1. Show the ping results to test reachability (5%)

h1 and h2 ping GWr

```
mininet> h1 ping GWr -c 1
PING 10.0.0.3 (10.0.0.3) 56(84) bytes of data.
64 bytes from 10.0.0.3: icmp_seq=1 ttl=64 time=0.110 ms

--- 10.0.0.3 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 0.110/0.110/0.110/0.000 ms
mininet> h2 ping GWr -c 1
PING 10.0.0.3 (10.0.0.3) 56(84) bytes of data.
64 bytes from 10.0.0.3: icmp_seq=1 ttl=64 time=0.091 ms

--- 10.0.0.3 ping statistics ---
1 packets transmitted, 1 received, 0% packet loss, time 0ms
rtt min/avg/max/mdev = 0.091/0.091/0.091/0.000 ms
```

2. Show all interfaces of Node BRGr after h1 and h2 can ping GWr(5%)

Before

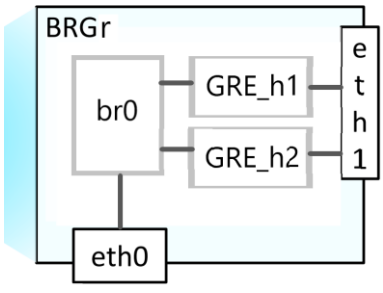
```
0 Name:  BRGr-eth0
1 Name:  br0
2 Name:  BRGr-eth1
3 Name:  any
4 Name:  lo
5 Name:  nflog
6 Name:  nfqueue
7 Name:  usbmon1
8 Name:  usbmon2
```

After

```
0 Name:  BRGr-eth0
1 Name:  br0
2 Name:  BRGr-eth1
3 Name:  GRE_h1
4 Name:  GRE_h2
5 Name:  any
6 Name:  lo
7 Name:  nflog
8 Name:  nfqueue
9 Name:  usbmon1
10 Name:  usbmon2
```

3. Draw the interconnection diagram of interfaces and Linux bridge on BRGr. Explain your diagram with the screenshot of interface list of BRGr. (10%)

diagram



BRGr interconnection diagram

screenshot

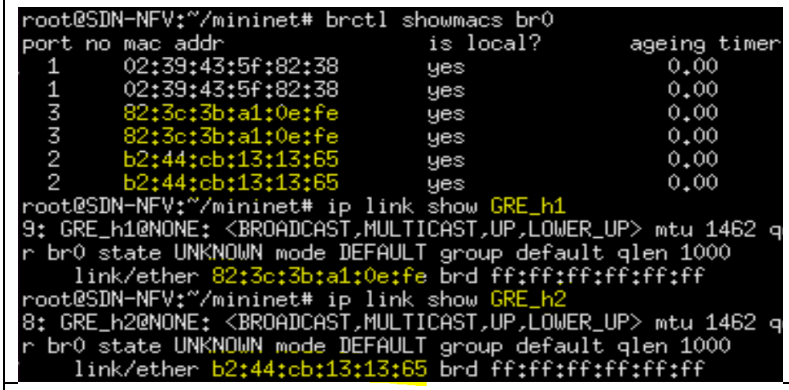
```
0 Name:  BRGr-eth0
1 Name:  br0
2 Name:  BRGr-eth1
3 Name:  GRE_h1
4 Name:  GRE_h2
5 Name:  any
6 Name:  lo
7 Name:  nflog
8 Name:  nfqueue
9 Name:  usbmon1
10 Name:  usbmon2
```

Explain

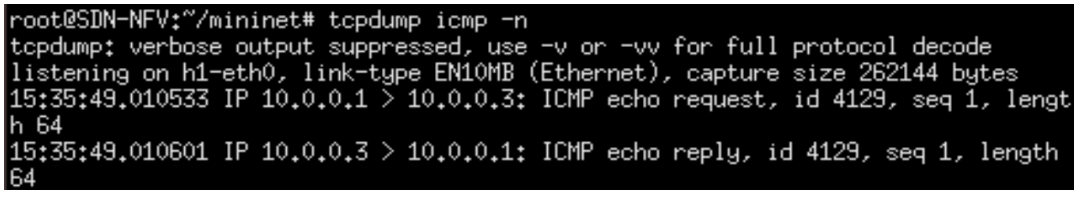
Add a bridge br0 and connect it to BRGr-eth0.

After receiving GRE packet , set up gretap interfaces GRE_h1 for 140.114.0.1 and GRE_h2 for 140.115.0.1.

4. Explain how Linux kernel of BRGr determines which gretap interface to forward packets from GWr to hosts (h1 or h2)?
Describe your answer with appropriate screenshot. (10%)

screenshot

Explain
Linux bridge learns MAC address like bridge and switch. The MAC address for a frame is learned when the frame enters the bridge through an interface. The MAC address is recorded in the bridge table and looked up when the bridge forwarding frames.
Other details
The interfaces with ‘is local’ as Yes are interfaces directly on the Linux Bridge including tap interfaces. In the screenshot, Port 1 is connected to eth0; Port 2 represent the tap interfaces GRE_h2, and Port 3 represent GRE_h1 on br0.

5. Run tcpdump on h1 to capture packet and take screenshot to explain why or why not h1 is aware of GRE tunneling. (10%)

screenshot

Explain
The payload packet with private IP is encapsulated with GRE and delivery header by BRG1; then forward to BRGr. BRGr extracts the payload packet and routes it to GWr with private IP afterwards. Since the tunnel is implemented by routers, the endpoint hosts don’t need to be aware of the tunnel.