JUNOS
Basic Configuration

Juniper™ NETWORKS

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

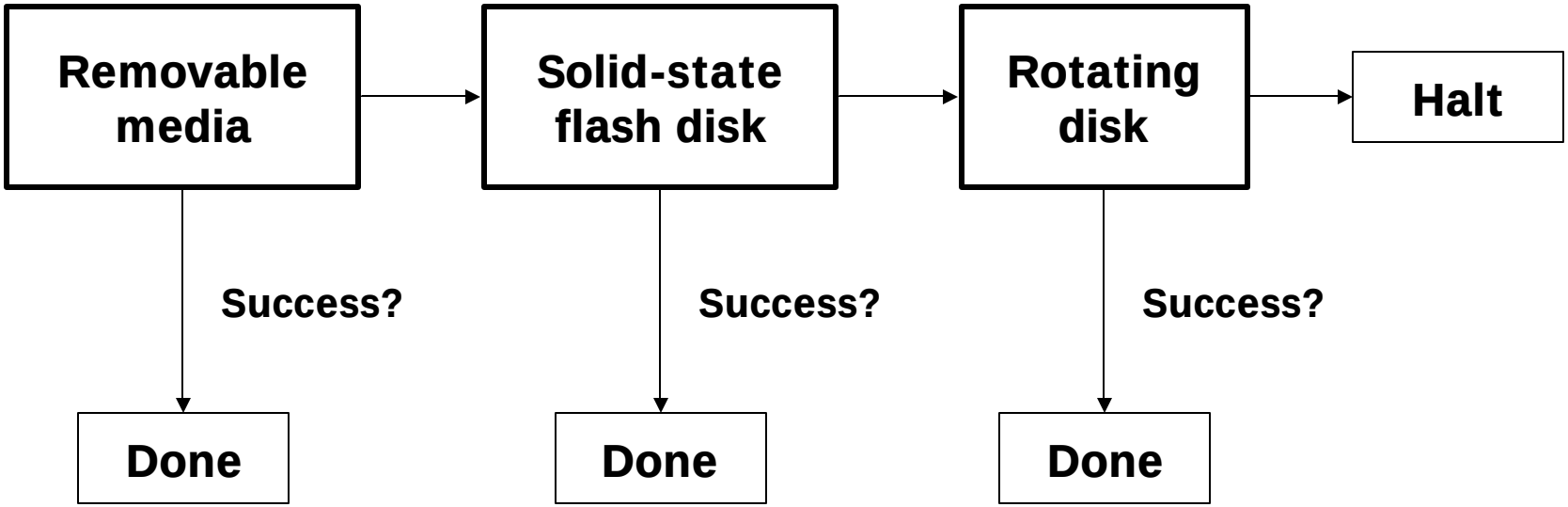
- Removable media
  - Used for install and upgrade, normally left empty
  - RE –PCMCIA flash card
- Flash drive
  - Solid-state media
  - Primary source for booting software
- Hard drive
  - Secondary source for booting software

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



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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
Copyright (c) 1980, 1983, 1986, 1988, 1990, 1991, 1993, 1994
The Regents of the University of California. All rights reserved.
---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

  ***package-m.nZnumber*.tgz**

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

- For example

  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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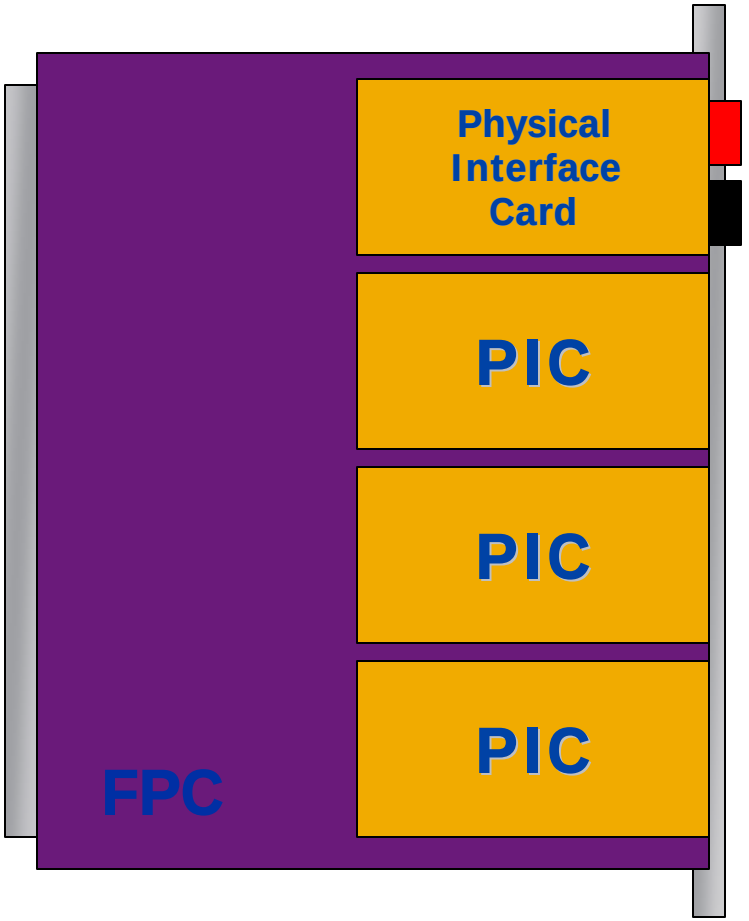
Standard Interfaces

- 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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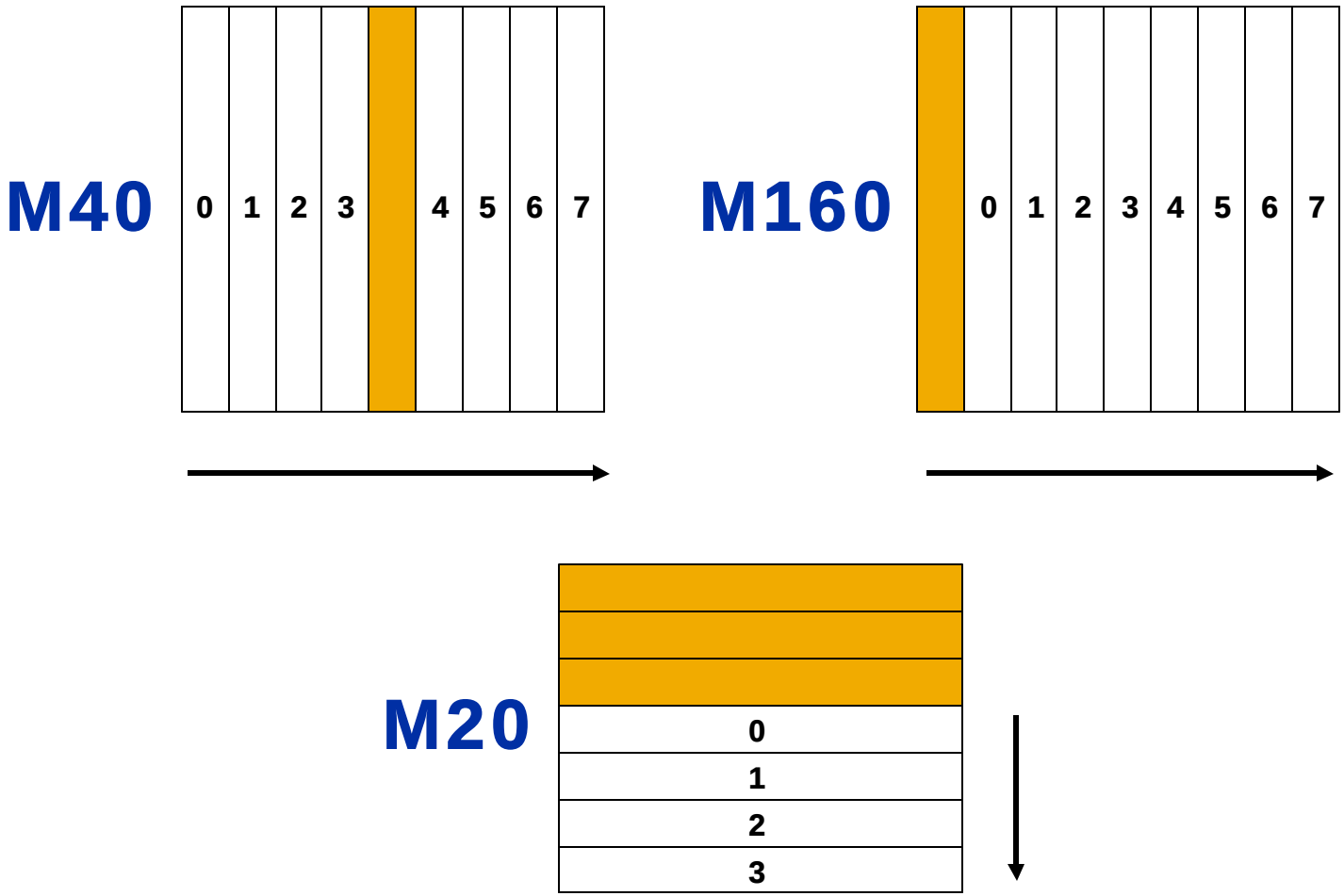
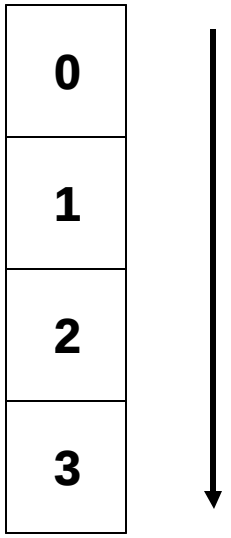
FPC Slot Numbers

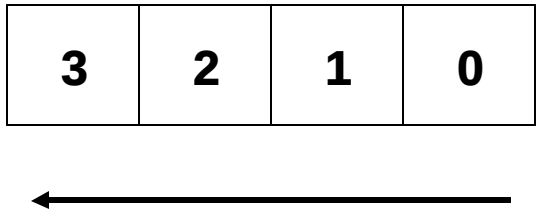


PIC Slot Numbers

- M40 and M160
  - Top to bottom

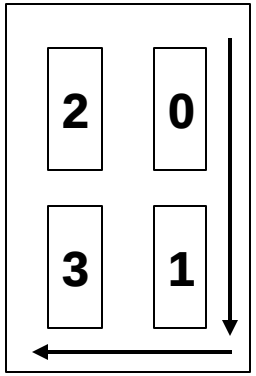


- M20
  - Right to left

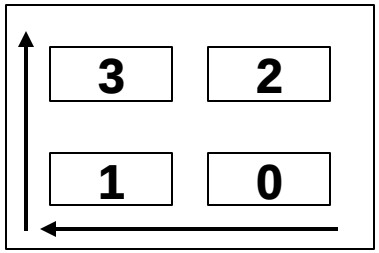


Port Numbers

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

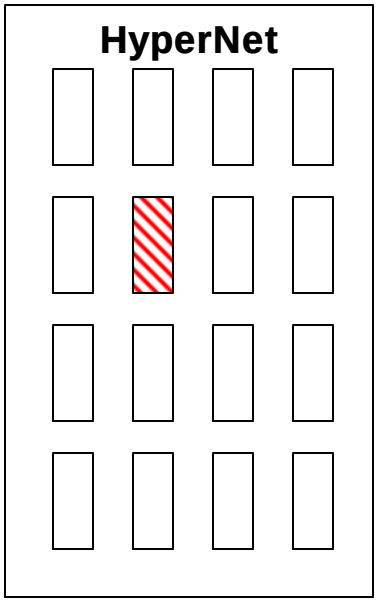


- **M20**
  - **Right to left**
  - **Bottom to top**



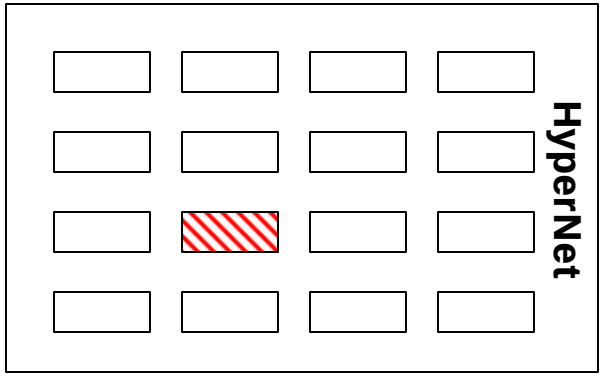
Test Your Knowledge (I)

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



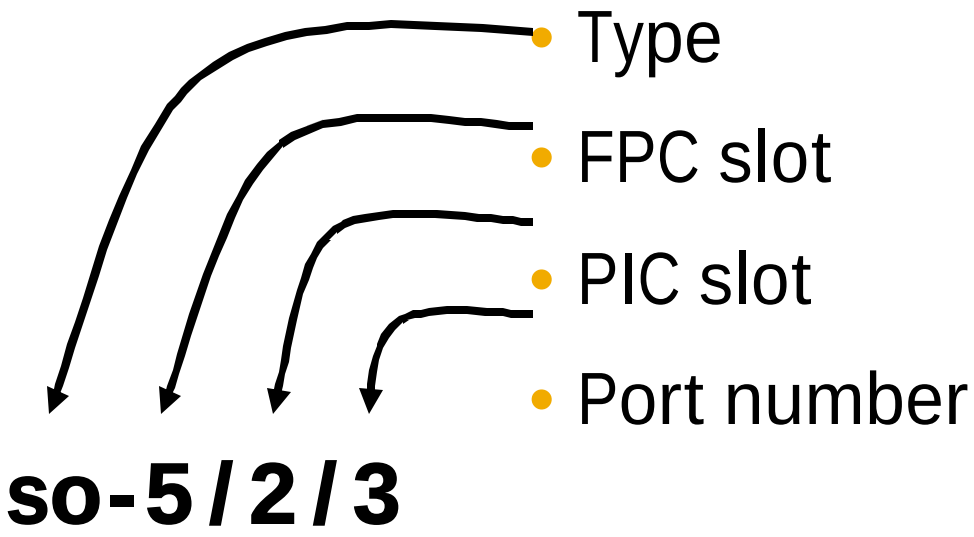
Test Your Knowledge (II)

On this mythical M20 PIC, what port number is this?



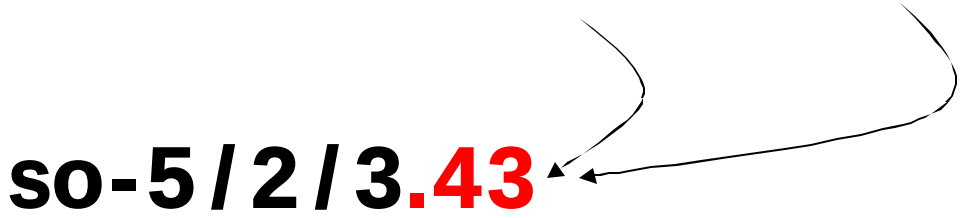
Interface Names

- Physical interfaces have standard names



Interface Names

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



- 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

```
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` ***A.B.C.D/prefix_length***
  - Remote address on point-to-point links: `destination` ***A.B.C.D***
  - Broadcast address: `broadcast` ***A.B.C.D***
  - MTU size: `mtu` ***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

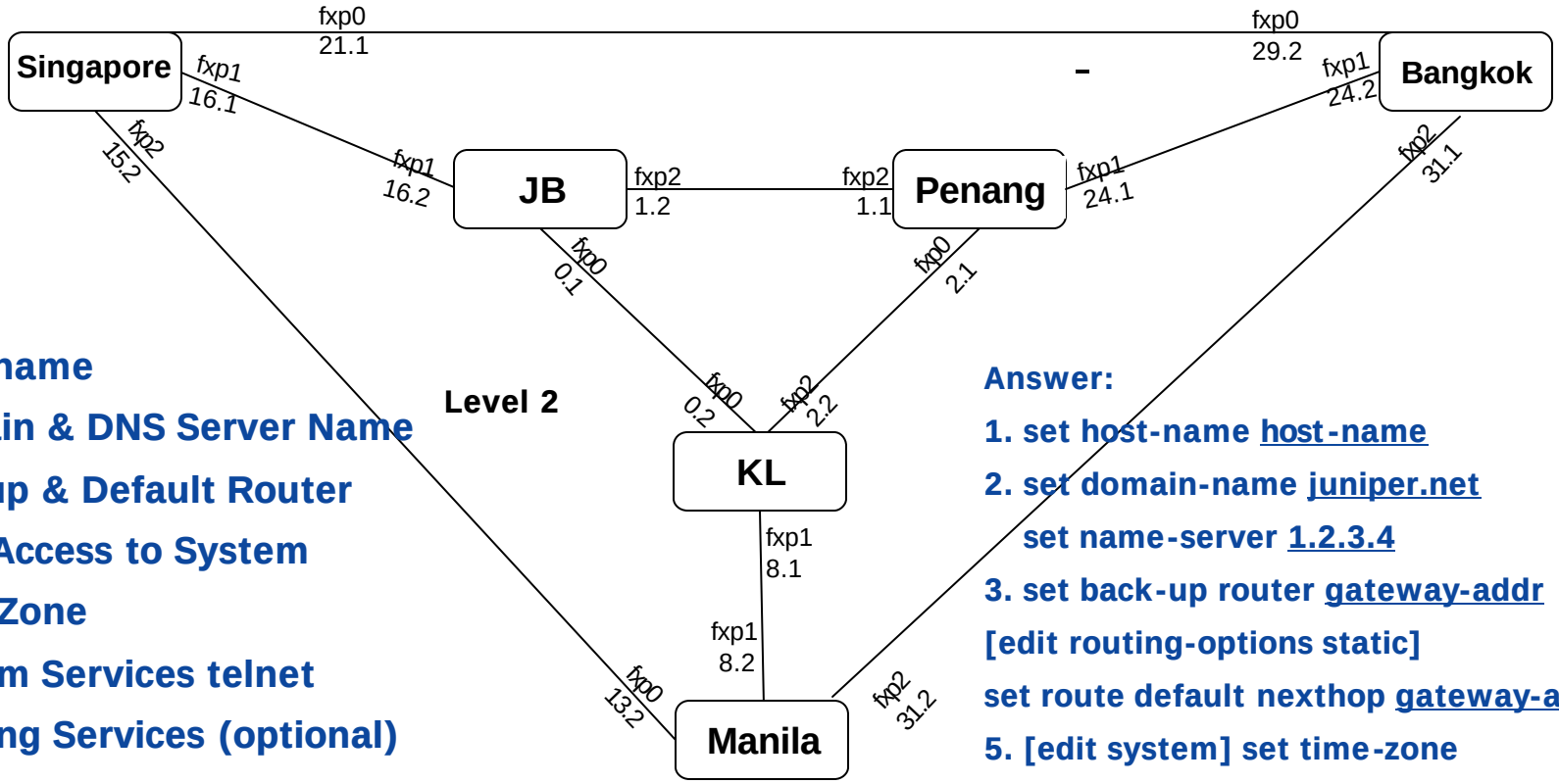
```
interfaces {
     so-1/0/3 {
          unit 0 {
                family inet {
                     address 10.0.20.1/24;
                }
          }
     }
}
```

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

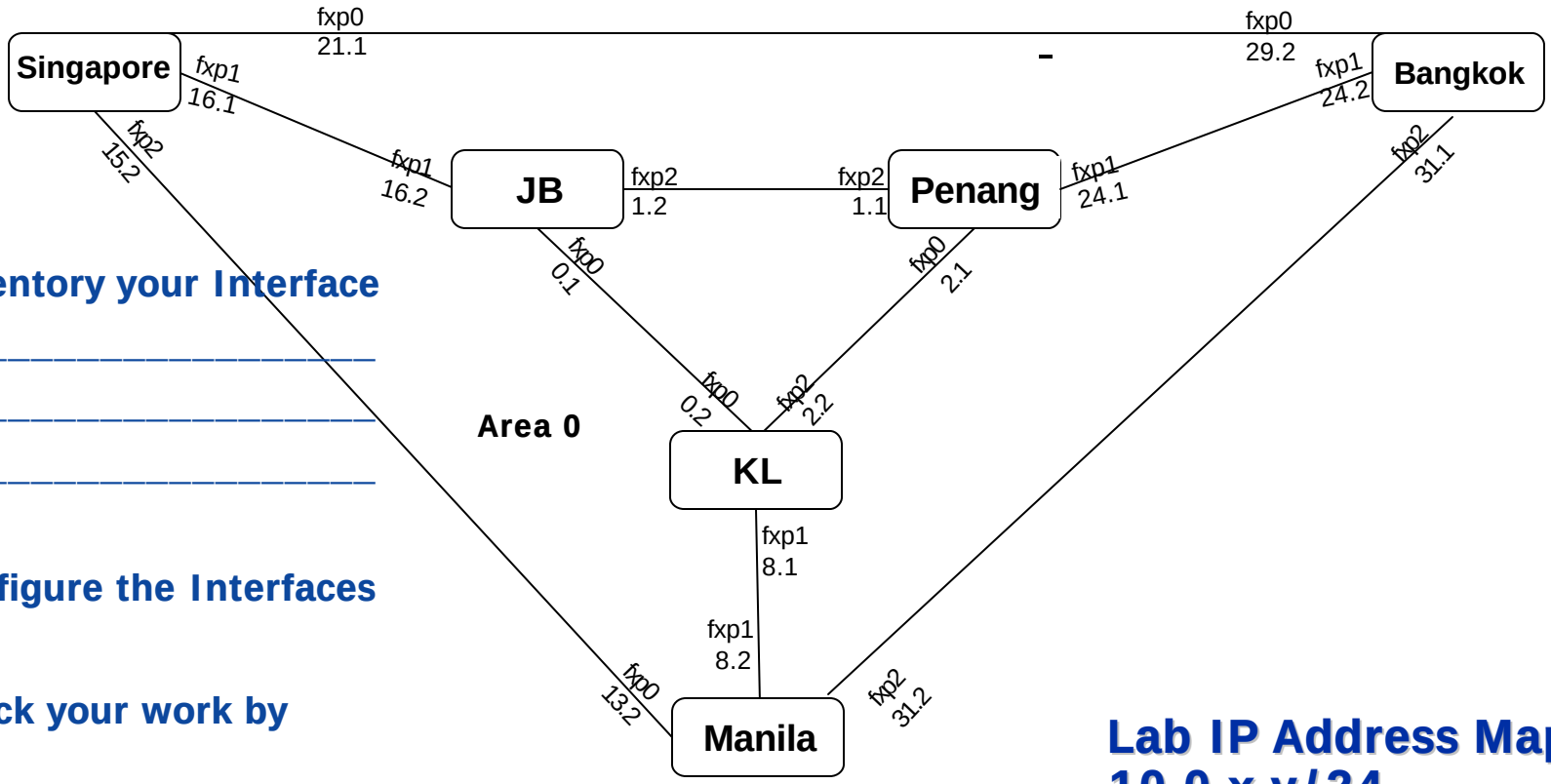


1. Host name
2. Domain & DNS Server Name
3. Backup & Default Router
4. User Access to System
5. Time Zone
6. System Services telnet
7. Logging Services (optional)

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:_____

Lab IP Address Map
10.0.x.y/24