OpenSimMPLS

v2.0

Quick user guide

June 2018

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Introduction

OpenSimMPLS is a MPLS network simulator, written in Java, portable and Multilanguage. It can simulate:

- Single-domain MPLS networks (use only LERs, LSRs, traffic generators and traffic sinks if you want to simulate this kind of networks).
- Single-domain MPLS networks that support Guarantee of Service (GoS) using active techniques (mix LERs, LSRs, active LERs, active LSRs, traffic generators and traffic sinks, as desired, if you want to simulate this kind of networks).

This guide is a little help so you can take your first steps with the simulator quickly. Therefore it is brief and schematic.

Requirements

You need to have installed in your operating system:

- Java 8.

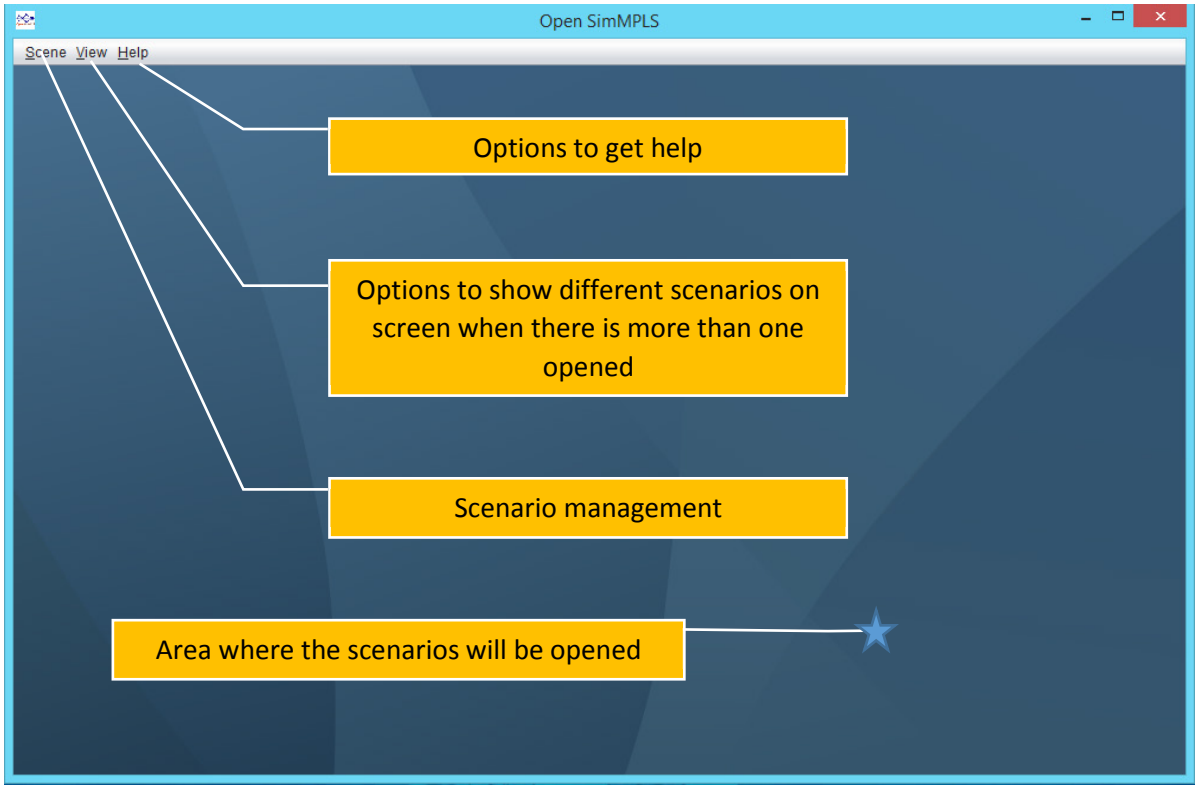
And, of course, have downloaded OpenSimMPLS v2.0, which you can do from the project page that you see in the header of this guide.

Starting OpenSimMPLS v2.0

Once downloaded, run the simulator with the following command:

```
java -jar openSimMPLS-bin-v2.0.jar
```

Main simulator interface

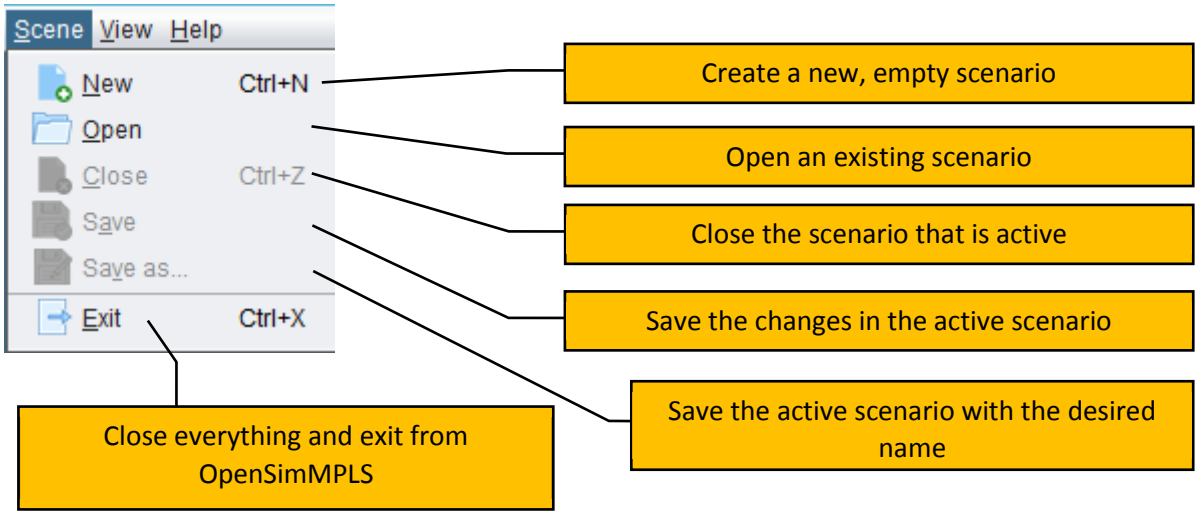


The initial window of the simulator appears only with a menu of options and a large space within which the different scenarios that are being designed or simulated will be displayed.

OpenSimMPLS allows you to keep more than one scenario open or running simultaneously.

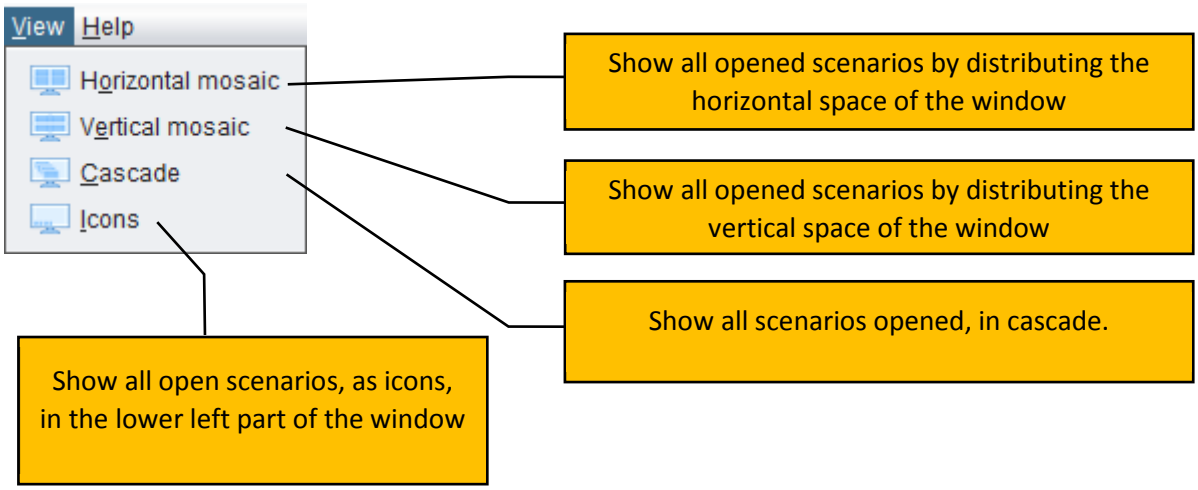
Scenario menu

Some of the options will only be active if there is a scenario opened.

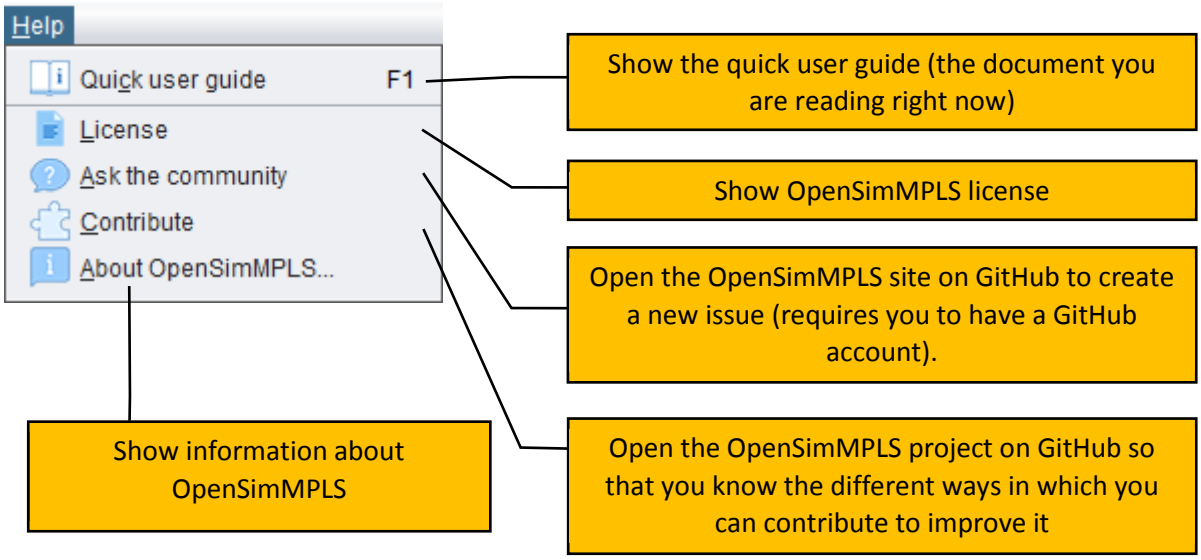


View menu

Some of the options will only be active if there is a scenario opened.

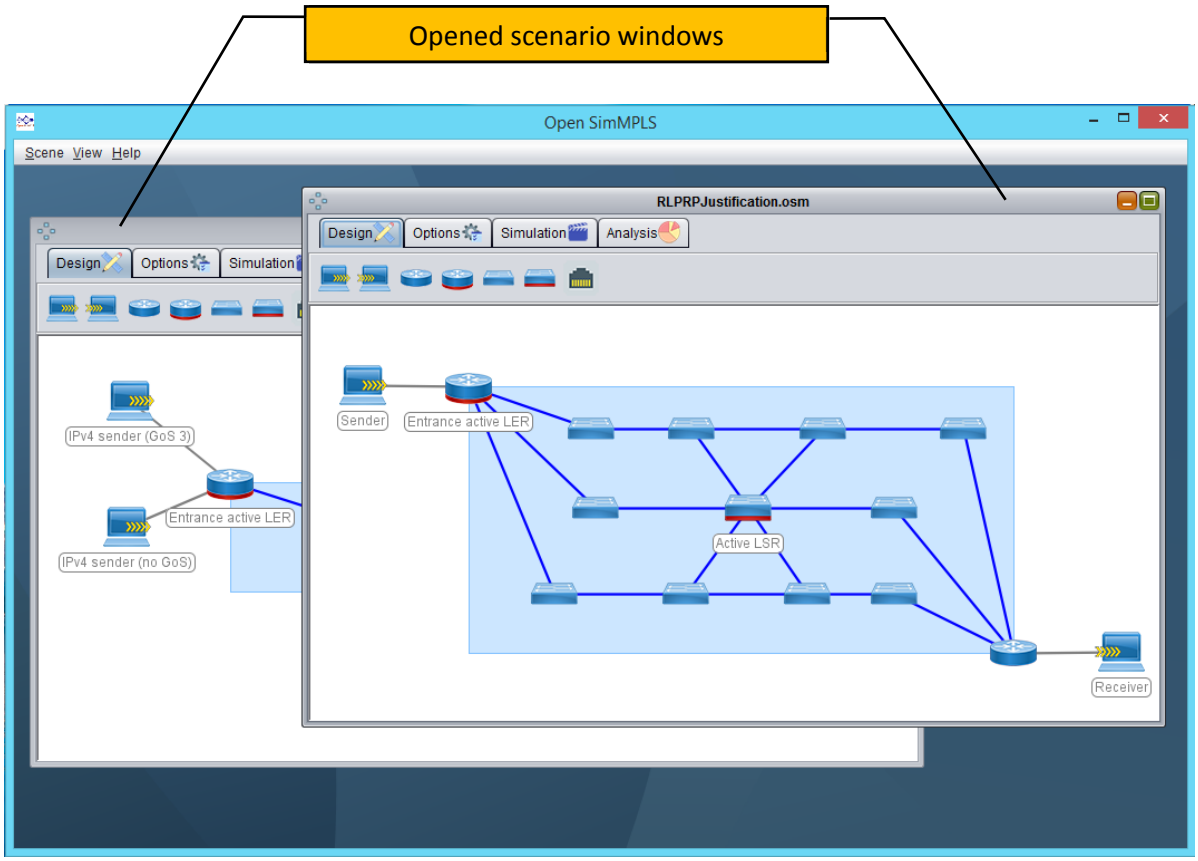


Help menu



Scenario window

Each scenario has its own window within the simulator. This is where all the action happens and where all the OpenSimMPLS functionality is. Each open scenario is independent of the other open scenarios.

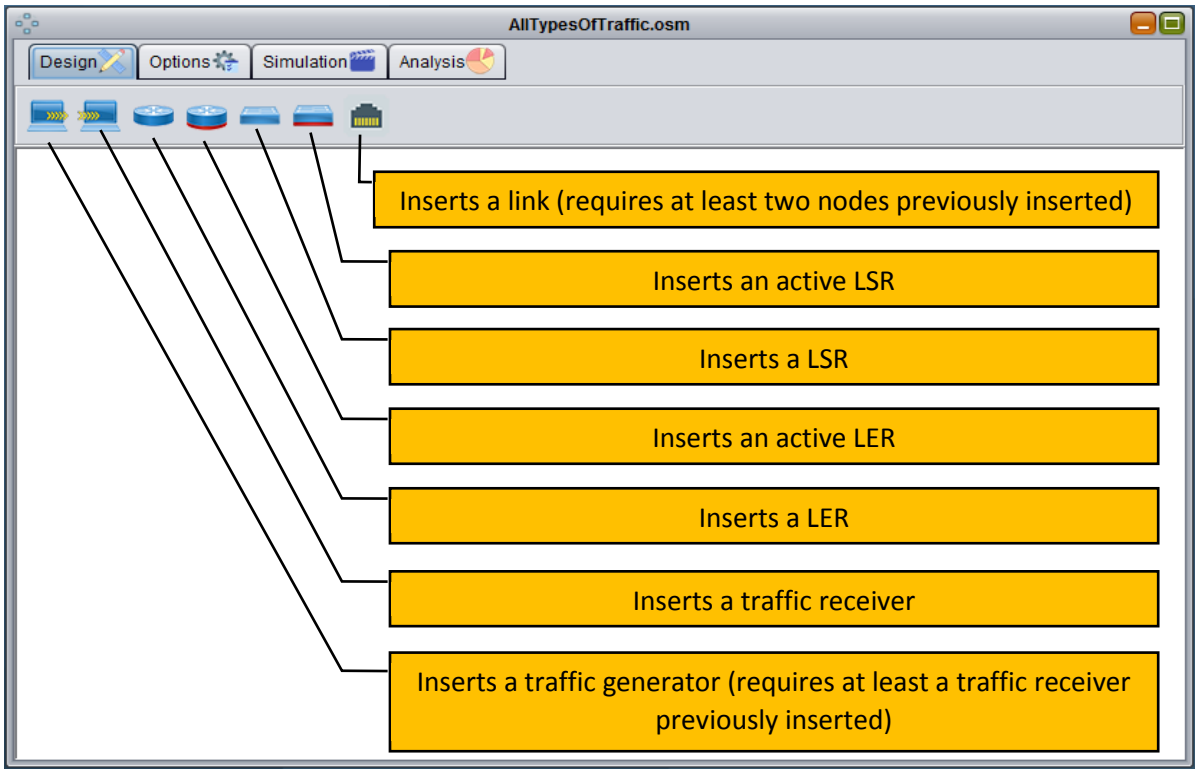


The scenario window has four tabs that will guide you through the simulation process. Follow them in the order in which they appear:

1. **Scenario design.** Configure the topology, the elements, the links and the configuration all of them. It also defines the type of traffic you want to generate and who will receive it.
2. **Options.** Put a title and describe your scenario. In addition, select the duration of the simulation and the grain of it.
3. **Simulation.** Put your scenario to work and interact with the simulation in real time.
4. **Analysis.** Select elements of the topology and see statistical information about them. Observe what has happened throughout the time of the simulation.

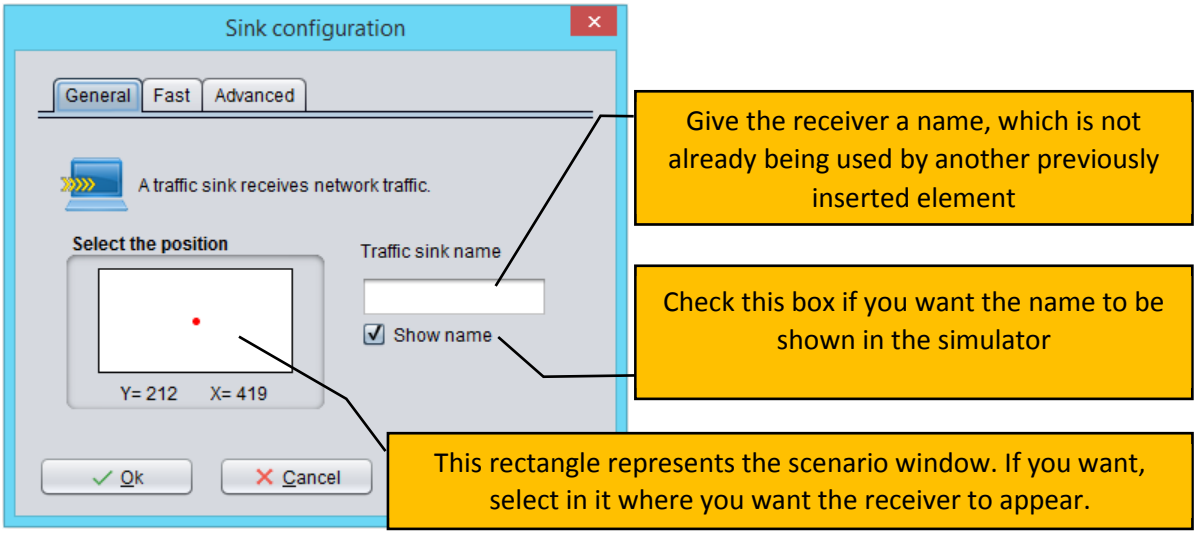
Step 1. Scenario design

To design the scenario, select the Design tab.

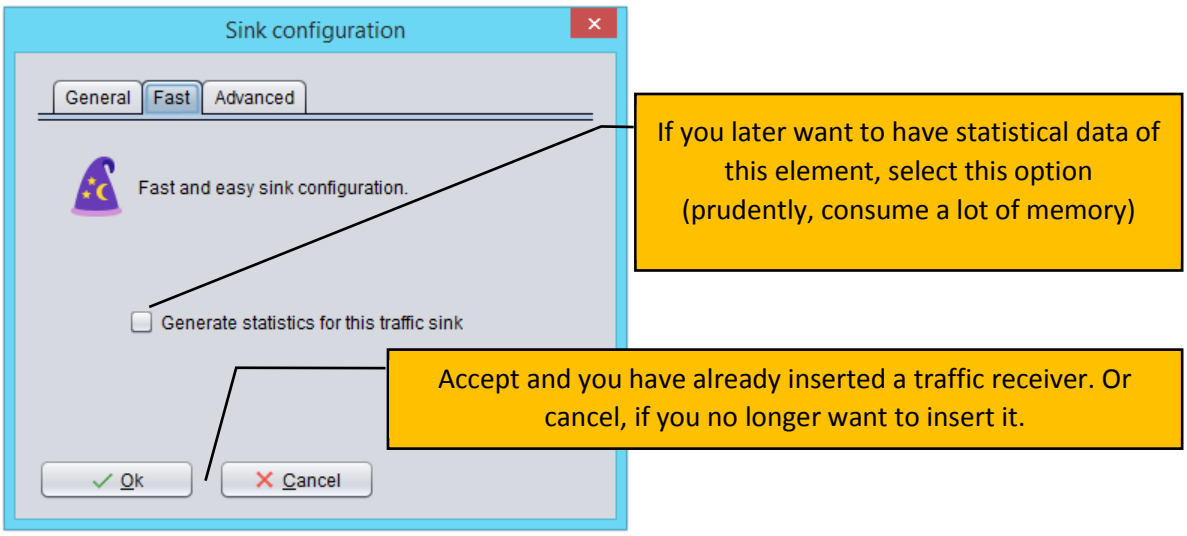


Traffic sinks insertion and configuration

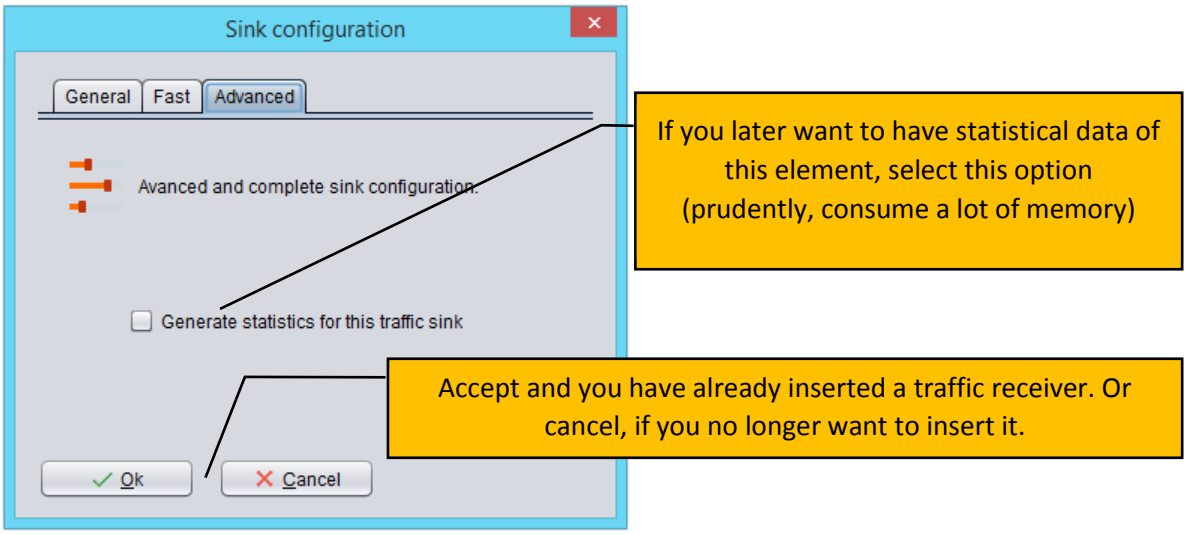
When we insert a traffic receiver, its configuration window appears, with three tabs: general configuration, quick configuration or advanced configuration (to choose).



If you want, you can use the quick settings to have something to try if you're in a hurry. Or if you want to configure all the parameters, use the advanced settings. It does not make sense to use both tabs.

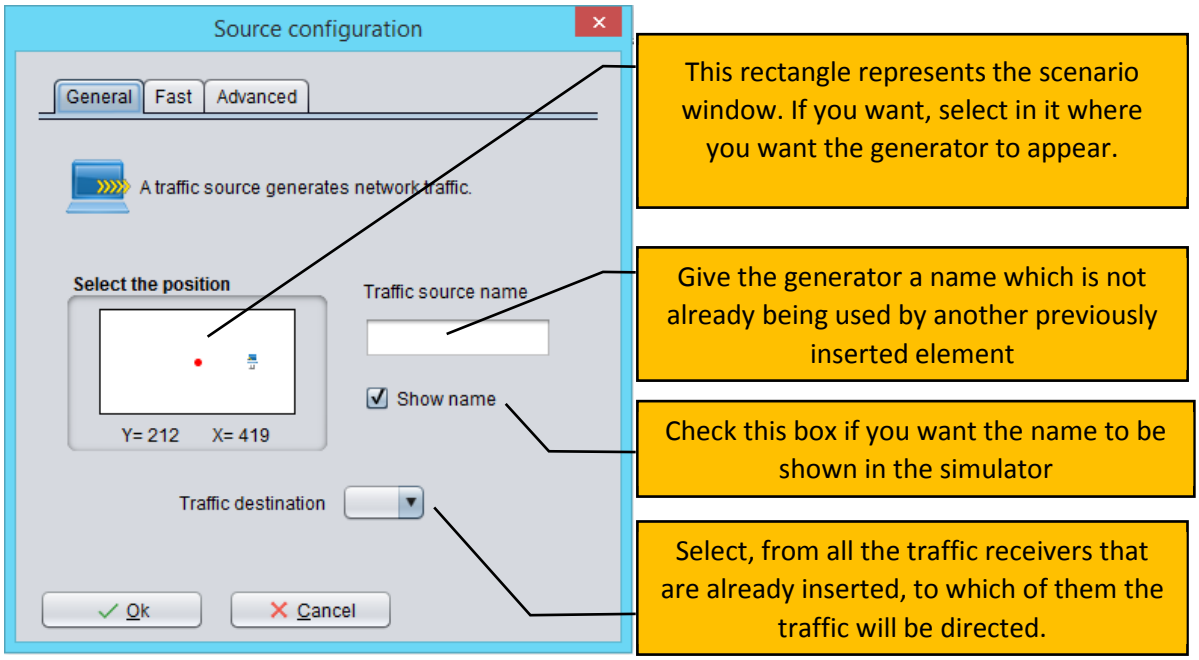


In the case of the traffic receiver, the advanced configuration and quick configuration are the same. There is not much to configure.

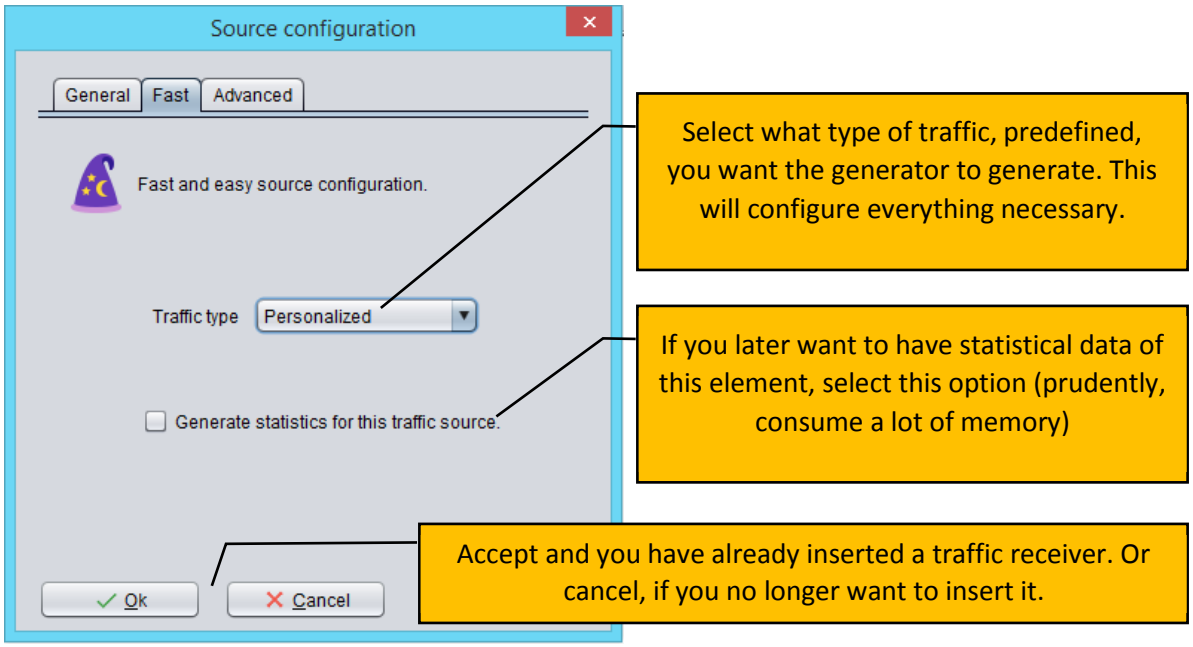


Traffic generators insertion and configuration

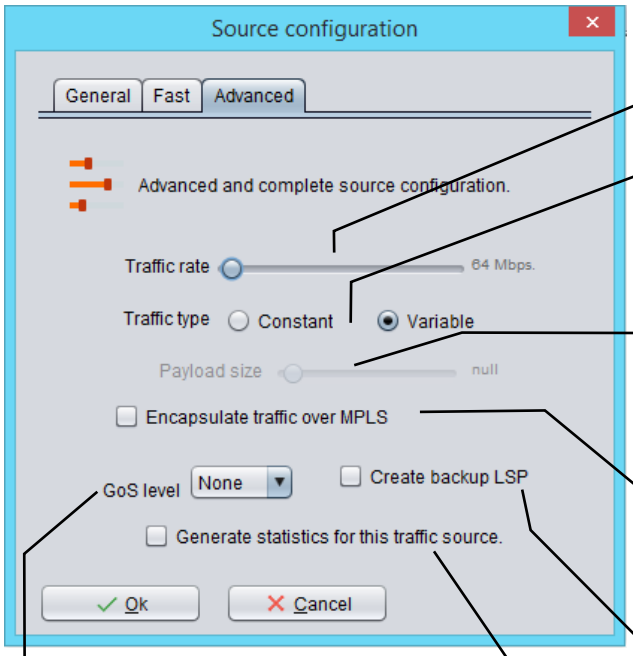
When we insert a traffic generator, its configuration window appears, with three tabs: general configuration and quick configuration or advanced configuration (to choose).



If you want, you can use the quick settings to have something to try if you're in a hurry. Or if you want to configure all the parameters, use the advanced settings. It does not make sense to use both tabs.



In the case of the traffic receiver, the advanced configuration allows defining all aspects of the traffic that you want to generate.



Choose the number of megabits per second you want to generate

You can generate constant traffic (with the size you choose) or variable (following statistics from the Abilene Network).

For constant traffic, select the size of the payload of the packets, in octets.

By default it will generate IPv4 traffic. Check this box if you want to generate MPLS traffic.

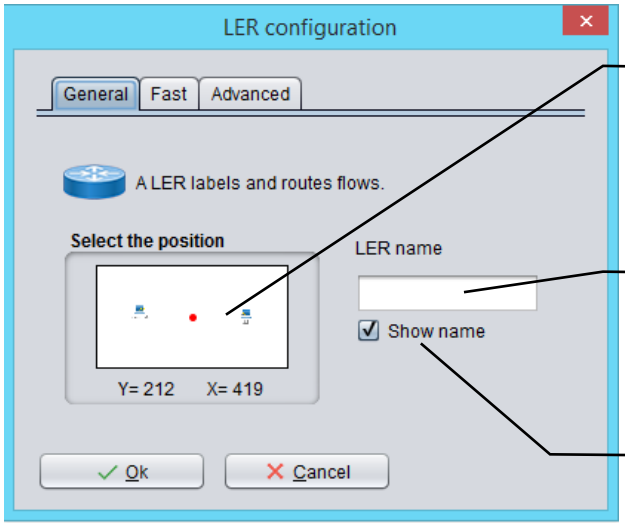
You can request that an additional backup LSP be pre-established for traffic by checking this box.

Select the level of Service Guarantee (GoS) you want for traffic. Higher level for more important traffic.

If you later want to have statistical data of this element, select this option (prudently, consume a lot of memory)

LERs insertion and configuration

When we insert an LER, its configuration window appears, with three tabs: general configuration and quick configuration or advanced configuration (to choose).

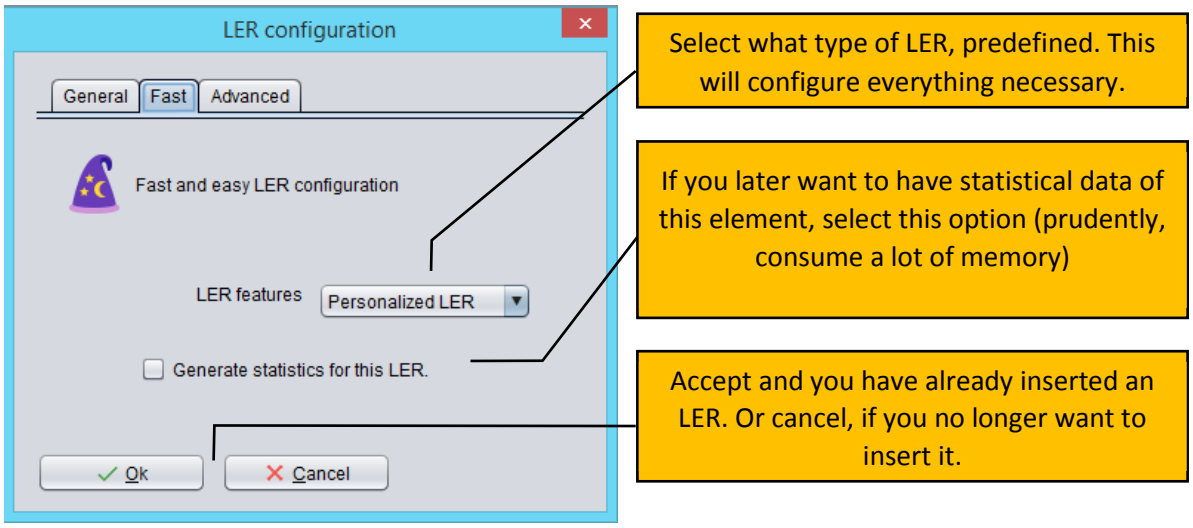


This rectangle represents the scenario window. If you want, select in it where you want the LER to appear.

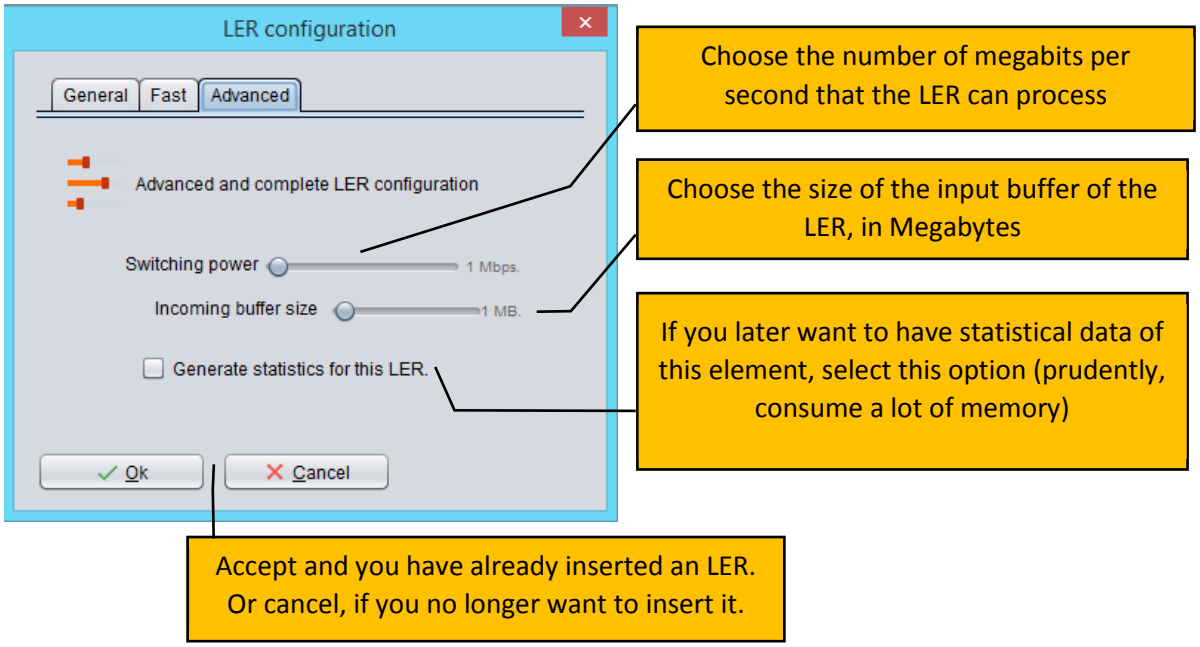
Give the LER a name which is not already being used by another previously inserted element

Check this box if you want the name to be shown in the simulator

If you want, you can use the quick settings to have something to try if you're in a hurry. Or if you want to configure all the parameters, use the advanced settings. It does not make sense to use both tabs.

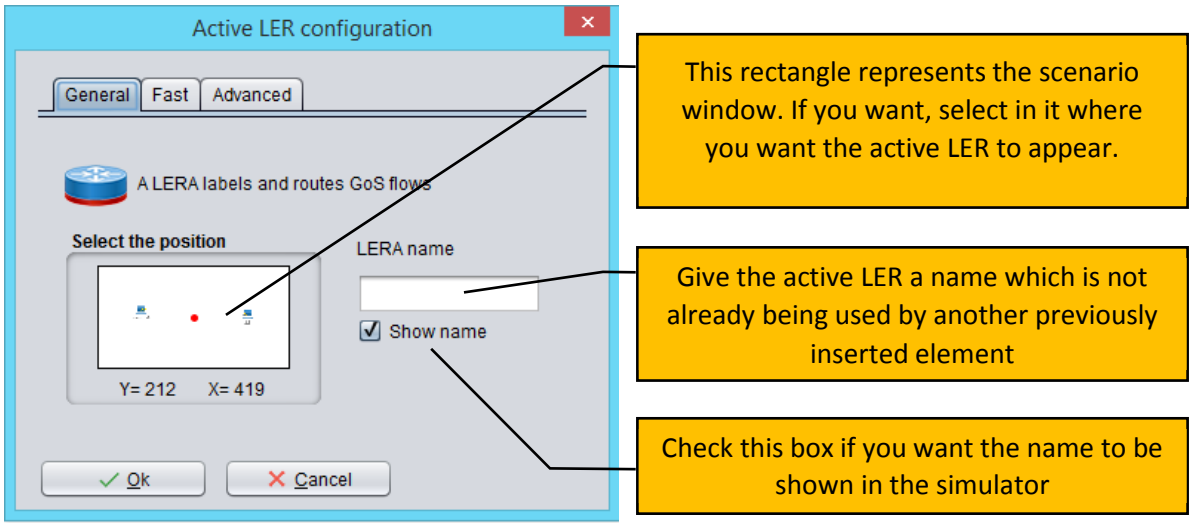


In the case of the LER, the advanced configuration allows defining all aspects of the hardware required.

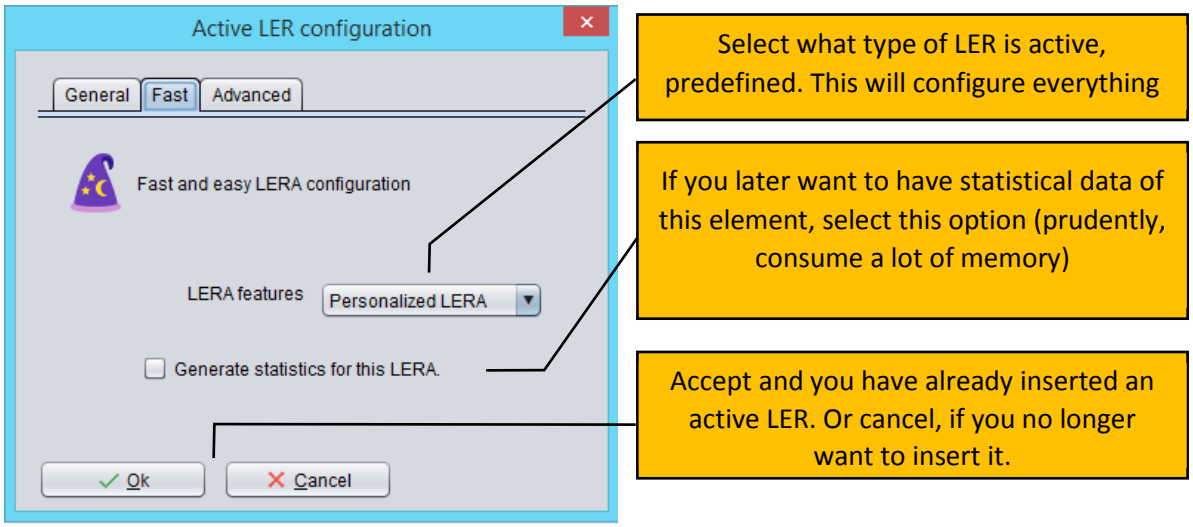


Active LERs insertion and configuration

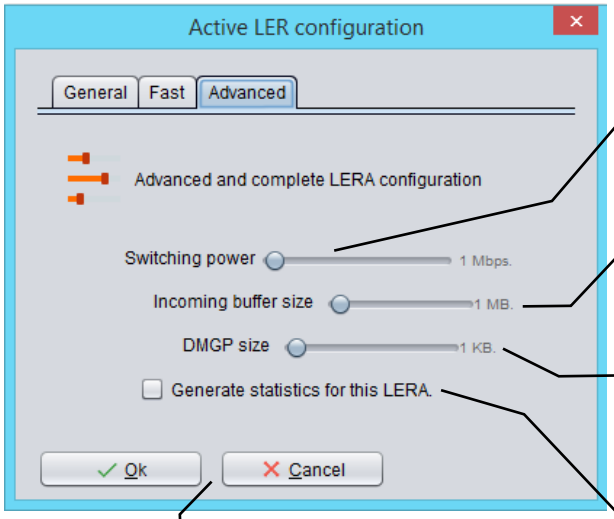
When we insert an active LER, its configuration window appears, with three tabs: general configuration and quick configuration or advanced configuration (to choose).



If you want, you can use the quick settings to have something to try if you're in a hurry. Or if you want to configure all the parameters, use the advanced settings. It does not make sense to use both tabs.



In the case of the active LER, the advanced configuration allows defining all the necessary hardware aspects.



Choose the number of megabits per second that the active LER can process

Choose the size of the input buffer of the active LER, in Megabytes

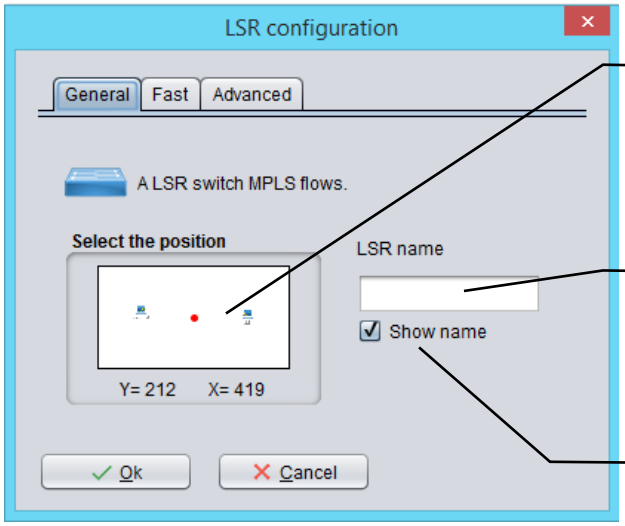
Choose the size of the DMGP in Kilobytes. Larger DMGP allows you to recover more packets locally.

If you later want to have statistical data of this element, select this option (prudently, consume a lot of memory)

Accept and you have already inserted an active LER. Or cancel, if you no longer want to insert it.

LSRs insertion and configuration

When we insert an LSR, its configuration window appears, with three tabs: general configuration and quick configuration or advanced configuration (to choose).

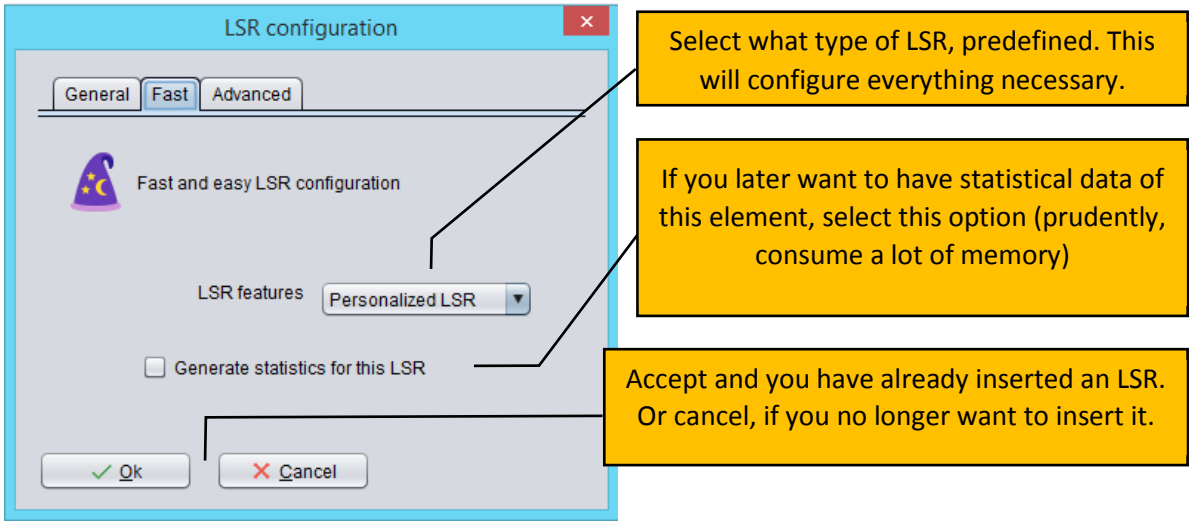


This rectangle represents the scenario window. If you want, select in it where you want the LSR to appear.

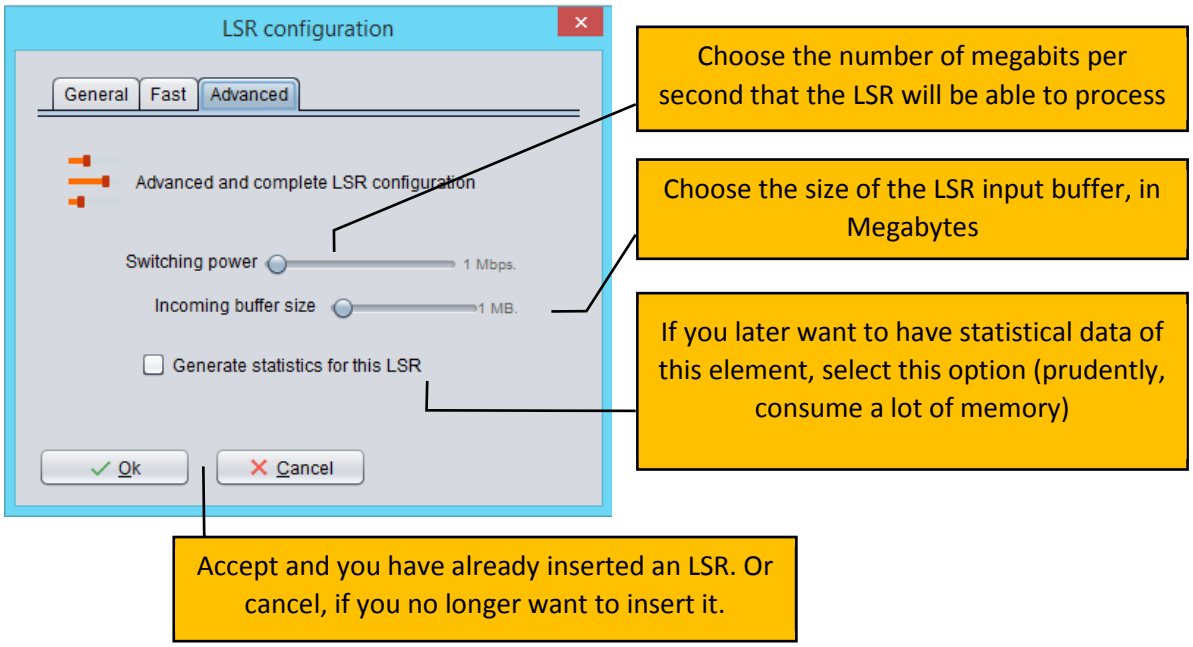
Give the LSR a name which is not already being used by another previously inserted element

Check this box if you want the name to be shown in the simulator

If you want, you can use the quick settings to have something to try if you're in a hurry. Or if you want to configure all the parameters, use the advanced settings. It does not make sense to use both tabs.

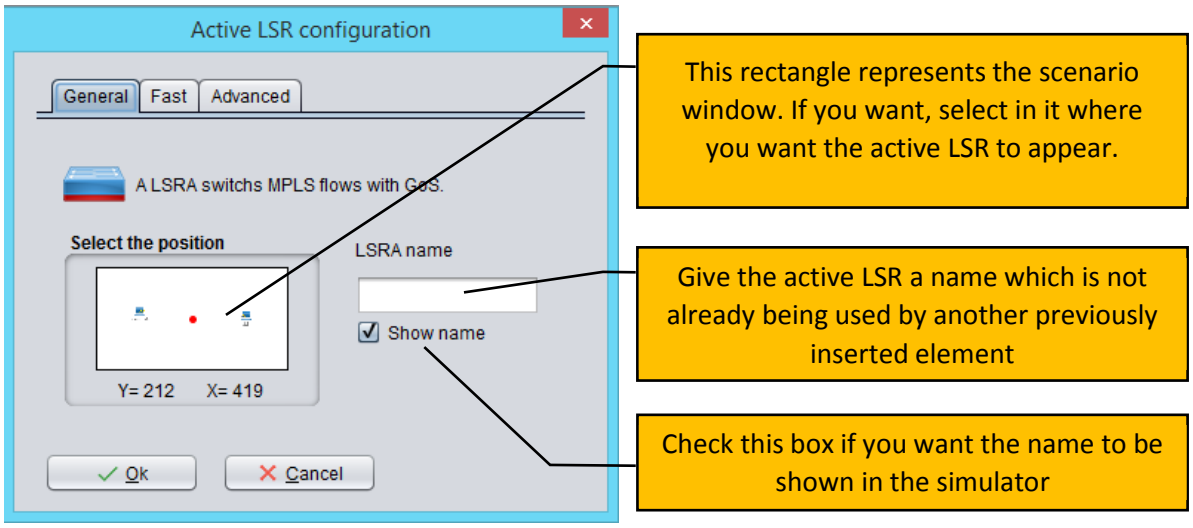


In the case of the LSR, the advanced configuration allows defining all aspects of the hardware required.

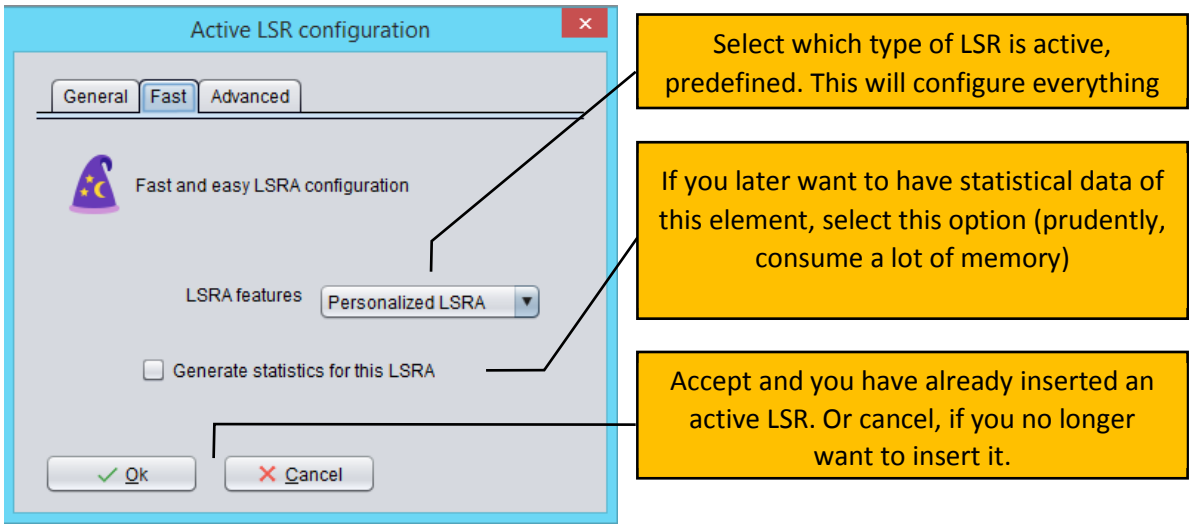


Active LSRs insertion and configuration

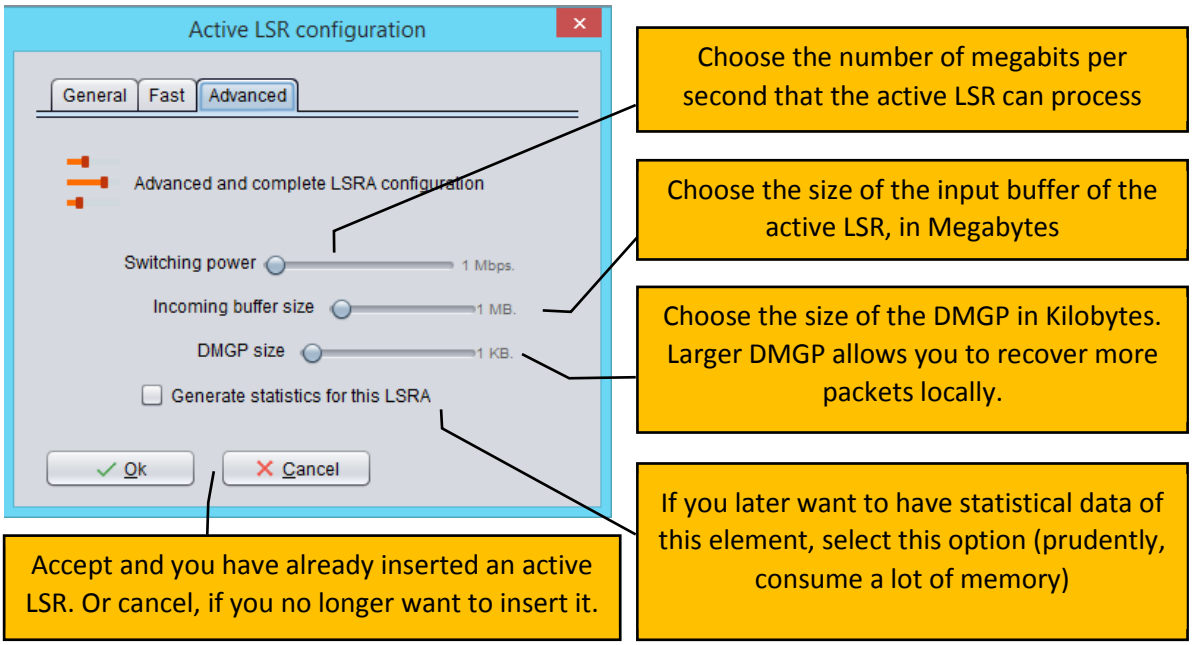
When we insert an active LSR, its configuration window appears, with three tabs: general configuration and quick configuration or advanced configuration (to choose).



If you want, you can use the quick settings to have something to try if you're in a hurry. Or if you want to configure all the parameters, use the advanced settings. It does not make sense to use both tabs.

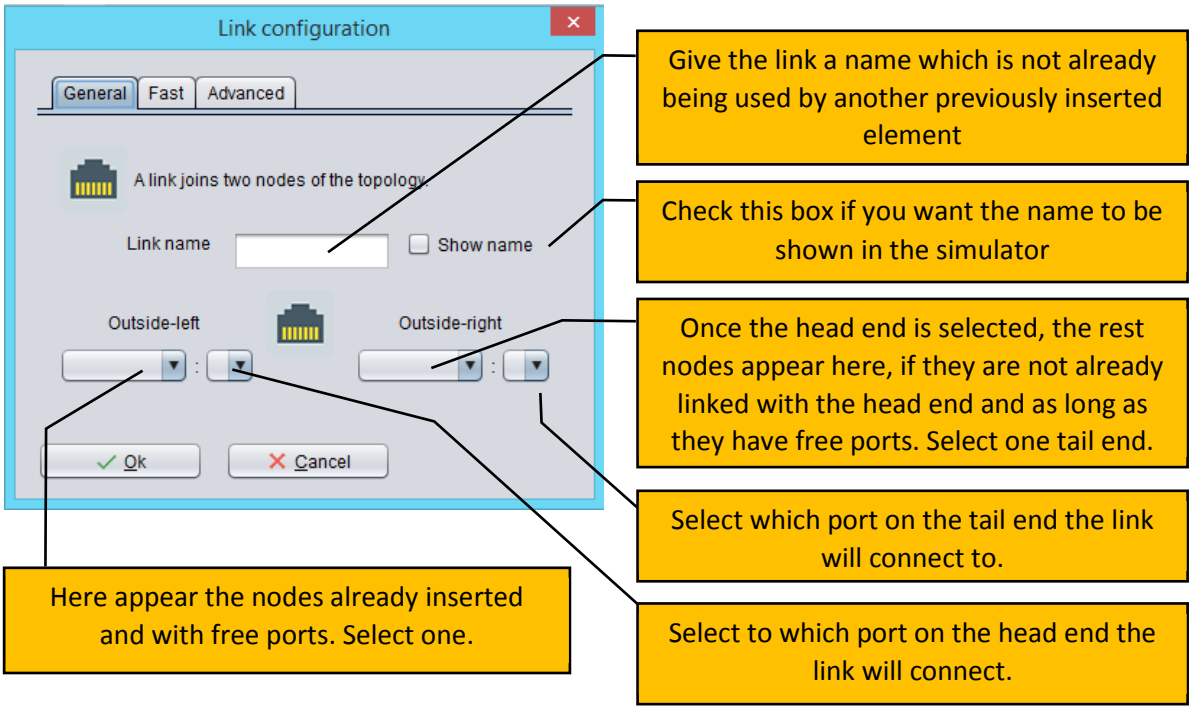


In the case of the active LSR, the advanced configuration allows defining all the necessary hardware aspects.

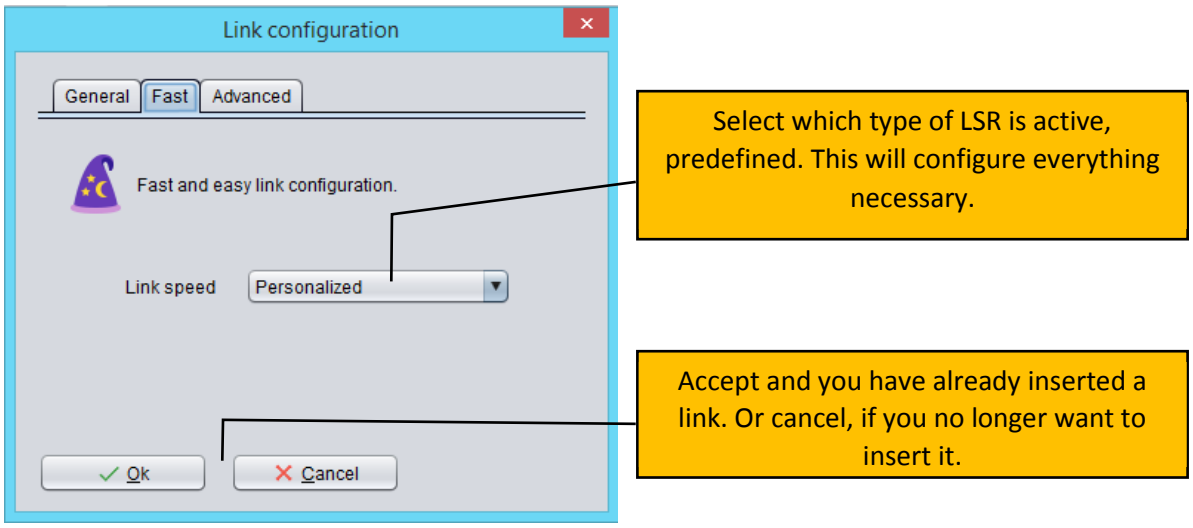


Links insertion and configuration

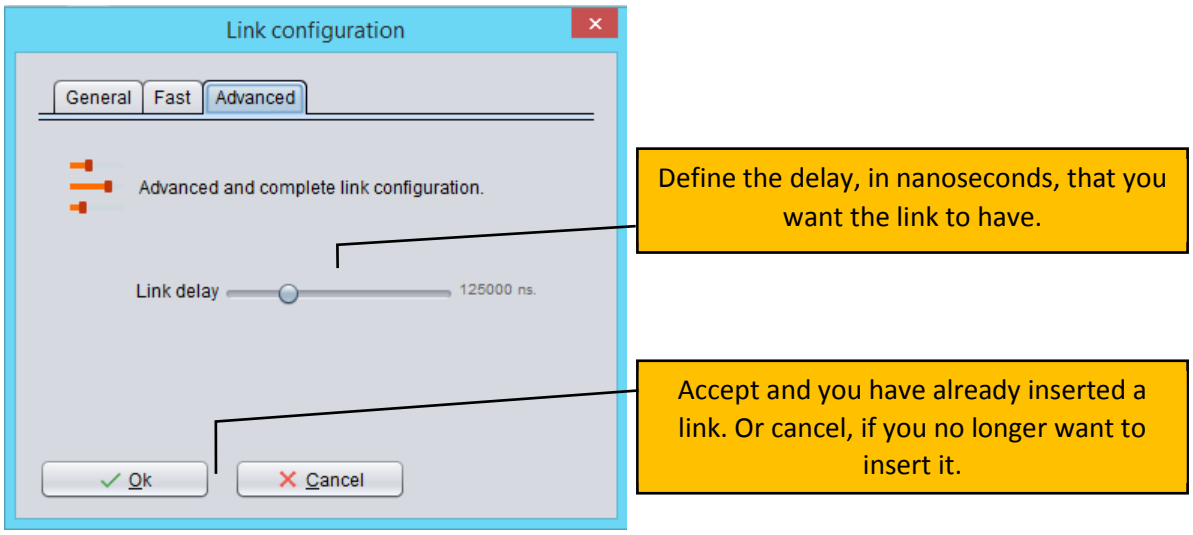
When we insert a link, its configuration window appears, with three tabs: general configuration and quick configuration or advanced configuration (to choose).



If you want, you can use the quick settings to have something to try if you're in a hurry. Or if you want to configure all the parameters, use the advanced settings. It does not make sense to use both tabs.

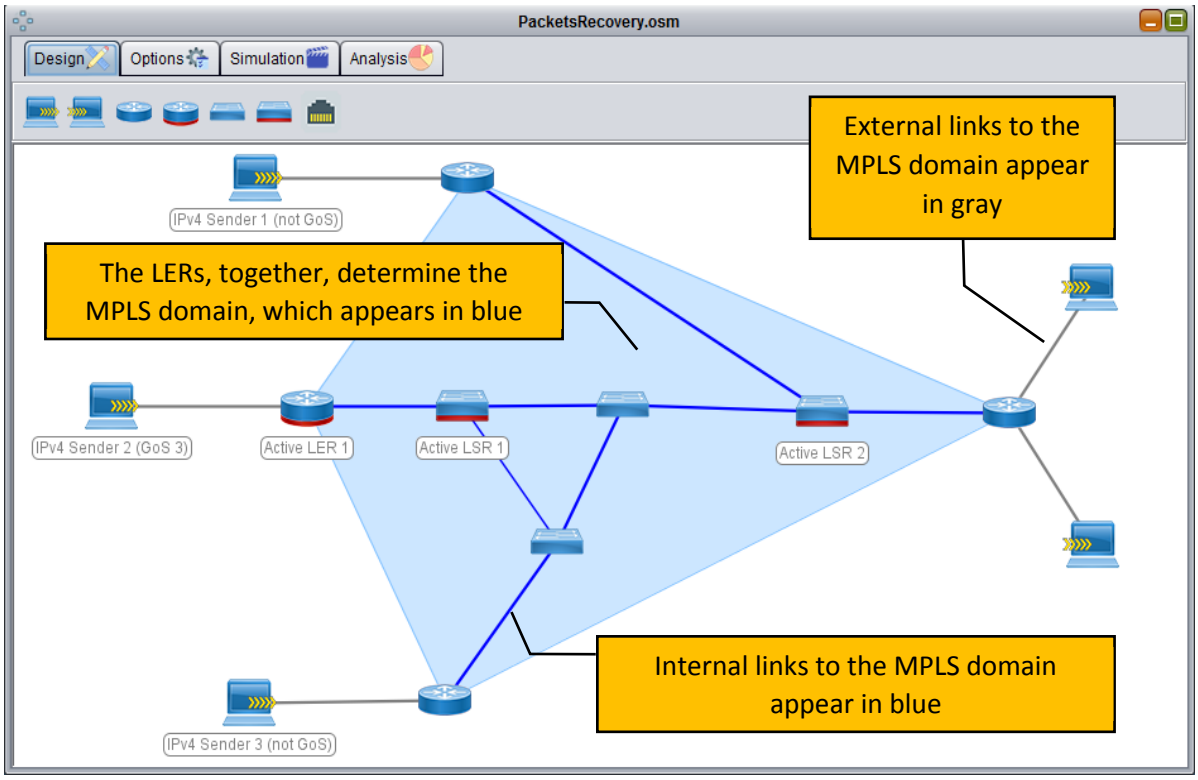


In the case of the active LSR, the advanced configuration allows defining all the necessary hardware aspects.



Design finishing

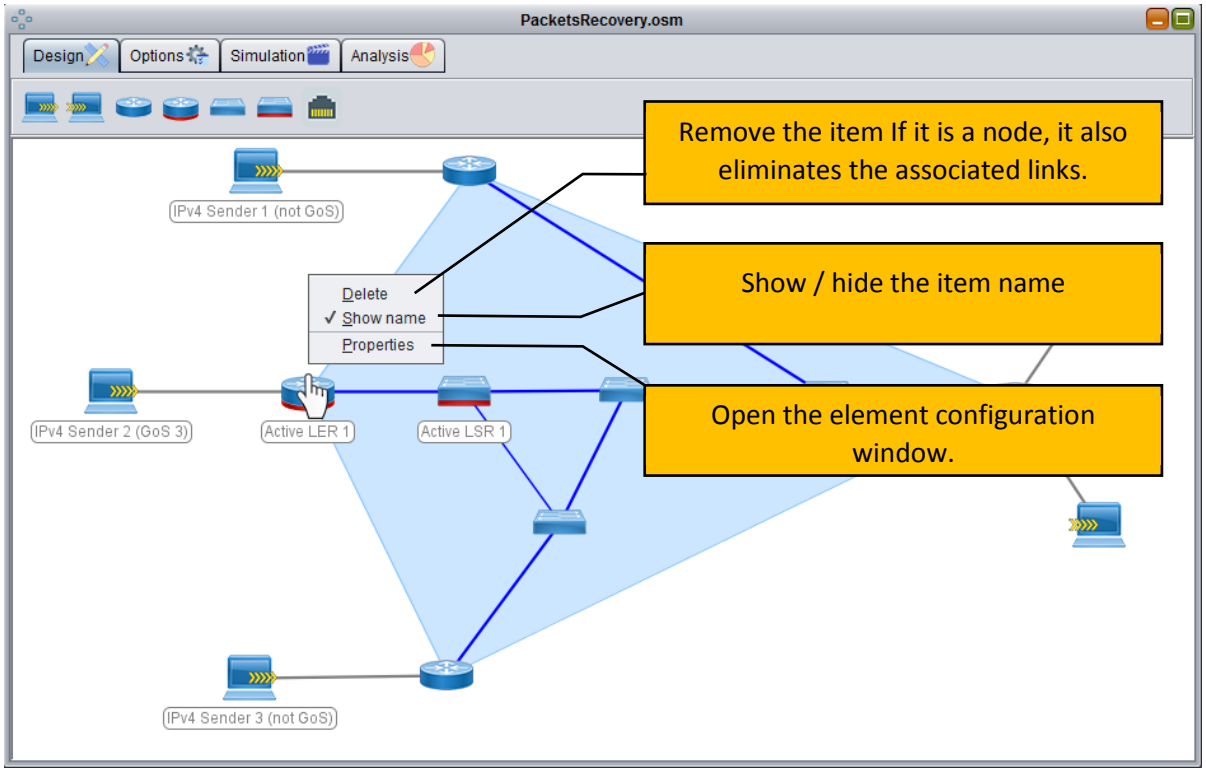
Repeat the process of inserting elements as many times as necessary until you have designed the desired topology. The following figure shows an example of how a completely designed scenario would look.



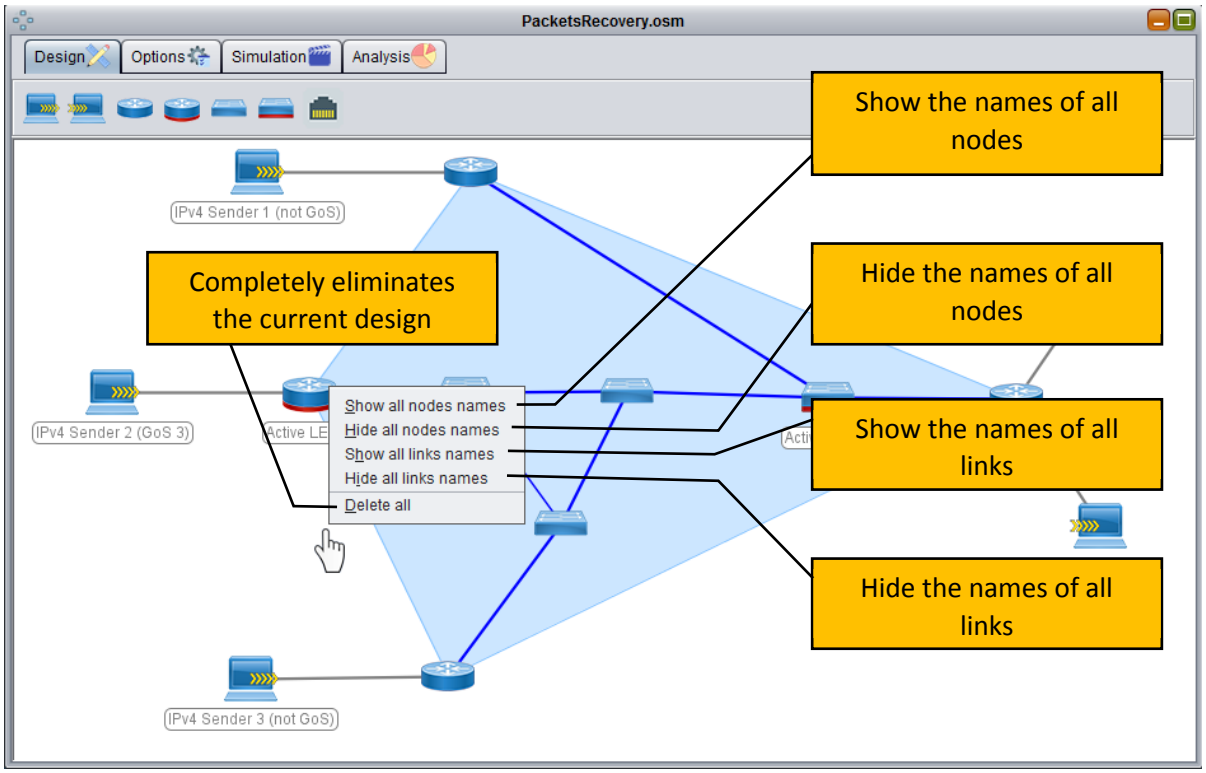
Design editing

At any time, the design can be edited: change the settings, delete inserted elements, and so on. For example:

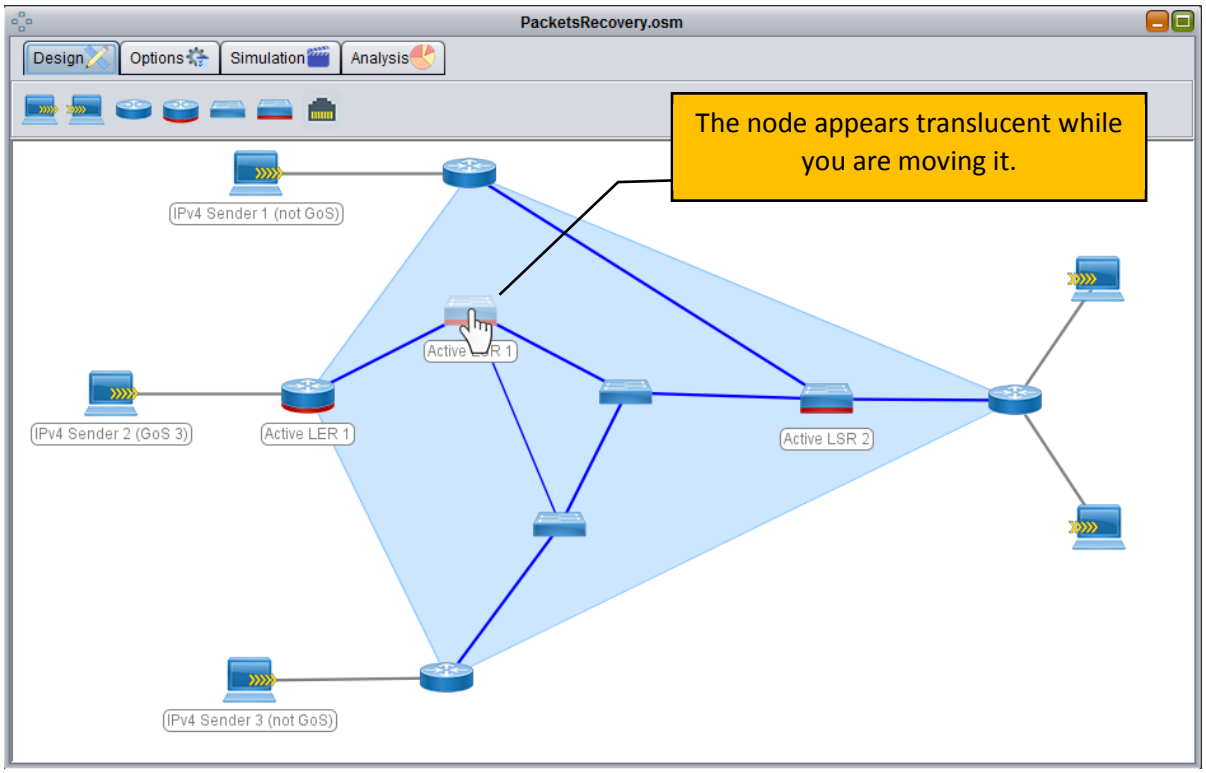
- A right click on an element (node or link) shows options on that element.



- A right click on the background of the design space shows global options on the design.

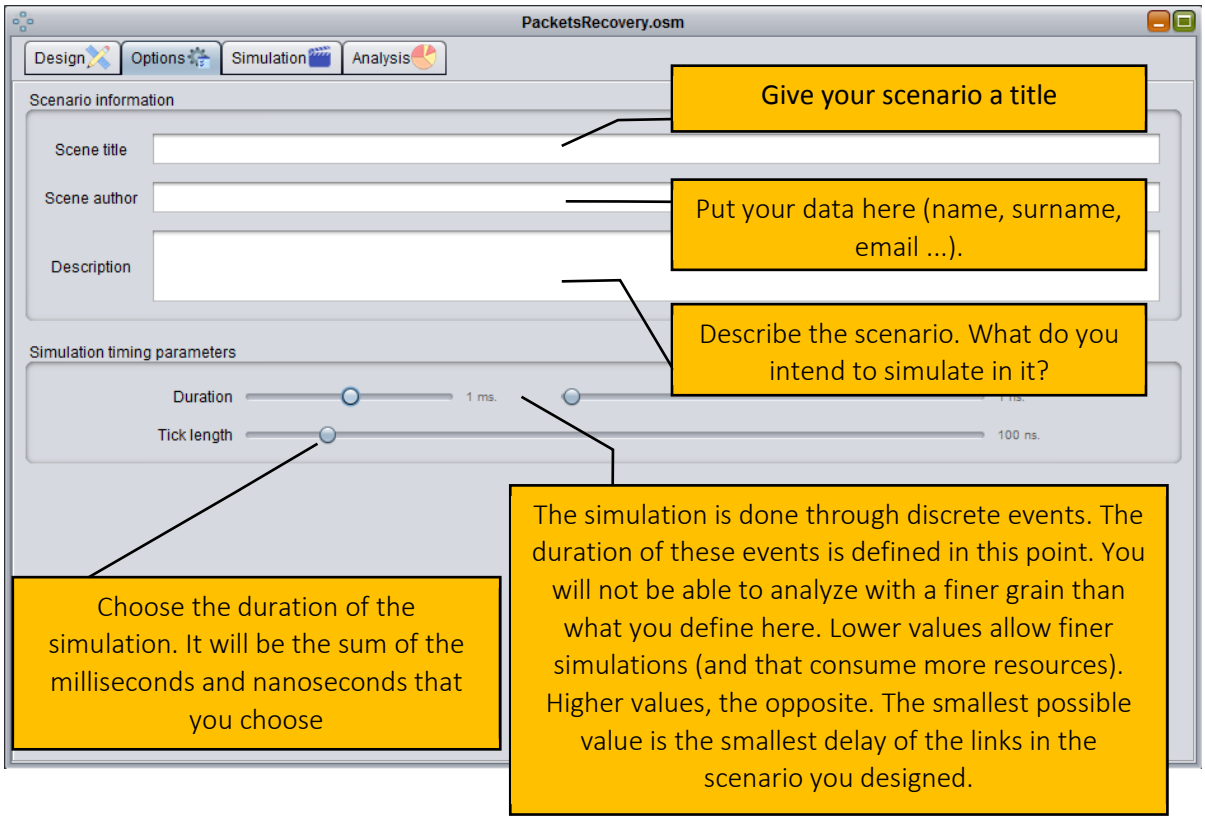


- You can drag the nodes with the main mouse button to place them where you want.



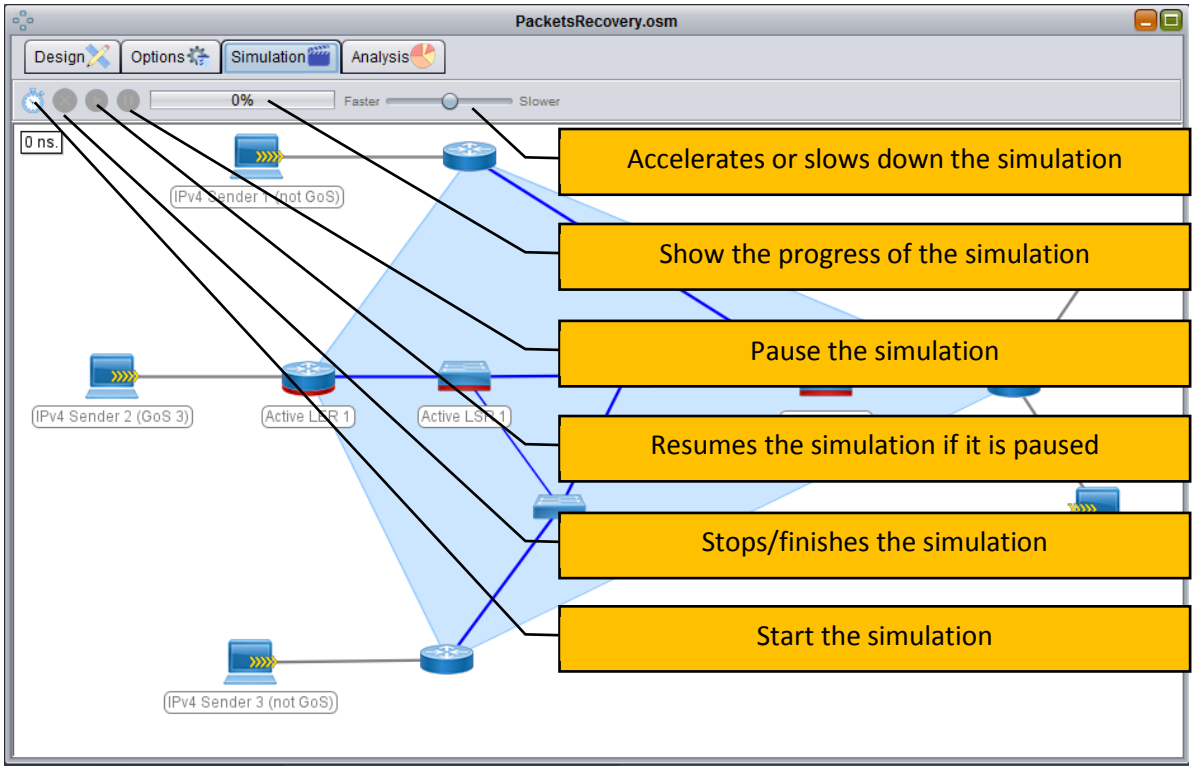
Step 2. Scenario information and timing parameters

To define the duration and basic data of the scenario, select the "Options" tab. In this tab you can define several aspects such as, for example, data about the scenario (author, title, description) or the duration of the simulation and its granularity.



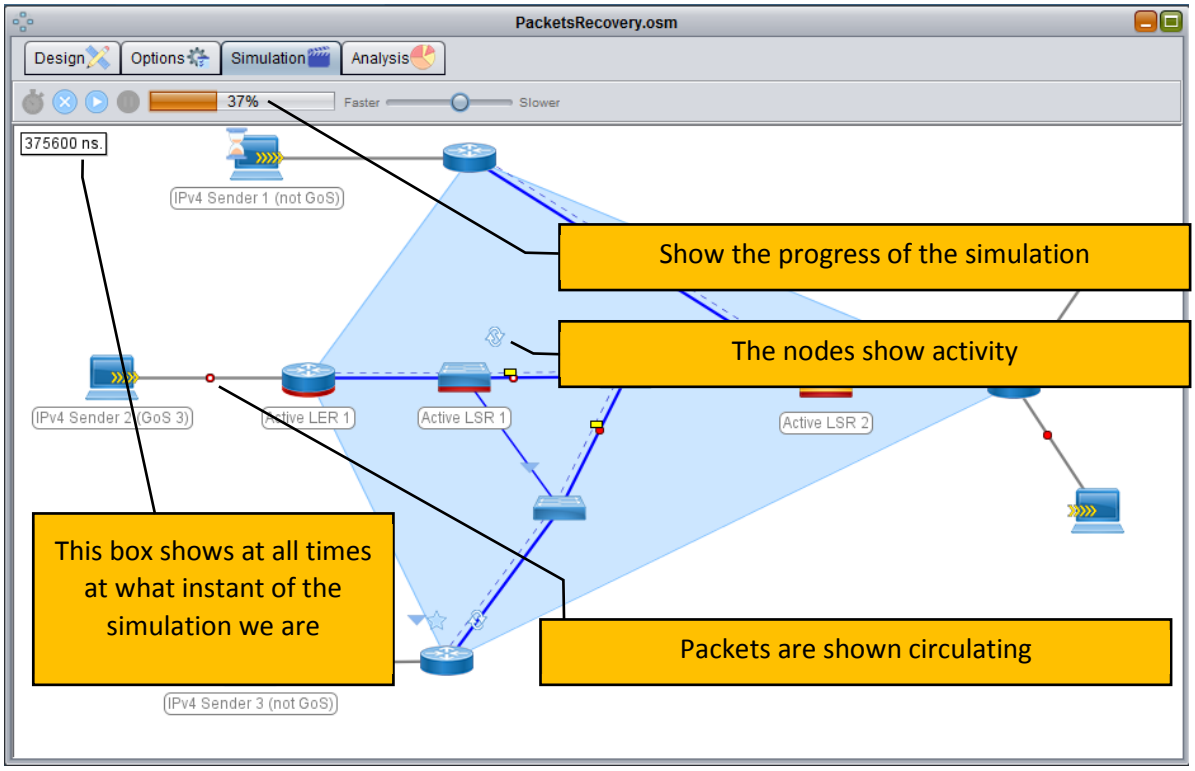
Step 3. Simulation execution

When everything is configured in the "Design" and "Options" tabs, it is usual to go to the "Simulation" tab, where the designed scenario can be put into operation.



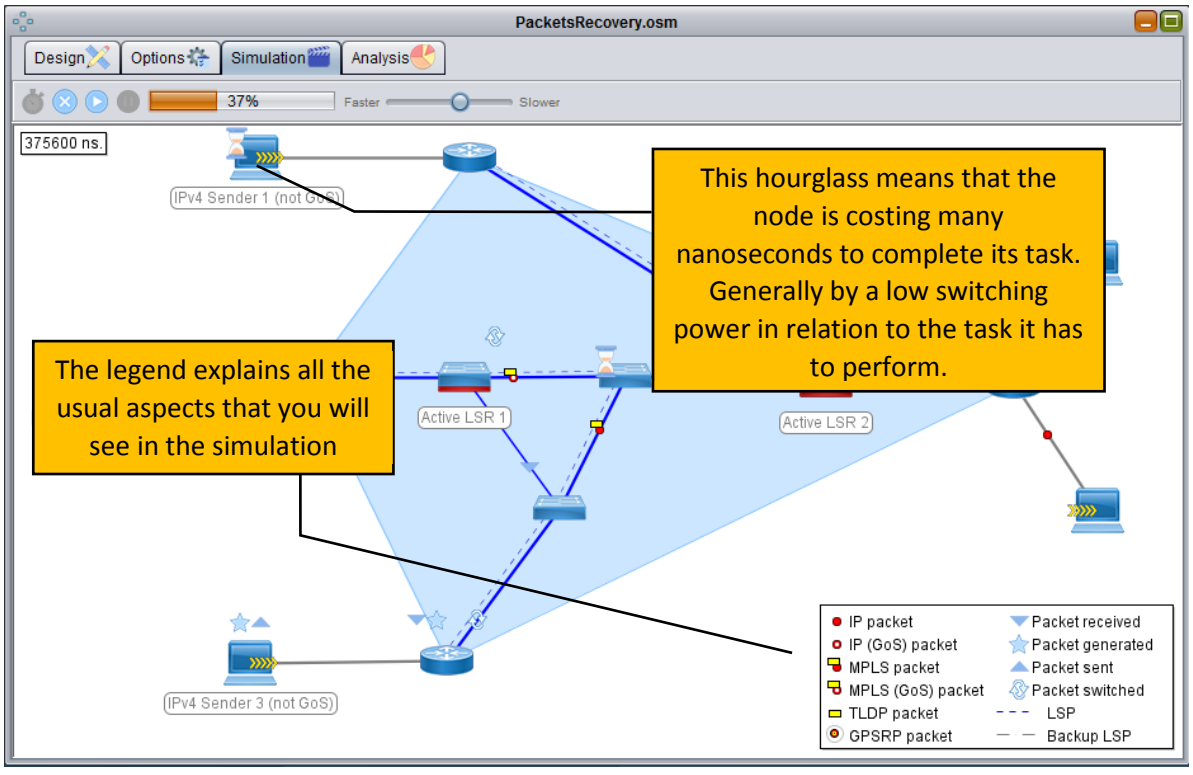
Start simulation

When the simulation starts, all the elements of the scenario begin to work in unison with the parameters that have been configured for them.



Understanding the simulation

You can see a legend that explains all the symbols that you can see in the simulation. To make this legend appear, you must click with the main mouse button in the background of the simulation panel (click again to hide it).

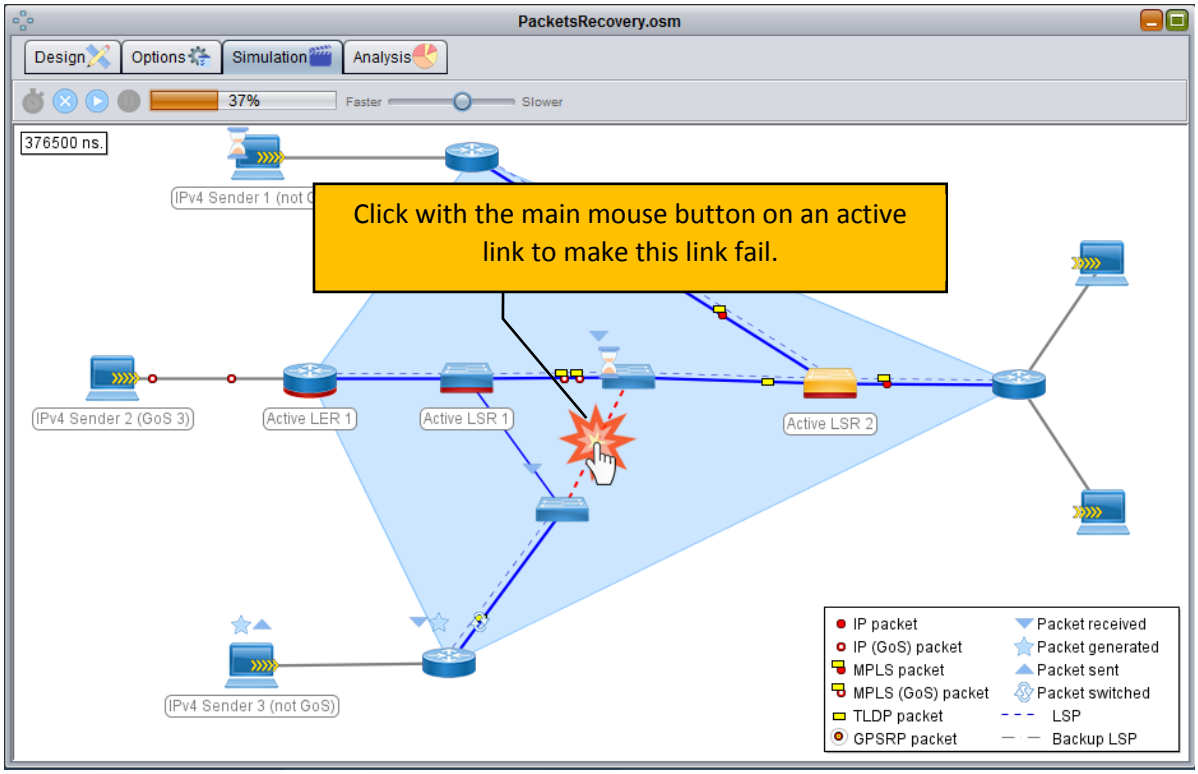


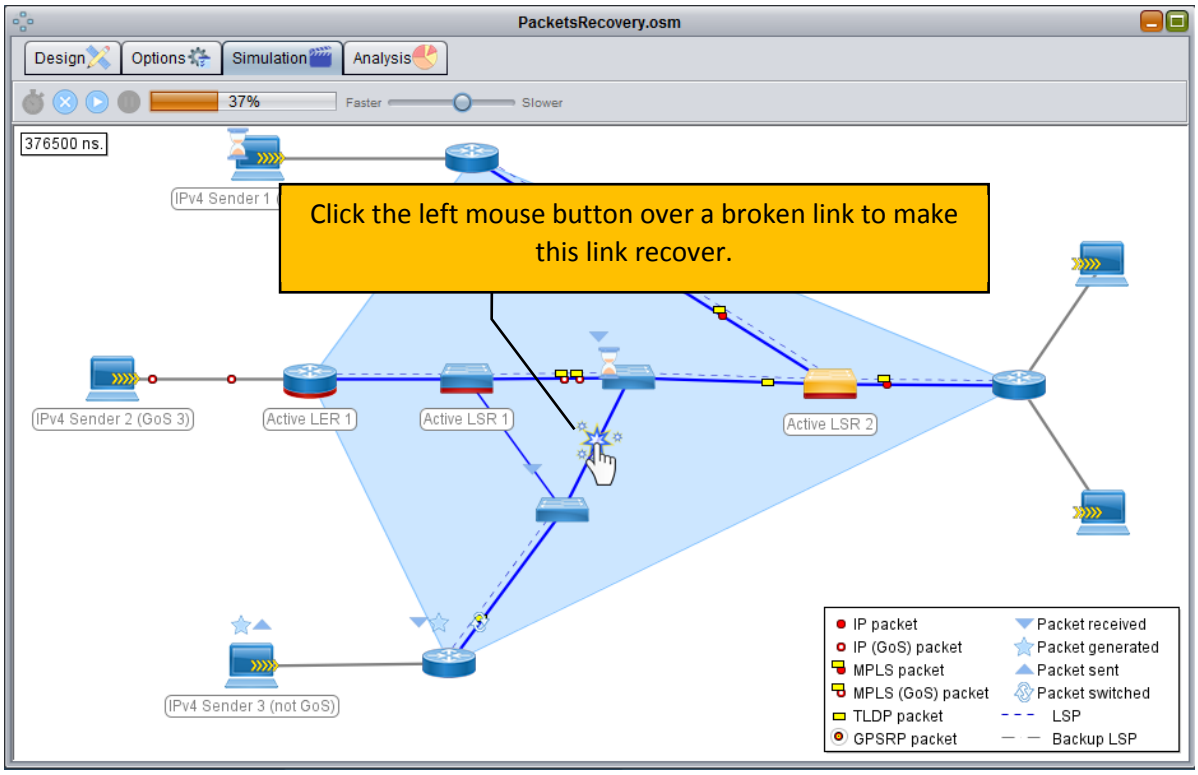
Interacting with the simulation

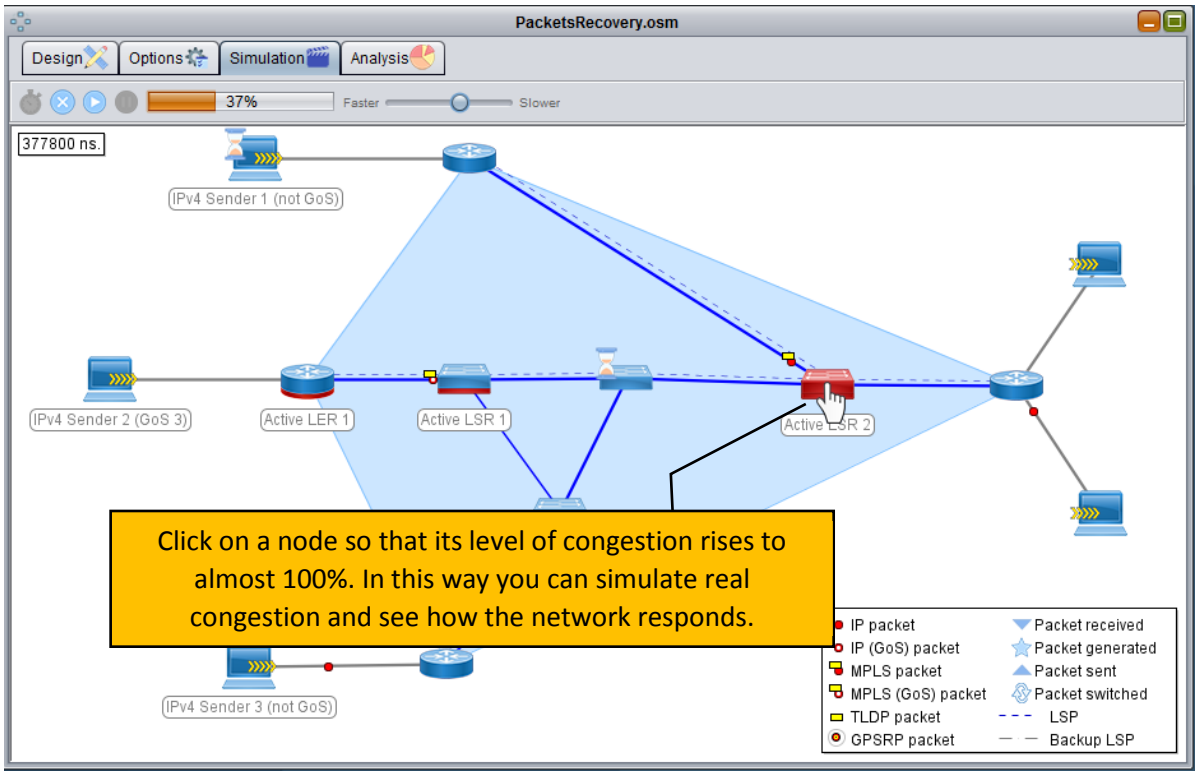
You can interact with the simulation in two ways:

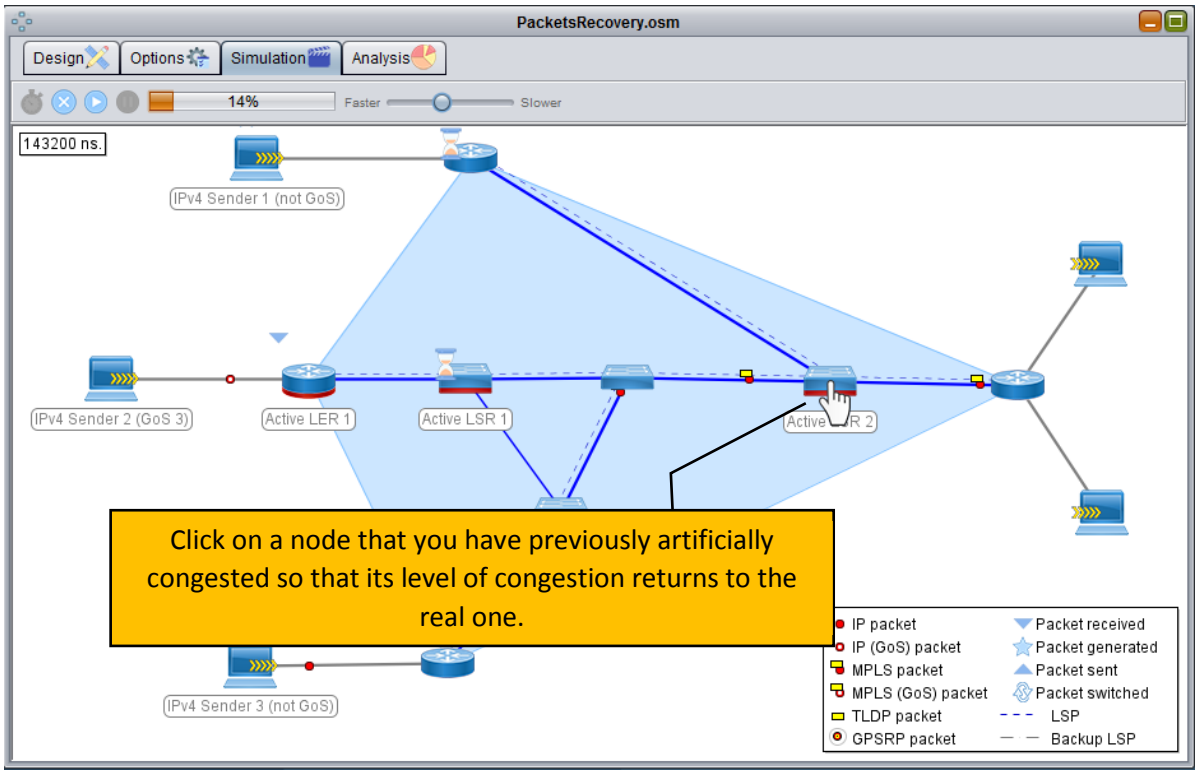
- Manually causing congestion in a node.
- Making a link fail.

The simulation will adjust to the disasters you cause. This way you can analyze what happens in situations that could happen in reality.




PacketsRecovery.osm
Design
Options
Simulation
Analysis
37%
Faster
Slower
376500 ns.
IPv4 Sender 1
Click the left mouse button over a broken link to make this link recover.
IPv4 Sender 2 (GoS 3)
Active LER 1
Active LSR 1
Active LSR 2
IPv4 Sender 3 (not GoS)
IP packet
IP (GoS) packet
MPLS packet
MPLS (GoS) packet
TLDP packet
GPSRP packet
Packet received
Packet generated
Packet sent
Packet switched
LSP
Backup LSP

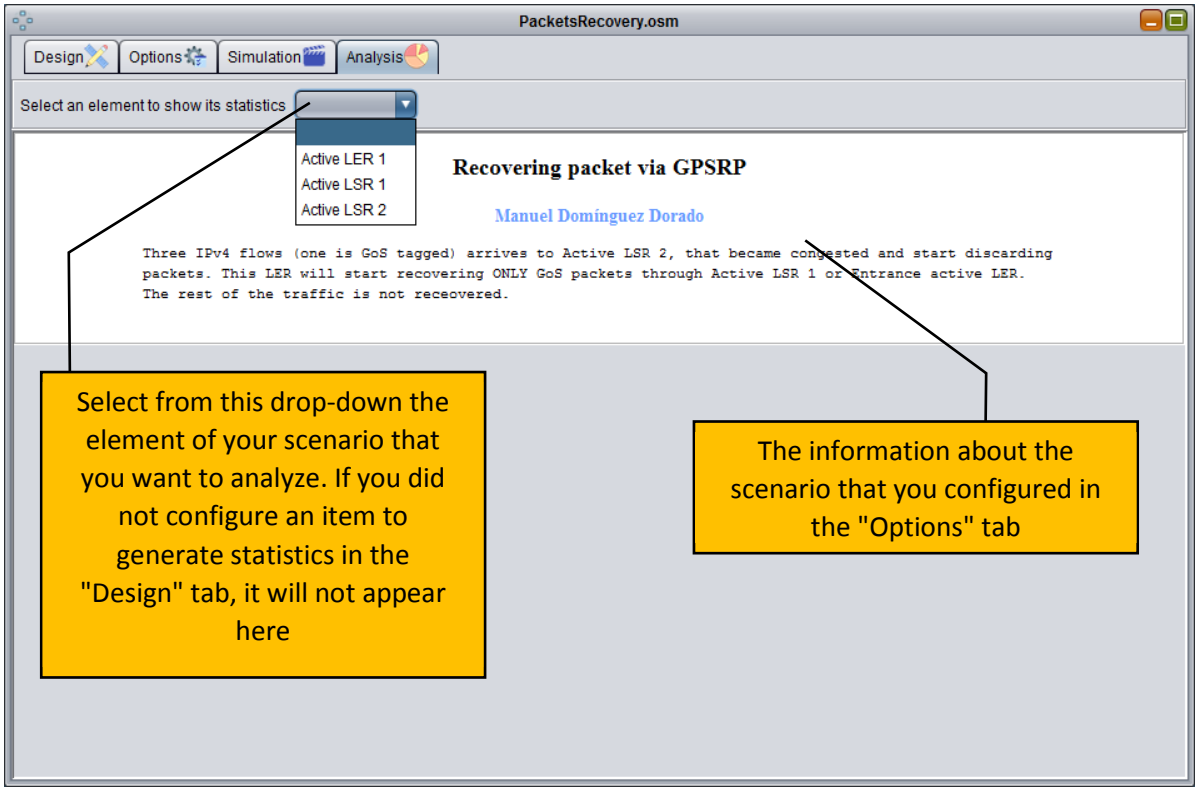

PacketsRecovery.osm
Design
Options
Simulation
Analysis
37%
Faster
Slower
377800 ns.
IPv4 Sender 1 (not GoS)
IPv4 Sender 2 (GoS 3)
Active LER 1
Active LSR 1
Active LSR 2
Click on a node so that its level of congestion rises to almost 100%. In this way you can simulate real congestion and see how the network responds.
IPv4 Sender 3 (not GoS)
IP packet
IP (GoS) packet
MPLS packet
MPLS (GoS) packet
TLDP packet
GPSRP packet
Packet received
Packet generated
Packet sent
Packet switched
LSP
Backup LSP



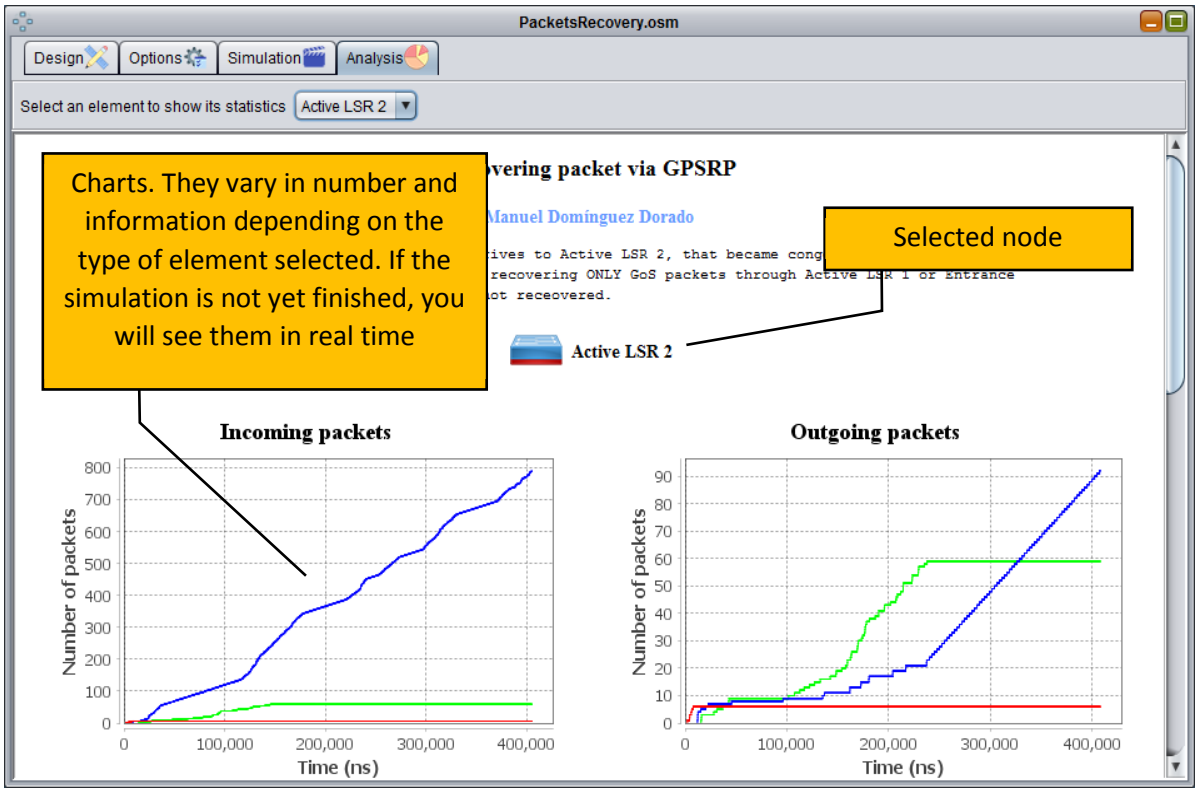
Step 4. Analyzing the simulation

After finishing the simulation (or while it is running) you can go to the "Analysis" tab to see the statistics of those elements that you have configured to generate them.

Selection of the element to analyze

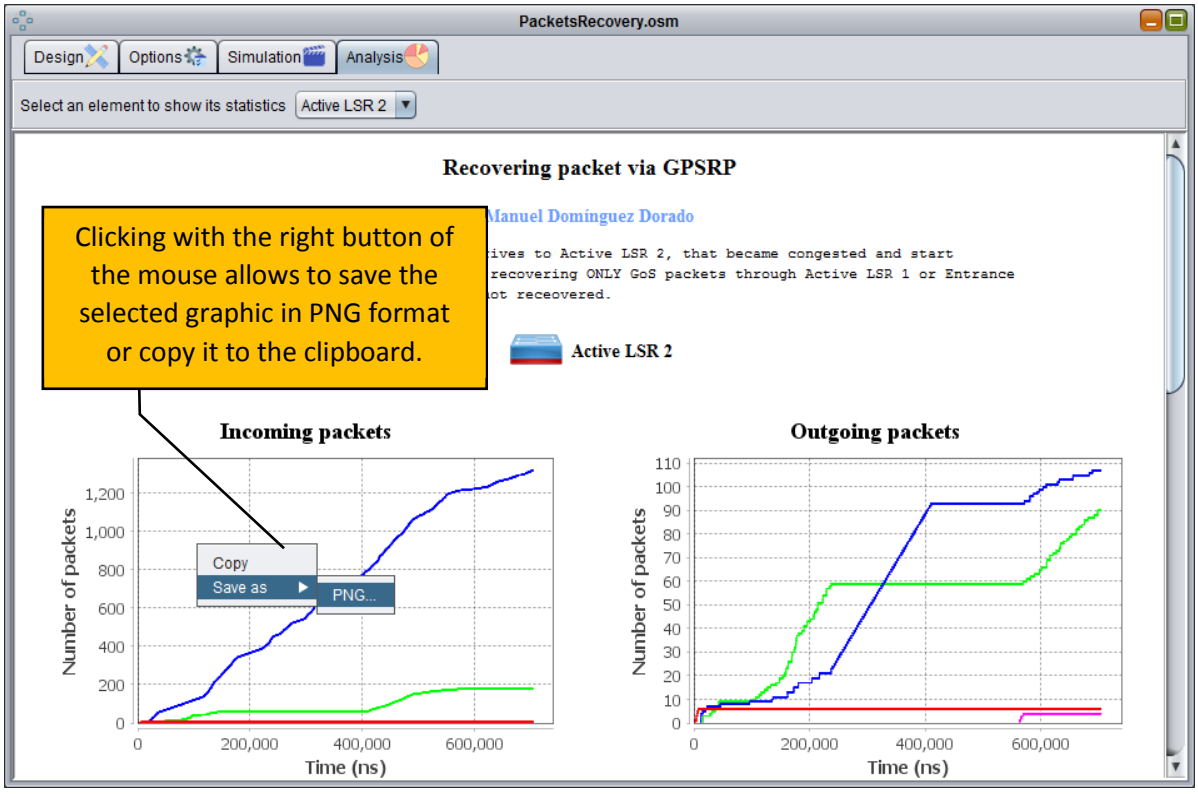


Statistical analysis



Exporting charts

The graphics can be exported in PNG format to illustrate your work, practices ... in short, to reuse them where you see fit. You can also copy them to the clipboard and paste them directly elsewhere.



Contribute

OpenSimMPLS is open source software. It is used by professionals and universities around the world (in more than 130 countries). It is a simulator in operation since 2004. Its maintenance is expensive in terms of time so, if you can contribute to its evolution/use, my family will thank you. There are many ways to collaborate.

Teachers

As a teacher, you use this simulator in your practices regarding communication networks. You can contribute a lot:

- Contribute the **teaching units** you use, to teachers from other parts of the world. It is not necessary to provide the solutions, but the statements, the scenarios you use and the purpose of the practical session.
- **Encourage your students to contribute**, instilling in them from the beginning in class a collaborative culture and respect for the work of others. Not only will they learn more about MPLS networks, but they will learn to work with repositories of software versions, pull requests and collaborate on software development projects.

Students

The students are very active. You are the people who directly use the simulator and, therefore, those who most discover their shortcomings. You can contribute a lot:

- **Contribute the scenarios that you develop** in your class practices.
- Contribute with **source code to repair bugs** or add new functionality.
- **Translate the simulator into other languages**. It is currently translated into Spanish and English, but any other language will be welcome. Together with them, Chinese and Arabic would allow practically anyone to understand it.
- **Build community.** Go to the OpenSimMPLS repository on GitHub: detect bugs, file issues for them, help answering questions from other users of the simulator, and so on.

Researchers

Most researchers use OpenSimMPLS as the basis to develop your own techniques. You can contribute a lot in this regard:

- **Source code of algorithms or novel techniques** for the simulator. If it's already done, why not bring it?

Professionals/developers

Professionals who use this simulator, get an economic benefit. I do not need financial resources, but time. **If your company uses this simulator, ask it to sponsor a few hours of your dedication to improve it**. It is the best way for you to have a simulator that is not obsolete.

Thanks for, at least, thinking about it ☺