JUNOS Basic Configuration
Agenda

Installation
  • Power-up & Power-down
  • Initial Configuration

Interface
  • Standard Interfaces
  • FPC, PIC & Port Number
  • Configuring Interface
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Powerup and Powerdown

- **Powerup**
  - Connect all cables
  - Turn on one power supply
  - Turn on second power supply

- **Powerdown**
  - Shut down JUNOS routing software
  - CLI `request system halt` command
  - Turn off power supplies
Visible Activity at Startup

- Craft interface displays:
  - Starting Routing Engine
  - Starting PFE
  - Starting Cards

- FPC LEDs
  - Blink green while testing
  - Become solid green when tests pass

- Alarm LEDs light as needed
Initial Configuration

- Using serial console
  - Root password
  - Machine name
  - IP address (prefix) and prefix length assigned to management interface (fxp0)
  - DNS server
Troubleshooting

- **Craft interface**
  - Red LEDs indicate failure
  - LCD displays all major and minor alarms

- **Syslog messages**
  - Contain more detailed information
  - `CLI show log messages` command

- **CLI**
  - Interactive failure analysis using `show` commands
  - `monitor log files using monitor command`
Boot Devices and Media

- Removable media
  - Used for install and upgrade, normally left empty
  - RE — PCMCIA flash card
- Flash drive
  - Solid-state media
  - Primary source for booting software
- Hard drive
  - Secondary source for booting software
Software Installation

- Arrives preinstalled from factory onto
  - Flash drive
  - Hard drive (alternate copy)
  - Removable media (e.g. PCMCIA)

- Can boot from alternate copy
  - If flash drive fails, router can still boot from hard drive or removable media

- Upgradable
  - Upgrade packages available through the Internet or on removable media
Boot Sequence

- Hardware controlled
  - Software notifies hardware when boot completes

**Diagram:**
- Removable media → Solid-state flash disk → Rotating disk → Halt
- Success? → Done
- Success? → Done
- Success? → Done
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Initial Configuration

- Root password
  - Root password **not** set at factory
  - Must use console to configure root password
- Router and domain name
- Management interface IP address and prefix length
- Default router IP address
- DNS server IP address
Initial Configuration

- Enter configuration mode
  
  `root@> configure`
  
  `[edit]`
  
  `root@#`

- Set root password
  
  - Plain text known
    
    `root@# set system root-authentication plain-text-password`

  - Pre-encrypted password
    
    `root@# set system root-authentication encrypted-password encrypted-password`

  - SSH (secure shell) key
    
    `root@# set system root-authentication ssh-rsa key`
Initial Configuration

- Set router name
  
  ```
  [edit]
  root@# set system host-name lab2
  ```

- Set router domain name
  
  ```
  [edit]
  root@# set system domain-name juniper.net
  ```

- Commit changes so far
  
  ```
  [edit]
  root@# commit
  commit complete
  ```

  ```
  [edit]
  root@lab2#
  ```
Initial Configuration

- Set management Ethernet IP address and prefix

  ```
  [edit]
  root@lab2# set interfaces fxp0 unit 0 family inet address ip-address/prefix-length
  ```

- Set default route

  ```
  [edit]
  root@lab2# set system backup-router gateway-address
  root@lab2# set routing-options static route default nexthop gateway-address retain no-readvertise
  ```

- Set name server address

  ```
  [edit]
  root@lab2# set system name-server ns-address
  ```
Full Installation

- Reinstall JUNOS software if storage media fails or is corrupted
- Future major software revisions may require full installation
- Three steps
  - Prepare to reinstall JUNOS software
  - Reinstall JUNOS software
  - Configure JUNOS software
Full Installation: Preparation

- Record basic information
  - Router name
  - Management interface IP address and prefix length
  - Default router IP address
  - Domain name and DNS server IP address
- Copy existing configuration file to a safe place on the network
  - Located in /config/juniper.conf
  - Full installation erases both flash and rotating drives
- Locate your Juniper installation media
  - LS-120 floppy or PCMCIA card contains entire JUNOS distribution
Full Installation: Reinstallation

- Insert installation media into Routing Engine
  - PCMCIA flash card
- Reboot router
  - Use the CLI from the serial console
    ```
    root@lab2> request system halt
    ```
  - Power-cycle router
- Follow prompts
  - Enter configuration information saved during installation preparation
- System reboots automatically after installation completes
Full Installation: Software Configuration

- Log in as root

    no-name (ttyd0)

    login: root

    Last login: date on ttyd0


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    ---JUNOS 4.0R1 built 2000-02-10 09:29:44 UTC

    #

- Start CLI

    # cli

    root@no-name>
Full Installation: Software Configuration

- Enter configuration mode

  root@no-name> configure

  [edit]

  root@no-name#

- Set root password
  - Plain-text
    
    root@no-name# set system root-authentication plain-text-password text-password
  
  - Pre-encrypted password
    
    root@no-name# set system root-authentication encrypted-password encrypted-password
  
  - SSH key
    
    root@no-name# set system root-authentication ssh-rsa key
Software Update Packages

- JUNOS software updates are contained in four packages
  - jkernel- Operating system
  - jroute- Routing Engine software
  - jpfe- Packet Forwarding Engine software
  - jdocs- On-line documentation
  - jbundle- All four upgrade packages
- Packages can be upgraded individually
- CLI `show system software` command displays installed packages
Package Naming Convention

- Software packages have standard names

  \texttt{package-m.nZnumber.tgz}

  - \texttt{m.n} is the major version number
  - \texttt{Z} is a single uppercase letter
    - A– Alpha
    - B– Beta
    - R– Release
    - I– Internal
  - \texttt{number} is the release number, which might include the build number for that release

- For example

  \texttt{jbundle-4.0R1.2.tgz}
Upgrade Software Packages

- Download current package from software download page at www.juniper.net
- Add new package
  
  ```
  root@lab2> request system software add new-package-name
  Checking available free disk space...11200k available, 6076k suggested.
  ```
- If needed, reboot router
  
  ```
  root@lab2> request system reboot
  ```
Back Up Existing Software

- System software and configuration can be backed up to rotating disk
- Best used
  - Before major upgrade to ensure system recovery if necessary
  - When system is known stable
- CLI request system snapshot command
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Standard Interfaces

- Interface contained on PIC
- PIC plugs into FPC
  - FPC has room for four PICs
- FPC plugs into chassis
Standard Interfaces

- Packet-based SONET/SDH PICs
  - 4-port OC-3
  - 1-port OC-12
    - Standard packet version or channelized to DS-3 level
  - 1-port OC-48
    - Takes up all four PIC slots on M20 or M40
    - Takes up one PIC slot on M160
  - 1-port OC-192
    - Takes up all four PIC slots on M160
    - Not available on M20 or M40
Standard Interfaces

- ATM based SONET/SDH PICs
  - 2-port OC-3 ATM
  - 1-port OC-12 ATM
- 4 port DS-3 PIC
  - 4 ports
- 4 port E-3 PIC
- Ethernet PICs
  - 1 Port Gigabit Ethernet
  - 4 Port 100 Mbit Ethernet
Standard Interfaces

- System uses consistent names for all customer interfaces
- Based on
  - Interface port type
  - FPC slot number
  - PIC slot number within FPC
  - Port number within PIC
Interface Port Type

- **at**—ATM over SONET/SDH ports
- **e3**—E-3 ports
- **fe**—Fast Ethernet ports
- **so**—SONET/SDH ports
- **t3**—DS-3 ports
- **ds-** Nx64k interfaces
- **ge**—Gigabit Ethernet ports
- **ml**—multilink
- **ls**—link services
- **sp**—adaptive services pic
- **vt**—virtual interface
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FPC Slot Numbers

**M40**

```
0 1 2 3 4 5 6 7
```

**M160**

```
0 1 2 3 4 5 6 7
```

**M20**

```
0
1
2
3
```
PIC Slot Numbers

- M40 and M160
  - Top to bottom

- M20
  - Right to left
Port Numbers

- **M40 and M160**
  - Top to bottom
  - Right to left

- **M20**
  - Right to left
  - Bottom to top
Test Your Knowledge (I)

On this *mythical* M40 PIC, what port number is this?

![Diagram showing HyperNet ports]
Test Your Knowledge (II)

On this **mythical** M20 PIC, what port number is this?
Interface Names

- Physical interfaces have standard names

- Type
  - FPC slot
  - PIC slot
  - Port number

so-5/2/3
Interface Names

- Logical interfaces are used to set up Frame Relay DLCIs or ATM virtual circuits

so-5/2/3.43

- Interface number is separate in meaning from the actual DLCI or ATM VC and can be any arbitrary value

- Suggested convention is to keep them the same whenever possible
Permanent Interfaces

- Router has two permanent interfaces
  - Out-of-band management interface is called fxp0
  - Internal Routing Engine to PFE connection is called fxp1
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Configure Interfaces

- Two steps
  - Configure physical properties
  - Configure logical properties
Configure Interfaces

- Physical properties
  - Clocking
  - Scrambling
  - Frame check sequence (FCS)
  - Maximum transmission unit (MTU)
  - Keepalives
  - Other link characteristics

- Logical properties
  - Protocol family (Internet, ISO, MPLS)
  - Addresses (IP address, ISO NET address)
  - Virtual circuits (VCI/VPI, DLCI)
  - Other characteristics
Configure Interfaces

- Standard configuration statement hierarchy

```plaintext
interfaces {
    interface-name {
        physical-properties;
        [...]
        unit unit-number {
            logical-properties;
            [...]
        }
    }
}
```
Configure Physical Properties

- Configure physical properties of the interface using the `set` command:

  ```
  set interface so-1/0/3 no-keepalives
  ```

- Or park yourself in the interfaces section of the hierarchy and set many options

  ```
  lab@omaha> configure
  [edit]
  lab@omaha# edit interfaces so-1/0/3
  [edit interfaces so-1/0/3]
  lab@omaha# set no-keepalives
  lab@omaha# set sonet-options fcs 32
  lab@omaha# commit
  ```
Default Settings

- Default settings for an interface are usually enough to get you talking
- Most interfaces do not need complex setup
Logical Interface Settings

- Each physical interface has one or more logical interfaces.
- Logical interface separates configuration information for each ATM virtual circuit, Frame Relay DLCI, or VLAN.
- Some physical interface encapsulations allow only one possible logical interface:
  - PPP
  - HDLC
Logical Interface Settings

- Logical settings
  - Protocol family (Internet, ISO, MPLS)
    - Protocol MTU
    - IP address
    - Other protocol options
  - Virtual circuit identifiers (VPI.VCI, DLCI)
  - Other according to-circuit characteristics
Unit Numbers

- Each logical interface has a unit number
- Number can be arbitrary
  - Typically, the unit number is the same as the VC or DLCI number
- Some physical interfaces have only one possible logical interface, and one unit number only, which must be configured as unit zero
Configure Logical Interfaces

- Use the `set` command to configure a logical interface, using the unit number.

- For example

  ```
  set interface so-1/0/3 unit 40 dlci 40
  ```

- Or park yourself at the unit level

  ```
  lab@omaha> configure
  [edit]
  lab@omaha# edit interfaces so-1/0/3 unit 40
  [edit interfaces so-1/0/3 unit 40]
  lab@omaha# set dlci 40
  lab@omaha# set family inet address 10.0.20.1/24
  lab@omaha# commit
  ```
Configure Protocol Families

- Each major protocol is called a family
- Internet protocol has TCP, UDP, and ICMP as family members
- Most common protocol families are
  - Internet (inet)
  - International Standards Organization (iso)
  - Traffic engineering (mpls)
  - Multiple families can live on one logical interface
Configure Protocol Families

- Internet protocol family (inet)
- Allows you to set
  - IP address: address \texttt{A.B.C.D/prefix\_length}
  - Remote address on point-to-point links: destination \texttt{A.B.C.D}
  - Broadcast address: broadcast \texttt{A.B.C.D}
  - MTU size: mtu \texttt{bytes}
  - ICMP redirect control: no-redirects
Configure Protocol Families

- Minimal sample configuration

  lab@omaha> configure
  [edit]
  lab@omaha# edit interfaces so-1/0/3
  [edit interfaces so-1/0/3]
  lab@omaha# set unit 0 family inet address 10.0.20.1/24
  lab@omaha# commit

- Displayed as

  interfaces {
    so-1/0/3 {
      unit 0 {
        family inet {
          address 10.0.20.1/24;
        }
      }
    }
  }
Hands-On Session
System Configuration - 30 min

Lab IP Address Map
10.0.x.y/24

Domain juniper.net 1.2.3.4
Gateway 10.100.0.1

1. Host name
2. Domain & DNS Server Name
3. Backup & Default Router
4. User Access to System
5. Time Zone
6. System Services telnet
7. Logging Services (optional)

Answer:
1. set host-name host-name
2. set domain-name juniper.net
   set name-server 1.2.3.4
3. set back-up router gateway-addr
   [edit routing-options static]
   set route default nexthop gateway-addr
5. [edit system] set time-zone
6. set services telnet
7. [edit system] set syslog file filename
Interface Configuration -30 min

1. Inventory your Interface
   - fxp0: ___________________
   - fxp1: ___________________
   - fxp2: ___________________

2. Configure the Interfaces

3. Check your work by
   - ping: ___________________
   - traceroute: _______________

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