Cisco Configuration Essentials

Campus Network Design & Operations Workshop

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NSRC
Network Startup Resource Center

Introduction to Cisco devices

- Presentation describes components of Cisco routers and switches running Cisco IOS
  - IOS is Cisco’s Internet Operating System, the software used to control the router or switch
- Cisco produces other equipment running other operating systems:
  - IOS-XR (high end routers)
  - IOS-XE (replacing IOS)
  - NX-OS (datacentre & enterprise switches)
- Equipment from other vendors uses similar concepts

Where is the configuration?

Router always has two configurations

- **running-config**
  - Stored in RAM
  - Shows which parameters are currently in use.

    ```
    show running-config
    ```
  - Modified with:

    ```
    configure terminal
    ```
- **startup-config**
  - Stored in NVRAM
  - Loaded by router next time it boots
  - This is where the running-config is saved

    ```
    show startup-config
    ```

Management input sources

- Console:
  - Direct access via serial port
- Auxiliary Port:
  - Access via Modem or other serial devices
  - (Also used for accessing other serial devices)
- Virtual Terminals (VTY):
  - Telnet/SSH

Changing the configuration

- Commands are implemented immediately
  - Be careful when typing at the command line interface
- When working on the serial console or via Telnet or SSH, commands can also be:
  - Copied from a text file and pasted into the terminal
    - Be very careful with cut and paste – character loss from cut and paste buffer can cause unintended consequences
  - Copied by SCP or TFTP from a file prepared previously on a SCP or TFTP server
    - Strongly encouraged in day-to-day operations

Access Modes

- Standard user access:
  - Allows users to see some of the device status
  - Prompt:

```
Router>
```

- Privileged user access:
  - Full administrative view of the device
  - Accessed by:

```
Router> enable
Router#
```

- Configuration mode:
  - Accessed by:

```
Router# configure terminal
Router(config)#
```

Access Modes

- Exiting configuration mode:

```
Router(config)# end     (or Ctrl-Z)
Router#
```

- Exiting privileged mode:

```
Router# disable
Router>
```

- Logging off:

```
Router> exit
```

Saving Configuration

- Very important to save the configuration to the device NVRAM after it has been updated
  - The device does NOT do it automatically
  - Done in privileged mode:

```
Router# write memory
```

  - Can be shortened to just:

```
Router# wr
```

- Full long hand form of Cisco command to save configuration:

```
Router# copy running-config startup-config
```

Saving Configuration

- There are many available options for saving the configuration:
  - Locally on the device
  - On an external server using TFTP or SCP

```
Router# copy running-config ?
  flash:          Copy to flash: file system
  ftp:            Copy to ftp: file system
  scp:            Copy to scp: file system
  slot0:          Copy to slot0: file system
  slot1:          Copy to slot1: file system
  startup-config  Copy to startup configuration
  tftp:           Copy to tftp: file system
  ...
```

Context Help

- Use “?” to obtain a list of commands available in your current configuration mode:

```
Router(config)#?
Configure commands:
  aaa                 Authentication, Authorization and Accounting
  aal2-profile        Configure AAL2 profile
  access-list         Add an access list entry
  alarm-interface     Configure a specific Alarm Interface Card
  alias               Create command alias
  appfw               Configure the Application Firewall policy
  application         Define application
  archive             Archive the configuration
  arp                 Set a static ARP entry
```

Online Help

- Use “?” also to see all possible parameters to an incomplete command:

```
Router(config)#username ?
  WORD  User name
Router(config)#username cndlab ?
  password      Specify the password for the user
Router(config)#username cndlab password secret-pass

Router#show ?
  aaa                       Show AAA values
  aal2                      Show commands for AAL2
  access-expression         List access expression
  access-lists              List access lists
  accounting                Accounting data for active sessions
```

Command Completion

- Use the Tab key to complete a command:

```
router(config)# int<TAB>
router(config)# interface fa<TAB>
router(config)# interface fastEthernet 0
router(config-if)# ip add<TAB>
router(config-if)# ip address n.n.n.n m.m.m.m
```

Command Shorthand

- IOS understands shorthand
  - Complete command does not need to be typed as long as the initial characters are unique

```
router(config)# int fa 0
router(config-if)# ip add 192.168.1.1 255.255.255.0
router(config-if)# no sh
router(config-if)# ^Z
router# sh ip int br
Interface      IP-Address    OK?  Method  Status  Protocol
FastEthernet0  192.168.1.1   YES  NVRAM   up      up
```

  - Can you work out the full form of the above commands?

Moving faster around the command line

Move within command history

⇧	Previous command
⇩	Next command

Line editing

⇦	move to the left within a line
⇨	move to the right within a line
Ctrl-a	move to beginning of line
Ctrl-e	move to end of line
Ctrl-k	delete until end of line

Verifying and Troubleshooting

- Checking configuration:
  - Need to be in privileged mode to do this:
  - Current running configuration

```
Router# show running-config
```

  - Saved configuration

```
Router# show startup-config
```

  - Or

```
Router# show configuration
```

- Checking specific interface running configuration

```
Router# show run interface Gig0/0
```

Verifying and Troubleshooting

- Checking interface status:
  - Can be in standard or privileged mode to do this:

```
Router# show interface Gig0/0
```

  - Checks interface Gigabit 0/0
- Checking status of all interfaces:
  - Can be in standard or privileged mode to do this:

```
Router# show interface description
Interface  Status     Protocol Description
Fa0/0      up         up       Backbone LAN
Fa0/1      up         up       Server LAN
Fa1/0      up         up       Wireless LAN
Fa1/1      up         up       ISP Link
Lo0        up         up       Loopback
```

Verifying and Troubleshooting

- Getting a brief list of IPv4 status of all interfaces

```
Router# show ip interface brief
```

- Getting a brief list of IPv6 status of all interfaces

```
Router# show ipv6 interface brief
```

- Find out about directly attached Cisco devices
  - "Cisco Discovery Protocol" – CDP
  - Can be in standard or privileged mode to do this:

```
Router# show cdp neighbor
```

Verifying and Troubleshooting

- Checking logs:
  - Need to be privileged mode to do this:

```
Router# show logging
```

- Show software and hardware details of the device:

```
Router# show version
```

  - Or:

```
Router# show hardware
```

- Show device inventory (more hardware details)

```
Router# show inventory
```

Verifying and Troubleshooting

Checking device status while inside configuration mode:

```
Router(config)# do show interface Gig0/0
```

- The “do” command lets the operator run all privileged mode commands from within the configuration mode of the router
- Much quicker/easier than exiting configure mode, running the status command, and then returning to configure mode

Undoing Configuration

To undo IOS configuration:

- Simply negate the configuration command

```
Router# sh run int fa 0/0
interface FastEthernet 0/0
 description Link to Core-Router
 ip address 192.168.1.10 255.255.255.224

Router# conf t
Router(config)# int fa 0/0
Router(config-if)# no ip address
Router(config-if)# end

Router# sh run int fa 0/0
interface FastEthernet 0/0
 description Link to Core-Router
Router#
```

Poor defaults

For historical reasons, there are some legacy default settings which you will want to change on every device

Poor defaults (1)

- Log messages are sent to the console port
  - They mix in with whatever you are typing!

```
Router(config-if)#ip addre*Jun 20 07:53:55.755:
%LINEPROTO-5-UPDOWN: Line protocol on Interface
GigabitEthernet3/0, changed state to downss 1.2.3.4
```

- Solution: log to memory buffer instead

```
Router(config)#no logging console
Router(config)#logging buffer 8192 debug
```

- Use “show log” to see buffer contents

Poor defaults (2)

- DNS lookups are sent to broadcast address
  - Can cause long delays e.g. for reverse lookups

```
Router#ping nsrc.org
Translating "nsrc.org"...domain server (255.255.255.255)
% Unrecognized host or address, or protocol not running.
```

- Solution: disable DNS resolution completely

```
Router(config)#no ip domain-lookup
```

- Alternatively: configure real DNS servers
  - But this can also lead to delays when network is down

```
Router(config)#ip name-server 8.8.8.8
Router(config)#ip name-server 8.8.4.4
```

Poor defaults (3)

- Typos interpreted as hostname to connect to

```
Router#wrtie
Translating "wrtie"...domain server (255.255.255.255)

% Bad IP address or host name
```

- Solution: “transport preferred none”

```
Router(config)#line con 0
Router(config-line)#transport preferred none
Router(config-line)#line vty 0 4          *
Router(config-line)#transport preferred none
```

```
Router#wrtie
         ^
% Invalid input detected at '^' marker.
```

* **line vty 0 15** on some devices

Poor defaults (4)

- Router does not forward IPv6 traffic!
- Solution:
  - only on routers, not layer2-only devices

```
Router(config)#ipv6 unicast-routing
```

Questions?