

1. How do you create a simple topology with one switch and two hosts using Mininet?

Steps:

* Install the required packages:

sudo apt update → Update the repository

sudo apt install mininet (or)

sudo apt-get install mininet

sudo apt install openvswitch-switch

* Run the following command to create the topology

sudo mn --topo single,2 --controller=remote --switch ovsk

sudo → Mininet needs to run under root to create topologies

mn → Mininet CLI command that initializes Mininet network

--topo → Specifies built-in topology type

single → A topology with single switch

1,2 → Number of hosts connected that initialize the Mininet network.

Therefore, One switches (s1)

Two hosts (h1, h2)

--controller=remote → Specifies that controller is external (remote)

--switch ovsk → Open vswitch as software switch
ovsk stands for Open vSwitch Kernel mode,
faster and performance testing.

After running the command there would be a message following which the mininet interface will open

mininet> h1 ping h2

Mininet → It is a network emulator that allows to create a virtual network on a single machine, including hosts, switches, controllers and links, using lightweight installation.

Topology → layout or structure of how devices are connected in a network.

Common types are Tree, Star, Bus, Ring, Mesh.

Switch → network devices that connects multiple devices within the same network, forwarding data only to the intended recipient.

Host → any device that can send or receive data over a network.

2) How can you test connectivity between two hosts in a Mininet topology?

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* Run the following command

Method 1: 1. Start mininet

sudo mn

By default, it creates

1. One switch (s1)

2. Two hosts (h1, h2)

3. Controller (c1)

2. Ping between hosts

mininet> h1 ping h2

⇒ Mininet resolves hostnames internally, and both h1 and h2 typically have default IP's like 10.0.0.1, 10.0.0.2

Method 2: mininet> pingall

This command pings all hosts from every other host

Purpose of ping :

- * sends ICMP Echo request packets and waits for replies to check if the destination host is reachable
- * Useful for checking connectivity, Testing latency, Debugging routing / network issues

3) Check the IP address of your Linux system.

An IP address (Internet Protocol address) is a unique address assigned to a device (like computer, phone, or server) on a network. It allows devices to communicate with each other over a network like the internet or a local network (LAN)

Types :

1. IPV4 (most common)

- * Four numbers separated by dots

Eg : 192.168.1.10

Each number ranges from 0 to 255

2. IPV6 (newer, for more device)

- * eight groups of hexadecimal numbers separated by colons.

Eg : 2001:0db8:85a3:0000:8a2e:0370:7334

Two categories :

1. Public : used on Internet, unique worldwide
2. Private : used inside private networks (like WiFi)

Commands to find out IP address :

1. ip a (or ip addr)

- * displays information about all network interfaces on the system.

- * This information includes :

- Interface

- IP address

- MAC address

- Operational status

- MTU and other devices .

2. ipconfig

- * displays interfaces and IP addresses info

- + older technique but still widely used .

4) What steps would you follow to simulate link failure between nodes in Mininet ?

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- * Run the following command to create the topology

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sudo → Mininet needs to run under root to create topologies

mn → Mininet cli command that initializes Mininet network

--topo → Specifies built-in topology type

single → A topology with single switch

12 → Number of hosts connected that initialize the Mininet network.

Therefore. One switches (s1)

Two hosts (h1, h2)

* Connectivity Testing

mininet > pingall

mininet > h1 ping h2

Checks whether packets can travel between hosts.

* How to detect or simulate failures ?

If a link fails, you can detect it using :

* ping → if there is no failure or disconnection

* traceroute → to see if packets are reaching their disconnection

* ovs-ofctl dump-flows → to check flow entries at switch level

5) How do you connect to a remote linux server using a given IP address and username?

Steps : Using SSH

1. Install open SSH

sudo apt update

sudo apt install openssh-server

2. Check if the SSH is running

sudo systemctl status ssh

If open ssh is not running, start the openssh using the following command.

sudo systemctl start ssh

3. Run the following command :

ssh user@ip (or) ssh user@hostname

For example :

ssh alice@192.168.1.10

What is SSH ?

- * SSH (Secure Shell) is a standard and secure method to remotely access Linux/Unix-based system.
- * It encrypts both the login credentials and the session data, making it much safer than alternatives like Telnet.

6) How can you connect a Mininet Topology to a real network topology?

Steps :

1. Install the required libraries

sudo apt update

sudo apt install mininet

2. Create a mininet topology

sudo mn --topo single,2 --controller=remote --switch
ovsk

3. Working with Open vSwitch (OVS)

ovs-vsctl add-br br0

ovs-vsctl add-port br0 eth0

⇒ These commands create OVS bridges and connect physical interfaces.

⇒ Typically done on the host system, outside of Mininet, for managing real networking infrastructure.

7) Test the connectivity to a website using ping

Ping is a network diagnostic tool used to test whether a specific host is reachable across an IP network.

How it works?

- * Sends ICMP Echo request packets to target host
- * Waits for ICMP Echo reply packets
- * Displays round-trip time and packet loss statistics.

Key purpose :

- * Check if a host (local or remote) is alive and reachable.
- * Measure latency (response time) between your machine and the destination
- * Detect packet loss or connectivity problems.

Command :

ping <ip address>

Eg : ping 16.184.40.163

ping <domain name>.com

Eg : ping google.com

ping <website>

Eg : ping www.google.com

- * If DNS is properly configured, domain names will be resolved to their respective IP addresses automatically.
- * If successfully executed, it returns a output in the terminal.

8) How can you integrate Mininet with OpenDaylight as SDN controller ?

Steps :

1. Install Mininet

sudo apt install mininet

2. Install Java

sudo apt install openjdk-8-jdk -y
java - version

3. Download and install OpenDaylight

wget https://neuus.opendaylight.org/content/repositories/public/oog/opendaylight/integration/karaf/0.7.4/karaf-0.7.7.tar.gz

tar -xvzf karaf-0.7.4.tar.gz

cd karaf-0.7.4

4. Start openaylight

./bin/karaf

feature:install odl-restconf odl-l2switch-switch
odl-openflowplugin-flow-services.

5. Verify ODL RESTCONF is running

Run : http://localhost:8181/restconf/

use credentials

Username : admin

Password : admin

6. Run mininet and point to ODL

sudo mn --topo=tree,2 --controller=remote,
ip=127.0.0.1, port=6553

7. Check flow entries in ODL

http://localhost:8181/index.html

q) Command to edit the network interface , assigning the ip and gateway . write down the steps.

1. Check all current interfaces:

ip link show → output :

1. lo : . . .

2. enp0s8 : . . .

2. Bring the interface down

sudo ip link set dev enp0s8 down

3- Assign IP address

sudo ip addr add 192.168.1.10/24 dev enp0s8

4. Bring the interface down

sudo ip link set dev enp0s8 up

5. Add default gateway

sudo ip route add default via 192.168.1.1

To test use the following command: ip addr show enp0s8

10) Write the command to list all active TCP connections along with their process IDs. Identify any connections in LISTEN or ESTABLISHED STATE.

1) Create LISTEN → nc -l 8888

In another terminal,

sudo ss -tupn | grep 8888

2) Create ESTABLISHED → nc localhost 8888

Now for checking

1. Install requirements

sudo apt update

sudo apt install net-tools iproute2 -y

2. Use the ss to view TCP Connections

sudo ss -tupn

-t → TCP

-u → UDP

-p → process

-n → Don't resolve names

The output would be as follows.

Netid	state	Recv-Q	Send-Q	Loc. . . .
	LISTEN			
	ESTABLISHED			

ii) How to check the linux distribution with particular version?

1. Recommended Command

`cat /etc/os-release`

2 Display only the version.

`lsb-release -a`

3. Kernel version and system info

`uname -a`

12) Open Wireshark, start a capture and browse any website.
stop a capture after a few seconds.