

Linux installation & containers

- Downloaded ubuntu image from the URL: <https://www.ubuntu.com/download/desktop>
- Select the LTS version: Ubuntu 18.04.2 LTS (*This is an ISO image of size 1.9 GB*)
- Using the ISO image, create a VM in VM Ware Fusion or Virtual Box.
- Specify the username/password to be used while creating the VM.
- Make sure the bidirectional clipboard copies and bidirectional drag-and-drop features are enabled after creating the VM.
- Start the VM.
- To enable the root account, open a terminal and run the following command to set a root password.
 - `#sudo passwd root`
- Set the password as `cisco123`
- Switch to root user using the below command.
 - `#su`
- Install and create Linux containers using below commands.
 - `#apt install lxc lxctl lxc-templates`
 - `#lxc-create -n nso-cfs -t ubuntu`
 - `#lxc-create -n nso-rfs -t ubuntu`

*NB - The file systems of the containers are mounted at and can be accessed under -
/var/lib/lxc/<container_name>/rootfs*

For the above examples, below are the locations -

/var/lib/lxc/nso-cfs/rootfs/

/var/lib/lxc/nso-rfs/rootfs/

- View the created containers.
 - `#lxc-ls -f` (*The command displays the IP address of the containers. To connect to a container, use ubuntu/ubuntu credentials via SSH with the IP address displayed in the above command output.*)
- Start the containers
 - `#lxc-start nso-cfs`
 - `#lxc-start nso-rfs`
- Stop the containers
 - `#lxc-stop nso-cfs`
 - `#lxc-stop nso-rfs`

NSO System Install

- Following are the pre-requisites for installing NSO on a Linux machine –
 - Java & Python
 - Apache ant
 - build-essential
 - net-tools
- Execute below commands to install the above packages –
 - `#apt install default-jre`
 - `#apt install ant`
 - `#apt install python`
 - `#apt install build-essential`
 - `#apt install default-jdk`
 - `#apt install net-tools`
- Enable ssh file transfer, install ssh packages using the following command -
 - `#apt install ssh`
- Download NSO from earth.tail-f.com (version nso-4.7.3.linux.x86_64.signed.bin)
- Extract the same using below command
 - `#sh nso-4.7.3.linux.x86_64.signed.bin`
- Copy the NSO installation binary to a location on both `nso-cfs` and `nso-rfs` containers
- Install NSO as system-install in both `nso-cfs` and `nso-rfs` containers
 - `#sh nso-4.7.3.linux.x86_64.installer.bin --system-install`
- Create the 'ncsadmin' group, use Linux shell command
 - `#groupadd ncsadmin`
- Create the 'ncsoper' group, use Linux shell command
 - `#groupadd ncsoper`
- Add an existing user to one of these groups, use Linux shell command
 - `#usermod -a -G <groupname> <username>`
 - `#usermod -a -G ncsadmin ubuntu`
 - `#usermod -a -G ncsadmin root`
 - `#usermod -a -G ncsoper ubuntu`
 - `#usermod -a -G ncsoper root`
- Start NSO
 - `#source /etc/profile.d/ncs.sh`
 - `#/etc/init.d/ncs start`
- Stop NSO
 - `#/etc/init.d/ncs stop`

NB - only after restarting the Linux container for each NSO installed, NSO config mode will be enabled.

NSO LSA Setup

- Enable SSH to NSO RFS node, edit the ncs.conf file in RFS node.
- Location of the file: /etc/ncs/ncs.conf

```
<transport>
  <ssh>
    <enabled>true</enabled>
    <ip>0.0.0.0</ip>
    <port>2022</port>
  </ssh>
  <tcp>
    <enabled>>false</enabled>
    <ip>127.0.0.1</ip>
    <port>2023</port>
  </tcp>
</transport>
```

- Restart the RFS NSO
- LSA should be enabled in CFS node, edit the ncs.conf file in CFS node.
- Location of the file: /etc/ncs/ncs.conf

```
<large-scale>
  <lsa>
    <enabled>true</enabled>
  </lsa>
</large-scale>
```

- Restart the CFS NSO
- Commit queue configuration, should be done on both the CFS and RFS nodes.
 - `ubuntu@ncs(config)# devices global-settings commit-queue enabled-by-default true async atomic true check-integrity true error-option rollback-on-error`
- Cluster configuration, CFS node only
 - `ubuntu@ncs(config)# cluster authgroup ubuntu default-map remote-name ubuntu remote-password ubuntu`
 - `ubuntu@ncs(config)# cluster authgroup ubuntu umap ubuntu remote-name ubuntu remote-password ubuntu`
 - `ubuntu@ncs(config)# cluster commit-queue enabled`
 - `ubuntu@ncs(config)# cluster device-notifications enabled`
 - `ubuntu@ncs(config)# cluster remote-node nso-rfs address <IP address of RFS> port 2022 authgroup ubuntu username ubuntu`
 - `ubuntu@ncs(config)# commit`

- Devices authgroup configuration
 - `ubuntu@ncs(config)# devices authgroups group ubuntu default-map remote-name ubuntu remote-password ubuntu`
 - `ubuntu@ncs(config)# commit`
- Add RFS as a device in CFS, use the following XML template snippet (*change the values for name, address, port, authgroup accordingly*)

```
<config xmlns="http://tail-f.com/ns/config/1.0">
  <devices xmlns="http://tail-f.com/ns/ncs">
    <device>
      <name>rfs-nso</name>
      <address>10.0.3.205</address>
      <port>2022</port>
      <authgroup>ubuntu</authgroup>
    <device-type>
      <netconf>
        <ned-id xmlns:ned="http://tail-f.com/ns/ncs-ned">ned:lsa-netconf</ned-id>
      </netconf>
    </device-type>
    <use-lsa />
    <state>
      <admin-state>unlocked</admin-state>
    </state>
  </device>
</devices>
</config>
```