LIGHTNING INSTALLATION MANUAL

Lightning 0.8.6

11/09/2018

This user manual will explain the installation procedure of **Lightning** (https://github.com/ptoribi/lightning), the network simulator based on Docker containers. This document is intended to be a guide for the system administrator of your organization.

For information about how to use this program, please refer to the *"User Manual"*. For creating and configuring your own containers or scenarios repository, please take a look to the *"Professor manual"*.

Compatibility

Debian 9 x86_64 (compatibility with more OS will be checked in the nearly future).

Before the installation

Before installing Lightning please check that your OS counts with the following **dependencies**:

- **docker-ce** (Docker Community Edition) A complete guide for installing Docker can be found in the official documentation of the project: https://docs.docker.com/

  On the left panel: **Get Docker** -> **Docker CE** -> **Linux** -> Select your Linux distro and follow the instructions.

- **utilities**: brctl (command line tool for ethernet bridges manipulation), xmllint (XML parser), evince (PDF viewer), git (version control software)

  ```
  # apt-get install bridge-utils libxml2-utils evince git
  ```

- **other utilities** that may probably be already installed in your OS:

  ```
  # apt-get install sudo bash x11-utils libc-bin coreutils
  iproute2 iptables mawk sed
  ```

Install the program

- **Get the last version of the project**

  ```
  $ git clone https://github.com/ptoribi/lightning.git
  ```

- **Change default locations** (Optional)

  In order to set the location where the application folder and the symbolic link to the main program will be installed, you can change inside the **`install`** file the following variables:

  - **LIGHTNING_INSTALLATION_DIRECTORY**
  - **SYMLINK_INSTALLATION_DIRECTORY**

```
# Please, feel free to modify the variable LIGHTNING_INSTALLATION_DIRECTORY accordingly
# to your system needs, but do NOT add the final slash ("/") at the end of the directory.
# A folder called "lightning" will be created inside this location in order to
# store the files and libraries needed by the program. The default value is /usr/local
LIGHTNING_INSTALLATION_DIRECTORY=/usr/local

# Please, feel free to modify the variable SYMLINK_INSTALLATION_DIRECTORY accordingly
# to your system needs, but do NOT add the final slash ("/") at the end of the directory.
# A symbolic link to the main binary (stored in LIGHTNING_INSTALLATION_DIRECTORY/lightning)
# will be created inside this location. Please ensure this location is included in the
# PATH variable of your operating system. The default value is /usr/local/bin
SYMLINK_INSTALLATION_DIRECTORY=/usr/local/bin
```

  Please ensure before installing that those paths are included in your system's PATH variable. If you have no special needs the default values just work well.

- **Change default repositories** (Optional)

  You can specify your own code, scenarios and Docker image repositories to be used by Lightning. This can be done by modifying the **`variables.conf`** file:

```
# Docker images repository
DOCKER_IMAGE_host="ptoribi/ptoribi:host"
DOCKER_IMAGE_router="ptoribi/ptoribi:router"

# Git repository for CODE
GIT_REPO="https://github.com/ptoribi/lightning.git"

# Git repository for SCENARIOS
GIT_REPO_SCENARIOS="https://github.com/ptoribi/lightning-scenarios.git"
```

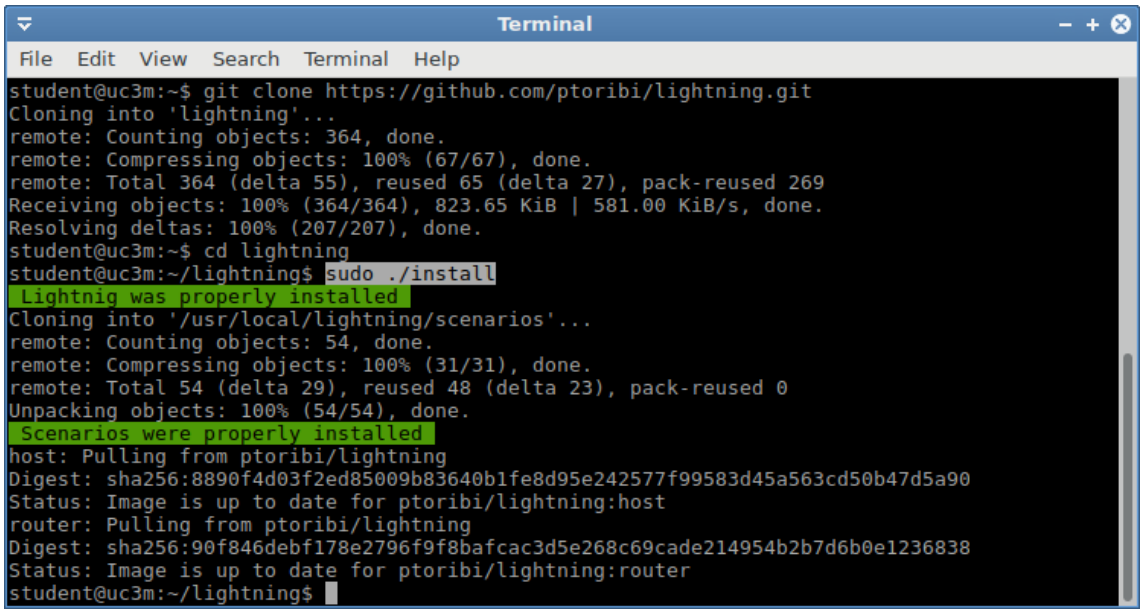
  Please agree these values with the professor that will use Lightning.

  Alternatively, the file **`variables.conf`** can also be modified after the installation.

- **Install Lightning**

  The installation script will copy all the necessary files to the operating system, and, in addition, will install the scenarios and Docker images indicated in the `variables.conf` file.

```
$ cd lightning
$ sudo ./install
```



After the installation

The user "root" should not execute Lightning directly, only regular users should. Regular users must execute Lightning with root privileges, this can be done by using **one** of these four different ways:

- **Adding the specific user to the sudo group (warning!, that user will be allowed to execute all the programs in the system as root):**

```
$ sudo usermod -a -G sudo USER_NAME
```

- **Allowing that specific user to execute Lightning:**

```
$ sudo bash -c "echo 'USER_NAME ALL=(ALL) NOPASSWD: $(dirname
$(readlink -f $(which lightning)))/lightning' >>
/etc/sudoers"
```

- **Creating a new group and allowing all its members to execute Lightning, then adding the specific user to that group:**

```
$ sudo groupadd GROUP_NAME
$ sudo bash -c "echo '%GROUP_NAME ALL=NOPASSWD: $(dirname
$(readlink -f $(which lightning)))/lightning' >>
/etc/sudoers"
$ sudo usermod -a -G GROUP_NAME USER_NAME
```

- **Allowing all the users in the system to execute Lightning:**

```
$ sudo bash -c "echo 'ALL ALL=(ALL) NOPASSWD: $(dirname
$(readlink -f $(which lightning)))/lightning' >>
/etc/sudoers"
```

Add new scenarios

There are two folders related to scenarios storage:

- **`scenarios`** → will be populated with the scenarios stored in the configured online repository (`GIT_REPO_SCENARIOS` variable in the `variables.conf` file).
- **`scenarios-local`** → this folder is intended for storing scenarios locally to the computer.

Both folders allow to create other one-level-depth folders inside them to classify the scenarios (for example, with the names of the academic courses).

Add new functions

Apart from using use the default functions (stored in the **`functions`** file), new functions can be defined in the **`personalized_functions`** file.

For the time being, when using a *XML document* for defining the network scenario Lightning only allows to use the default functions, for using functions created by the professors, they should define the scenario as a *direct execution file*.

Security

The **`security/container_capabilities.conf`** file indicates the capabilities given to the Docker containers. It is important not to add unnecessary capabilities in order to keep a good level of security (hardening) if it is required by your organization:

```
#ALL                # Give all possible capabilities
SETPCAP             # Modify process capabilities.
MKNOD               # Create special files using mknod(2).
AUDIT_WRITE         # Write records to kernel auditing log.
CHOWN               # Make arbitrary changes to file UIDs and GIDs (see chown(2)).
NET_RAW             # Use RAW and PACKET sockets.
```

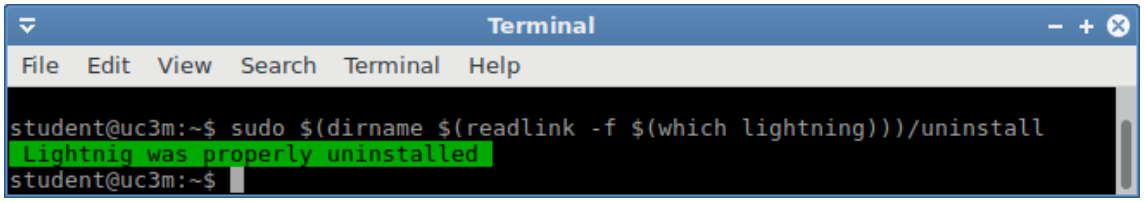
The **`security/sudo_commands.conf`** file indicates the commands that the user will be able to execute with administrative privileges using **sudo** (and without entering a password) inside the container:

```
#ALL                    # Allow to execute all the commands of the system with sudo
/sbin/ip
/sbin/ifconfig
/sbin/route
```

Uninstall the program

You will be able to uninstall the program by executing:

```
$ sudo $(dirname $(readlink -f $(which lightning)))/uninstall
```



Please note that all the files related to Lightning will be removed from the system, including the **`scenarios-local`** folder and the **`personalized_functions`** file.