Advanced Computer Networking (ACN)

Router Project – Problem 1 Solution

Prof. Dr.-Ing. Georg Carle, Sebastian Gallenmüller

Chair of Network Architectures and Services
School of Computation, Information and Technology
Technical University of Munich

Project – Problem 1

1a) Avoid removing default route

- VM will lose its Internet connection
- SSH connection will continue to work (because there is a separate route to the testbed management host `10.16.0.1`)

Project – Problem 1

1a) Avoid removing default route

- VM will lose its Internet connection
- SSH connection will continue to work (because there is a separate route to the testbed management host `10.16.0.1`)

1b) Create experiment script

Rather simple modification of the provided template.

1a) Avoid removing default route

- VM will lose its Internet connection
- SSH connection will continue to work (because there is a separate route to the testbed management host `10.16.0.1`)

1b) Create experiment script

Rather simple modification of the provided template.

1c) Client VM configuration script (only shown for Client 1)

```
ip addr add 192.168.1.2/24 broadcast 192.168.1.255 dev enp2s0
ip link set enp2s0 up
ip route add 192.168.2.0/24 via 192.168.1.1 dev enp2s0 # route to client2
ip route add 192.168.3.0/24 via 192.168.1.1 dev enp2s0 # route to client3
```

Note: Routes without gateway (`via 192.168.1.1`) will also work, however, Client 1 will then assume the other clients to be in a local, non-routed network. For the purpose of creating a router, we explicitly want to route packets.

1d) Router VM configuration script

- See README.md: install driver, bind interfaces, create hugepages
- Configuring interfaces using `ip` is unnecessary (changing to DPDK driver removes the configuration)

1d) Router VM configuration script

- See README.md: install driver, bind interfaces, create hugepages
- Configuring interfaces using `ip` is unnecessary (changing to DPDK driver removes the configuration)

1e) Ping / tcpdump test

`ping` tool typically creates ICMP packets, however, `tcpdump` sees only ARP packets.

- Reason: To create ICMP packets, Client 1 needs to know the next hop's destination MAC address.
- If you specified a gateway (see Problem 1b), Client 1 creates ARP requests for `192.168.1.1` that are forwarded to Client 2. ARP reply is not created at Client 2, as Client 2 is not correctly addressed in the ARP request.
- If you did not specify a gateway, Client 1 creates ARP requests for `192.168.2.2` that are forwarded to Client 2. ARP reply is created at Client 2, as it is correctly addressed, however, the unidirectional forwarder does not transmit the ARP replies to Client 1.
- Without receiving the correct ARP reply, Client 1 will continue to send ARP requests

1d) Router VM configuration script

- See README.md: install driver, bind interfaces, create hugepages
- Configuring interfaces using `ip` is unnecessary (changing to DPDK driver removes the configuration)

1e) Ping / tcpdump test

`ping` tool typically creates ICMP packets, however, `tcpdump` sees only ARP packets.

- Reason: To create ICMP packets, Client 1 needs to know the next hop's destination MAC address.
- If you specified a gateway (see Problem 1b), Client 1 creates ARP requests for `192.168.1.1` that are forwarded to Client 2. ARP reply is not created at Client 2, as Client 2 is not correctly addressed in the ARP request.
- If you did not specify a gateway, Client 1 creates ARP requests for `192.168.2.2` that are forwarded to Client 2. ARP reply is created at Client 2, as it is correctly addressed, however, the unidirectional forwarder does not transmit the ARP replies to Client 1.
- Without receiving the correct ARP reply, Client 1 will continue to send ARP requests

1f) Bidirectional forwarding

Modify `start_thread()` to start a second thread forwarding from dst to src