

# Assignment 2

IP Interfaces: Part 1

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## Part 0: Warm Up

- What is the slash notation representation of 255.255.255.0?**  
/24
- What is the dot-decimal representation of /30?**  
255.255.255.252
- What is the smallest subnet size that would accommodate 5 hosts?**  
a subnet with at least 3 bits.  
Need at least 7 addresses (5 hosts + 1 network + 1 broadcast).  $2^N \geq 7$ .  $N=3$
- Fill in the blank cells in the table below (R1 eth0 filled in by Vital system)**

Here is one solution.

VM (interface)	IP Address (CIDR Notation)
R1 (eth1)	10.10.10.1/29
R2 (eth0)	10.10.10.2/29
Kali (eth0)	10.10.10.3/29

## Part 1: Configuring Network Interfaces

After configuration

R1 Screenshot of the .conf file under /etc/frr/frr.conf

```
root@CN-R1:/home/student# cat /etc/frr/frr.conf
frr version 7.1
frr defaults traditional
hostname CN-R1
log syslog informational
service integrated-vtysh-config
!
interface eth1
ip address 10.10.10.1/29
!
line vty
!
root@CN-R1:/home/student#
```

R2 Screenshot of the .conf file under /etc/frr/frr.conf

```
root@CN-R2:/home/student# cat /etc/frr/frr.conf
frr version 7.1
frr defaults traditional
hostname CN-R2
log syslog informational
service integrated-vtysh-config
!
interface eth0
 ip address 10.10.10.2/29
!
line vty
!
root@CN-R2:/home/student#
```

## Part 2: Configuring Kali

Screenshot of the /etc/network/interfaces file in Kali

```
root@kali:/home/student# cat /etc/network/interfaces
# This file describes the network interfaces available on your system
# and how to activate them. For more information, see interfaces(5).

source /etc/network/interfaces.d/*

# The loopback network interface
auto eth0
iface eth0 inet static
    address 10.10.10.3
    netmask 255.255.255.248
    network 10.10.10.0
    broadcast 10.10.10.7
```

Screenshot showing that pinging works between R1, R2, and Kali

R1 ping R2

```
root@CN-R1: /home/student
File Edit View Search Terminal Help
root@CN-R1:/home/student# ping 10.10.10.2
PING 10.10.10.2 (10.10.10.2) 56(84) bytes of data.
64 bytes from 10.10.10.2: icmp_seq=1 ttl=64 time=0.349 ms
64 bytes from 10.10.10.2: icmp_seq=2 ttl=64 time=0.286 ms
64 bytes from 10.10.10.2: icmp_seq=3 ttl=64 time=0.330 ms
64 bytes from 10.10.10.2: icmp_seq=4 ttl=64 time=0.383 ms
^C
--- 10.10.10.2 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 37ms
rtt min/avg/max/mdev = 0.286/0.337/0.383/0.035 ms
```

R1 ping Kali

```
root@CN-R1: /home/student
File Edit View Search Terminal Help
root@CN-R1:/home/student# ping 10.10.10.3
PING 10.10.10.3 (10.10.10.3) 56(84) bytes of data.
64 bytes from 10.10.10.3: icmp_seq=1 ttl=64 time=0.829 ms
64 bytes from 10.10.10.3: icmp_seq=2 ttl=64 time=0.370 ms
64 bytes from 10.10.10.3: icmp_seq=3 ttl=64 time=0.264 ms
64 bytes from 10.10.10.3: icmp_seq=4 ttl=64 time=0.405 ms
64 bytes from 10.10.10.3: icmp_seq=5 ttl=64 time=0.383 ms
^C
--- 10.10.10.3 ping statistics ---
5 packets transmitted, 5 received, 0% packet loss, time 58ms
rtt min/avg/max/mdev = 0.264/0.450/0.829/0.195 ms
```

R2 ping R1

```
root@CN-R2: /home/student
File Edit View Search Terminal Help
root@CN-R2:/home/student# ping 10.10.10.1
PING 10.10.10.1 (10.10.10.1) 56(84) bytes of data.
64 bytes from 10.10.10.1: icmp_seq=1 ttl=64 time=0.362 ms
64 bytes from 10.10.10.1: icmp_seq=2 ttl=64 time=2.31 ms
64 bytes from 10.10.10.1: icmp_seq=3 ttl=64 time=0.326 ms
64 bytes from 10.10.10.1: icmp_seq=4 ttl=64 time=0.328 ms
^C
--- 10.10.10.1 ping statistics ---
4 packets transmitted, 4 received, 0% packet loss, time 32ms
rtt min/avg/max/mdev = 0.326/0.832/2.312/0.854 ms
```

R2 ping Kali

```
root@CN-R2: /home/student
File Edit View Search Terminal Help
root@CN-R2:/home/student# ping 10.10.10.3
PING 10.10.10.3 (10.10.10.3) 56(84) bytes of data.
64 bytes from 10.10.10.3: icmp_seq=1 ttl=64 time=0.360 ms
64 bytes from 10.10.10.3: icmp_seq=2 ttl=64 time=0.374 ms
64 bytes from 10.10.10.3: icmp_seq=3 ttl=64 time=0.541 ms
64 bytes from 10.10.10.3: icmp_seq=4 ttl=64 time=0.551 ms
64 bytes from 10.10.10.3: icmp_seq=5 ttl=64 time=0.365 ms
64 bytes from 10.10.10.3: icmp_seq=6 ttl=64 time=0.361 ms
64 bytes from 10.10.10.3: icmp_seq=7 ttl=64 time=0.404 ms
64 bytes from 10.10.10.3: icmp_seq=8 ttl=64 time=0.390 ms
^C
--- 10.10.10.3 ping statistics ---
8 packets transmitted, 8 received, 0% packet loss, time 173ms
rtt min/avg/max/mdev = 0.360/0.418/0.551/0.076 ms
```

Kali ping R1

```
student@kali: ~  
File Edit View Search Terminal Help  
student@kali:~$ ping 10.10.10.1  
PING 10.10.10.1 (10.10.10.1) 56(84) bytes of data.  
64 bytes from 10.10.10.1: icmp_seq=1 ttl=64 time=0.378 ms  
64 bytes from 10.10.10.1: icmp_seq=2 ttl=64 time=0.333 ms  
64 bytes from 10.10.10.1: icmp_seq=3 ttl=64 time=0.275 ms  
64 bytes from 10.10.10.1: icmp_seq=4 ttl=64 time=0.319 ms  
^C  
--- 10.10.10.1 ping statistics ---  
4 packets transmitted, 4 received, 0% packet loss, time 60ms  
rtt min/avg/max/mdev = 0.275/0.326/0.378/0.038 ms
```

Kali ping R2

```
student@kali: ~  
File Edit View Search Terminal Help  
student@kali:~$ ping 10.10.10.2  
PING 10.10.10.2 (10.10.10.2) 56(84) bytes of data.  
64 bytes from 10.10.10.2: icmp_seq=1 ttl=64 time=0.298 ms  
64 bytes from 10.10.10.2: icmp_seq=2 ttl=64 time=0.348 ms  
64 bytes from 10.10.10.2: icmp_seq=3 ttl=64 time=0.317 ms  
^C  
--- 10.10.10.2 ping statistics ---  
3 packets transmitted, 3 received, 0% packet loss, time 32ms  
rtt min/avg/max/mdev = 0.298/0.321/0.348/0.020 ms
```

### Part 3: Questions

**a. Why did we choose the /29 subnet mask for Area 0?**

Need at least 5 addresses (3 hosts + 1 network + 1 broadcast).  $2^N \geq 5$ .  $N=3$

The subnet with at least 3 bits. Address length is 32 bit.

$32 - 3 = 29$ . So we choose the /29 subnet mask

**b. The Linux arp (see man arp) command will print the current entries in the machine's address resolution protocol table. Now that you have configured Area 0, what entries are currently in R1, R2, and Kali?**

Screenshot of the ARP tables on R1, R2, and Kali, before pinging works between R1, R2, and Kali. The entries are unknown.

R1



```

root@CN-R1:/home/student# arp
Address          HWtype  HWaddress      Flags Mask    Iface
192.58.128.30    (incomplete)                  eth0
192.228.79.201   (incomplete)                  eth0
202.12.27.33     (incomplete)                  eth0
192.5.5.241      (incomplete)                  eth0
192.112.36.4     (incomplete)                  eth0
199.7.91.13      (incomplete)                  eth0
198.41.0.4       (incomplete)                  eth0
199.7.83.42      (incomplete)                  eth0
192.203.230.10   (incomplete)                  eth0
198.97.190.53    (incomplete)                  eth0
193.0.14.129     (incomplete)                  eth0
192.36.148.17    (incomplete)                  eth0
192.33.4.12      (incomplete)                  eth0
128.238.2.38     (incomplete)                  eth0

```

R2 nothing

```

root@CN-R2:/home/student# arp
root@CN-R2:/home/student# arp

```

Kali nothing

```

root@kali:/home/student# arp
root@kali:/home/student#

```

Screenshot of the ARP tables on R1, R2, and Kali, after pinging works between R1, R2, and Kali

ARP table on R1:

```

root@CN-R1: /home/student
File Edit View Search Terminal Help
root@CN-R1:/home/student# arp
Address          HWtype  HWaddress      Flags Mask    Iface
192.58.128.30    (incomplete)                  eth0
192.5.5.241      (incomplete)                  eth0
202.12.27.33     (incomplete)                  eth0
198.97.190.53    (incomplete)                  eth0
198.41.0.4       (incomplete)                  eth0
192.36.148.17    (incomplete)                  eth0
128.238.2.38     (incomplete)                  eth0
192.228.79.201   (incomplete)                  eth0
199.7.91.13      (incomplete)                  eth0
199.7.83.42      (incomplete)                  eth0
10.10.10.2        ether    00:00:00:00:00:03  C          eth1
192.203.230.10   (incomplete)                  eth0
192.33.4.12      (incomplete)                  eth0
193.0.14.129     (incomplete)                  eth0
10.10.10.3        ether    00:00:00:00:00:04  C          eth1
192.112.36.4     (incomplete)                  eth0

```

ARP table on R2

```

root@CN-R2: /home/student
File Edit View Search Terminal Help
root@CN-R2:/home/student# arp
Address          HWtype  HWaddress      Flags Mask    Iface
10.10.10.1        ether    00:00:00:00:00:02  C          eth0
10.10.10.3        ether    00:00:00:00:00:04  C          eth0

```

## ARP table on Kali

```
student@kali: ~
File Edit View Search Terminal Help
student@kali:~$ arp
Address          HWtype  HWaddress      Flags Mask    Iface
10.10.10.2        ether    00:00:00:00:00:03  C             eth0
10.10.10.1        ether    00:00:00:00:00:02  C             eth0
```

The entries are as followed.

R1 entry	00:00:00:00:00:02
R2 entry	00:00:00:00:00:03
Kali entry	00:00:00:00:00:04

- c. Now ping both R2 and Kali from R1. Note the changes on each machine's ARP tables. At this point, R2 should be aware of R1, but why doesn't R2 have a table entry for Kali? (10 points)

Before ping both R2 and Kali from R1, R1 ARP screenshot:

```
root@CN-R1: /home/student# arp
Address          HWtype  HWaddress      Flags Mask    Iface
192.58.128.30    (incomplete)          eth0
192.228.79.201   (incomplete)          eth0
202.12.27.33     (incomplete)          eth0
192.5.5.241      (incomplete)          eth0
192.112.36.4     (incomplete)          eth0
199.7.91.13      (incomplete)          eth0
198.41.0.4       (incomplete)          eth0
199.7.83.42      (incomplete)          eth0
192.203.230.10   (incomplete)          eth0
198.97.190.53    (incomplete)          eth0
193.0.14.129     (incomplete)          eth0
192.36.148.17    (incomplete)          eth0
192.33.4.12      (incomplete)          eth0
128.238.2.38     (incomplete)          eth0
```

After ping both R2 and Kali from R1, R1 ARP screenshot:

```
root@CN-R1: /home/student
File Edit View Search Terminal Help
root@CN-R1: /home/student# arp
Address          HWtype  HWaddress      Flags Mask    Iface
192.58.128.30    (incomplete)          eth0
192.5.5.241      (incomplete)          eth0
202.12.27.33     (incomplete)          eth0
198.97.190.53    (incomplete)          eth0
198.41.0.4       (incomplete)          eth0
192.36.148.17    (incomplete)          eth0
128.238.2.38     (incomplete)          eth0
192.228.79.201   (incomplete)          eth0
199.7.91.13      (incomplete)          eth0
10.10.10.2        ether    00:00:00:00:00:03  C             eth1
192.203.230.10   (incomplete)          eth0
192.33.4.12      (incomplete)          eth0
10.10.10.3        ether    00:00:00:00:00:04  C             eth1
192.112.36.4     (incomplete)          eth0
```

Before ping both R2 and Kali from R1, R2 ARP screenshot:

```
root@CN-R2:/home/student# arp
root@CN-R2:/home/student# arp
```

After ping both R2 and Kali from R1, R2 ARP screenshot. R2 know R1's entry

```
root@CN-R2:/home/student# arp
Address          HWtype  HWaddress      Flags Mask
10.10.10.1        ether   00:00:00:00:00:02  C
```

Before ping both R2 and Kali from R1, R3 ARP screenshot:

```
root@kali:/home/student# arp
root@kali:/home/student#
```

After ping both R2 and Kali from R1, R3 ARP screenshot. Kali know R1's entry.

```
root@kali:/home/student# arp
Address          HWtype  HWaddress      Flags Mask    Iface
10.10.10.1        ether   00:00:00:00:00:02  C             eth0
root@kali:/home/student#
```

Because R2 and Kali have not ping(communicate with) one to another directly.