Solution to IPv4 Routing Assignment

Quick solution

- On Node A add a static route to Node C 192.168.2.12 using as gateway node B 192.168.11

  ```
  nriga@NodeA:$
  sudo route add -net 192.168.2.0 netmask 255.255.255.0 gw 192.168.1.11
  ```

- On Node B activate IP routing:

  ```
  nriga@NodeB:$   sudo sh -c 'echo 1 > /proc/sys/net/ipv4/ip_forward'
  ```

- On Node C setup traffic for Node A 192.168.1.10 through node B 192.168.2.11

  ```
  nriga@NodeC:$
  sudo route add -net 192.168.1.0 netmask 255.255.255.0 gw 192.168.2.11
  ```

Detailed writeup

Screenshot of Topology

Flack

![Flack Screenshot](image1)

Portal

![Portal Screenshot](image2)

Omni

A sample output for sliver status can be found [here](http://example.com).

Question 1

What happens when you traceroute from A to IP address 192.168.2.12 before you setup the static routes? Why? The output of traceroute should look like:
traceroute to 192.168.2.12 (192.168.2.12), 30 hops max, 60 byte packets
1 10.103.0.1 (10.103.0.1) 0.691 ms 0.626 ms 0.576 ms
2 bbn-ssg.bbn.xo (192.168.103.1) 0.994 ms 1.946 ms 2.126 ms
3 ctrl-gw.exogeni.gpolab.bbn.com (192.1.242.1) 1.679 ms 1.614 ms 1.273
4 192.1.101.3 (192.1.101.3) 3.160 ms 2.873 ms 2.836 ms
5 vl209.mag02.bos01.atlas.cogentco.com (38.104.187.117) 4.073 ms **
6 vl209.mag02.bos01.atlas.cogentco.com (38.104.187.117) 7.495 ms !H **

This shows that the packets are going through the control interface, since this is the default gateway for unknown IP subnets and it is being propagated up the chain of default IP routers.

**Question 2**

On Node A add a static route to Node C 192.168.2.12 using as gateway node B 192.168.11

```bash
nriga@NodeA:~$ sudo route add -net 192.168.2.0 netmask 255.255.255.0 gw 192.168.1.11
```

**Routing table after the change:**

```bash
nriga@NodeA:~$ sudo route
sudo: unable to resolve host NodeA
Kernel IP routing table
Destination Gateway Genmask Flags Metric Ref Use Iface
192.168.3.0 * 255.255.255.0 U 0 0 0 eth1
192.168.2.0 192.168.1.11 255.255.255.0 UG 0 0 0 eth2
10.103.0.0 * 255.255.255.0 U 0 0 0 eth0
192.168.1.0 * 255.255.255.0 U 0 0 0 eth2
default 10.103.0.1 0.0.0.0 UG 0 0 0 eth0
```

Similarly on Node C setup traffic for Node A 192.168.1.10 through node B 192.168.2.11

```bash
nriga@NodeC:~$ sudo route add -net 192.168.1.0 netmask 255.255.255.0 gw 192.168.2.11
```

**Routing table after the change:**

```bash
Kernel IP routing table
Destination Gateway Genmask Flags Metric Ref Use Iface
192.168.3.0 * 255.255.255.0 U 0 0 0 eth2
192.168.2.0 * 255.255.255.0 U 0 0 0 eth1
10.103.0.0 * 255.255.255.0 U 0 0 0 eth0
192.168.1.0 192.168.2.11 255.255.255.0 UG 0 0 0 eth1
default 10.103.0.1 0.0.0.0 UG 0 0 0 eth0
```

Now that we set the routes try to ping:

```bash
nriga@NodeA:~$ ping 192.168.2.12
PING 192.168.2.12 (192.168.2.12) 56(84) bytes of data.
```

```
^C
--- 192.168.2.12 ping statistics ---
13 packets transmitted, 0 received, 100% packet loss, time 12096ms
```

Ping does not work basically because although packets are forwarded to Node B, Node B is not
configured to act as an IP router.

On Node B activate IP routing:

```
ng@NodeB:$ sudo sh -c 'echo 1 > /proc/sys/net/ipv4/ip_forward'
```

And now ping works

```
ng@NodeA:$ ping 192.168.2.12
PING 192.168.2.12 (192.168.2.12) 56(84) bytes of data.
64 bytes from 192.168.2.12: icmp_req=1 ttl=63 time=16.2 ms
64 bytes from 192.168.2.12: icmp_req=2 ttl=63 time=0.823 ms
64 bytes from 192.168.2.12: icmp_req=3 ttl=63 time=0.612 ms
^C
--- 192.168.2.12 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2000ms
rtt min/avg/max/mdev = 0.612/5.878/16.200/7.299 ms
```

Question 3

Now traceroute works and traffic does go through Node B

```
ng@NodeA:$ traceroute 192.168.2.12
traceroute to 192.168.2.12 (192.168.2.12), 30 hops max, 60 byte packets
  1 192.168.1.11 (192.168.1.11) 26.160 ms 33.906 ms 21.220 ms
  2 192.168.2.12 (192.168.2.12) 23.534 ms 18.626 ms 31.061 ms
```

Screenshot of traceroute

![Traceroute Screenshot](image)

Attachments

- [iprouting-topo-flack.png](image) (120.7 kB) - added by nriga@bbn.com on 09/17/13 13:00:20.
- [iprouting-topo-portal.png](image) (99.4 kB) - added by nriga@bbn.com on 09/17/13 13:03:55.
- [omni-ready-silver.json](image) (3.0 kB) - added by nriga@bbn.com on 09/20/13 10:48:24.
- [iprouting-traceroute-after.png](image) (63.0 kB) - added by nriga@bbn.com on 09/20/13 11:39:16.
- [iprouting-solutions.pdf](image) (476.4 kB) - added by nriga@bbn.com on 09/20/13 12:16:53.