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MANRS Lab

Teachers' Guide

Version 1 – 31 December 2018

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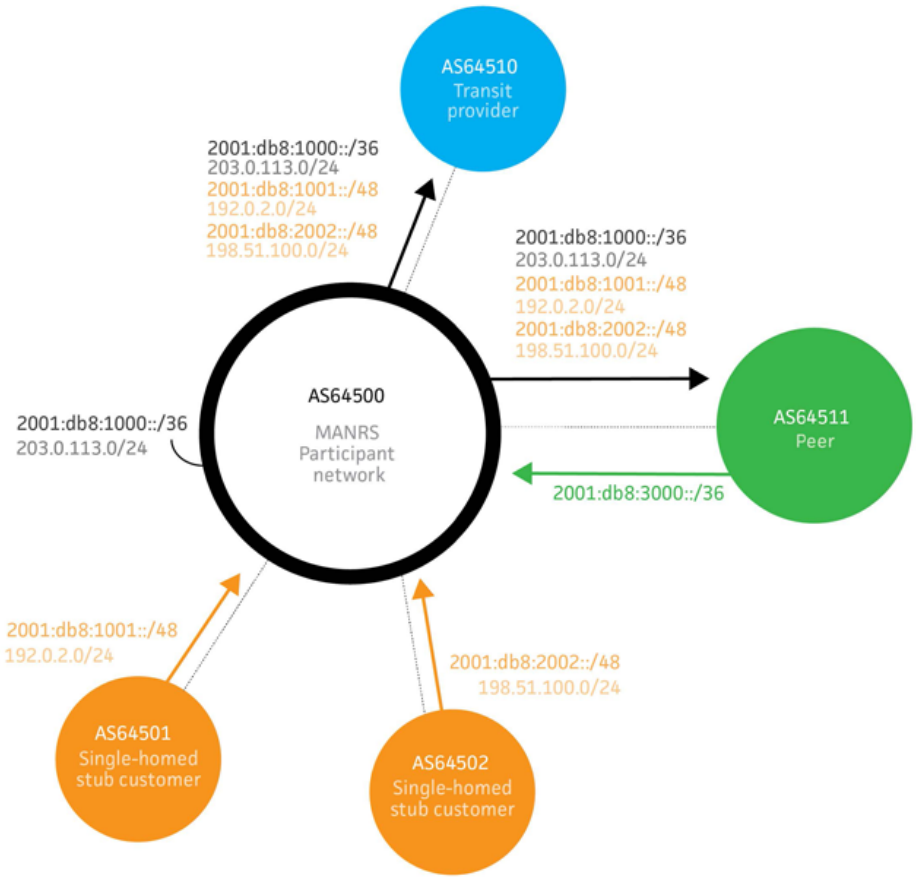
Introduction

This MANRS Lab is designed to let students gain experience with implementing MANRS on a router. The exercises will follow the MANRS Implementation guide at https://www.manrs.org/isps/guide/ very closely, including the network topology:



The lab management system uses the existing GNS3 open source software for managing the simulation environments. There are multiple copies of the same lab, where the only difference is the type of router the student gets access to (AS64500). There are versions with Cisco IOS, Juniper JunOS and Mikrotik. The lab management software is very flexible so other labs can be built as required. For more information on that see the **Exercise Creation Guide**.

Client software requirements

Browser

The lab is accessed through a modern web browser. Current versions of Safari, Chrome and Firefox have been tested.

Installing GNS3 client software (optional)

This is only required to get low-level access to the lab. For normal use this shouldn't be necessary, but it can be useful for debugging and getting tcpdump or Wireshark traces from what is happening in the lab.

To access the server securely an OpenVPN client is used. Instructions on how to use the VPN can be found on https://docs.gns3.com/1c2Iyiczy6efnv-TS_4Hc7p11gn03-ytz9ukgwFfckDk/index.html. Popular OpenVPN client applications are Viscosity and Tunnelblick.

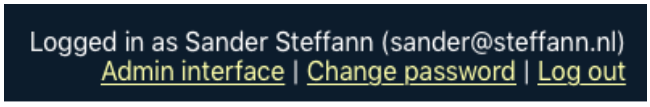
Teachers can use the GNS3 client on their PC to get direct access to the lab configurations over the VPN. The client software can be downloaded from https://github.com/GNS3/gns3-gui/releases and instructions on how to configure it are at https://docs.gns3.com/1K_OVfincey0cUw6CP4dWVgs_pBXMdlJ6gdFGjNy8EZQ/index.html. Make sure to select the "Run everything on a remote server" option.

When downloading the GNS3 client software make sure you download the exact same version as is used on the server. If the versions do not match the client will refuse to connect to the server.

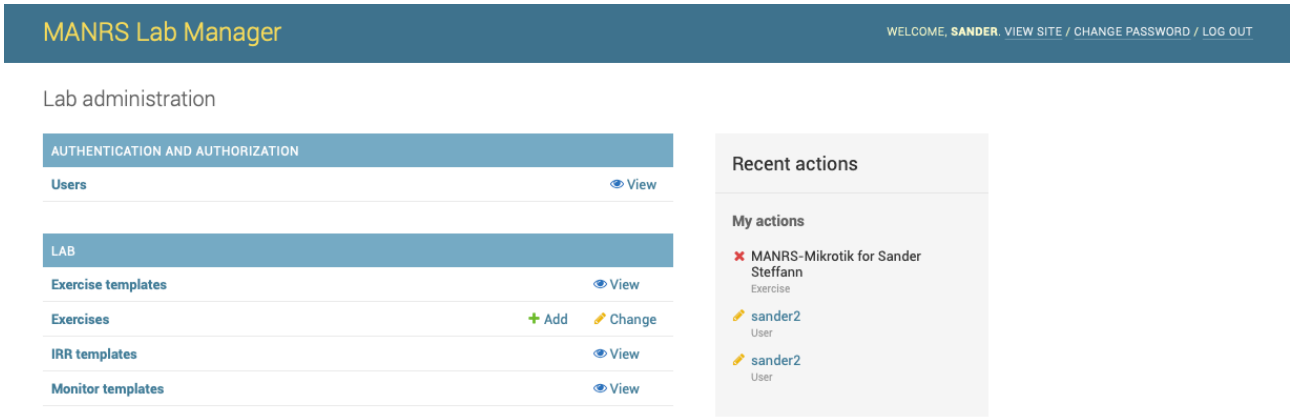
User interface

The lab is web-based and can be used with any modern browser. You do not need any other tools for managing students and exercises. The same goes for students: they configure the routers through a browser based terminal window, and interaction with the IRR database is web based as well.

When you log in with teacher or administrator access permissions you will see these links at the top of your screen:



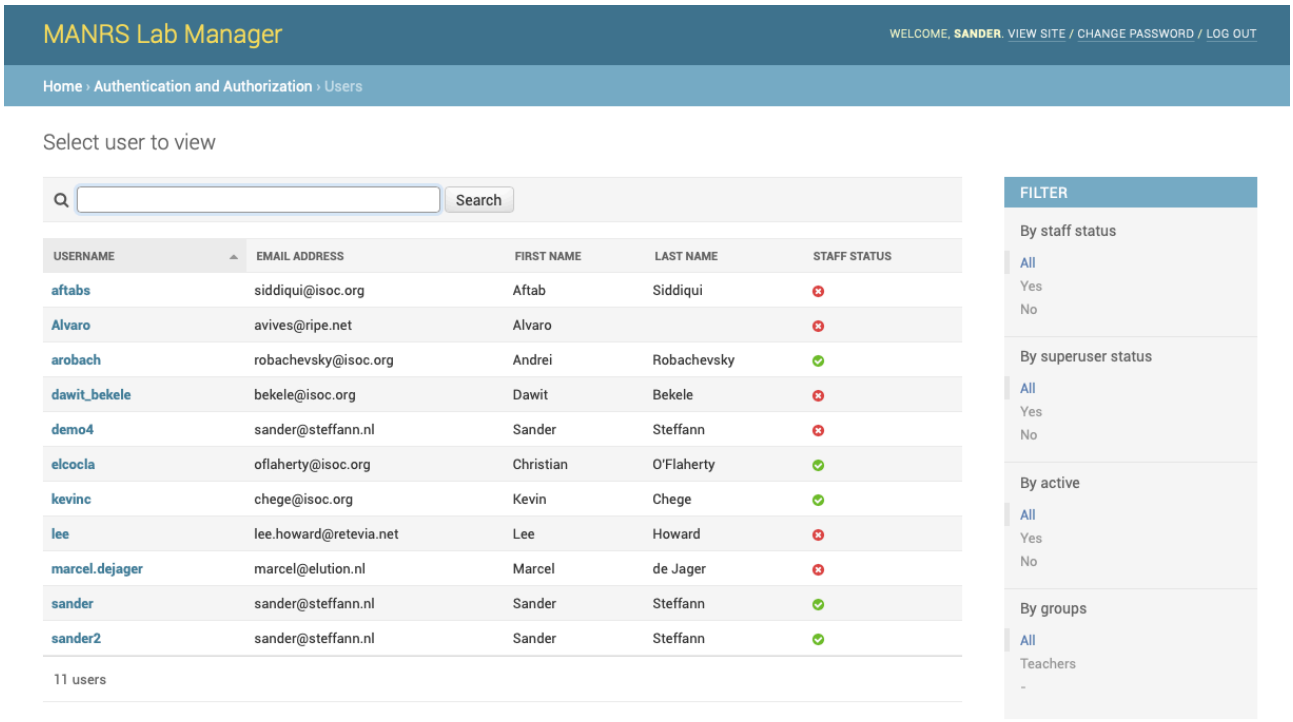
Click the "Admin interface" link to go to the administration interface:



From here you can go to all the separate parts of the system.

Users

When you click on "Users" in the main screen you will see something like:



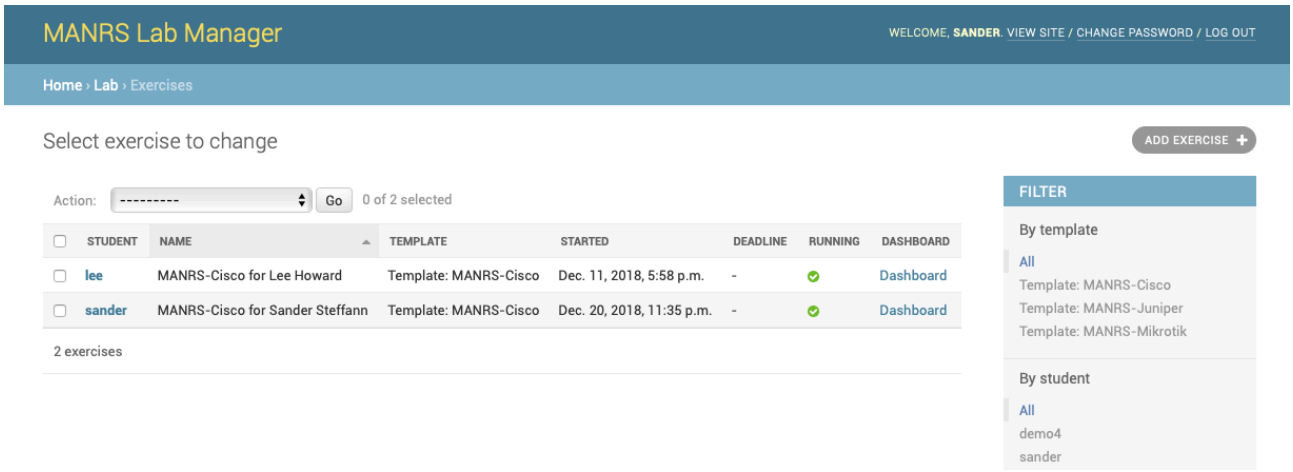
On the right side there are some options to filter the list of users. Staff status means that the user has access to the administration interface. Superuser status means that the user has permission to do anything. The active filter shows whether the user has activated their account by clicking on the activation link in the email they receive when signing up. And the groups filter shows which users belong to which authorization group.

You can click a username to see some more details about that user, like when they last logged in.

For security reasons this interface is limited to viewing only. You cannot add or change users here. Users can register and activate themselves through the public web interface. These screens are provided to be able to monitor what students are doing.

Exercises

This is the most important admin interface for a teacher. Here you can see all the exercises that students are (or have been) working on:



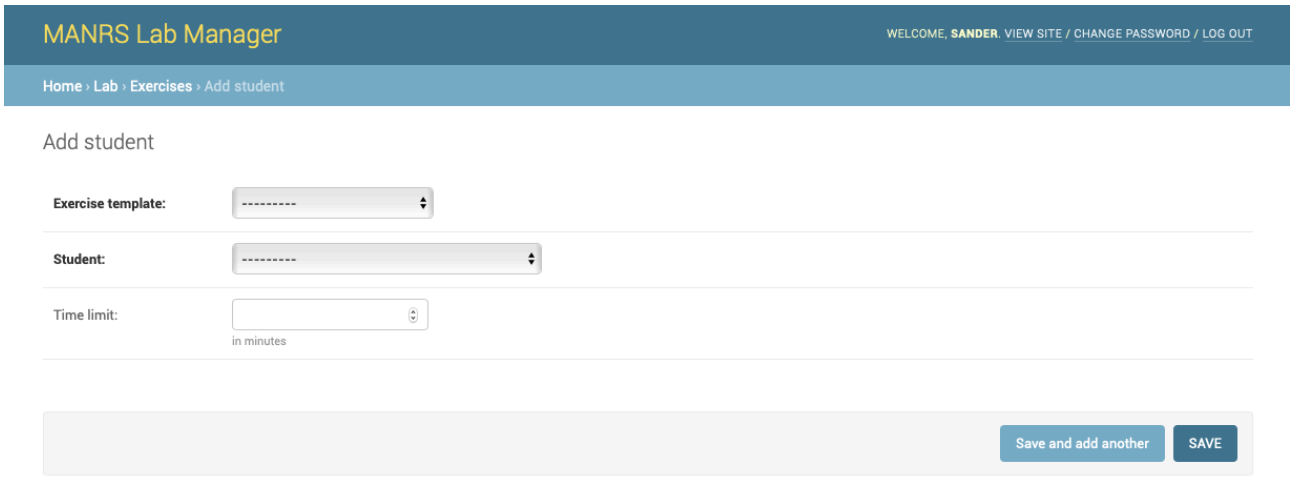
You can see the username of the student, the name of the exercise, the name of the exercise template that it is based on, when it was started, what the deadline is (if any) and whether the exercise is currently running. On the right side there are options for filtering on exercise template and student username.

Working together with a student

Clicking on the "Dashboard" link will take you to the dashboard of that student's exercise. The management system allows multiple users to simultaneously look at one dashboard. Console sessions to the student's routers are shared, so as a teacher you can see what they are typing and intervene where necessary.

Adding an exercise for a student

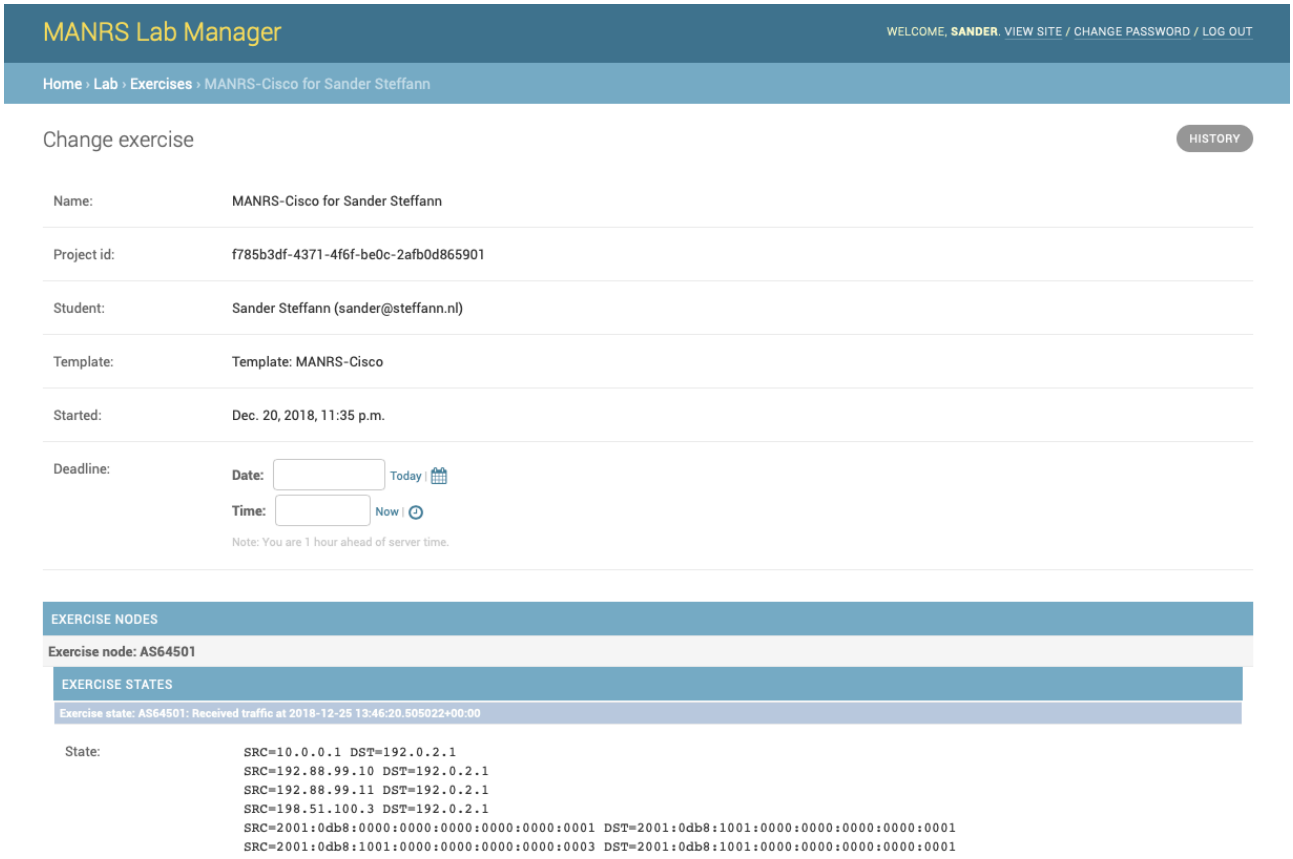
With the "Add exercise" button in the top right corner of the screen you can start a new exercise for a student:



Here you can select an exercise template and a student. You can also set, change or remove the time limit for this student. For example if you want to let the student play with the lab over the weekend you can extend the time limit. Please be careful with not setting a time limit at all: this will keep the lab running indefinitely and will consume server resources.

Raw exercise details

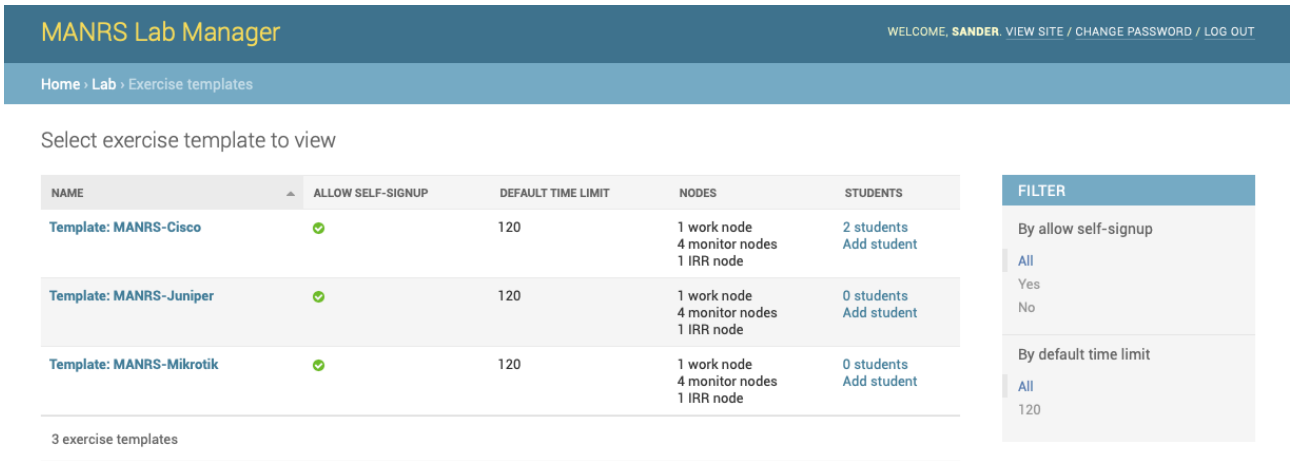
Clicking on a username will take you to the details of that exercise:



You can change the deadline here, as well as see all the low-level details of what the lab management system is seeing from that exercise. It will show you things like source and destination addresses of received ping packets, received routes, IRR information etc. You can use this to compare the student's results to what is expected of the student as specified in the IRR and Monitor Templates (see below).

Exercise templates

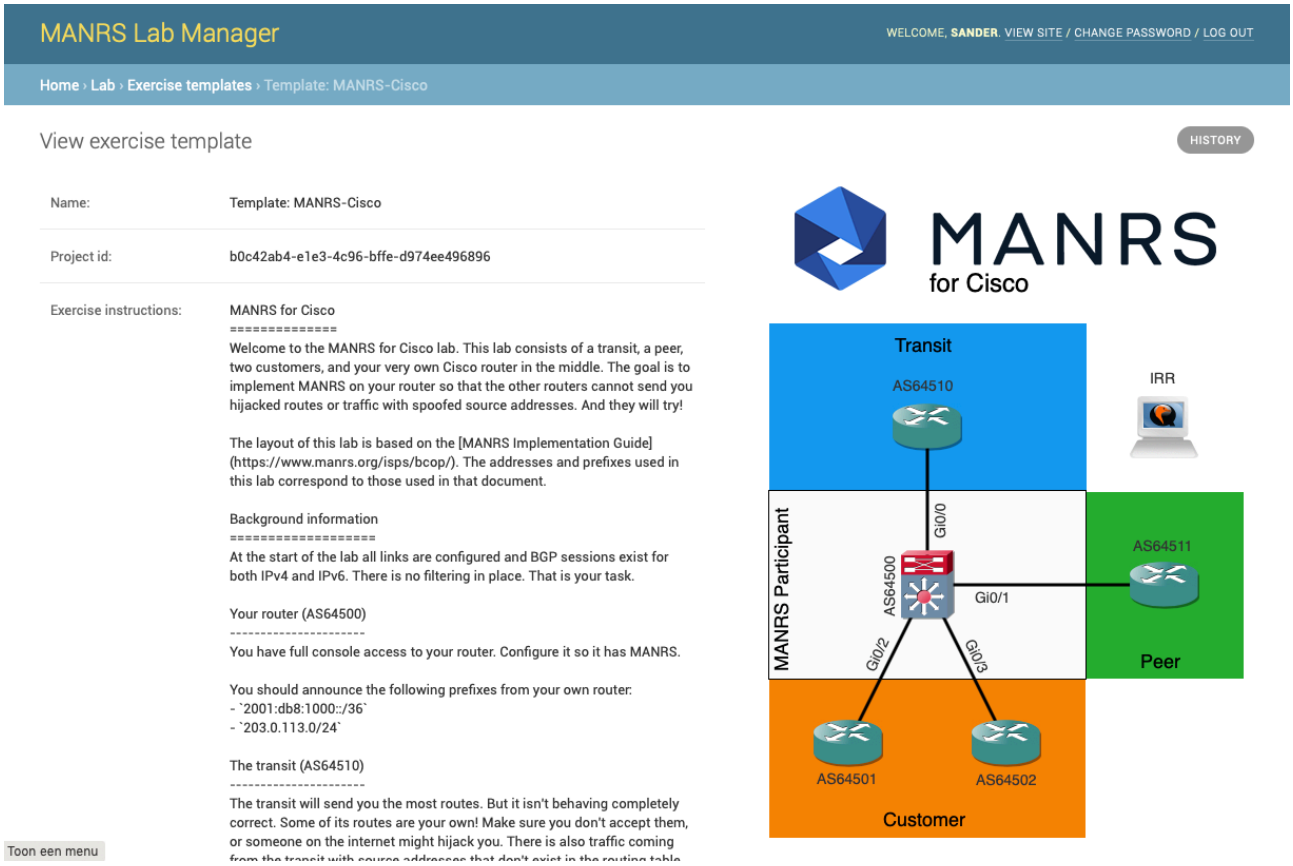
When you click on "Exercise templates" in the main screen you will see something like:



This shows you an overview of all the exercise types that are available in the system. In this example there are three versions of the MANRS exercise for different vendors.

There are links to see all students who are doing an exercise and to add new students. Both these links correspond to the filtering and "Add exercise" functionality explained earlier in the "Exercises" section.

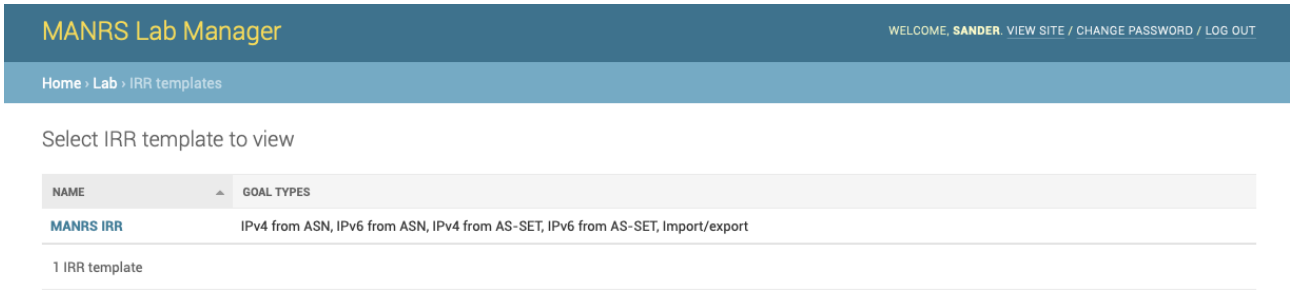
When you click on a template name you will see the raw information that is shows to the student for this exercise:



This information is shows for your convenience. Teachers do not have access to change exercise templates. You can however see a history of all the changes to the template over time by clicking on the "History" button in the top right corner of the screen.

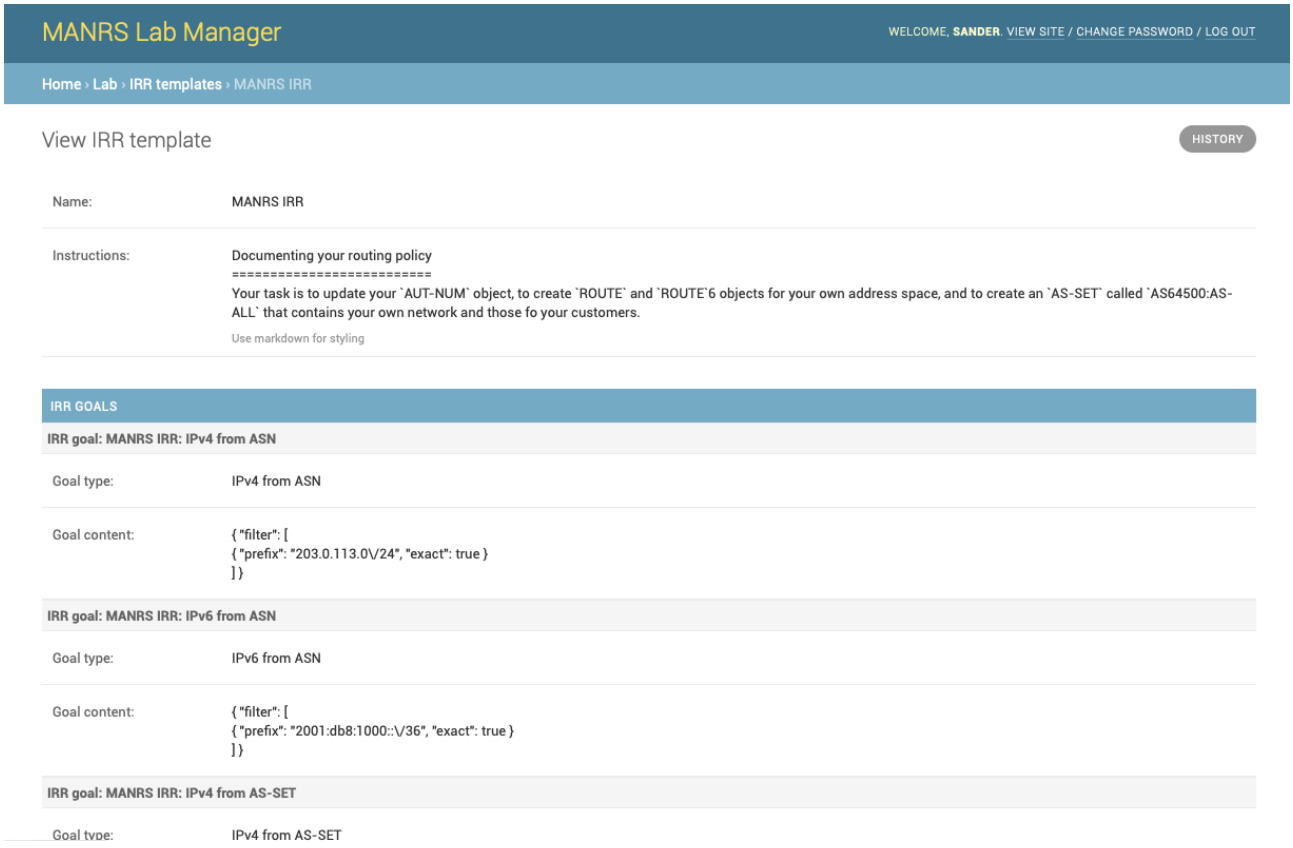
IRR Templates

When you click on "IRR templates" in the main screen you will see something like:



This shows you the different templates for what the end goals are expected to be for students. Each IRR node in an exercise template (these are the nodes that contain an IRR database and let the user work with it) will be linked to an IRR template that defines what the student should achieve. The system matches the students' results against these templates, and the student will only pass the test when their results match the content of this template.

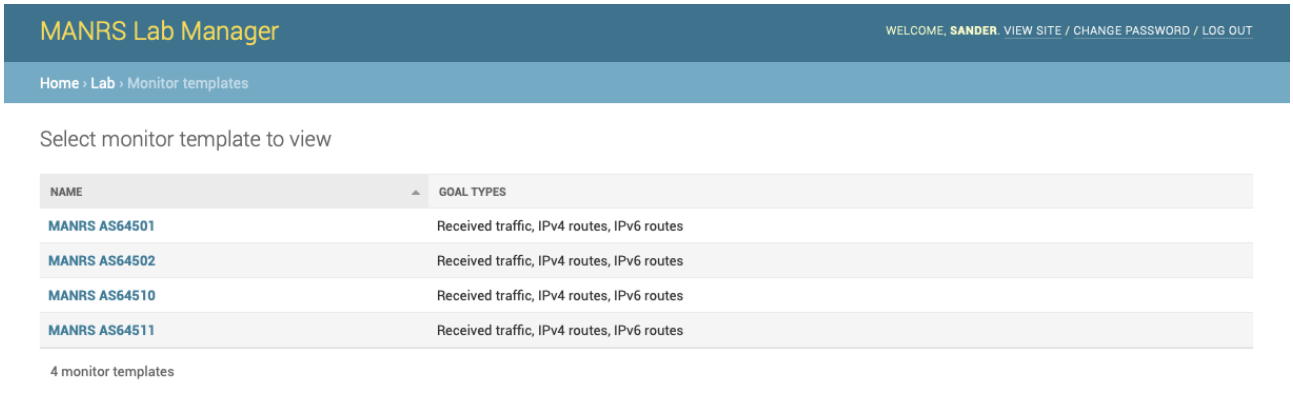
You can see the raw data of what is expected of the student by clicking on the name of an IRR template:



Teachers do not have access to change IRR templates. You can however see a history of all the changes to the template over time by clicking on the "History" button in the top right corner of the screen.

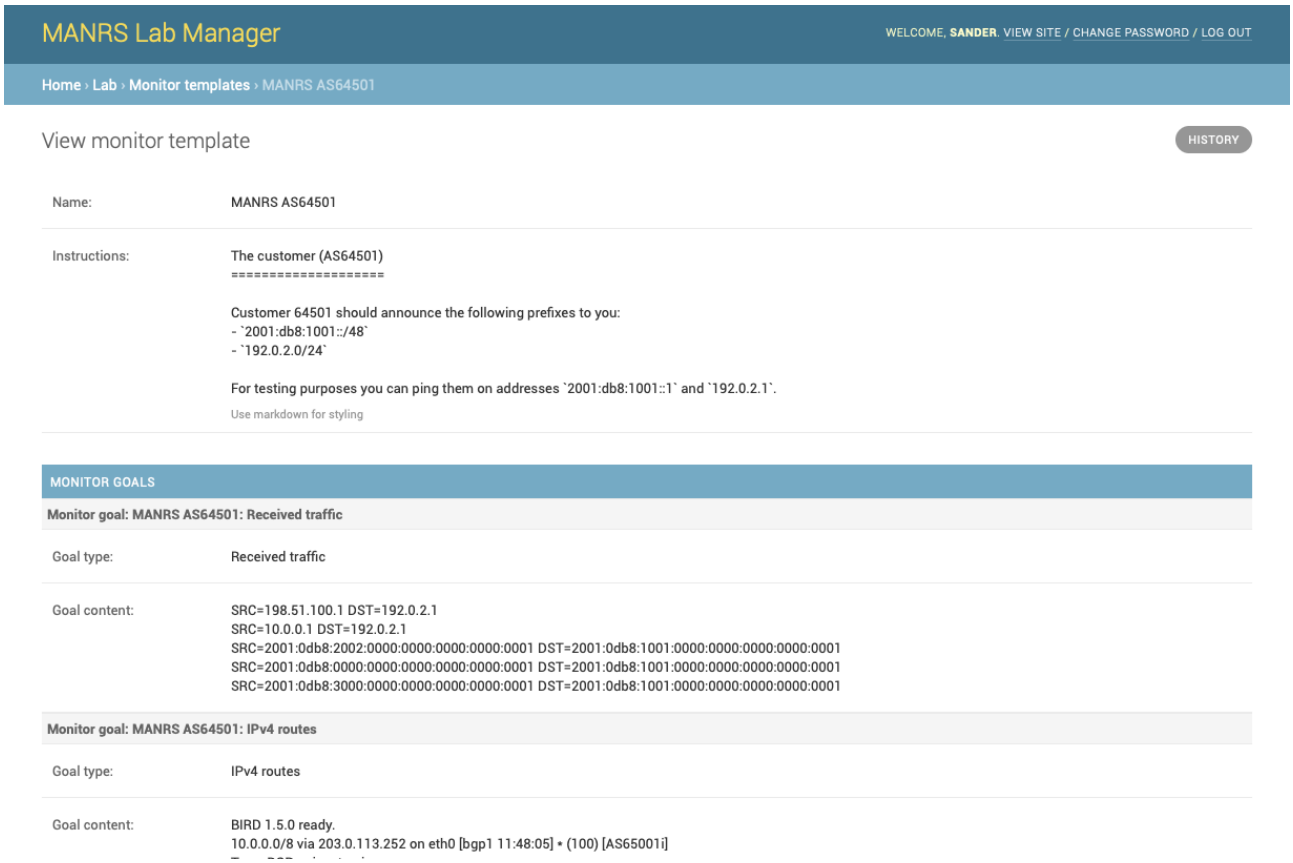
Monitor templates

When you click on "Monitor templates" in the main screen you will see something like:



This works in a similar way to the IRR templates. Every monitor node in an exercise template (these are the nodes that announce BGP routes and monitor the results of a student's actions) its linked to a monitor template. The system matches the students' results against these templates, and the student will only pass the test when their results match the content of this template.

Clicking on the name of a template will show you the raw data:



Teachers do not have access to change monitor templates. You can however see a history of all the changes to the template over time by clicking on the "History" button in the top right corner of the screen.

Troubleshooting

From student's dashboard

It can sometimes happen that things don't work as expected in a student's lab. When that happens go to the student's exercise dashboard and try the following:

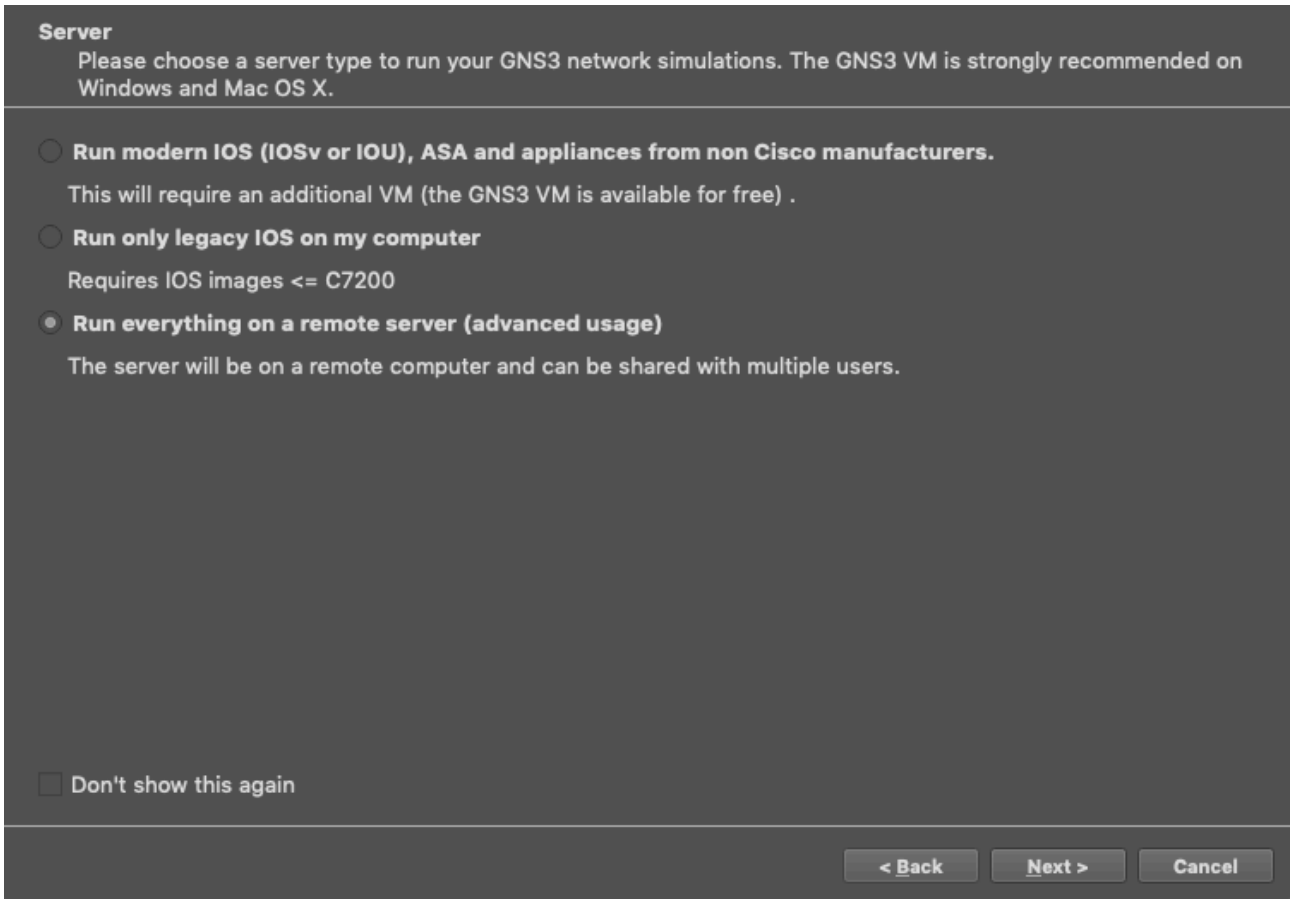
- make sure you can ping the other end of a link
- shutdown an interface and bring it back up to reset the link
- make sure your BGP sessions are up
- clear your BGP sessions after changing filters

And if all else fails, use the "reboot device" button you can find on the bottom of each tab.

From the GNS3 back-end system

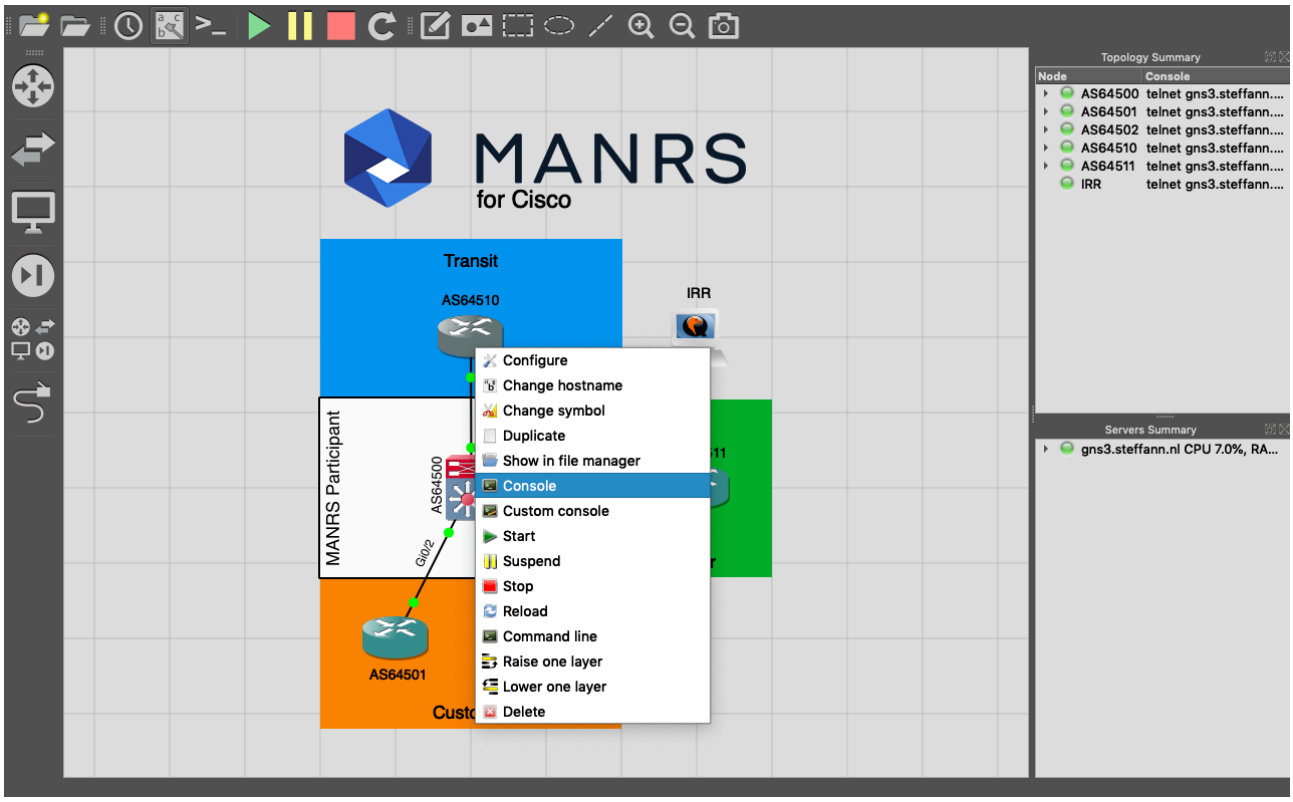
When you have a VPN to the lab management server and you have the GNS3 client installed on your own laptop you can access the low-level details of the system.

After creating a VPN connection to access the GNS3 server back-end, start the GNS3 client application. When starting it for the first time it will ask you which server to use:

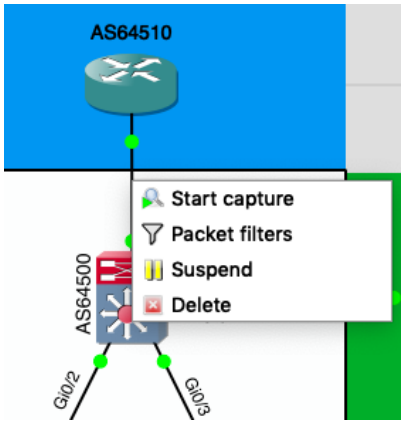


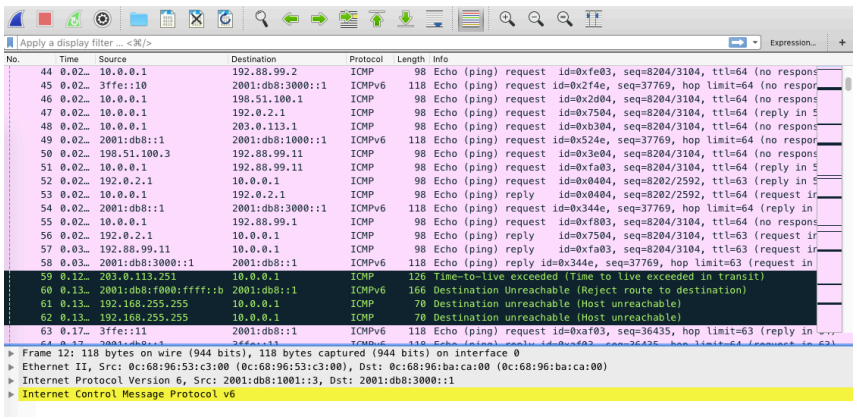
Choose "Run everything on a remote server" here. The next screen will ask you for the host and port of the server. Enter the hostname or IP address provided to you by the server administrator. The port number is usually `3080`.

From the project's library open the project that corresponds to the student's exercise. The name will correspond to the name in the "Exercises" list. When the project is opened you can right-click on any device and open its console:



This will give you back-end access to all devices, even the ones the student cannot access directly. It also lets you monitor the links between the devices. Right-click on a link and you can select "Start capture". If you have Wireshark installed on your laptop it will open it and feed the packets from the lab straight to your local Wireshark so you can see in real time what is happening on the wire in the lab:





This may be useful in cases where you see behaviour in the lab that you cannot explain.