Bridge Firewall Configuration

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❖ 차 례

- Introduction
- The Scenario
  - Bridge Configuration
  - PF Firewall Rules Configuration
- Bridge Testbed

- 결 과

- 향후 진행 사항 및 문제점

❖ Introduction

❑ Bridge Firewall

- ➢ 네트워크 망과 망 사이의 Connection을 하는 역할을 Hub(Switch Hub)는 일반적인 IP를가지고있지 않고 Layer 2 의 Frame 전달을 함.
  - 일반적인 Switch Hub는 Bridge로 볼 수 있음.

- ➢ Bridge Firewall은 위의 개념에서 보듯 OpenBSD의 Box에 Nic 2 장을 이용한 방화벽으로 Non IP를 사용하여 Bridge를 생성하고 Rules Packet Passing Traffic 수행.
  - OpenBSD Kernal level 지원
  - OpenBSD Non-IP외 NIC 추가시 관리목적으로 IP 사용가능.
  - L2, L3, L4, 각 Layer 별 지원

❖ The Scenario

❑ Requirements

➢ Performance PF OpenBSD

- 350Mhz or Higher x86 class processor
- 256MB of RAM
- 4GB hard drive
- 2 NIC(High quality recommended, e.g., Intel,3com)
  - o Management IP NIC 사용시 1 NIC 추가 필요.
- OpenBSD 3.3 or Higher
  - o QoS 사용시 커널 업데이트 요망 (Default QoS 지원됨).

```
[root@ root]# uname -amnprsv
OpenBSD 3.3 vpn#4 i386 Intel Pentium II ("GenuineIntel" 686-class, 512KB L2 cache)
[root@ root]# dmesg
OpenBSD 3.3-stable (vpn) #4: Thu Nov 6 17:12:36 PST 2003
    root@openbsd.openable.net:/usr/src/sys/arch/i386/compile/vpn
cpu0: Intel Pentium II ("GenuineIntel" 686-class, 512KB L2 cache) 351 MHz
.....
```

❖ The Scenario (cont_#2)

❑ Bridge Configuration

➢ Setting up the bridge

- OpenBSD installation is finished, remove any IP address information.
  - o man bridge
- We need to enable ip forwarding between the two network interface.

```
edit your /etc/sysctl.conf:
net.inet.ip.forwarding=1        # 1=Permit forwarding (routing) of packets
```

- We Need to enable pf firewall. (edit /etc/rc.conf)

```
edit your /etc/rc.conf
pf=YES                          # Packet filter / NAT
pf_rules=/etc/pf.conf           # Packet filter rules file
```

- The 2 bridge interfaces are fxp0 and fxp1.(If your interface names are different, change the interface names accordingly)

```
# echo "up" > /etc/hostname.fxp0   (External interface)
# echo "up" > /etc/hostname.fxp1   (Internal interface)
# echo "add xl0 add xl1 up" > /etc/bridgename.bridge0
```

❖ The Scenario (cont_#3)

❑ Bridge Configuration(cont_#2)

- ➢ Verity the bridge is up by running.
  - You should see output that includes this entry.
  - # ifconfig -a

```
[root@ root]# ifconfig -a
fxp0: flags=8943<UP,BROADCAST,RUNNING,PROMISC,SIMPLEX,MULTICAST> mtu 1500
        address: 00:90:27:34:48:d3
        media: Ethernet autoselect (100baseTX full-duplex)
        status: active
fxp1: flags=8943<UP,BROADCAST,RUNNING,PROMISC,SIMPLEX,MULTICAST> mtu 1500
        address: 00:a0:c9:8b:8e:51
        media: Ethernet autoselect (100baseTX full-duplex)
        status: active
fxp2: flags=8843<UP,BROADCAST,RUNNING,SIMPLEX,MULTICAST> mtu 1500
        address: 00:03:47:b0:5b:17
        media: Ethernet autoselect (100baseTX full-duplex)
        status: active
        inet 100.100.11.2 netmask 0xffffff00 broadcast 100.100.11.255
pflog0: flags=141<UP,RUNNING,PROMISC> mtu 33224
bridge0: flags=41<UP,RUNNING> mtu 1500
                .....
```

❖ The Scenario (cont_#4)

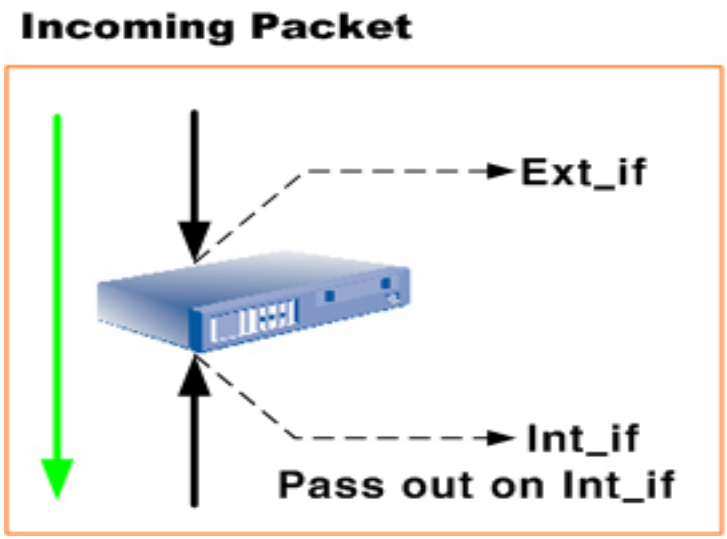
❑ PF Firewall Rules Configuration

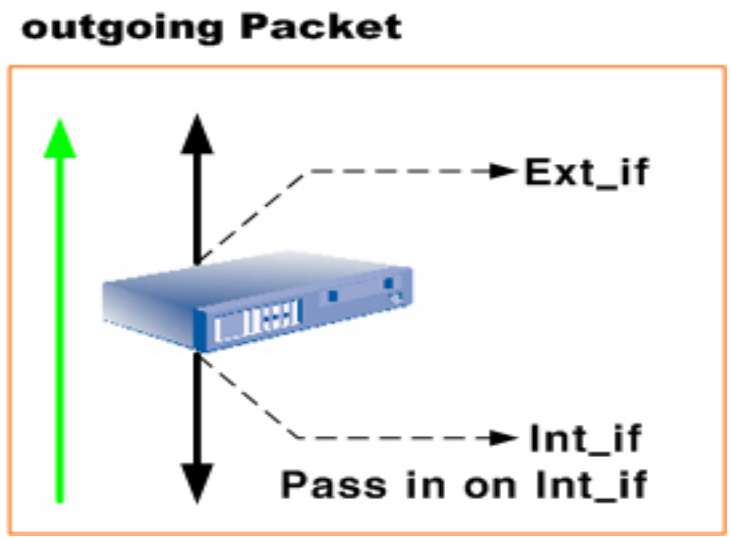
- ➢ pf(Packet Filter) is the packet filtering system in OpenBSD 3.0 and later.
- ➢ Its syntax and functionality are very similar to ipf in both FreeBSD, NetBSD, and earlier versions of OpenBSD. If you are familiar with ipf ruleset syntax, pf syntax should be readable.

- ➢ Traffic problem <Importance>
  - When using state keeping on a bridge, the packet goes through PF twice; it is an incoming packet on one interface, and an outgoing packet on the other.
  - Soulations
    - o Ext_if(fxp0) , Int_if(fxp1) = < State keep >
      - » Ext_if Rules → Allow all traffic traversing Ext_if.
      - » Int_if Rules → Rules of the pf assign for a task.

❖ The Scenario (cont_#5)

❑ PF Firewall Rules Configuration(cont_2)





❑ Simple Firewall Rules

```
##### outside interface
pass in  on fxp0 from any to any keep state
pass out on fxp0 from any to any keep state
##### internal interface
pass in  on fxp1 from any to any keep state
pass out on fxp1 from any to any keep state
```

❖ The Scenario (cont_#6)

- Advanced Firewall Ruleset.
  - Our example Filtering requirements:
    - **All ssh traffic will be allowed from the internet to any machine on the network.**
    - **All http traffic will be allowed form the internet to our webserver.**
    - **All UDP domain(for DNS lookups) and ntp will be allowed in.**
    - **ICMP echo request/reply (ping) will be allowed.**
    - **All access out from our network to the Internet will be allowed.**
    - **We want to keep state on all inbound connections.**
    - **We want to keep state on all outbound connections.**
    - **We want to log all dropped packets.**

❖ The Scenario (cont_#7)

❑ Advanced Firewall Ruleset(cont_2)

```
#       $OpenBSD: pf.conf,v 1.19 2003/03/24 01:47:28 ian Exp $
ext_if="fxp0"
int_if="fxp1"
man_if="fxp2"

##### Management Interface 100.100.11.2 ---> 100.100.11.1
pass in quick on fxp2 all
pass out quick on fxp2 all

####External Bridge interface rules ((allow all in - filter on
internal)
# In bridge mode, We only filter on one interface.
pass in quick on $ext_if all
pass out quick on $ext_if all

#Block and  Log everything In by default
block out log on $int_if all  ---> 들어오는 모든 패킷 Drop.
```

❖ The Scenario (cont_#8)

❑ Advanced Firewall Ruleset(cont_3)

```
#######Incoming Packet Rules
#######--> Allowed incoming tcp services (ssh, telnet, http, domain, ntp)
pass out on $int_if proto tcp from any to any port = 22  keep state
pass out on $int_if proto tcp from any to any port = 23  keep state
pass out on $int_if proto tcp from any to 192.168.135.248 port = http keep state
pass out on $int_if proto udp from any to any port  { domain, ntp } keep state
pass out on $int_if proto tcp from any to 192.168.135.248 port 21 keep state
###pass out on $int_if proto tcp from any to 192.168.135.247 port 21 keep state

#######Allow ICMP (ping) IN
###pass out/in  certain ICMP queries and keep state (ping)
pass out on $int_if inet proto icmp all icmp-type 8 code 0 keep state

#######OUT Rules
pass in on $int_if inet proto icmp all icmp-type 8 code 0 keep state
###----Pass (Allow)  all UDP/TCP Out and keep state
pass in on $int_if proto udp all keep state
pass in  on $int_if proto tcp all modulate state
########### Edited by temasys.. 2003/12/11/14:29
```

❖ The Scenario (cont_#8)

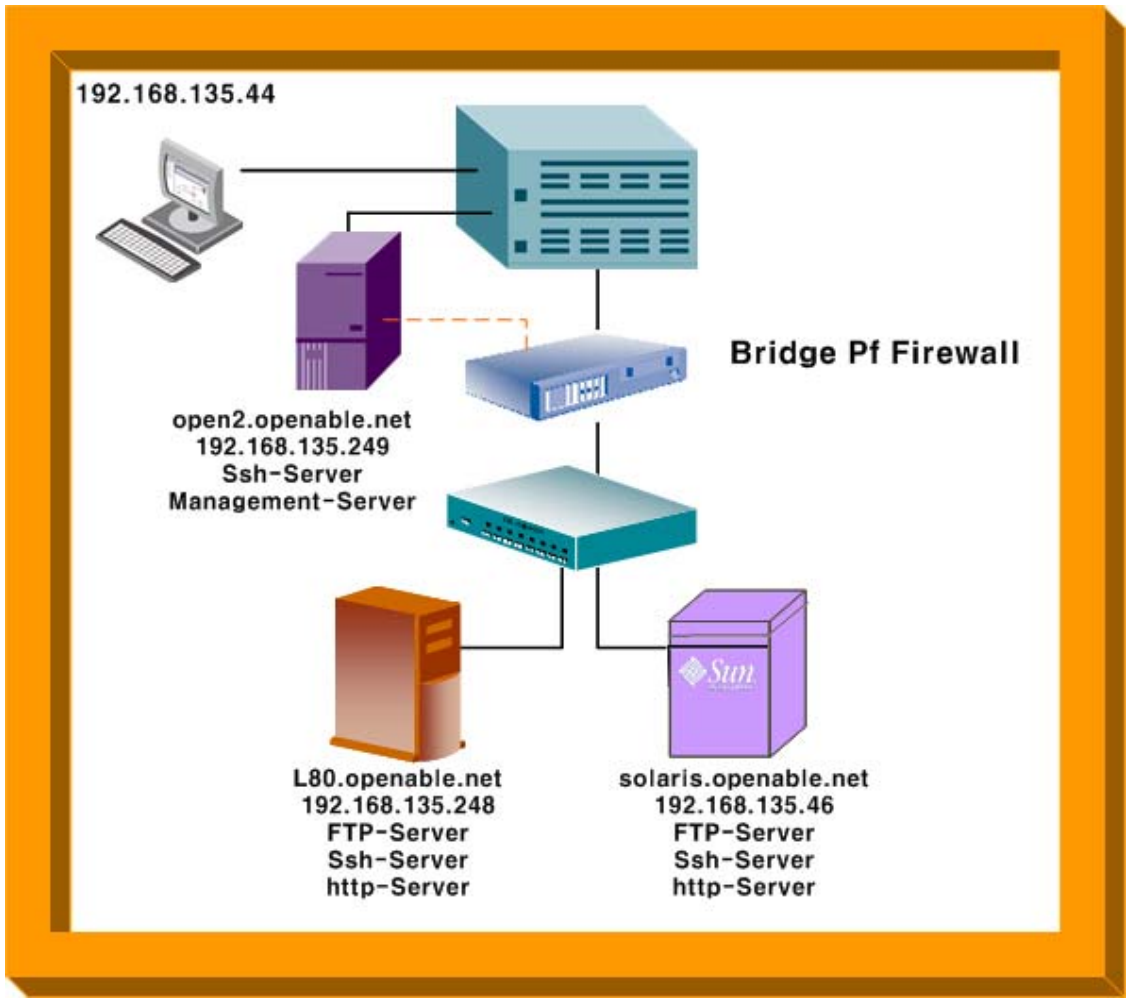
❑ pf commands

- **flush current filter rules & reload:**
  - # /sbin/pfctl -F rules && /sbin/pfctl -R /etc/pf.conf
- flush current nat rules & reload:
  - # /sbin/pfctl -F nat && /sbin/pfctl -N /etc/nat.conf
- show filter information (statistics and counters):
  - # pfctl -s info
- to display the current list of active MAP/redirect filters and active sessions:
  - # /sbin/pfctl -s state
- to find out the ``hit'' statistic for each individual rule in /etc/pf.conf:
  - # /sbin/pfctl -s rules -v
- watch port scans going by on the screen:

  /var/log/pflog is a binary file generated by pflogd so you can't just view it. Use tcpdump instead:
  - # tcpdump -i pflog0 -r /var/log/pflog

❖ Bridge Testbed

❑ TestBed



❖ 결 과

- OpenBSD의 Bridge PF firewall 사용
- 주로 네트워크 변경이 불가능한 곳에서 사용하는 것이 적합함.
- QoS 지원으로 인한 traffic 처리 가능

- 상용 방화벽과의 차별화된 전략.
  - 공개용 운영체제이면서 보안에 완벽한 보안전략제시
  - pf Stateful packet Inspection 방식

- Routing을 하지 않으므로 처리 속도면과 시스템 안정성면에서 일반 Routing Firewall에 비해 뛰어남

❖ 향후 진행 사항 및 문제점

- ❑ Bridge PF에 QoS 보안 정책 실험.
- ❑ 공개된 Bridge firewall 문서의 오류.
- ❑ 실제 네트워크에 삽입후 테스트 요함.

❖ Q n A