Trace output file
Statistics Output File	Output File	Statistics output file
Output A Line for No Data Statistics	Bool	Enables to output a line with no data to the statistics output file.

Allow Node Recreation for Statistics	Bool	Indication to reuse statistis when node is recreated
Static Route File	Input File	Static route configuration file
Terminate Simulation When Routing Fails	Bool	Terminates simulation when routing fails.
Trace File for Playback	Input File	Binary trace file for playback
Mobility File for Playback	Input File	Binary mobility trace file for playback
Statistics File for Playback	Input File	Statistics file for playback
Simulation Progress Output Interval [%]	Double	Interval of displaying simulation progress in percent of the simulation time.
Enable Unused Parameter Warnings	Bool	Enables warnings about unused parameters

17.1.3. GIS

Property	Type	Description
Driving Side of Road	Enum	Driving side of road: Right or Left
Break Down Curved Road into Straight Roads	Bool	Indicates whether to break down curved roads into connected straight roads This parameter has to be set to False when using the Multi-Agent Extension Module.
Number of Building Entrances	Integer	The minimum number of entrances of buildings
Number of Station Entrances	Integer	The minimum number of entrances of stations
Number of Bus Stop Entrances	Integer	The minimum number of entrances of bus stops
Number of Park Entrances	Integer	The minimum number of entrances of parks
Add Intersection Margin	Bool	Indicates whether to set margins on roads for intersections. This function coordinates the stop lines at intersections so that they can be at realistic positions if two roads with different width cross at the intersection. This parameter has to be set to True when using the Multi-Agent Extension Module.
Traffic Light Pattern Definition	Input File	Traffic light pattern definition file

File		
GIS Data Source for Simulation	String	GIS Data Source for Simulation "InternalGisData": Use GIS data in the current scenario "ExternalShapeFiles": Use shape files (.shp) in the directory specified by the "Shape File Directory" property.
Shape File Directory	Input File	Directory containing shape files (.shp) Effective only if the "GIS Data Source for Simulation" property is "ExternalShapeFiles".
Latlong-based Position	Bool	Indicates whether to use GIS data in which coordinates are in latitude and longitude
Latitude Origin [degree]	Double	Base position in degrees of latitude to covert from lat/long to X/Y.
Longitude Origin [degree]	Double	Base position in degrees of longitude to covert from lat/long to X/Y.

17.1.4. Antenna/Propagation

Property	Type	Description
Number of Threads for Prop	Integer	Number of threads for calculation of radio propagation
Custom Antenna File	Input File	Custom antenna pattern file
2.5D to 3D Interpolation Algorithm Number for Custom Antenna File	Enum	2.5D to 3D interpolation algorithm number for custom antenna file. 1 or 2.
Legacy Antenna Pattern Format for Custom Antenna	Bool	Indicates whether the custom antenna file is in the legacy antenna pattern format or not. Set this property value True if the custom antenna file is in the format supported by Scenargie 1.7 r13769 or earlier versions.
Material File	Input File	Material definition file
Moving Object Shape File	Input File	Moving object shape definition file

17.1.5. Channel

Property	Type	Description
Frequency	Double	Channel center frequency
Bandwidth	Double	Channel bandwidth
MIMO Channel File Name	Input File	MIMO channel file
MIMO Channel File Looping	Bool	Indicates whether to use the same channel file repeatedly.
Frequency Selective Channel File Name	Input File	Frequency selective channel file
Number of Channels	Integer	Number of channels if multiple channels are used
Channel <Number> Frequency	Double	Center frequency of channel <Number>
Channel <Number> Bandwidth	Double	Bandwidth of channel <Number>
Channel <Number> MIMO File Name	Input File	MIMO channel file for channel<Number>
Frequency Selective Channel <Number> File Name	Input File	Frequency selective channel file for channel <Number>
Channel <Number> Spectral Mask MHz dBr	String	Spectral mask of channel <Number> for calculating inter-channel interference correlation matrix. List pairs of the distance from the center frequency in MHz and the relative power in dBr. Example: 20MHz bandwidth-channel at 2.4GHz 9.0 0.0 11.0 -20.0 20.0 -28.0 30.0 -40.0
Channel <Number> Nominal Transmit Width	Double	Nominal transmit bandwidth of channel <Number> for calculating inter-channel interference correlation matrix
Channel <Number> Receive Width	Double	Receive bandwidth of channel <Number> for calculating inter-channel interference correlation matrix
Enable Mask Calculated Channel Interference	Bool	Indicates whether to enable spectral mask-based inter-channel interference

		calculation.
Channel Interference Matrix	String	Inter-channel interference correlation matrix If two channels are used, and the inter-channel correlation is 0.5, the value of the property is written as "1 0.5 0.5 1" (CH0→CH0 CH0→CH1 CH1→CH0 CH1→CH1)
Propagation Model	Enum	Propagation model: FreeSpace, TwoRayGround, OkumuraHata, COST231Hata, COST231Indoor, WallCount, ITU-R_P.1411, Taga, ITM, TwoTier, Trace, TGaxIndoor, ITU-UMi, LTE_Macro, LTE_Pico, FUPM, or HFPM * Appropriate extension module is required to use LTE_Macro, LTE_Pico, FUPM, and HFPM.
Okumura-Hata Environment	Enum	<OkumuraHata Model> Environment: Urban_LargeCity, Urban_MediumOrSmallCity, Suburban, or Rural.
COST231 Hata Environment	Enum	<COST231Hata Model> Environment: Suburban or Metropolitan
Indoor Breakpoint Distance	Double	<COST231Indoor Model> Breakpoint distance in meters
Baseline Propagation Model	Enum	<WallCount Model> Baseline propagation model
Penetration Loss (dB)	Double	<WallCount Model> Penetration loss per wall in dB
LoS Calculation policy	Enum	<ITU-R_P.1411 Model> LOS calculation policy: Median, Lower, or Upper
Max Diffraction Count	Enum	<ITU-R_P.1411 Model> Maximum diffraction count
LoS Angle Threshold	Double	<ITU-R_P.1411 Model> LoS angle threshold in degrees

Max NLoS Distance	Double	<ITU-R_P.1411 Model> Maximum NLoS distance in meters
Enable Building based LoS Calculation	Bool	<ITU-R_P.1411 Model> Indicates whether to utilize building layout for LoS calculation
NLoS1 Calculation Policy	Enum	<ITU-R_P.1411 Model> NLoS1 calculation policy: Urban or Suburban
NLoS2 Calculation Policy	Enum	<ITU-R_P.1411 Model> NLoS2 calculation policy Urban or Residential
NLoS2 Loss Direction	Enum	<ITU-R_P.1411 Model> Policy to select the path loss value from the calculation results of different directions: Directional, BidirectionalLargeLoss, BidirectionalSmallLoss, SmallNodeIdToLargeNodeIdLoss, or LargeNodeIdToSmallNodeIdLoss Directional: Selects the path loss from Tx to Rx BidirectionalLargeLoss: Selects larger path loss of from Tx to Rx and from Rx toTx. BidirectionalSmallLoss : Selects smaller path loss of from Tx to Rx and from Rx to Tx. SmallNodeIdToLargeNodeIdLoss : Selects path loss from a communication object with smaller node ID to one with larger node ID. LargeNodeIdToSmallNodeIdLoss : Selects path loss from a communication object with larger node ID to one with smaller node ID.
NLoS2 Use Policy	Enum	<ITU-R_P.1411 Model> NLoS2 use policy: Default, AlwaysUse800To2000MHzCalculation, or AlwaysUse2To16GHzCalculation * Default chooses the suitable equation according to the frequency.
NLoS2 Extension	Enum	<ITU-R_P.1411 Model> NLoS2 extension: Off or UseInverseLargerLoss

Use Larger Loss Value at LoS and NLoS2 Bound	Bool	<ITU-R_P.1411 Model> Whether to use the loss in LoS when the calculation result of loss in NLloS is smaller than that in LoS.
NLoS Calculation Policy 800 to 2GHz	Enum	<ITU-R_P.1411 Model> NLoS calculation policy for 800MHz-2000MHz: Lower, Upper, or GeometricMean
Enable SHF Propagation Model	Bool	<ITU-R_P.1411 Model> Indication to utilize calculation model for SHF
SHF Effective Road Height	Double	<ITU-R_P.1411 Model> Effective road height at SHF
SHF Short Distance	Double	<ITU-R_P.1411 Model> Short distance at SHF in meters (>0)
Enable Propagation Between Terminals Located Below Roof-Top Height at UHF	Bool	<ITU-R_P.1411 Model> Whether to enable calculation of propagation between terminals located blow roof-top height at UHP
Height Differ Threshold	Double	<ITU-R_P.1411 Model> Threshold to determine the difference of height of buildings in meters (>0)
Below Roof-Top Calculation Policy	Enum	<ITU-R_P.1411 Model> Below roof-top calculation policy: Urban, Suburban, Dense, High-Rise
Well Below Roof-Top Height	Double	<ITU-R_P.1411 Model> Well below roof-top height in meters (>0)
Below Roof-top Location Percentage	Enum	<ITU-R_P.1411 Model> Below roof-top location percentage: 1, 10, 50, 90, or 99
Roof-Top Transition Region	Double	<ITU-R_P.1411 Model> Roof-Top transition region in meters (>0)
LoS consts CSV	String	<Taga Model> Coefficients used in the equation to obtain path pass at LOS (CSV format)
NLoS1 consts CSV	String	<Taga Model> Coefficients used in the equation to obtain path pass at NLoS1 (CSV format)
NLoS2 consts CSV	String	<Taga Model> Coefficients used in the equation to obtain path pass at NLoS2 (CSV format)

Enable Building based LoS Calculation	Bool	<Taga Model> Indicates whether to utilize building layout for LoS calculation
NLoS Loss Direction	Enum	<Taga Model> Policy to select the path loss value from the calculation results of different directions: Directional, BidirectionalLargeLoss, BidirectionalSmallLoss, SmallNodeIdToLargeNodeIdLoss, or LargeNodeIdToSmallNodeIdLoss Directional：Selects the path loss from Tx to Rx BidirectionalLargeLoss: Selects larger path loss of from Tx to Rx and from Rx toTx. BidirectionalSmallLoss：Selects smaller path loss of from Tx to Rx and from Rx to Tx. SmallNodeIdToLargeNodeIdLoss：Selects path loss from a communication object with smaller node ID to one with larger node ID. LargeNodeIdToSmallNodeIdLoss：Selects path loss from a communication object with larger node ID to one with smaller node ID.
Calculation Point Division Length	Double	<ITM Model> Calculation point division length (corresponds to the maximum granularity of calculation)
Earth Dielectric Constant	Double	<ITM Model> Earth dielectric constant
Earth Conductivity	Double	<ITM Model> Earth conductivity
Atmospheric Bending Constant	Double	<ITM Model> Atmospheric bending constant
Fraction of Time	Double	<ITM Model> Fraction of time
Fraction of Situations	Double	<ITM Model> Fraction of situations
Radio Climate	Enum	<ITM Model> Climate: Equatorial, Continental-Subtropical, Maritime-Tropical, Desert, Continental-Temperate, Maritime-Temperate-Over-Land, or Maritime-Temperate-Over-Sea

Polarization	Enum	<ITM Model> Polarization: Horizontal or Vertical
Enable Foliage Loss	Bool	<ITM Model> Indicates whether to enable foliage loss
Enable Vertical Diffraction Path Calculation	Bool	<ITM Model> Indicates whether to use the path loss calculation results of vertical diffraction path if it is less than the path loss obtained by the normal path loss calculation results in the ITM model.
Primary Propagation Model	Enum	<Two Tier Model> Primary propagation model
Secondary Propagation Model	Enum	<Two Tier Model> Secondary propagation model
Nodes Running Secondary Prop Model	Object	<Two Tier Model> Communication objects that use the secondary propagation model.
Default Propagation Model	Enum	<Trace Model> Default propagation model. This model is used if the trace is unavailable.
Freespace Breakpoint	Double	Distance to break point in meters
Floor Attenuation [dB]	Double	Attenuation loss for floor(ceiling) in dB
Wall Attenuation [dB]	Double	Annenuation loss for wall in dB
Enable Shadowing Loss	Bool	<LTE_Macro Model, LTE_Pico Model> Indicates whether to enable shadowing loss
Cross Correlation Factor for Shadowing	Double	<LTE_Macro Model, LTE_Pico Model> Cross correlation factor for shadowing (0–1)
Shadowing Map File	Input File	<LTE_Macro Model, LTE_Pico Model> Shadowing map file
Enable Penetration Loss	Bool	<LTE_Macro Model, LTE_Pico Model> Indicates whether to enable penetration loss.
Penetration Loss (dB)	Double	<LTE_Macro Model, LTE_Pico Model> Penetration loss per wall in dB
Pathloss Calculation Model	Enum	<FUPM Model, HFPM Model> Path loss calculation model FUPM: Hata, COST_hata, Walfisch_Ikegami, OPAR, FreeSpace, VPUP, or TPGeodesic HFPM: FULL3D

Propagation Trace File	Output File	Propagation trace file If Propagation Model is Trace, it is treated as an input file, otherwise it is treated as an output file. (File output function is only available only with Dot Eleven Module and ITS Extension Module.)
Enable Propagation Delay	Bool	Indicates whether to enable propagation delay (the value should bet set false for LteDownlink and LteUplink)
Max Signal Propagation (optimization)	Double	Maximum signal propagation distance
Allow Multiple Interfaces on Same Channel	Bool	Indicates whether to allow multiple interfaces on the same channel
Fading Model	Enum	Fading model: Off, Rayleigh, or Nakagami
Shape Factor m	Integer	<Nakagami Fading Model> Shape factor m
Enable Selection Combining Diversity	Bool	<Rayleigh Fading Model> Indicates whether to enable selection combining diversity
Enable Fixed Velocity	Bool	<Rayleigh Fading Model> Indicates whether to use a fixed velocity when calculating the doppler frequency.
Fixed Velocity	Double	<Rayleigh Fading Model> Fixed velocity used for calculating the doppler frequency
Velocity Update Interval	Time	<Rayleigh Fading Model> Velocity update interval
Minimum Velocity	Double	<Rayleigh Fading Model> Minimum relative velocity
Number of Sub Path	Integer	<Rayleigh Fading Model> Number of sub-paths
Shadowing Model	Enum	Shadowing model: SimpleLogNormal
Standard Deviation	Double	<SimpleLogNormal> Standard deviation of log normal shadowing

17.1.6. Position

Property	Type	Description
X Coordinate [m]	Double	X Coordinate [m]
Y Coordinate [m]	Double	Y Coordinate [m]
Z Coordinate [m]	Double	Z Coordinate [m]
Longitude	Double	Longitude
Latitude	Double	Latitude
Rotation	Double	Rotation

17.1.7. Simulation Object

Property	Type	Description
Simulation Node ID	Integer	Node ID used in the simulator
Trace Tags	Check List	Trace tags: Check the following tags Mobility, Application, Transport, Network, Routing, Mac, Phy, PhyInterference, Gis, and Mas
Trace Start Time	Time	Trace start time

17.1.8. Building

Property	Type	Description
Height [m]	Double	Height of the building in meters
People Capacity [people]	Integer	People capacity of the building (Number of people)
Vehicle Capacity [vehicle]	Integer	Vehicle capacity of the building (Number of vehicles)
Building Material for FUPM / Roof Material for HFPM	String	<FUPM> Building material name <FHPM> Roof material name
Wall Material for HFPM	String	<HFPM> Wall material name
Floor Material for HFPM	String	<HFPM> Floor material name

17.1.9. Entrance

Property	Type	Description
People Flow Rate [people/s]	Integer	Maximum number of people which can enter a building/park per second

Queue Type	Enum	Queue form type at an entrance [Line]
Number of People per Row [people/row]	Integer	Number of people per row in a line
Row Separation [m]	Double	Distance between rows
Column Separation [m]	Double	Distance between columns

17.1.10. Wall

Property	Type	Description
Material	String	Wall material name
Wall Thickness [m]	Double	Thickness of the wall in meters
Height [m]	Double	Height of the wall in meters

17.1.11. Road

Property	Type	Description
Width [m]	Double	Width of the road in meters
Speed Limit [km/h]	Double	Speed limit in km/h
Number of Lanes (Src -> Dest)	Integer	Number of lanes from the source to the destination
Number of Lanes (Dest -> Src)	Integer	Number of lanes from the destination to the source
Pedestrian Capacity [people/m^2]	Double	Maximum number of people per unit area in people/m2
Road Type	Enum	Road type: Road (vehicles and pedestrians), Pedestrian (only pedestrians), Motorway (only vehicles)

17.1.12. TrafficLight

Property	Type	Description
Switching Pattern Type	Enum	Switching patter type: Predefined or Manual
Predefined Pattern Name	String	Predefined switching pattern type file that is used when Switching Pattern Type is Predefined.
Start Time Offset	Time	Offset of the start time of the traffic light pattern
Green Duration	Time	Green duration

Yellow Duration	Time	Yellow duration
Red Duration	Time	Red duration

17.1.13. BusStop/Park/Station

Property	Type	Description
Capacity [people]	Integer	People capacity (Number of people)

17.1.14. POI

Property	Type	Description
Capacity [people]	Integer	People capacity (Number of people)
POI Information	String	Information for POI

17.1.15. Communication Object

Property	Type	Description
Display	Enum	Shape of the communication object on the screen: Rectangle, StaticRectangle, or Icon
X Length [m]	Double	X length of the rectangle in meters (Effective only if Display is Rectangle)
Y Length [m]	Double	Y length of the rectangle in meters (Effective only if Display is Rectangle)
Icon Path	Input File	Icon file (Effective only if Display is Icon)
Moving Object Shape Type	String	Moving object shape type name

17.1.16. Point Object

Property	Type	Description
Display	Enum	Display type: Circle or Icon
Radius [m]	Double	Radius in meters [m] (Effective only if Display is Circle)
Icon Path	Input File	Icon file (Effective only if Display is Icon)

17.1.17. GIS Object

Property	Type	Description
Disabled Time	Time	Time when the GIS object is disabled.
Enabled Time	Time	Time when the GIS object is enabled.

Z Coordinate Reference	Enum	The reference point of Z coordinate of the GIS object: SeaLevel or GroundLevel

17.1.18. Mobility

Property	Type	Description
Mobility Model	Enum	Mobility model: Stationary, Random-Waypoint, Gis-Based-Random-Waypoint, or Trace-File
Granularity Meters	Double	Granularity of positions in meters
Pause Time	Time	<Random-Waypoint Model, Gis-Based-Random-Waypoint Model> Pause time
Minimum Speed	Double	<Random-Waypoint Model, Gis-Based-Random-Waypoint Model> Minimum speed
Maximum Speed	Double	<Random-Waypoint Model, Gis-Based-Random-Waypoint Model> Maximum speed
Use Rectangle Movable Area	Bool	Indicates whether to use rectangle movable area. If this property is false, the area is specified by a polygon.
Movable Area GIS Object Name	String	The name of a polygon GIS object that specifies the movable area.
Movable Area Min x,y Max x,y	String	<Random-Waypoint Model> Movable area's minimum x, y-coordinates and maximum x, y-coordinates e.g.) -250,-250,250,250
Ground GIS Object Type	Enum	<Gis-Based-Random-Waypoint Model> GIS Object type that moving objects move along: Road
Mobility File	Input File	<Trace-File Model> Mobility trace file
Dynamic Object Creation	Bool	Indicates whether to enable the dynamic object creation function
Position Initialization File	Input File	<Random-Waypoint Model,

		Gis-Based-Random-Waypoint Model> Position initialization file that has initial positions of objects.
Lane Offset Meters	Double	<Gis-Based-Random-Waypoint Model> Lane offset in meters
Route Search Based Algorithm	Bool	<Gis-Based-Random-Waypoint Model> Indicates whether to use a route search based algorithm
Need To Add Ground Height	Bool	Indicates whether to add the ground height to the Z coordinate of each object.

17.1.19. Transport

Property	Type	Description
TCP Settings	Enum	TCP setting method: Default, Manual
Congestion Control Module Name	Enum	Name of the used congestion control module: "NewReno", "Reno", "CUBIC", "H-TCP", "Vegas", "Hamilton-Delay", "CAIA-Hamilton-Delay", or "CAIA-Delay-Gradient"
Enabled H-TCP Adaptive Backoff	Bool	Indicates whether to enable the adaptive backoff function of HTCP
Enabled H-TCP RTT Scaling	Bool	Indicates whether to enable the RTT scaling of HTCP
Vegas Alpha	Integer	TCP Vegas Alpha threshold in MSS
Vegas Beta	Integer	TCP Vegas Beta threshold in MSS
HD Qthresh	Integer	Threshold of delay (qthresh) of Hamilton-Delay in a multiple of 10ms
HD Qmin	Integer	Threshold of the minimum delay (qmin) of Hamilton-Delay in a multiple of 10ms
HD Pmax	Integer	Maximum backoff probability of Hamilton-Delay in percent
CHD Qmin	Integer	Minimum backoff probability of CAIA-Hamilton-Delay in percent
CHD Pmax	Integer	Maximum backoff probability of CAIA-Hamilton-Delay in percent

Enabled CHD Loss Fair	Bool	Indicates whether to enable shadow window of CAIA-Hamilton-Delay
Enabled CHD Use Max	Bool	Indicates whether to use the maximum RTT as RTT in CAIA-Hamilton-Delay
CHD Qthresh	Integer	Delay threshold of CAIA-Hamilton-Delay in 10ms
CDG Wif	Integer	Per RTT window increase factor in RTT used by CAIA-Delay-Gradient. If this value is zero, the congestion window is increased by 1MSS every 1RTT）
CDG Wdf	Integer	Window decrease factor in percent used by CAIA-Delay-Gradient
CDG Loss Wdf	Integer	Window decrease for packet loss in percent used by CAIA-Delay-Gradient
CDG Smoothing Factor	Integer	Number of samples used in the moving average smoothing used by CAIA-Delay-Gradient
CDG Exp Backoff Scale	Integer	Scaling parameter for the probabilistic exponential backoff used by CAIA-Delay-Gradient [17]
CDG Consec Cong	Integer	Number of consecutive delay gradient based congestion episodes which will trigger loss based CC compatibility. This value is used by CAIA-Delay-Gradient [17]
CDG Hold Backoff	Integer	Number of consecutive delay gradient based congestion episodes to hold the window backoff for loss based CC compatibility. This value is used by CAIA-Delay-Gradient
Host Cache Hash Size	Integer	Size of TCP hostcache hash table
Host Cache Bucket Limit	Integer	Per-bucket hash limit for hostcache
Enabled Blackhole	Bool	Indicates whether to ignore segments arriving to closed ports. If this value is false, the TCP sends RST
Enabled Delayed ACK	Bool	Indicates whether to enable delayed ACK
Timer Delayed ACK Time	Time	Maximum delay for delayed ACKs
Enabled Drop SYN+FIN	Bool	Indicates whether to drop TCP packets with

		both SYN and FIN flags are set
Enabled RFC3042	Bool	Indicates whether to enable RFC3042
Enabled RFC3390	Bool	Indicates whether to enable RFC3390
Slow Start Flight Size Segments	Integer	Slow start flight size in MSS. This is the initial size of the congestion window in slow start. If RFC3390 is enabled, this value is not used
Slow Start Local Flight Size Segments	Integer	Slow start flight size for local networks in MSS. If RFC3390 is enabled, this value is not used
Enabled RFC3465 ABC	Bool	Indicates whether to enable RFC3465
RFC3465 ABC L Var	Integer	The maximum size of the congestion window in MSSs during slow start. This value is used only when RFC3465 is enabled
Enabled Insecure RST	Bool	Indicates whether to accept RST packets with an invalid sequence number
Enabled Auto Receive Buffer	Bool	Indicates whether to enable automatic receive buffer sizing
Auto Receive Buffer Increment Bytes	Integer	Incremental step size in bytes of automatic receive buffer
Auto Receive Buffer Max Bytes	Integer	Maximum size of automatic receive buffer in bytes
Enabled Auto Send Buffer	Bool	Indicates whether to enable to automatic send buffer sizing
Auto Send Buffer Increment Bytes	Integer	Incremental step size in bytes of automatic send buffer
Auto Send Buffer Max Bytes	Integer	Maximum size of automatic send buffer in bytes
Timer Keep Init Time	Time	Timeout time for establishing a connection
Enabled Keep Alive	Bool	Indicates whether to enable keep-alive probes
Timer Keep Idle Time	Time	Idle time before keepalive probes begin
Timer Keep Interval Time	Time	Interval of keep-alive probes
Timer Keep Count	Integer	Maximum count of keep alive probes before disconnection
Timer MSL Time	Time	Maximum segment lifetime (MSL)
Timer Retransmit Min Time	Time	Minimum retransmission timeout

Timer Retransmit Slop Time	Time	Constant time added to the calculated retransmission timeout
Enabled Timer Fast FIN_WAIT_2 Timeout	Bool	Indicates whether to enable fast FIN_WAIT_2 timeout
Timer FIN_WAIT_2 Timeout Time	Time	Timeout time in case when fast FINWAIT2 timeout is enabled
Timer Max Persist Idle Time	Time	Maximum persist idle time (Maximum idle time length that the connection has zero-size window before disconnection)
Reassemble Max Segments	Integer	Maximum number of segments in a reassemble queue
Enabled RFC2018 SACK	Bool	Indicates whether to enable RFC2018 SACK
RFC2018 SACK Max Holes	Integer	RFC2018 maximum number of SACK holes per connection
RFC2018 SACK Global Max Holes	Integer	RFC2018 maximum number of SACK holes per node
Max TIME_WAIT Count	Integer	Maximum number of connection ends in TIME_WAIT state
Max Segment Size	Integer	Maximum segment size
Min MSS	Integer	Minimum segment size
Enabled RFC1323	Bool	Indicates whether to enable RFC1323
ISN Reseed Interval Time	Time	Initial sequence number calculation reseed interval. If this property is 0, the calculation is not reseeded
Enabled SYN Cookies	Bool	Indicates whether to enable SYN cookies
Enabled SYN Cookies Only	Bool	Indicates whether to use only SYN cookies when SYN cookies function is enabled. If this value is true, SYN cache is not used
SYN Cache Hash Size	Integer	size of SYN cache hash table
SYN Cache Bucket Limit	Integer	Per-bucket hash limit for SYN cache
Enabled RST Sock Fail	Bool	Indicates whether to send RST if creating socket fails
Send Buffer Bytes	Integer	Send buffer size in bytes
Receive Buffer Bytes	Integer	Receive buffer size in bytes
Max Sockets	Integer	Maximum number of sockets

Buffer Max Bytes	Integer	Maximum buffer size in bytes
Enabled Nagle	Bool	Indicates whether to enable Nagle's algorithm
Enabled Options	Bool	Indicates whether to enable TCP options
V6 Max Segment Size	Integer	IPv6 maximum segment size in bytes

17.1.20. Routing

Property	Type	Description
Routing Protocol	Enum	Routing protocol: Kernel_AODV, NRL_OLSR, or NU_OLSRv2
Active Route Timeout Time	Time	<Kernel_AODV> Active route timeout time (ACTIVE_ROUTE_TIMEOUT)
Allowed Hello Loss Packets	Integer	<Kernel_AODV> Allowed number of consecutive HELLO packet losses (ALLOWED_HELLO_LOSS)
Hello Interval Time	Time	<Kernel_AODV> Hello interval time (HELLO_INTERVAL)
My Route Timeout Time	Time	<Kernel_AODV> My route timeout time (MY_ROUTE_TIMEOUT)
Hop Limit	Integer	<Kernel_AODV> Hop limit (NET_DIAMETER)
Node Traversal Time	Time	<Kernel_AODV> Node traversal time (NODE_TRAVERSAL_TIME)
RREQ Retries	Integer	<Kernel_AODV> Maximum RREQ Retry times (RREQ_RETRIES)
Flooding Method	Enum	<NRL_OLSR> Flooding method: Off, S-MPR, NS-MPR, NOT-SYM, Simple, ECDS, or MPR-CDS
Maximum Forward Delay	Time	<NRL_OLSR> Maximum forward delay of OLSR packets
Hello Interval	Time	<NRL_OLSR> HELLO interval (HELLO_INTERVAL)
Hello Jitter	Double	<NRL_OLSR> HELLO jitter
Hello Timeout Factor	Double	<NRL_OLSR> Factor used for calculating the neighbor node hold time
Shortest Path Algorithm	Enum	<NRL_OLSR> Shortest path algorithm:

		ShortestHop, SPF, MinMax, or RobustRoute
TC Interval	Time	<NRL_OLSR> TC interval
TC Jitter	Double	<NRL_OLSR> TC jitter
TC Timeout Factor	Double	<NRL_OLSR> Factor used for calculating the topology hold time
Willingness	Integer	<NRL_OLSR> Willingness
Attached Network Address List	String	IP address list for external networks (Delimiter: space)
Attached Network Mask List	String	Subnet mask length in bits for external networks (Delimiter: space)
Attached Network Distance List	String	Hop count to external networks (Delimiter: space)
Hello Interval	Time	<NU_OLSRv2> Maximum time between the transmission of two successive HELLO messages (HELLO_INTERVAL)
Hello Max Jitter	Time	<NU_OLSRv2> Maximum jitter used for sending HELLO messages (HP_MAXJITTER)
Hello Start Time	Time	<NU_OLSRv2> Time point to send the first HELLO message
Link Quality Type	String	<NU_OLSRv2> Link quality type: No or Hello
LQ Hyst Accept	Double	<NU_OLSRv2> Threshold of link quality to determine the availability of the link. If the link quality is greater or equal to this value, the protocol determines the link is available.
LQ Hyst Reject	Double	<NU_OLSRv2> Threshold of link quality to determine the availability of the link. If the link quality is less or equal to this value, the protocol determines the link is available.
LQ Initial Quality	Double	<NU_OLSRv2> Initial link quality
LQ Initial Pending	Bool	<NU_OLSRv2> Indicates whether the link is considered pending.
LQ Hyst Scale	Double	<NU_OLSRv2> A constant used for updating link quality

LQ Loss Detect Scale	Double	<NU_OLSRv2> A constant used for calculating the waiting time for detecting loss of a HELLO message.
Link Metric Type	String	<NU_OLSRv2> Link metric type: No, ETX, or Static
LM Etx Memory Length	Integer	<NU_OLSRv2> Number of past items saved for calculating ETX link metric
LM Etx Metric Interval	Time	<NU_OLSRv2> ETX link metric update interval
LM Metric List File	String	<NU_OLSRv2> Link metric list file name
TC Interval	Time	<NU_OLSRv2> The maximum time between the transmission of two successive TC messages (TC_INTERVAL)
TC Max Jitter	Time	<NU_OLSRv2> Maximum jitter used for sending TC messages (TP_MAXJITTER)
TC Start Time	Time	<NU_OLSRv2> Time point to send the first TC message
TC Hop Limit	Integer	<NU_OLSRv2> Hop limit of TC messages
Willingness	Integer	<NU_OLSRv2> Willingness
Broadcast Priority	Integer	<NU_OLSRv2> Priority of control messages of OLSRv2

17.1.21. Antenna

Property	Type	Description
Channel Instance ID	Enum	Channel instance ID
Antenna Model	Enum	Antenna model: Omnidirectional, Sectored, FUPM/HFPM, or Custom
Gain dBi	Double	Antenna gain for omnidirectional antenna model in dBi
Max Gain dBi	Double	Maximum antenna gain for sectored antenna model in dBi
Quasi-Omni Mode Gain dBi	Double	Antenna gain in dBi for quasi omni mode
Height	Double	Antenna height relative to the position of the communication object
Azimuth from North Clockwise	Double	Azimuth of the antenna relative to the

		direction of the communication object (clockwise)
Elevation from Horizontal	Double	Elevation angle of the antenna from the direction of the communication object (Positive value means upward.)
Offset Distance	Double	Offset distance of the antenna from the position of the node
Offset Angle	Double	Offset azimuth of the antenna from the position of the node (clockwise)
Tx Antenna Pattern File	Input File	<FUPM/HFPM Model> Tx antenna pattern file (.uan)
Tx Antenna Bearing	Double	<FUPM/HFPM Model> Bearing of the Tx antenna; Rotation angle of the z-axis of the Tx antenna (clockwise relative to the positive direction of the y-axis)
Tx Antenna Pitch	Double	<FUPM/HFPM Model> Pitch of the Tx antenna; Rotation angle of the x-axis of the Tx antenna (clockwise relative to the positive direction of the z-axis)
Tx Antenna Roll	Double	<FUPM/HFPM Model> Roll of the Tx antenna; Rotation angle of the y-axis of the Tx antenna (clockwise relative to the positive direction of the x-axis)
Rx Antenna Pattern File	Input File	<FUPM/HFPM Model> Rx antenna pattern file (.uan)
Rx Antenna Bearing	Double	<FUPM/HFPM Model> Bearing of the Rx antenna; Rotation angle of the z-axis of the Rx antenna (clockwise relative to the positive direction of the y-axis)
Rx Antenna Pitch	Double	<FUPM/HFPM Model> Pitch of the Rx antenna; Rotation angle of the x-axis of the Rx antenna (clockwise relative to the positive direction of the z-axis)
Rx Antenna Roll	Double	<FUPM/HFPM Model> Roll of the Rx antenna; Rotation angle of the y-axis of the Rx antenna (clockwise relative to the

		positive direction of the x-axis)

17.1.22. Network（Interface）

Property	Type	Description
Interface Network Address	String	IP address of the communication object If the value of this property is "<Subnet address> + $n", $n is replaced by the node ID of the communication object and the IP address is calculated. If the value of this property is "192.168.0.0 + $n" and the node ID is 74, "192.168.0.74" is given to the communication object.
Network Address Prefix Length [bit]	Integer	Network address prefix length in bits
Subnet Address Is Multihop	Bool	Indicates whether the subnet that the interface is connected to is a multihop network.
Network Address Is Primary	Bool	Indicates whether the IP address given to the interface is primary.
Allow Routing Back Out Same Interface	Bool	Indicates whether to allow the interface to send a packet back to the same interface.
Ignore Unregistered Protocol	Bool	Indicates whether to ignore packets with an unregistered protocol number.
Gateway Address	String	Gateway IP address
MAC Protocol	String	MAC protocol name
Max Packets per Queue	Integer	Maximum number of packets per transmission queue （0 means infinite size）
Max Bytes per Queue	Integer	Maximum bytes per transmission queue （0 means infinite size）
Max Packets per Sub-Queue	Integer	Maximum number of packets per sub transmission queue （0 means infinite size）
Max Bytes per Sub-Queue	Integer	Maximum bytes per sub transmission queue （0 means infinite size）

DHCP Client	Bool	<DHCP> Indicates whether to enable DHCP client function
DHCP Server	Bool	<DHCP> Indicates whether to enable DHCP server function
DHCP Model	Enum	<DHCP> DHCP Model Abstract: Abstract Model ISC: ISC DHCP
DHCP Client Packet Priority	Integer	<DHCP> Priority of DHCP client packets (Effective only if DHCP client is true and DHCP Model is abstract.)
DHCP Server Packet Priority	Integer	<DHCP> Priority of DHCP server packets (Effective only if DHCP server is true and DHCP Model is Abstract.)
DHCP Server Use Server Address As Default Gateway Address	Bool	<DHCP> Indicates whether the DHCP server uses its address as the default gateway address. (Effective only if DHCP server is true and DHCP Model is Abstract.)
DHCP Server Default Gateway Address To Offer	String	<DHCP> Default gateway address that the DHCP server offers (Effective only if DHCP Server is True, DHCP Model is Abstract, and DHCP Server Use Server Address As Default Gateway Address is False.)
ISC DHCP Client Config File	Input File	<ISC DHCP> Client configuration file (Effective only if DHCP Client is True and DHCP Model is ISC.)
ISC DHCP Client Input Lease File	Input File	<ISC DHCP> Client input lease file (Effective only if DHCP Client is True and DHCP Model is ISC.)
ISC DHCP Client Output Lease File	Output File	<ISC DHCP> Client output lease file (Effective only if DHCP Client is True and DHCP Model is ISC.)
ISC DHCP Client Packet Priority	Integer	<ISC DHCP> Priority of client packets (Effective only if DHCP Client is True and DHCP Model is ISC.)

ISC DHCP Server Config File	Input File	<ISC DHCP> Server configuration file (Effective only if DHCP Server is True and DHCP Model is ISC.)
ISC DHCP Server Input Lease File	Input File	<ISC DHCP> Server input lease file (Effective only if DHCP Server is True and DHCP Model is ISC.)
ISC DHCP Server Output Lease File	Output File	<ISC DHCP> Server output lease file (Effective only if DHCP Server is True and DHCP Model is ISC.)
ISC DHCP Server Packet Priority	Integer	<ISC DHCP> Priority of server packets (Effective only if DHCP Server is True and DHCP Model is ISC.)
Enabled NDP	Bool	<NDP> Indicates whether to enable NDP (Effective only if IPv6 is used.)
NDP Mode	Enum	<NDP> Mode: Host or Router (Effective only if Enabled NDP is True and IPv6 is used.)
Address Resolution	Bool	<NDP> Indicates whether to enable address resolution (Effective only if Enabled NDP is True and IPv6 is used.)
Address Autoconfiguration	Bool	<NDP> Indicates whether to enable address autoconfiguration (Effective only if Enabled NDP is True, NDP Mode is Host, and IPv6 is used.)
Gateway Autoconfiguration	Bool	<NDP> Indicates whether to enable gateway autoconfiguration (Effective only if Enabled NDP is True, NDP Mode is Host, and IPv6 is used.)
Router Advertisement Interval	Double	<NDP> Router advertisement interval (Effective only if Enabled NDP is true, NDP Mode is router, and IPv6 is used.)
Router Advertisement Jitter	Double	<NDP> Router advertisement jitter (Effective only if Enabled NDP is true, NDP Mode is router, and IPv6 is used.)
Enabled ARP	Bool	<ARP> Indicates whether to enable ARP

Enabled Proxy ARP	Bool	<ARP> Indicates whether to enable Proxy ARP
ARP Probe Wait	Double	<ARP> Maximum delay before address probing
ARP Probe Num	Integer	<ARP> Number of probe packets
ARP Probe Min	Double	<ARP> Minimum delay until repeated probe
ARP Probe Max	Double	<ARP> Minimum delay until repeated probe
ARP Announce Wait	Double	<ARP> Maximum wait before announcing
ARP Announce Num	Integer	<ARP> Number of announcement packets
ARP Announce Interval	Double	<ARP> Time between announcement packets
ARP Max Conflicts	Integer	<ARP> Maximum number of conflicts before rate-limiting
ARP Rate Limit Interval	Double	<ARP> Delay between successive attempts
ARP Packet Priority	Integer	<ARP> Packet priority

17.1.23. Network（Node）

Property	Type	Description
Hop Limit	Integer	Initial value of TTL (Time to Live, IPv4) or Hop Limit field (IPv6) filed of IP header. Maximum hop count.
Loopback Delay	Double	Loopback Delay

17.1.24. CBR

Property	Type	Description
Destination	Object	Destination communication object
Destination is Multicast Group	Bool	Indicates whether the destination is a multicast group
Destination Multicast Group Number	Integer	Destination multicast group number
Start Time	Time	Start time
End Time	Time	End time
Start Time Max Jitter	Time	Maximum jitter added to the start time
Payload Size	Integer	Payload size
Traffic defined by	Enum	Method to define the traffic amount:

		Interval, PacketsPerSecond, or BitsPerSecond
Packet Interval	Time	Packet transmission interval
Traffic Volume (bit)	Integer	Traffic volume in bits per second (Effective only if "Traffic defined by" is "BitsPerSecond".)
Traffic Volume (packet)	Double	Traffic volume in packets per second (Effective only if "Traffic defined by" is "PacketsPerSecond".)
Priority	Integer	Priority
Auto Port Mode	Bool	Indicates whether to enable the auto port mode
Destination Port	Integer	Destination port number (Effective only if Auto Port Mode is False.)
Use Virtual Payload	Bool	Indicates whether to enable the virtual payload function

17.1.25. VBR

Property	Type	Description
Destination	Object	Destination communication object
Destination is Multicast Group	Bool	Indicates whether the destination is a multicast group
Destination Multicast Group Number	Integer	Destination multicast group number
Start Time	Time	Start time
End Time	Time	End time
Start Time Max Jitter	Time	Maximum jitter added to the start time
Payload Size	Integer	Payload size
Traffic defined by	Enum	Method to define the traffic amount: Interval, PacketsPerSecond, or BitsPerSecond
Mean Packet Interval	Time	Mean packet transmission interval
Traffic Volume (bit)	Integer	Traffic volume in bits per second (Effective only if "Traffic defined by" is "BitsPerSecond".)

Traffic Volume (packet)	Double	Traffic volume in packets per second (Effective only if "Traffic defined by" is "PacketsPerSecond".)
Minimum Packet Interval	Time	Minimum packet transmission interval
Maximum Packet Interval	Time	Maximum packet transmission interval
Priority	Integer	Priority
Auto Port Mode	Bool	Indicates whether to enable the auto port mode
Destination Port	Integer	Destination port number (Effective only if Auto Port Mode is False.)
Use Virtual Payload	Bool	Indicates whether to enable the virtual payload function

17.1.26. FTP

Property	Type	Description
Destination	Object	Destination communication object
Start Time	Time	Start time
End Time	Time	End time
Start Time Max Jitter	Time	Maximum jitter added to the start time
Flow Size	Integer	Flow size
Priority	Integer	Priority
Auto Port Mode	Bool	Indicates whether to enable the auto port mode
Destination Port	Integer	Destination port number (Effective only if Auto Port Mode is False.)
Use Virtual Payload	Bool	Indicates whether to enable the virtual payload function

17.1.27. Multi FTP

Property	Type	Description
Destination	Object	Destination communication object
Start Time	Time	Start time
End Time	Time	End time
Start Time Max Jitter	Time	Maximum jitter added to the start time
Max Flow Size	Integer	Maximum flow size
Mean Flow Size	Integer	Minimum flow size

Standard Deviation Flow Size	Integer	Standard deviation of flow size
Mean Reading Time	Time	Mean reading time
Priority	Integer	Priority
Auto Port Mode	Bool	Indicates whether to enable the auto port mode
Destination Port	Integer	Destination port number (Effective only if Auto Port Mode is False.)
Use Virtual Payload	Bool	Indicates whether to enable the virtual payload function

17.1.28. VoIP

Property	Type	Description
Destination	Object	Destination communication object
Start Time	Time	Start time
End Time	Time	End time
Start Time Max Jitter	Time	Maximum jitter added to the start time
Mean Active/Inactive State Duration	Time	Mean Active/Inactive state duration
State Transition Probability	Double	State transition probability
Mean Beta for Packet Arrival Delay Jitter	Time	Mean packet arrival delay jitter
Jitter Buffer Window	Time	Jitter buffer window
Priority	Integer	Priority
Auto Port Mode	Bool	Indicates whether to enable the auto port mode
Destination Port	Integer	Destination port number (Effective only if Auto Port Mode is False.)
Use Virtual Payload	Bool	Indicates whether to enable the virtual payload function

17.1.29. VideoStreaming

Property	Type	Description
Destination	Object	Destination communication object
Start Time	Time	Start time
End Time	Time	End time

Start Time Max Jitter	Time	Maximum jitter added to the start time
Minimum Inter-Arrival Time between Packets	Time	Minimum inter-arrival time between packets (Pareto distribution)
Maximum Inter-Arrival Time between Packets	Time	Maximum inter-arrival time between packets (Pareto distribution)
Mean Inter-Arrival Time between Packets	Time	Mean inter-arrival time between packets (Pareto distribution)
Jitter Buffer Window	Time	Jitter buffer window
Frame Rate	Double	Frame rate
Number of Packets in a Frame	Integer	Number of packets n a frame
Minimum Packet Size	Integer	Minimum packet size (Pareto distribution)
Maximum Packet Size	Integer	Maximum packet size (Pareto distribution)
Mean Packet Size	Integer	Mean packet size (Pareto distribution)
Priority	Integer	Priority
Auto Port Mode	Bool	Indicates whether to enable the auto port mode
Destination Port	Integer	Destination port number (Effective only if Auto Port Mode is False.)
Use Virtual Payload	Bool	Indicates whether to enable the virtual payload function

17.1.30. HTTP

Property	Type	Description
Destination	Object	Destination communication object
Start Time	Time	Start time
End Time	Time	End time
Start Time Max Jitter	Time	Maximum jitter added to the start time
Minimum Main Object Size	Integer	Minimum main object size
Maximum Main Object Size	Integer	Maximum main object size
Mean Main Object Size	Integer	Mean main object size
Standard Deviation Main Object Size	Integer	Standard deviation of main object size
Minimum Number of Embedded Objects	Integer	Minimum number of embedded objects
Maximum Number of	Integer	Maximum number of embedded objects

Embedded Objects		
Mean Number of Embedded Objects	Integer	Mean number of embedded objects
Minimum Embedded Object Size	Integer	Minimum embedded object size
Maximum Embedded Object Size	Integer	Maximum embedded object size
Mean Embedded Object Size	Integer	Mean embedded object size
Standard Deviation Embedded Object Size	Integer	Standard deviation of embedded object size
Mean Page Reading Time	Time	Mean page reading time
Mean Embedded Reading Time	Time	Mean embedded object reading time
Priority	Integer	Priority
Auto Port Mode	Bool	Indicates whether to enable the auto port mode
Destination Port	Integer	Destination port number (Effective only if Auto Port Mode is False.)
Use Virtual Payload	Bool	Indicates whether to enable the virtual payload function

17.1.31. Flooding

Property	Type	Description
Destination	Object	Destination communication object
Start Time	Time	Start time
End Time	Time	End time
Start Time Max Jitter	Time	Maximum jitter added to the start time
Payload Size	Integer	Payload size
Interval	Time	Data transmission interval
Max Hop Count	Integer	Maximum hop count
Min Waiting Period	Time	Minimum waiting period
Max Waiting Period	Time	Maximum waiting period
Counter Threshold	Integer	Counter threshold
Distance Threshold	Double	Distance threshold
Priority	Integer	Priority

Auto Port Mode	Bool	Indicates whether to enable the auto port mode
Destination Port	Integer	Destination port number (Effective only if Auto Port Mode is False.)
Use Virtual Payload	Bool	Indicates whether to enable the virtual payload function

17.1.32. IperfUdp

Property	Type	Description
Destination	Object	Destination communication object
Start Time	Time	Start time
Time Mode	Bool	Indicates whether the data transfer mode is Time Mode: True: Transfer data during the period specified by Total Time. False: Transfer data of the size specified by Total Size.
Total Time	Time	Total data transmission time (Effective only if Time Mode is True)
Total Size	Integer	Total data transmission size in bytes (Effective only if Time Mode is False.)
UDP Payload Size	Integer	UDP payload size in bytes
UDP Rate	Integer	UDP data rate in bit/s
UDP Use System Time	Bool	Indicates whether to use system time (real time) instead of simulation time.
Priority	Integer	Priority
Auto Address Mode	Bool	Indicates whether to use the auto address mode: True: Specify the destination with the Destination property False: Specify the destination with the Destination Address property
Destination Address	String	Destination address (Effective only if Auto Address Mode is False.)

Auto Port Mode	Bool	Indicates whether to enable the auto port mode
Destination Port	Integer	Destination port number (Effective only if Auto Port Mode is False.)
Use Virtual Payload	Bool	Indicates whether to enable the virtual payload function

17.1.33. IperfUdp Client

Property	Type	Description
Destination Address	String	Destination communication object (Effective only if Auto Address Mode is False.)
Destination Port	Integer	Destination port number (Effective only if Auto Port Mode is False)
Start Time	Time	Start time
Time Mode	Bool	Indicates whether the data transfer mode is Time Mode: True: Transfer data during the period specified by Total Time. False: Transfer data of the size specified by Total Size.
Total Time	Time	Total data transmission time (Effective only if Time Mode is True)
Total Size	Integer	Total data transmission size in bytes (Effective only if Time Mode is False.)
UDP Payload Size	Integer	UDP payload size in bytes
UDP Rate	Integer	UDP data rate in bit/s
UDP Use System Time	Bool	Indicates whether to use system time (real time) instead of simulation time.
Priority	Integer	Priority
Use Virtual Payload	Bool	Indicates whether to enable the virtual payload function

17.1.34. IperfUdp Server

Property	Type	Description

Destination Port	Integer	Destination port number (Effective only if Auto Port Mode is False)
Start Time	Time	Start Time
UDP Payload Size	Integer	UDP payload size in bytes
UDP Use System Time	Bool	Indicates whether to use system time (real time) instead of simulation time.
Priority	Integer	Priority
Use Virtual Payload	Bool	Indicates whether to enable the virtual payload function

17.1.35. IperfTcp

Property	Type	Description
Destination	Object	Destination communication object
Start Time	Time	Start Time
Time Mode	Bool	Indicates whether the data transfer mode is Time Mode: True: Transfer data during the period specified by Total Time. False: Transfer data of the size specified by Total Size.
Total Time	Time	Total data transmission time (Effective only if Time Mode is True)
Total Size	Integer	Total data transmission size in bytes (Effective only if Time Mode is False.)
TCP Buffer Size	Integer	TCP send buffer size in bytes
Priority	Integer	Priority
Auto Address Mode	Bool	Indicates whether to use the auto address mode: True: Specify the destination with the Destination property False: Specify the destination with the Destination Address property
Destination Address	String	Destination address (Effective only if Auto Address Mode is False.)
Auto Port Mode	Bool	Indicates whether to enable the auto port

		mode
Destination Port	Integer	Destination port number (Effective only if Auto Port Mode is False.)
Use Virtual Payload	Bool	Indicates whether to enable the virtual payload function

17.1.36. IperfTcp Client

Property	Type	Description
Destination Address	String	Destination Address (Effective only if Auto Address Mode is False.)
Destination Port	Integer	Destination port number (Effective only if Auto Port Mode is False)
Start Time	Time	Start Time
Time Mode	Bool	Indicates whether the data transfer mode is Time Mode: True: Transfer data during the period specified by Total Time. False: Transfer data of the size specified by Total Size.
Total Time	Time	Total data transmission time (Effective only if Time Mode is True)
Total Size	Integer	Total data transmission size in bytes (Effective only if Time Mode is False.)
TCP Buffer Size	Integer	TCP send buffer size in bytes
Priority	Integer	Priority
Use Virtual Payload	Bool	Indicates whether to enable the virtual payload function

17.1.37. IperfTcp Server

Property	Type	Description
Destination Port	Integer	Destination port number (Effective only if Auto Port Mode is False)
Start Time	Time	Start Time
TCP Buffer Size	Integer	TCP send buffer size in bytes

Priority	Integer	Priority
Use Virtual Payload	Bool	Indicates whether to enable the virtual payload function

17.1.38. Bundle Protocol

Property	Type	Description
Max Storage Size	Integer	Maximum size of the storage that stores bundles in bytes
Data Transport Mode	Enum	Data transport protocol (TCP or UDP)
Routing Algorithm	Enum	Routing algorithm (Epidemic, Spray-And-Wait, Direct-Delivery, or MaxProp）
Max Number of Copies	Integer	Maximum number of copies (used in Spray-And-Wait algorithm)
Binary Mode	Bool	Indicates whether to enable binary mode in Spray-And-Wait algorithm
Enable Delivery Ack	Bool	Indicates whether to enable delivery ack
Hello Interval	Time	Hello message send interval
Hello Max Jitter	Double	Maximum jitter added to the transmission time of Hello messages
Request Resend Interval	Time	Bundle request resend interval
Control Packet Max Jitter	Double	Maximum jitter to send control packet
Data Packet Priority	Integer	Priority of data packets
Control Packet Priority	Integer	Priority of control packets
Max Control Packet Size	Integer	Maximum size of control packet
Use Virtual Payload	Bool	Indicates whether to enable the virtual payload function

17.1.39. Bundle Message

Property	Type	Description
Message Destination	Object	Destination communication object
Message Start Time	Time	Start time
Message End Time	Time	End time
Message Max Jitter	Double	Maximum jitter added to the start time
Message Size	Integer	Message size in bytes

Message Send Interval	Time	Message send interval
Message Lifetime	Time	Message lifetime

17.1.40. Sensing

Property	Type	Description
Sensing Start Time	Time	Start time
Sensing End Time	Time	End time
Sensing Interval	Time	Sensing interval
Coverage Shape Type	Enum	Shape type of sensing coverage (FanShape or GISObject）
Coverage Distance	Double	<Fan Shape> Coverage distance
Horizontal Coverage Angle	Double	<Fan Shape> Horizontal coverage angle
Vertical Coverage Angle	Double	<GIS Object> Vertical coverage angle
Height from Platform	Double	<Fan Shape> Height of the sensor position from the platform
Azimuth from Platform Direction	Double	<Fan Shape> Azimuth of the horizontal sensing direction from the platform direction
Elevation from Platform Direction	Double	<Fan Shape> Elevation angle of the vertical sensing direction from the platform direction
Coverage Area Gis Object Name	Object Name	<GIS Object> Coverage area GIS object name（Only Building, Park, Area, and Road GIS objects are acceptable)
Coverage Area Height	Double	<GIS Object> Coverage area height
Detection Accuracy Granularity	Double	Detection distance granularity (the smaller this value, the better accuracy)
Position Error Standard Deviation Distance	Double	Standard deviation of position error
Detection Condition	Enum	Detection condition: LosOnly or LosAndNlos LosOnly: Detects only objects at LoS LoaAndNlos: Detects objects at LoS and NLoS
Detection Target	Check List	Detection targets: Check the following objects Communication Object, Building, Wall,

		Road, Intersection, Railroad, Station, TrafficLight, BusStop, Area, Park, and Entrance、POI
Detection Error Rate	Double	Detection error rate
Transmission Condition	Enum	Transmission condition between this communication object and the detected communication object: Simplex or Duplex Simplex: Only transmission from this communication object (with Sensor) to the detected object Duplex: Duplex communication between this communication object and the detected object
Transmission Data Error Rate	Double	Transmission data error rate

17.1.41. TraceBasedApp

Property	Type	Description
Destination	Object	Destination communication object
Start Time	Time	Start time
End Time	Time	End time
Start Time Max Jitter	Time	Maximum jitter added to the start time
Input File Type	Enum	Input file type（only .pcap）
Pcap Input File	Input File	pcap Input file
Pcap First Packet Time	Time	Simulation time corresponding to the first packet transmission time of a pcap trace
Pcap Trimming Header Size [byte]	Integer	The size trimmed away from each packet read from a pcap trace. If a packet includes UDP (8 bytes), IPv4 (20 bytes) and Ethernet (14 bytes) header set 42 to this property.
Priority	Integer	Priority
Auto Port Mode	Bool	Indicates whether to enable the auto port mode
Destination Port	Integer	Destination port number (Effective only if Auto Port Mode is False.)
Use Virtual Payload	Bool	Indicates whether to enable the virtual

		payload function

17.1.42. CBRwithQoS

Property	Type	Description
Destination	Object	Destination communication object
Start Time	Time	Start time
End Time	Time	End time
Start Time Max Jitter	Time	Maximum jitter added to the start time
Payload Size	Integer	Payload size
Traffic defined by	Enum	Method to define the traffic amount: Interval, PacketsPerSecond, or BitsPerSecond
Packet Interval	Time	Packet transmission interval
Traffic Volume (bit)	Integer	Traffic volume in bits per second (Effective only if "Traffic defined by" is "BitsPerSecond".)
Traffic Volume (packet)	Double	Traffic volume in packets per second (Effective only if "Traffic defined by" is "PacketsPerSecond".)
Baseline Bandwidth	Integer	Baseline (minimum) bandwidth
Maximum Bandwidth	Integer	Maximum bandwidth
Schedule Scheme	Enum	Scheduling scheme for QoS guarantee (PriBased)
Priority	Integer	Priority
Auto Port Mode	Bool	Indicates whether to enable the auto port mode
Destination Port	Integer	Destination port number (Effective only if Auto Port Mode is False.)
Use Virtual Payload	Bool	Indicates whether to enable the virtual payload function

17.1.43. VBRwithQoS

Property	Type	Description
Destination	Object	Destination communication object
Start Time	Time	Start time

End Time	Time	End time
Start Time Max Jitter	Time	Maximum jitter added to the start time
Payload Size	Integer	Payload size
Traffic defined by	Enum	Method to define the traffic amount: Interval, PacketsPerSecond, or BitsPerSecond
Mean Packet Interval	Time	Mean packet interval
Traffic Volume (bit)	Integer	Traffic volume in bits per second (Effective only if "Traffic defined by" is "BitsPerSecond".)
Traffic Volume (packet)	Double	Traffic volume in packets per second (Effective only if "Traffic defined by" is "PacketsPerSecond".)
Minimum Packet Interval	Time	Minimum packet interval
Maximum Packet Interval	Time	Maximum packet interval
Baseline Bandwidth	Integer	Baseline (minimum) bandwidth
Maximum Bandwidth	Integer	Maximum bandwidth
Schedule Scheme	Enum	Scheduling scheme for QoSguarantee (PriBased)
Priority	Integer	Priority
Auto Port Mode	Bool	Indicates whether to enable the auto port mode
Destination Port	Integer	Destination port number (Effective only if Auto Port Mode is False.)
Use Virtual Payload	Bool	Indicates whether to enable the virtual payload function

17.1.44. FTPwithQoS

Property	Type	Description
Destination	Object	Destination communication object
Start Time	Time	Start time
End Time	Time	End time
Start Time Max Jitter	Time	Maximum jitter added to the start time
Flow Size	Integer	Flow size
Baseline Bandwidth	Integer	Baseline (minimum) bandwidth

Max Bandwidth	Integer	Maximum bandwidth
Baseline Reverse Bandwidth	Integer	Baseline (minimum) bandwidth for QoS guarantee (Feedback)
Maximum Reverse Bandwidth	Integer	Maximum bandwidth for QoS guarantee (Feedback)
Schedule Scheme	Enum	Scheduling scheme for QoSguarantee (PriBased)
Priority	Integer	Priority
Auto Port Mode	Bool	Indicates whether to enable the auto port mode
Destination Port	Integer	Destination port number (Effective only if Auto Port Mode is False.)
Use Virtual Payload	Bool	Indicates whether to enable the virtual payload function

17.1.45. MultiFTPwithQoS

Property	Type	Description
Destination	Object	Destination communication object
Start Time	Time	Start time
End Time	Time	End time
Start Time Max Jitter	Time	Maximum jitter added to the start time
Max Flow Size	Integer	Maximum flow size
Mean Flow Size	Integer	Mean flow size
Standard Deviation Flow Size	Integer	Standard deviation of flow size
Mean Reading Time	Time	Mean reading time
Baseline Bandwidth	Integer	Baseline (minimum) bandwidth
Max Bandwidth	Integer	Maximum bandwidth
Baseline Reverse Bandwidth	Integer	Baseline (minimum) bandwidth for QoS guarantee (Feedback)
Maximum Reverse Bandwidth	Integer	Maximum bandwidth for QoS guarantee (Feedback)
Schedule Scheme	Enum	Scheduling scheme for QoSguarantee (PriBased)
Priority	Integer	Priority
Auto Port Mode	Bool	Indicates whether to enable the auto port

		mode
Destination Port	Integer	Destination port number (Effective only if Auto Port Mode is False.)
Use Virtual Payload	Bool	Indicates whether to enable the virtual payload function

17.1.46. VoIPwithQoS

Property	Type	Description
Destination	Object	Destination communication object
Start Time	Time	Start time
End Time	Time	End time
Start Time Max Jitter	Time	Maximum jitter added to the start time
Mean Active/Inactive State Duration	Time	Mean Active/Inactive state
State Transition Probability	Double	State transition probability
Mean Beta for Packet Arrival Delay Jitter	Time	Mean packet arrival delay jitter
Jitter Buffer Window	Time	Jitter buffer window
Baseline Bandwidth	Integer	Baseline (minimum) bandwidth
Max Bandwidth	Integer	Maximum bandwidth
Schedule Scheme	Enum	Scheduling scheme for Qi's guarantee (PriBased)
Priority	Integer	Priority
Auto Port Mode	Bool	Indicates whether to enable the auto port mode
Destination Port	Integer	Destination port number (Effective only if Auto Port Mode is False.)
Use Virtual Payload	Bool	Indicates whether to enable the virtual payload function

17.1.47. VideoStreamingwithQoS

Property	Type	Description
Destination	Object	Destination communication object
Start Time	Time	Start time
End Time	Time	End time

Start Time Max Jitter	Time	Maximum jitter added to the start time
Frame Rate	Double	Frame rate
Number of Packets in a Frame	Integer	Number of packets in a frame
Minimum Packet Size	Integer	Minimum packet size (Pareto distribution)
Maximum Packet Size	Integer	Maximum packet size (Pareto distribution)
Mean Packet Size	Integer	Mean packet size (Pareto distribution)
Jitter Buffer Window	Time	Jitter buffer window
Minimum Inter-Arrival Time between Packets	Time	Minimum inter-arrival time between packets (Pareto distribution)
Maximum Inter-Arrival Time between Packets	Time	Maximum inter-arrival time between packets (Pareto distribution)
Mean Inter-Arrival Time between Packets	Time	Minimum inter-arrival time between packets (Pareto distribution)
Baseline Bandwidth	Integer	Baseline (minimum) bandwidth
Max Bandwidth	Integer	Maximum bandwidth
Schedule Scheme	Enum	Scheduling scheme for QoS guarantee（PriBased）
Priority	Integer	Priority
Auto Port Mode	Bool	Indicates whether to enable the auto port mode
Destination Port	Integer	Destination port number (Effective only if Auto Port Mode is False.)
Use Virtual Payload	Bool	Indicates whether to enable the virtual payload function

17.1.48. HTTPwithQoS

Property	Type	Description
Destination	Object	Destination communication object
Start Time	Time	Start time
End Time	Time	End time
Start Time Max Jitter	Time	Maximum jitter added to the start time
Minimum Main Object Size	Integer	Minimum main object size
Maximum Main Object Size	Integer	Maximum main object size
Mean Main Object Size	Integer	Mean main object size
Standard Deviation Main	Integer	Standard deviation of man object size

Object Size		
Minimum Number of Embedded Objects	Integer	Minimum number of embedded objects
Maximum Number of Embedded Objects	Integer	Maximum number of embedded objects
Mean Number of Embedded Objects	Integer	Mean number of embedded objects
Minimum Embedded Object Size	Integer	Minimum embedded object size
Maximum Embedded Object Size	Integer	Maximum embedded object size
Mean Embedded Object Size	Integer	Mean size of embedded objects
Standard Deviation Embedded Object Size	Integer	Standard deviation of the size of embedded objects
Mean Page Reading Time	Time	Mean page reading time
Mean Embedded Reading Time	Time	Mean embedded object reading time
Baseline Bandwidth	Integer	Baseline bandwidth
Max Bandwidth	Integer	Maximum bandwidth
Schedule Scheme	Enum	Schedule Scheme for QoS (PriBased)
Priority	Integer	Priority
Auto Port Mode	Bool	Indicates whether to enable the auto port mode
Destination Port	Integer	Destination port number (Effective only if Auto Port Mode is False.)
Use Virtual Payload	Bool	Indicates whether to enable the virtual payload function

17.1.49. IperfUdpWithQos

Property	Type	Description
Destination	Object	Destination node ID
Start Time	Time	Start time
Time Mode	Bool	Specifies data transmission mode: true: Time-mode. The instance sends data during the specified period.

		false: The instance sends data of specified size.
Total Time	Time	Length of data transmission period (Effective only when Time Mode is true)
Total Size	Integer	Total transmission data size in bytes (Effective only when Time Modes is false)
UDP Payload Size	Integer	Payload size of UDP packets
UDP Rate	Integer	Data rate in bits/s
UDP Use System Time	Bool	Indicates whether to use system time (real time) instead of simulation time
Baseline Bandwidth	Integer	Baseline bandwidth in QoS guarantee
Max Bandwidth	Integer	Maximum bandwidth in QoS guarantee
Schedule Scheme	Enum	Scheduling scheme in QoS guarantee: "PriBased"
Priority	Integer	Priority
Auto Address Mode	Bool	Indicates how to specify the destination address true: to use a node ID false: to use the address specified by Destination Address
Destination Address	String	Destination address (Effective only when Auto Address Mode is false)
Auto Port Mode	Bool	Indicates whether to use the auto destination port setting mode
Destination Port	Integer	Destination port number used in the manual port number setting mode
Use Virtual Payload	Bool	Indicates whether to use the virtual payload function

17.1.50. IperfTcpWithQos

Property	Type	Description
Destination	Object	Destination node ID
Start Time	Time	Start time
Time Mode	Bool	Specifies data transmission mode:

		true: Time-mode. The instance sends data during the specified period false: The instance sends data of specified size
Total Time	Time	Length of data transmission period (Effective only when Time Mode is true.)
Total Size	Integer	Total transmission data size in bytes (Effective only when Time Mode is false)
TCP Buffer Size	Integer	Send buffer size in bytes
Baseline Bandwidth	Integer	Baseline bandwidth in QoS guarantee
Max Bandwidth	Integer	Maximum bandwidth in QoS guarantee
Baseline Reverse Bandwidth	Integer	Baseline bandwidth (minimum bandwidth) for feedback in bytes/second
Maximum Reverse Bandwidth	Integer	Maximum bandwidth for feedback in bytes/second
Schedule Scheme	Enum	Scheduling scheme for QoS guarantee: "PriBased"
Priority	Integer	Priority
Auto Address Mode	Bool	Indicates how to specify the destination address true: to use a node ID false: to use the address specified by Destination Address
Destination Address	String	Destination address (Effective only when Auto Address Mode is false)
Auto Port Mode	Bool	Indicates whether to use the auto destination port setting mode
Destination Port	Integer	Destination port number used in the manual port number setting mode
Use Virtual Payload	Bool	Indicates whether to use the virtual payload function

17.1.51. AbstractNetworkMac

Property	Type	Description
Output Bandwidth	Integer	Output bandwidth

Minimum Latency	Double	Minimum latency
Maximum Latency	Double	Maximum latency
Packet Drop Rate	Double	Packet drop rate

17.1.52. Aloha

Property	Type	Description
Aloha Model	Enum	Protocol model. unslotted or slotted.
Datarate	Double	Data rate
Aloha Tx Power	Double	Transmission power
Aloha Minimum Data Transmission Interval	Time	Minimum data transmission interval
Aloha Maximum Data Transmission Jitter	Time	Maximum data transmission jitter
Aloha Slot Time	Time	Slot time used with the slotted model
Aloha Minimum Retry Interval	Time	Minimum retry interval
Aloha Maximum Retry Interval	Time	Maximum retry interval
Aloha Retry Limit	Integer	Maximum number of retires
Aloha Signal Rx Power Threshold	Double	Signal receive port threshold
Aloha Phy Frame Data Padding [bit]	Integer	PHY frame data padding size
Aloha Phy Delay Until Airborne	Time	PHY layer delay until airborne

18. Appendix

This product contains the following program licensed by GNU Lesser General Public License (LGPL). Users of this product are allowed to obtain the source code, as well as to duplicate and distribute it based on the LGPL. The LGPL license file is contained in the product package. The source code can be obtained from our product download site. (You do not need to obtain the source code to use this product.)

- Qt LGPL version
- FFmpeg version SVN-r17655, Copyright (c) 2000-2009 Fabrice Bellard, et al.