Lab 2: Network Interface Bonding for port trunking/link aggregation

Subject: Network Interface Bonding **Lecturer:** Jirawat Thaenthong **Organization:** Faculty of Technology and Environment, PSU, Phuket Campus. **Date:** 19/5/60 **Version: 1.0** **Objective:** 1. Trainees study and practice network interface bonding for port trunking/link aggregation on Ubuntu	**Approved**

Instructions& Prerequisites:

- Trainees should have basic skill of Linux commands.
- Linux virtual machine (VirtualBox/VMware)
- Make sure that your virtual machine with two NICs
- We run virtual machine under the NAT network.

Concept:

Bonding is assigning multiple network cards with same IP address is called bonding. We can apply network bonding for link aggregation or improving the network throughput.

- **Mode=0 (balance-rr): round-robin policy**
- **Mode=1 (active-backup): active-backup policy**
- **Mode=2 (balance-xor): XOR policy, it selects the same slave for each destination MAC address.**
- **Mode=3 (broadcast): broadcast policy, transmits everyting on all slave interfaces.**
- **Mode=4 (802.3ad): IEEE 802.3ad dynamic link aggregation.** Creates aggregation groups that share the same speed and duplex settings. Utilizes all slaves in the active aggregator according to the 802.3ad specification.
    - o Prerequisites:
        - Ethtool support in the base drivers for retrieving the speed and duplex of each slave.
        - A switch that supports IEEE 802.3ad Dynamic link aggregation. Most switches will require some type of configuration to enable 802.3ad mode.

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Task 1: Network interface bonding

1. Verify your NICs

   $ ifconfig –a

   <Sample output>

```
Ubuntu 16.04 LTS (Finish Lab 1: Network Troubleshooting) [Running]
simon@Sumetal:~$ ifconfig -a
enp0s3    Link encap:Ethernet  HWaddr 08:00:27:5e:a9:06
          inet addr:10.0.2.15  Bcast:10.0.2.255  Mask:255.255.255.0
          inet6 addr: fe80::a00:27ff:fe5e:a906/64 Scope:Link
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:14 errors:0 dropped:0 overruns:0 frame:0
          TX packets:22 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:2482 (2.4 KB)  TX bytes:2230 (2.2 KB)

enp0s8    Link encap:Ethernet  HWaddr 08:00:27:07:fa:46
          BROADCAST MULTICAST  MTU:1500  Metric:1
          RX packets:0 errors:0 dropped:0 overruns:0 frame:0
          TX packets:0 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:0 (0.0 B)  TX bytes:0 (0.0 B)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:176 errors:0 dropped:0 overruns:0 frame:0
          TX packets:176 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1
          RX bytes:15494 (15.4 KB)  TX bytes:15494 (15.4 KB)

simon@Sumetal:~$
```

2. Install '**ifenslave**' package if needed (Normally, Ubuntu 16.04 already installed the package).

   $ sudo apt install ifenslave

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3. Edit **'/etc/modules'** file

   $ sudo vi /etc/modules

   Add 'bonding' to the last line

   <Sample>

   # /etc/modules: kernel modules to load at boot time.

   #

   # This file contains the names of kernel modules that should be loaded

   # at boot time, one per line. Lines beginning with "#" are ignored.

   # Parameters can be specified after the module name.

   bonding

   ----

4. Edit **'/etc/network/interfaces'** and update the following lines:

   #eth1 configuration

   auto enp0s3

   iface enp0s3 inet manual

   bond-master bond0

   bond-primary enp0s3

   #enp0s8 configuration

   auto enp0s8

   iface enp0s8 inet manual

   bond-master bond0

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      # Bonding enp0s3 & enp0s8 to create bond0 NIC

      auto bond0

      iface bond0 inet static

      address 10.0.2.15

      gateway 10.0.2.1

      netmask 255.255.255.0

      dns-nameservers 172.19.200.4   **←change to your current nameserver**

      dns-search psu.ac.th

      bond-mode active-backup   **←we use active-backup mode**

      bond-miimon 100

      bond-slaves none

5.   Enable service and the interface

      $ sudo /etc/init.d/networking restart

      $ sudo ifup bond0

6.   Test network bonding

      $ cat /etc/proc/bonding/bond0

      <Sample output>

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```
Ubuntu 16.04 LTS (Finish Lab 1: Network Troubleshooting) [Running]
simon@Sumetal:~$ cat /proc/net/bonding/bond0
Ethernet Channel Bonding Driver: v3.7.1 (April 27, 2011)

Bonding Mode: fault-tolerance (active-backup)
Primary Slave: enp0s3 (primary_reselect always)
Currently Active Slave: enp0s3
MII Status: up
MII Polling Interval (ms): 100
Up Delay (ms): 0
Down Delay (ms): 0

Slave Interface: enp0s3
MII Status: up
Speed: 1000 Mbps
Duplex: full
Link Failure Count: 0
Permanent HW addr: 08:00:27:5e:a9:06
Slave queue ID: 0

Slave Interface: enp0s8
MII Status: up
Speed: 1000 Mbps
Duplex: full
Link Failure Count: 0
Permanent HW addr: 08:00:27:07:fa:46
Slave queue ID: 0
simon@Sumetal:~$
```

7. Verify your bond0 interface

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```
simon@Sumetal:~$ ifconfig
bond0     Link encap:Ethernet  HWaddr 08:00:27:5e:a9:06
          inet addr:10.0.2.15  Bcast:10.0.2.255  Mask:255.255.255.0
          inet6 addr: fe80::a00:27ff:fe5e:a906/64 Scope:Link
          UP BROADCAST RUNNING MASTER MULTICAST  MTU:1500  Metric:1
          RX packets:21 errors:0 dropped:2 overruns:0 frame:0
          TX packets:29 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:4187 (4.1 KB)  TX bytes:2452 (2.4 KB)

enp0s3    Link encap:Ethernet  HWaddr 08:00:27:5e:a9:06
          UP BROADCAST RUNNING SLAVE MULTICAST  MTU:1500  Metric:1
          RX packets:21 errors:0 dropped:0 overruns:0 frame:0
          TX packets:84 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:4213 (4.2 KB)  TX bytes:5916 (5.9 KB)

enp0s8    Link encap:Ethernet  HWaddr 08:00:27:5e:a9:06
          UP BROADCAST RUNNING SLAVE MULTICAST  MTU:1500  Metric:1
          RX packets:50 errors:0 dropped:50 overruns:0 frame:0
          TX packets:5 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:3026 (3.0 KB)  TX bytes:382 (382.0 B)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:191 errors:0 dropped:0 overruns:0 frame:0
          TX packets:191 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1
          RX bytes:14609 (14.6 KB)  TX bytes:14609 (14.6 KB)

simon@Sumetal:~$ _
```

8. Now your network bonding is running

9. Try mode=0,1,3,4

    You need to remark **bond-primary** option

    <Sample output of mode=0 (round-robin)>

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```
Ubuntu 16.04 LTS (Finish Lab 1: Network Troubleshooting) [Running]
simon@Sumetal:~$ cat /proc/net/bonding/bond0
Ethernet Channel Bonding Driver: v3.7.1 (April 27, 2011)

Bonding Mode: load balancing (round-robin)
MII Status: up
MII Polling Interval (ms): 100
Up Delay (ms): 0
Down Delay (ms): 0

Slave Interface: enp0s3
MII Status: up
Speed: 1000 Mbps
Duplex: full
Link Failure Count: 0
Permanent HW addr: 08:00:27:5e:a9:06
Slave queue ID: 0

Slave Interface: enp0s8
MII Status: up
Speed: 1000 Mbps
Duplex: full
Link Failure Count: 0
Permanent HW addr: 08:00:27:07:fa:46
Slave queue ID: 0
simon@Sumetal:~$ _
```

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Self-Study:

You have to repeat all tasks in lab sheet several times to understand the solution. Write down your own report and share with your friends.

Remark:

Do activity by yourself. Good Luck