CMPS 261 Server Management - Module 6: Networking

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Course Modules

- *Module 0: Course Design*
- Module 1: Introduction to Servers and Server Operating Systems
- Module 2: Getting Started with FreeBSD Server
- Module 3: Software Maintenance
- Module 4: Tuning and Configuration
- Module 5: Storage Management
- **Module 6: Networking**
- Module 7: Shell Scripting
- Module 8: Building a WordPress Server

Module 6

- **Networking**
- Part A
  - Configuring networking
  - Remote access to and from our server
  - Network server functions
- Part B
  - Firewalls
  - Jails

Objectives

- Upon successful completion of this module, you should be able to:
  - Configure networking on a FreeBSD system
  - Control remote access, and remotely access servers
  - Understand network server functions
  - Explain firewalls
  - Understand gateways and routing
  - Create and use jails

PART A

Configuring Networking

- References
  - Chapter 7: Network
  - Part IV: Network Communication

TCP/IP

- As with most computer systems today, TCP/IP is the protocol of choice for networking
- All the knowledge you obtained in CMPS 161 comes to use here

VirtualBox Network Adapter

- Regardless of host networking, VirtualBox sets up a wired virtual adapter
  - Known as device `em0`

Adapter Configuration

- Adapter configuration done via command ifconfig
- Adapter settings in /etc/rc.conf
  - DHCP:
    - `ifconfig_em0="DHCP"`
  - Fixed IP:
    - `ifconfig_em0="inet 192.168.1.12 netmask 255.255.255.0"`
    - `defaultroute="192.168.1.1"`
  - Hostname:
    - `hostname="CMPS261Server"`

Restarting Network Services

- If problems occur restarting services is always an option
  - `service netif restart`
  - `service routing restart`

DHCP Client

- dhclient
  - To renew DHCP lease:
    - `service dhclient restart interface`
    - `service dhclient restart em0`
  - Log of leases:
    - `/var/db/dhclient/leases.em0`

Checking Network Operations

- `ping`
- `tcpdump`
  - `tcpdump -e -t -n arp`
  - Capture to file:
    - `tcpdump -w /filelocation/trace.pcap -i em0`
  - Disregard your own computer
    - `tcpdump "not (host 192.168.1.74)"`
- `netstat`
- `traceroute`

Checking Routing

- `netstat -r`
- `route` command
  - `route show 192.168.1.1`
  - `route show google.com`
- Can add a static route dynamically
  - `route add`

Address Resolution Protocol

- `arp` command
  - To display contents of arp table:
    - `arp –a`
  - To display contents for specific host:
    - `arp 192.168.1.1`
  - To delete all contents of arp table:
    - `arp -ad`

DNS Configuration

- DNS servers to resolve to are stored in `/etc/resolv.conf`
- Can list up to three name servers
  - Should always have more than one

Remote Access

- References
  - OpenSSH

SSH Client

- To access a remote system, use ssh command
  - `ssh {userid}@{hostname}`
  - `ssh username@host2.pointpark.edu`
- If first time, your system will have fingerprint of remote system installed if you accept it
  - Stored in `~/.ssh/known_hosts`
- You will then be prompted for password

SSH Client

- Can use public/private key authentication instead
- Run ssh-keygen to generate key
  - `ssh-keygen –t rsa`
- This process will generate the public and private keys
- You must copy the public key to the remote server
  - Location is `~/.ssh/authorized_keys`
- If you do not use a passphrase, connection is automatic
- If you do, still must enter password

SSH File Copying

- `scp` command can be used to copy files
  - Similar syntax to `cp`
  - `scp admin1@host2.pointpark.edu:sourcefile destfile`

SSH Server

- FreeBSD acts as an SSH server by default
- Service name is `sshd`
  - To prevent all remote access: stop sshd service
  - To make permanent, edit `/etc/rc.conf` and remove `sshd_enable` line, or set it to `"NO"`
- Administration is often done via secure shell

SSH Server

- Controlling remote access
  - Edit `/etc/ssh/sshd_config`
- Add lines for remote users
  - To only allow root to log in from `192.168.1.32`:
    - `AllowUsers root@192.168.1.32`
  - To allow admin1 to log in from anywhere:
    - `AllowUsers admin`
  - To deny:
    - `DenyUsers user1`
  - To deny root remote login:
    - `PermitRootLogin no`

Network Server Functions

- References
  - Part IV: Network Communication

Server Functions

- Unix and FreeBSD support a complete set of operations commonly deployed on servers
  - Email
  - Printing
  - Network operations (DHCP, routing, DNS)
  - Database
  - And many more

Server Functions

- Setting up these functions requires
  - Installing appropriate packages
  - Performing configuration
- Refer to Service Application document in Module 3

PART B

Firewalls

- References
  - Firewall Concepts

Firewall Concepts

- Firewalls provide a means to control what IP traffic comes into and goes out of a system
- Rules are created to allow or deny:
  - Protocols
  - Hosts
  - Ports

FreeBSD Firewall Server

- Many organizations use a Unix system as a corporate firewall
- Typically requires a multi-homed server
- Two NIC cards
  - One card exposed to outside
  - One card connects to internal network

Client Firewall

- Three firewalls are built in to FreeBSD
  - `pf`
  - `ipfw`
  - `ipfilter`
- No firewall is active by default
  - Computer is completely open to inbound and outbound traffic

Setting Up PF

- Enable the services at start-up
  - Edit /etc/rc.conf
    - `pf_enable="YES"`
    - `pflog_enable="YES"`
  - Edit `/etc/pf.conf`
    - Add lines:
      - `block in all`
      - `pass out all keep state`
    - This will block all unsolicited inbound traffic, allow all outbound
    - Appropriate for a client computer, or a LAN server

Jails

- References
  - FreeBSD Handbook

Jails Concepts

- Jails are a form of virtualization
- FreeBSD subsystems are created on the host system
  - Each is effectively a complete FreeBSD install
    - And yet there are some shared resources
  - Users are isolated to their jail
    - That said, breaches are possible
- Point Park has provided you with a jail on the Rowland School of Business server

Jail Setup

- Multi-step process
- Recommend using jail manager

In Class Exercise

- Install a jail in your VM

THANK YOU!