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Linux Network Bonding - fail_over_mac

출처: <https://twpower.github.io/207-network-bonding-active-backup-fail-over-mac-option>

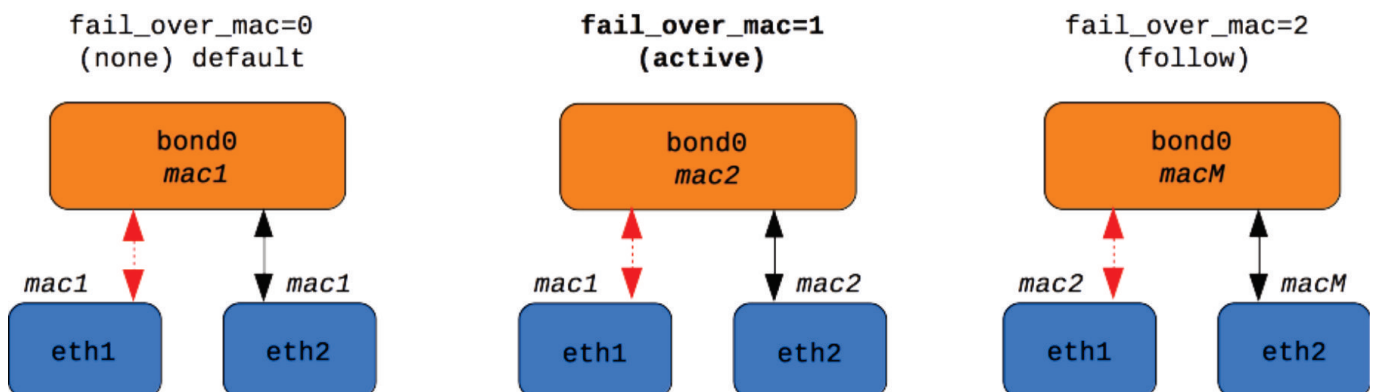
네트워크 본딩(Network Bonding)을 할 때 active-backup 모드에서 fail_over_mac 옵션에 대해 알아보자

환경

- CentOS 7.7.1908
- Bash shell(/bin/bash)
- Network bonding

fail_over_mac 옵션

fail_over_mac 옵션이란



- fail_over_mac : bond된 인터페이스와 slave 인터페이스들간에 어떻게 MAC 주소를 가져갈지 정하는 옵션으로 설정된 값에 따라 bond된 인터페이스와 slave 인터페이스들의 MAC을 설정하는 방식이 달라진다.
- 해당 옵션은 bonding mode가 active-backup 방식일때만 사용되는 옵션이다.
- 이미지 출처 : https://www.ibm.com/support/knowledgecenter/en/linuxonibm/com.ibm.linux.z.l0wlc00/l0wlc00_optionfailovermac.html

fail_over_mac 옵션 종류

- none or 0 : (Default) bond된 인터페이스와 모든 slave 인터페이스들의 MAC이 같은 값으로 설정되는 옵션으로 보통 가장 첫번째 slave 인터페이스의 MAC 주소를 모든 bond된 인터페이스와 slave 인터페이스들이 갖는다.
- active or 1 : active 상태인 slave 인터페이스의 MAC 주소를 bond된 인터페이스의 MAC으로 설정하는 옵션으로 failover된 상황에서 active 상태인 slave에 따라 bond된 인터페이스의 MAC 주소가 달라진다.

- follow or 2 : bond된 인터페이스의 MAC 주소는 고정이고(보통 첫번째 slave 인터페이스의 MAC 주소를 갖는다.) active 상태가 되는 slave 인터페이스 MAC 주소에 해당 MAC 주소를 부여하는 방식이다. failover가 일어날때 새로 active 상태가 될 인터페이스의 MAC 주소를 이전의 active 상태였던 인터페이스에 부여하고 bond된 인터페이스의 MAC을 받는다.

fail_over_mac 옵션 예제

예제 실행 환경

- 해당 예제의 Bonding 설정은 하단 (참고) Bonding 설정에 있습니다.
- Host OS : Mac OS
- Guest OS : CentOS 7.7.1908
- Hypervisor : VirtualBox

none or 0 옵션 예제

- Default option
- fail_over_mac=0
- VirtualBox에서는 해당 옵션으로 설정하면 active-backup이 잘 안되는 이슈가 있음.

```
[root@centos-client ~]# cat /etc/sysconfig/network-scripts/ifcfg-bond0 |  
grep fail_over_mac  
BONDING_OPTS="mode=1 miimon=100 fail_over_mac=0"
```

- bond0와 slave들(enp0s8과 enp0s9)의 MAC 주소가 동일

```
[root@centos-client ~]# ip link show  
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN mode  
DEFAULT group default qlen 1000  
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00  
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state  
UP mode DEFAULT group default qlen 1000  
    link/ether 08:00:27:2b:04:6e brd ff:ff:ff:ff:ff:ff  
3: enp0s8: <BROADCAST,MULTICAST,SLAVE,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast  
master bond0 state UP mode DEFAULT group default qlen 1000  
    link/ether 08:00:27:e8:26:58 brd ff:ff:ff:ff:ff:ff  
4: enp0s9: <BROADCAST,MULTICAST,SLAVE,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast  
master bond0 state UP mode DEFAULT group default qlen 1000  
    link/ether 08:00:27:e8:26:58 brd ff:ff:ff:ff:ff:ff  
8: bond0: <BROADCAST,MULTICAST,MASTER,UP,LOWER_UP> mtu 1500 qdisc noqueue  
state UP mode DEFAULT group default qlen 1000  
    link/ether 08:00:27:e8:26:58 brd ff:ff:ff:ff:ff:ff
```

active or 1 옵션 예제

- fail_over_mac=1

```
[root@centos-client ~]# cat /etc/sysconfig/network-scripts/ifcfg-bond0 |
grep fail_over_mac
BONDING_OPTS="mode=1 miimon=100 fail_over_mac=1"
bond0의 MAC 주소와 첫번째 slave인 enp0s8의 MAC 주소가 동일
[root@centos-client ~]# ip link show
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN mode
DEFAULT group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state
UP mode DEFAULT group default qlen 1000
    link/ether 08:00:27:2b:04:6e brd ff:ff:ff:ff:ff:ff
3: enp0s8: <BROADCAST,MULTICAST,SLAVE,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast
master bond0 state UP mode DEFAULT group default qlen 1000
    link/ether 08:00:27:e8:26:58 brd ff:ff:ff:ff:ff:ff
4: enp0s9: <BROADCAST,MULTICAST,SLAVE,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast
master bond0 state UP mode DEFAULT group default qlen 1000
    link/ether 08:00:27:27:a9:2d brd ff:ff:ff:ff:ff:ff
9: bond0: <BROADCAST,MULTICAST,MASTER,UP,LOWER_UP> mtu 1500 qdisc noqueue
state UP mode DEFAULT group default qlen 1000
    link/ether 08:00:27:e8:26:58 brd ff:ff:ff:ff:ff:ff
```

- enp0s8 인터페이스 Down

```
ip link set dev enp0s8 down
```

- bond0의 MAC 주소가 enp0s9의 MAC 주소로 변경됨

```
[root@centos-client ~]# ip link show
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN mode
DEFAULT group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state
UP mode DEFAULT group default qlen 1000
    link/ether 08:00:27:2b:04:6e brd ff:ff:ff:ff:ff:ff
3: enp0s8: <BROADCAST,MULTICAST,SLAVE> mtu 1500 qdisc pfifo_fast master
bond0 state DOWN mode DEFAULT group default qlen 1000
    link/ether 08:00:27:e8:26:58 brd ff:ff:ff:ff:ff:ff
4: enp0s9: <BROADCAST,MULTICAST,SLAVE,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast
master bond0 state UP mode DEFAULT group default qlen 1000
    link/ether 08:00:27:27:a9:2d brd ff:ff:ff:ff:ff:ff
9: bond0: <BROADCAST,MULTICAST,MASTER,UP,LOWER_UP> mtu 1500 qdisc noqueue
state UP mode DEFAULT group default qlen 1000
    link/ether 08:00:27:27:a9:2d brd ff:ff:ff:ff:ff:ff
```

follow or 2 옵션 예제

- fail_over_mac=2
- VirtualBox에서는 해당 옵션으로 설정하면 active-backup이 잘 안되는 이슈가 있음.

```
[root@centos-client ~]# cat /etc/sysconfig/network-scripts/ifcfg-bond0 |  
grep fail_over_mac  
BONDING_OPTS="mode=1 miimon=100 fail_over_mac=2"  
bond0의 MAC 주소와 첫번째 slave인 enp0s8의 MAC 주소가 동일  
[root@centos-client ~]# ip link show  
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN mode  
DEFAULT group default qlen 1000  
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00  
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state  
UP mode DEFAULT group default qlen 1000  
    link/ether 08:00:27:2b:04:6e brd ff:ff:ff:ff:ff:ff  
3: enp0s8: <BROADCAST,MULTICAST,SLAVE,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast  
master bond0 state UP mode DEFAULT group default qlen 1000  
    link/ether 08:00:27:e8:26:58 brd ff:ff:ff:ff:ff:ff  
4: enp0s9: <BROADCAST,MULTICAST,SLAVE,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast  
master bond0 state UP mode DEFAULT group default qlen 1000  
    link/ether 08:00:27:27:a9:2d brd ff:ff:ff:ff:ff:ff  
10: bond0: <BROADCAST,MULTICAST,MASTER,UP,LOWER_UP> mtu 1500 qdisc noqueue  
state UP mode DEFAULT group default qlen 1000  
    link/ether 08:00:27:e8:26:58 brd ff:ff:ff:ff:ff:ff
```

- enp0s8 인터페이스 Down

```
ip link set dev enp0s8 down
```

- bond0의 MAC 주소는 이전과 동일
- 새로 active 상태가 된 enp0s9 인터페이스에 bond0의 MAC 주소가 할당됨
- fail이 일어난 enp0s8 인터페이스에는 새로 active 상태가 된 enp0s9 인터페이스의 예전 MAC 주소가 할당됨

```
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN mode  
DEFAULT group default qlen 1000  
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00  
2: enp0s3: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast state  
UP mode DEFAULT group default qlen 1000  
    link/ether 08:00:27:2b:04:6e brd ff:ff:ff:ff:ff:ff  
3: enp0s8: <BROADCAST,MULTICAST,SLAVE> mtu 1500 qdisc pfifo_fast master  
bond0 state DOWN mode DEFAULT group default qlen 1000  
    link/ether 08:00:27:27:a9:2d brd ff:ff:ff:ff:ff:ff  
4: enp0s9: <BROADCAST,MULTICAST,SLAVE,UP,LOWER_UP> mtu 1500 qdisc pfifo_fast  
master bond0 state UP mode DEFAULT group default qlen 1000
```

```
link/ether 08:00:27:e8:26:58 brd ff:ff:ff:ff:ff:ff
10: bond0: <BROADCAST,MULTICAST,MASTER,UP,LOWER_UP> mtu 1500 qdisc noqueue
state UP mode DEFAULT group default qlen 1000
link/ether 08:00:27:e8:26:58 brd ff:ff:ff:ff:ff:ff
```

Bonding 설정

기본적인 본딩 설정은 아래와 같습니다.

Interfaces

- Bonding Interface : bond0
- Slave Interfaces : enp0s8, enp0s9

bond0

- /etc/sysconfig/network-scripts/ifcfg-bond0
- IPADDR와 PREFIX는 환경에 따라 다를 수 있습니다.
- fail_over_mac 옵션은 0~2까지 다르게 설정 가능합니다.

```
TYPE=Bond
BOOTPROTO=static
DEFROUTE=no
NAME=bond0
DEVICE=bond0
ONBOOT=yes
PREFIX=24
IPADDR=192.168.99.101
BONDING_OPTS="mode=1 miimon=100 fail_over_mac=1"
```

enp0s8, enp0s9

- /etc/sysconfig/network-scripts/ifcfg-enp0s8

```
NAME=enp0s8
DEVICE=enp0s8
TYPE=Ethernet
BOOTPROTO=none
ONBOOT=yes
MASTER=bond0
SLAVE=yes
```

- /etc/sysconfig/network-scripts/ifcfg-enp0s9

```
NAME=enp0s9
DEVICE=enp0s9
TYPE=Ethernet
BOOTPROTO=none
ONBOOT=yes
MASTER=bond0
SLAVE=yes
```

참고자료

- https://access.redhat.com/documentation/en-us/red_hat_enterprise_linux/7/html-single/networking_guide/index
- https://www.ibm.com/support/knowledgecenter/en/linuxonibm/com.ibm.linux.z.l0wlc00/l0wlc00_optionfailovermac.html
- <https://november11tech.tistory.com/128>

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Last update: **2020/03/16 02:30**

