JNCIP

Juniper® Networks Certified Internet Professional Study Guide - Chapter 1

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Juniper® NETWORKS

Chapter 1

Initial Configuration and Platform Troubleshooting

JNCIP LAB SKILLS COVERED IN THIS CHAPTER:

- ✓ Use terminal server to access router console ports
- ✓ Configure OoB management network and host name
- ✓ Create user accounts and system authentication options
- ✓ Configure syslog parameters
- ✓ Configure network management and NTP
- ✓ Determine JUNOS software version and perform upgrades
- ✓ Configure chassis alarms and redundancy

In this chapter, you will be exposed to configuration tasks that are characteristic of those encountered when installing a brand-new M-series or T-series router. These initial configuration and maintenance tasks include setting up the Out of Band (OoB) management network, user accounts and permissions, the Network Time Protocol (NTP), syslog parameters, chassis alarms, redundancy, and maintaining JUNOS software.

You will learn numerous JNCIP-level configuration requirements along with the commands needed to correctly configure a Juniper Networks router for that task. Wherever possible, you will also be provided with techniques that can be used to verify the operation and functionality of the various elements that make up your system's configuration. The chapter concludes with a case study that is designed to closely approximate a typical JNCIP initial system configuration scenario. A router configuration that meets all case study requirements is provided at the end of the case study for comparison with your own configuration.

To kick things off, you will need to access the console ports of your assigned routers using reverse telnet connections though a terminal server. As you establish initial contact with each of your routers, you should make note of the types of routers provided in your test bed and be on guard for any symptoms of hardware malfunction or aberrant operation.

TIP

Faulty hardware is never intentionally given to a JNCIP candidate, but hardware failures do occur. In view of the time pressures associated with the JNCIP practical examination, you would be wise to bring suspicions of faulty hardware to the proctor's attention as soon as possible. The proctor will confirm whether there is actually a problem and may provide workaround instructions as needed. Before calling in the proctor, it is generally a good idea to try rebooting the router, because symptoms of bad hardware may be caused by software malfunctions that are sometimes cleared by a reboot.

Task 1: Access Routers Using a Terminal Server

As described in the introduction, your JNCIP test bed consists of seven freshly flashed M-series routers, a terminal server, and a 100Mbps Fast Ethernet LAN segment that will serve as your network's Out of Band (OoB) management network. Because your routers have a factory-fresh default configuration, you will not be able to telnet to the routers until you have correctly configured the OoB management network. Therefore, you should plan on accessing the console ports of the routers assigned to your station using an IOS-based (2517 or similar) terminal server to perform your initial configuration task. Since the actual examination does not involve non–Juniper Networks products, you will be instructed on how to use the particular terminal server used at your testing center.

NOTE Although you can use the router console ports for the duration of the examination, most candidates find that it saves time to open multiple telnet sessions (one per router) using the Out Of Band (OoB) management network that is configured during the examination. You should use the terminal server whenever you are performing router maintenance (such as upgrading JUNOS software), or when routing problems cause telnet access problems.

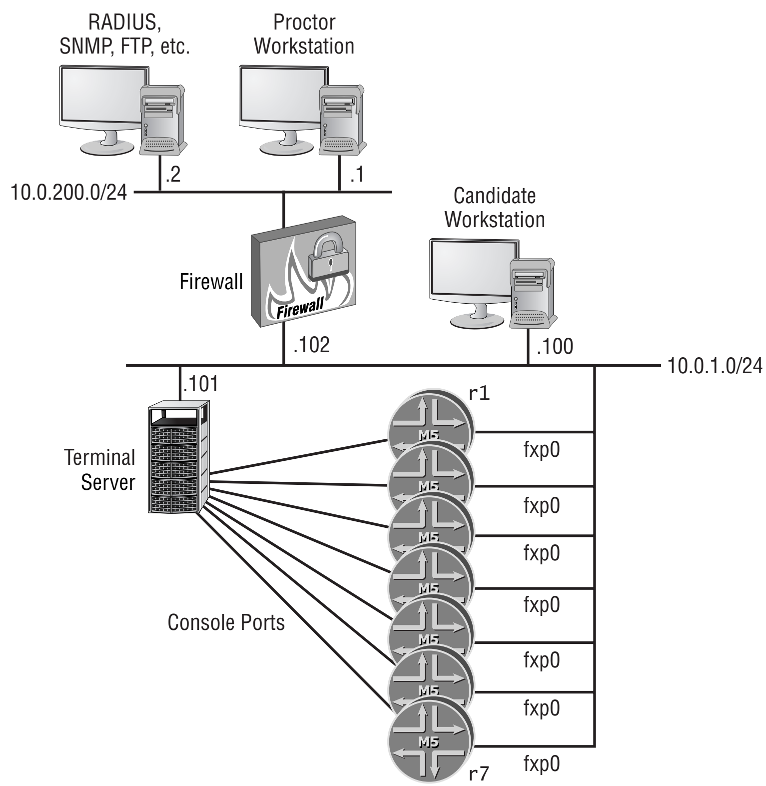
Console Connections

The OoB (Out of Band) management topology is illustrated in Figure 1.1. Based on this figure, you can see that the IP address of the terminal server is 10.0.1.101, and that its asynchronous interfaces are connected in ascending order to the console ports of each router that is associated with your test pod.

The testing center will provide you with both user EXEC and privileged EXEC mode passwords for the terminal server (or their equivalents should a non–IOS-based terminal server be in use). You'll sometimes need the privileged EXEC mode login to reset connections when you receive error messages about ports being busy or when you see messages about connections being refused. The following is an example of a typical login session to the terminal server:

```
telnet 10.0.1.101
Trying 10.0.1.101...
Connected to 10.0.1.101.
Escape character is '^]'.


User Access Verification

Password:
cert-ts>enable
Password:
cert-ts#
```

FIGURE 1.1 The Out of Band (OoB) management network



Depending upon the specifics of your test bed, you may want to configure symbolic name mappings on the terminal server to simplify the task of reverse telnetting. This will enable you to use symbolic names in lieu of specifying the reverse telnet port and IP address on the command line. In the preceding example, these name-to-address mappings have already been configured on the terminal server:

```
ip host r1 2001 10.0.1.101
ip host r2 2002 10.0.1.101
ip host r3 2003 10.0.1.101
ip host r4 2004 10.0.1.101
ip host r5 2005 10.0.1.101
ip host r6 2006 10.0.1.101
ip host r7 2007 10.0.1.101
```

In this configuration, you can see that port 2001 on the terminal server, which maps to its first asynchronous port, is associated with the symbolic name of `r1`. Now, to establish a reverse telnet connection to the console port of router 1, the user need only enter **`r1`** on the terminal server's command line. If host mappings have not been configured on your terminal server, you will need to specify the correct port identifier and IP address on the command line, as shown here:

```
cert-ts#telnet 10.0.1.101 2001
Trying 10.201.1.253, 2001 ... Open
<operator hits "enter">


Amnesiac (ttyd0)

login:
```

In the foregoing example, you can see that the reverse telnet session to `r1` has succeeded, in that the router is now presenting its login prompt.

NOTE: The `Amnesiac` prompt shown in the previous example is indicative of a router that is booting from a factory-fresh JUNOS software load, which, by definition, will not have a hostname configured. When preparing the lab for JNCIP testing, it is standard practice for the proctor to flash every router using removable media (PCMCIA) cards at the end of each certification attempt. This ensures that each new candidate will begin his or her test from a known starting point and will prevent possible difficulties caused by a previous candidate's tampering with the system's binaries or file structure.

Initial Console Login

Because the router is booting from a factory-fresh load, the only existing login account will be the user `root`. Initially, this account has no associated password. When logging in as `root`, the user is presented with the shell prompt, so the JUNOS software command-line interface (CLI) must be started manually as shown here:

```
login: root

--- JUNOS 5.2R1.4 built 2002-03-10 01:12:05 UTC

Terminal type? [vt100]
root@% cli
root>
```

Switching Among Reverse Telnet Sessions

Although the reverse telnet sessions can be opened in any order, it is highly recommended that you open the sessions to your routers in a sequential fashion. This will make it easy to switch among sessions using session numbers that map directly to corresponding router numbers. To regain the IOS command prompt, the user must enter an escape sequence consisting of a simultaneous Ctrl+Shift+6 followed by pressing the **x** key (the escape sequence is not echoed back to the user but is shown in angle brackets in the following to illustrate use of the escape sequence):

```
root> <control-shift-6 x>
pod2-ts#r2
Trying r2 (10.0.1.101, 2002)... Open


Amnesiac (ttyd0)

login:
```

After entering the escape sequence, the user is presented with an IOS prompt. If the user simply presses Enter at this point, the connection to `r1` will be resumed. In this example, the user establishes a reverse telnet session to the next router (router 2) using the symbolic name `r2`. To switch between these two sessions, the user can now enter the escape sequence followed by the connection number, which will be either a `1` or a `2` at this stage:

```
login: <control-shift-6 x>
pod2-ts#1
[Resuming connection 1 to 10.0.1.101 ... ]


root>
```

Clearing Terminal Server Sessions

Although it's rarely necessary, sometimes you have to manually clear one or more reverse telnet sessions on the terminal server when connections cannot be correctly established to a given router's console port. This will require that you regain a privileged EXEC mode IOS command prompt to display and clear the problem line. Listing 1.1 is an example of this process. It demonstrates the clearing of Line 2 after a problem with access to `r2` has been encountered:

Listing 1.1: Clearing Terminal Server Lines (IOS-Based Terminal Server)

```
pod2-ts#r2
Trying r2 (10.0.1.101, 2002)...
% Connection refused by remote host
```

```
pod2-ts#show line
 Tty Typ     Tx/Rx     A Modem  Roty AccO AccI  Uses    Noise   Overruns
   0 CTY               -   -      -    -    -     0        0        0/0
*  1 TTY   9600/9600   -   -      -    -    -     3        0        0/0
*  2 TTY   9600/9600   -   -      -    -    -     4     2031        0/0
   3 TTY   9600/9600   -   -      -    -    -     3     1546        0/0
   4 TTY   9600/9600   -   -      -    -    -     3        0        0/0
   5 TTY   9600/9600   -   -      -    -    -     1        0        0/0
   6 TTY   9600/9600   -   -      -    -    -     1    72050        3/0
   7 TTY   9600/9600   -   -      -    -    -     1    19691        1/0
   8 TTY   9600/9600   -   -      -    -    -     1        0        0/0
   9 TTY   9600/9600   -   -      -    -    -     1        0        0/0
  10 TTY   9600/9600   -   -      -    -    -     2        0        0/0
  11 TTY   9600/9600   -   -      -    -    -     0        0        0/0
  12 TTY   9600/9600   -   -      -    -    -     0        0        0/0
  13 TTY   9600/9600   -   -      -    -    -     0        0        0/0
  14 TTY   9600/9600   -   -      -    -    -     0        0        0/0
  15 TTY   9600/9600   -   -      -    -    -     0        0        0/0
  16 TTY   9600/9600   -   -      -    -    -     0        0        0/0
  17 AUX   9600/9600   -   -      -    -    -     0        0        0/0
* 18 VTY               -   -      -    -    -    26        0        0/0
  19 VTY               -   -      -    -    -     0        0        0/0
  20 VTY               -   -      -    -    -     0        0        0/0
  21 VTY               -   -      -    -    -     0        0        0/0
  22 VTY               -   -      -    -    -     0        0        0/0

pod2-ts#clear line 2
[confirm]y [OK]
pod2-ts#r2
Trying r2 (10.0.1.101, 2002)... Open
<user hits enter>

Amnesiac (ttyd0)

login:
```

Reverse telnet sessions connect the user to a tty (asynchronous terminal line) on the terminal server. You will want to focus on tty sessions that have an asterisk (*) next to them, because this character indicates the line is in use. To clear a line, enter the **clear line *n*** command at the privileged EXEC mode prompt, and confirm the clear by entering **y** when prompted.

A Caution About Clearing Sessions

The "failure" described in Listing 1.1 was simulated by trying to open a second telnet session to port 2002 on the terminal server without first clearing the existing session. The operator should have simply entered the session number (2 in this case) to switch back to the previously established connection to resume the connection to router `r2`. Clearing sessions in the manner described can result in session numbers that are no longer directly related to router numbers, which can be very confusing—for example, the session associated with `r2` might end up being number 8. When reverse telnet problems are detected, many candidates find it simpler to simply log out of an IOS-based terminal server, which causes the terminal server to clear all existing connections (after the user confirms). After reconnecting to the terminal server, the telnet sessions to all routers can be reestablished in the correct numeric sequence.

Task 2: Configure the OoB Management Network

Once you have opened reverse telnet sessions to each of the routers assigned to your test bed, you will want to configure and test the fxp0-based OoB management network and assign the correct hostname to each router. Once again referring to Figure 1.1, you can see that each router's fxp0 interface connects to a shared Ethernet segment with a logical IP subnet of 10.0.1.0/24. Also, the host value of each fxp0 address must match the router number, so router 1 will have the address 10.0.1.1 assigned to its fxp0 interface. The OoB management network must be reachable from the proctor's workstation, which is attached to subnet 10.0.200/24 behind a firewall router.

Because each router also requires a unique name, it makes sense to configure the router's hostname along with the OoB addressing and telnet service at this point. The following commands, entered on `r1`, will set the correct IP address and hostname for this exercise, and will enable the telnet service:

```
root> configure
Entering configuration mode

[edit]
root# set system host-name r1

[edit]
root# set interfaces fxp0 unit 0 family inet address 10.0.1.1/24

[edit]
root# set system services telnet
```

The resulting configuration is now as follows:

```
[edit]
root# show interfaces
fxp0 {
    unit 0 {
        family inet {
            address 10.0.1.1/24;
        }
    }
}

[edit]
root# show system
host-name r1;
services {
    telnet;
}
syslog {
    user * {
        any emergency;
    }
    file messages {
        any notice;
        authorization info;
    }
}
```

With the correct configuration now in `r1`, you decide to commit the changes to place them into effect:

```
[edit]
root# commit and-quit
commit complete
Exiting configuration mode

root@r1>
```

After the candidate configuration has been successfully committed, the router's command prompt takes on the newly assigned hostname. Although the configuration steps performed thus far will make telnet access available to the candidate, the router currently does not have a route back to the proctor's subnet, which will prevent proctor-initiated telnet connection to your routers. To rectify this situation, you must add a static route on each router for the 10.0.200/24 proctor subnet, using the firewall router (10.0.1.102) as the next hop. This route should have the `no-readvertise` tag to ensure the router does not inadvertently redistribute the static route in a later lab scenario. The following commands create the necessary static route and show the resulting configuration change:

```
[edit routing-options static route]
root@r1# set 10.0.200/24 next-hop 10.0.1.102 no-readvertise

[edit routing-options]
root@r1# show
static {
    route 10.0.200.0/24 {
        next-hop 10.0.1.102;
        no-readvertise;
    }
}
```

To confirm that the OoB management network and static routing are operational, try to ping the RADIUS/FTP server on the proctor subnet, like this:

```
root@r1> ping 10.0.200.2
PING 10.0.200.2 (10.0.200.2): 56 data bytes
64 bytes from 10.0.200.2: icmp_seq=0 ttl=255 time=1.228 ms
64 bytes from 10.0.200.2: icmp_seq=1 ttl=255 time=0.701 ms
^C
--- 10.0.200.2 ping statistics ---
2 packets transmitted, 2 packets received, 0% packet loss
round-trip min/avg/max/stddev = 0.701/0.964/1.228/0.264 ms
```

Based on the successful results shown in this output, things are now looking good for your OoB management network.

Task 3: Create User Accounts

When the OoB management network and its associated routing are confirmed to be operational, you will likely want to configure various user accounts. These accounts should make use of both local and remote authentication, and should also verify your ability to use `allow` and `deny` commands to provide local control of user authorization levels.

In the example shown in Table 1.1, the following accounts (and permissions) will be configured to demonstrate typical user account configuration and validation techniques.

TABLE 1.1 User Account Parameters

User	Password	Class/Permission	Notes
`root`	`root`	`superuser`	SSH with 1024-bit RSA public key authentication. Local password and RADIUS authentication criteria are the same as for user `lab`.
`lab`	`lab`	`superuser`	RADIUS/local password with automatic login in the event of RADIUS failure. RADIUS secret is *`jni`*.
`ops`	`operator`	Can view standard `show interfaces` output and conduct ping testing only.	RADIUS/local password, 5-minute inactivity time-out.

Configuring the Root Account

As noted in Table 1.1, the `root` user's account must be configured for SSH public key and RADIUS/local password authentication. The following commands configure the root account with the required SSH version 1 RSA public key (version 2 RSA keys are not supported at the time of this writing so a version 1 key must be loaded). It is important to note that the operator must manually add the opening and closing quotes (" ") so that white spaces in the key string do not cause syntax errors if the key is pasted from a terminal buffer. You could also choose to edit the `~/.ssh/authorized_keys` file manually to add the public RSA key (by escaping to a shell and using vi), or you could transfer the key file to the router using the `load-key-file` option with an appropriate URL, such as `ftp://user:password@hostname/file-name`. However, the CLI paste approach demonstrated here is generally considered to be the most straightforward:

```
[edit system root-authentication]
root@r1# set ssh-rsa "key-data-pasted-from-terminal"
```

And now, to enable the SSH service on the router, which by default will support both SSH version 1 and 2:

```
[edit system]
root@r1# set system services ssh
```

Since the use of SSH public key authentication for the root account has no effect on local console-based logins, we also set the required root password:

```
[edit system]
root@r1# set root-authentication plain-text-password
New password:
Retype new password:
```

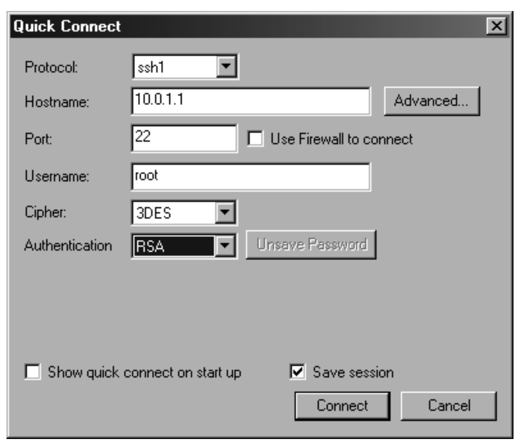
The following is the resulting configuration for the root account and the SSH service:

```
[edit system]
root@r1# show root-authentication
encrypted-password "$1$n/lx3$RNtF9uDlCsMsAL8gi/qA31"; # SECRET-DATA
ssh-rsa "1024 65537 
14507521839282798432482521835023055326381401663452058669080886491465544700784392
81114055822376198290722320666268020211763429857348456378696103199986915461962494
35479692894437417780898017483440313841107367122670080439972894195679320796753410
73122283389914186932758323117090604798581468254494190510741683980 3283 root"; # 
SECRET-DATA

lab@r2# show system services
ssh;
telnet;
```

Verify the Root Account

To confirm operation of the root account, you should test local authentication using the root password, and test SSH authentication using an appropriately configured session on your terminal emulator. The SSH session settings used in the SecureCRT application are shown in Figure 1.2; it should be noted that RSA (public key) has been selected as the authentication method (as opposed to password-based authentication).

FIGURE 1.2 SSH session settings for the root account



Generating SSH Key Pairs

The method used to generate your own SSH public/private key pair will vary based on SSH version and the particular client software being used.

For a Unix-like operating system Generate a 1024-bit SSH version 1 RSA key pair using the `ssh-keygen` program with the `–b` flag set to ***1024*** and the `-t` flag set to ***rsa1***. By default, the resulting public key will be written to `$HOME/.ssh/identity.pub`. The contents of this file would then be loaded into the router using the techniques described in the section "Configuring the Root Account" earlier in this chapter. Typical `ssh-keygen` output is shown here:

```
[harry@dr-data harry]$ ssh-keygen -b 1024 -t rsa1
Generating public/private rsa1 key pair.
Enter file in which to save the key (/home/harry/.ssh/identity):
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /home/harry/.ssh/identity.
Your public key has been saved in /home/harry/.ssh/identity.pub.
The key fingerprint is:
d1:ac:20:9b:f6:82:04:06:09:69:11:57:66:8d:17:be harry@dr-data.net
```

After loading the resulting public key into the router, SSH connectivity can be tested:

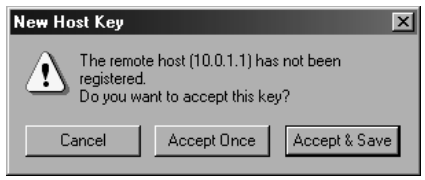
```
[harry@dr-data harry]$ ssh -l root -1 10.0.1.1
The authenticity of host '10.0.1.1 (10.0.1.1)' can't be established.
RSA1 key fingerprint is 10:e1:82:2f:6b:c3:9c:5e:84:d5:6c:0b:df:1c:3d:ea.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '10.0.1.1' (RSA1) to the list of known hosts.
Enter passphrase for RSA key '/home/harry/.ssh/identity':
Last login: Wed May 15 17:38:58 2002 from 10.0.1.201
--- JUNOS 5.2R2.3 built 2002-03-23 02:44:36 UTC

root@r1%
```

In this example, the -l switch was needed to indicate that the remote login name should be `root` instead of the user's local Unix login name, which would be `harry` in this case. The -1 was also needed to indicate that SSH version 1 should be used, because the SSH configuration on this author's Linux machine causes it to first try SSH version 2.

For the SecureCRT application Generate a key pair by clicking the Advanced button in the SSH Quick Connect dialog box, followed by selecting the Create Identity File option in the resulting Advanced SSH Options dialog box, which will open the SecureCRT Key Generation Wizard. The wizard will guide you through the remaining key generation steps. When the Wizard completes, you will be prompted to enter the directory and key filenames for your newly generated secret and public keys. When using SecureCRT version 3.1.2, the default location and filename for the secret key is `C:\Program Files\SecureCRT 3.0\identity`. The public key will be stored in the same directory with a `.pub` file extension. As described in the previous "For a Unix-like Operating System" section, the contents of this public key file should be loaded into the router using the procedures outlined in the "Configuring the Root Account" section earlier in this chapter.

You will be asked to accept a "new host key" when testing SSH connectivity to the router for the first time, as shown in Figure 1.3.

FIGURE 1.3 Accepting a new host key



After accepting the host key, you will be prompted to enter the pass phrase associated with the session's private key. When the correct pass phrase is entered, you should be logged in as the `root` user and presented with a shell prompt.

Configuring the Lab Account

The following commands establish the lab account and associate the user with the `superuser` login class:

```
[edit system]
root@r1# set login user lab class superuser
[edit system]
root@r1# set login user lab authentication plain-text-password
New password:
Retype new password:
```

Because the lab, root, and ops accounts are to be authenticated through RADIUS, you must now configure the RADIUS server's properties. The RADIUS-related parameters needed for this task are configured with the following commands:

```
[edit system]
lab@r1# set radius-server 10.0.200.2 secret jni
```

TIP: If your test bench does not offer RADIUS support, you can reduce the delay associated with the failed RADIUS authentication requests by setting the `retry` and `timeout` parameters to `1`.

To tell the system that RADIUS authentication is to be used first, you must specify `radius` as the first entry in the system's `authentication-order` list with the following command:

```
[edit system]
root@r1# set authentication-order radius
```

The resulting lab account and RADIUS configuration are shown next:

```
root@r1# show login user lab
class superuser;
authentication {
    encrypted-password "$1$nNISN$o7OGTEhEF5sOcgjS9pOLfO"; # SECRET-DATA
}
root@r1# show radius-server
10.0.200.2 secret "$9$NQVs4Pfz36A"; # SECRET-DATA
[edit system]
root@r1# show authentication-order
authentication-order radius;
```

Verify the Lab Account

To verify the lab account, we log out as `root` and reconnect as the `lab` user:

```
root@r1% exit
logout

r1 (ttyd0)

login: lab
Password:
Last login: Fri Mar  8 16:20:47 on ttyd0

--- JUNOS 5.2B3.1 built 2001-12-28 18:50:44 UTC

lab@r1>
```

Though the previous capture indicates that your user account is functional, notice the terminology "automatic login in the event of RADIUS failure" in Table 1.1, shown earlier. This should cause you to wonder what would happen if the RADIUS server should become unreachable. To simulate a RADIUS failure, the shared secret is changed to `foo` and the lab account is retested:

```
[edit system radius-server]
lab@r1# set 10.0.1.102 secret foo
```

```
[edit system radius-server]
lab@r1# commit and-quit
commit complete
Exiting configuration mode

lab@r1> quit


r1 (ttyd0)

login: lab
Password:
Local password:
Last login: Mon Apr  1 12:36:17 on ttyd0

--- JUNOS 5.2B3.1 built 2001-12-28 18:50:44 UTC

lab@r1>
```

Note the second prompt that asks for a local password. This indicates that automatic login is not functional. The problem lies in the omission of the `password` keyword in the system's `authentication-order` statement. Adding `password` after `radius` will cause the router to automatically verify the user's password against the local password database when access to the RADIUS server fails. To meet the configuration criteria, you must enter the following command to add `password` to the router's authentication order list:

```
[edit]
lab@r1# set system authentication-order password

[edit]
lab@r1# show system authentication-order
authentication-order [ radius password ];

[edit]
lab@r1# commit and-quit
commit complete
Exiting configuration mode
```

With the changes committed, we now retest the `lab` login:

```
lab@r1> quit

r1 (ttyd0)
```

```
login: lab
Password:
Last login: Mon Apr  1 12:41:09 on ttyd0

--- JUNOS 5.2B3.1 built 2001-12-28 18:50:44 UTC

lab@r1>
```

The user is now automatically logged in using the local password database when access to the RADIUS server is broken. After testing, you should reset the shared RADIUS secret to the correct value as specified in Table 1.1, shown earlier.

NOTE The local password database is not consulted when the RADIUS server returns an `access reject` message because of an unknown username or incorrect password being used. You will need to remove (or deactivate) the system's RADIUS configuration or change the authentication order to allow local logins if you feel that the RADIUS server has been misconfigured with regard to a given account's username or password.

Configure the Ops Account

You will now configure a user called `ops` that is only authorized to view the output of `show interfaces` and conduct ping testing.

The commands in Listing 1.2 configure the ops account and display the resulting configuration:

Listing 1.2: Commands for Configuring the Ops Account

```
[edit system login]
root@r1# set user ops class ops authentication plain-text-password
New password:
Retype new password:

[edit system login]
root@r1# set class ops permissions network

[edit system login class]
root@r1# set ops idle-timeout 5

[edit system login class]
root@r1# set ops allow-commands "show interfaces $"
```

```
[edit system login class]
root@r1# set ops deny-commands "traceroute|telnet|ssh"

[edit system login class]
root@r1# up

[edit system login]
root@r1# show user ops
uid 2002;
class ops;
authentication {
    encrypted-password "$1$SgJQQ$VYXXLPf9/TMOnb2ohWxOJ."; # SECRET-DATA
}

[edit system login]
root@r1# show class ops
idle-timeout 5;
permissions network;
allow-commands "show interfaces";
deny-commands "traceroute|telnet|ssh";
```

NOTE Because these user account requirements involve custom settings of login class permissions, care should be taken to avoid the use of the predefined login classes (`operator`, `read-only`, `superuser`, and `unauthorized`). The parameters associated with these accounts cannot be modified. Depending on the JUNOS software version being used, you may be allowed to configure customized settings for the predefined login classes, but these changes will not actually have any effect on their default permissions.

This configuration example illustrates one possible solution to the ops account restrictions as specified in this example. In this case, we begin with a login class that contains only the `network` permission, which, by default, allows only access to the ping, telnet, traceroute, and SSH commands. Because the `ops` user should have access only to the ping utility, the `deny-commands` option was used with a regular expression to explicitly deny access to the telnet, traceroute, and SSH commands. In a similar fashion, the `allow-commands` option was included in the `ops` class to explicitly permit the use of the `show interfaces` command. Further, the nature of this `allow-commands` regular expression will not allow arguments such as `detail` or `terse` with the `show interfaces` command, so the `ops` user will be able to issue only the standard `show interfaces` command. In contrast, specifying `show interfaces$` as the regular expression for allowed commands will provide access to the full range of options supported by the `show interfaces` command.

Verify the Ops Account

To confirm the ops login and account permissions, we log in as `ops` and verify that we have access to the standard `show interfaces` and `ping` commands. Listing 1.3 shows you this sequence. Based on the results shown in Listing 1.3, you can see that all the account restrictions for the `ops` user have been met.

Listing 1.3: Verify Ops Account Permissions

```
ops@r1> show ?
Possible completions:
  host                 Host name lookup service using domain name server
  interfaces           Show interface information

ops@r1> show interfaces
Physical interface: fe-0/0/0, Enabled, Physical link is Down
  Interface index: 10, SNMP ifIndex: 13
  Link-level type: Ethernet, MTU: 1514, Speed: 100mbps,
. . .

ops@r1> show interfaces fxp0 detail
error: permission denied for interfaces: detail

ops@r1> ping 10.0.1.102
PING 10.0.1.102 (10.0.1.102): 56 data bytes
64 bytes from 10.0.1.102: icmp_seq=0 ttl=255 time=0.560 ms
^C
--- 10.0.1.102 ping statistics ---
1 packets transmitted, 1 packets received, 0% packet loss
round-trip min/avg/max/stddev = 0.560/0.560/0.560/0.000 ms

ops@r1> tra
        ^
unknown command.
ops@r1> tel
        ^
unknown command.
ops@r1>
```

Task 4: Configure Syslog Parameters

Now that your user accounts are configured and you have confirmed that they work, you can move on to adjusting the default syslog parameters. The default syslog configuration on an M-series router will be similar to this example:

```
[edit]
lab@r1# show system syslog
user * {
    any emergency;
}
file messages {
    any notice;
    authorization info;
```

The default syslog settings will display emergency-level messages for all facility classes to any user that is logged in, and will log at the notice and info levels to the file `messages` for all facility classes and for the authorization class, respectively. The default archive settings will allow up to ten 128KB files that are not world-readable.

In this example, your goal is to modify the default syslog parameters to achieve the following criteria:

- Place authorization messages into a log file named `auth`
- Permit five copies of the `auth` file, each no larger than 5MB

The commands used to meet these requirements are as follows:

```
[edit system syslog]
lab@r1# delete file messages authorization

[edit system syslog]
lab@r1# set file auth authorization info

[edit system syslog]
lab@r1# set file auth archive files 5 size 5m
```

And here is the modified syslog stanza:

```
[edit system syslog]
lab@r1# show
user * {
    any emergency;
}
```

```
file messages {
    any notice;
}
file auth {
    authorization info;
    archive size 5m files 5;
}
```

Verify Syslog Operation

Verifying the modified syslog parameters is relatively simple. You can open a second telnet connection to the router and monitor the log files while you log in and out, or you can view the log files offline to confirm that authorization-related information is now being written to both the `auth` and `messages` log files. The second approach is illustrated next:

```
lab@r1> quit

r1 (ttyd0)

login: anything
Password:
Login incorrect
login: ^CClient aborted login

r1 (ttyd0)

login: lab
Password:
Last login: Mon Apr  1 14:33:26 on ttyd0

--- JUNOS 5.2B3.1 built 2001-12-28 18:50:44 UTC

lab@r1> show log auth
Apr  1 14:36:25 r1 login: 1 LOGIN FAILURE ON ttyd0
Apr  1 14:36:30 r1 login: login on ttyd0 as lab
```

When modifying the syslog configuration, care should be taken to ensure that the remaining default settings are left according to the lab scenario's instructions. For example, the following syslog configuration sets the default archive parameters of all files at the `[edit system syslog]` level and below to five files of 5MB each. Such a setting will also affect the size and number of the archived `messages` files stored on your router. Depending on the specifics of your configuration requirement, changing the default size and number of archived messages files could result in lost points on the JNCIP exam:

```
[edit system syslog]

lab@r1# show
archive size 5m files 5;
user * {
    any emergency;
}
file messages {
    any notice;
}
file auth {
    authorization info;
}
```

Task 5: Configure Network Management and NTP

Now that you have correctly set your syslog parameters, we next examine typical SNMP and NTP configuration requirements. SNMP can be used to pull statistics and operational status from your router, while the NTP protocol can be used to ensure that all of the routers in your test bench have an accurate and consistent time-of-day setting.

Configure SNMP

In the following example, we will configure SNMP with the parameters listed next. Refer to Figure 1.1, shown earlier, for addressing specifics:

- Only allow SNMP access from the SNMP server
- Only allow SNMP access over the fxp0 interface
- Use a community string of `test`
- Send all link up and down related traps to the SNMP server

These requirements are met with the following SNMP configuration:

```
[edit snmp]
lab@r1# show
interface fxp0.0;
```

```
community test {
    clients {
        10.0.200.2/32;
    }
}
trap-group interface {
    categories link;
    targets {
        10.0.200.2;
    }
}
```

By default, SNMP requests will be accepted over any interface. Specifying one or more interface names under the `interface` keyword will cause SNMP requests on nonmatching interfaces to be ignored. Similarly, all clients are allowed to make requests by default; specifying one or more client IP addresses after the `clients` keyword causes requests from nonmatching clients to be ignored. This example includes a trap group named *`interface`* that has been configured to send link up and down traps to the SNMP server by including the `link` keyword under the `categories` hierarchy. By default, both SNMP versions 1 and 2 traps will be sent, but either version can be forced through appropriate trap group configuration.

SNMP uses community strings for authentication. Failure to include a community string will result in the denial of all SNMP requests, while specifying the wrong community string will result in otherwise legitimate requests being denied, so take care when configuring your SNMP community values, and pay special attention to the community string case as the strings are case sensitive. By default, SNMP clients are authorized to view only. Read and write access (SNMP get and put) can be granted by including the `read-write` keyword under the community definition as shown next:

```
[edit snmp]
lab@r1# set community test authorization read-write
```

Verify SNMP

The verification of correct SNMP configuration can be difficult without access to the SNMP management station. There are a few things you can do to test your SNMP configuration, however. You can start by verifying that the router is now listening on UDP port 161, which is the port associated with SNMP requests:

```
lab@r1> show system connections
Active Internet connections (including servers)
Proto Recv-Q Send-Q  Local Address          Foreign Address        (state)
tcp4       0      0  *.23                   *.*                    LISTEN
tcp4       0      0  *.22                   *.*                    LISTEN
tcp4       0      0  10.0.1.1.22            10.0.1.100.2346        ESTABLISHED
tcp4       0      0  *.666                  *.*                    LISTEN
```

```
udp46      0      0  *.161                *.*
udp4       0      0  *.161                *.*
udp4       0      0  *.500                *.*
udp46      0      0  *.1025               *.*
udp4       0      0  *.1024               *.*
udp4       0      0  *.*                  *.*
udp4       0      0  *.123                *.*
```

Proper trap group operation can be verified by monitoring traffic on the system's OoB interface using the following steps. First, open a second telnet session to the router for the purpose of monitoring UDP traffic on the router's fxp0 interface. This is done using the following command:

```
root@r1> monitor traffic interface fxp0 matching udp
Listening on fxp0
```

Second, assign an arbitrary address to the router's lo0 interface in order to generate a link up trap. Once the configuration is committed, an SNMP trap should be generated on the router's fxp0 interface. If the trap group is configured correctly, you will see something that is similar to the following. Note that the destination address for the trap matches the address of the SNMP server shown earlier in Figure 1.1.

```
15:34:45.871146 Out 10.0.1.1.1024
  > 10.0.200.2.snmptrap:  C=interface Trap(36)
  E:2636.1.1.1.2.5 10.0.1.1 linkUp 1467547 [|snmp]
15:34:45.871250 Out 10.0.1.1.1024
  > 10.0.200.2.snmptrap:  C=interface V2Trap(35)
  system.sysUpTime.0=1467547 .iso.org.dod.internet=[|snmp]
```

You can monitor SNMP command response operation through SNMP protocol tracing, but the monitor traffic mechanism shown previously is the best way to verify that your router is sending SNMP traps as required.

NOTE

After verifying the trap, be sure to remove any arbitrary addressing that you have assigned to the lo0 interface. Neglecting to do so could cause problems in a subsequent lab scenario.

Configure NTP

Once again, refer to Figure 1.1 for the addressing specifics needed to complete this task. In this example, you will need to configure your router as a unicast NTP client because the NTP server is not directly attached to your OoB management network and the lack of multicast/broadcast forwarding on the firewall router will prevent the use of multicast or broadcast client modes.

In this example, you will configure NTP on the local router to meet the following criteria:

- The router must synchronize to the NTP server.
- The router's clock cannot set automatically at boot.
- NTP version 4 must be used, with MD5 authentication using key ID 101 and a key value of `jni`.

The following configuration commands get us started on these criteria:

```
[edit system ntp]
lab@r1# set server 10.0.200.2 key 101

[edit system ntp]
lab@r1# set trusted-key 101

[edit system ntp]
lab@r1# set authentication-key 101 type md5 value jni
```

The first command tells the router to operate as an NTP client, and to include authentication key 101 in the messages it sends to the NTP server identified as 10.0.200.2. The second command specifies that messages containing a key ID of 101 are to be trusted, and the last command defines the key parameters by specifying the use of message digest 5 (MD5) and the key value of `jni`. Since NTP version 4 is the default for unicast NTP in JUNOS software 5.2, no NTP version–related configuration is necessary, but explicit version configuration is never a bad idea when you are unsure about the system's default version.

The resulting NTP configuration is shown next:

```
[edit system ntp]
lab@r1# show
authentication-key 101 type md5 value "$9$Q5J23/tleWLxd"; # SECRET-DATA
server 10.0.200.2 key 101;
trusted-key 101;
```

It should be noted that the `boot-server` statement has been omitted from the previous configuration, because its presence will cause the router to automatically synchronize its clock upon bootup using the `ntpdate` command, which would violate the NTP configuration requirements listed at the beginning of this example.

Verify NTP

To verify NTP operation, commit your changes and issue the `show ntp associations` command, as shown next:

```
lab@r1> show ntp associations
     remote           refid        st t when poll reach   delay   offset  jitter
==============================================================================
 10.0.200.2       LOCAL(0)        11 u   25   64   37    0.492  2542804 4000.00
```

Many operators find the output of this command to be confusing. The key to this display is the overall fate of the clock selection and synchronization process, which is indicated by various characters in the far left margin. In this example, the presence of a space in front of the `10.0.200.2` address indicates that the peer has been rejected due to failed sanity checks or a stratum level that is too high. Synchronization with a particular NTP server is indicated with an asterisk (*) in the left margin, and this is what we need to see for 10.0.200.2 before we can move on.

However, the non-zero delay and offset fields in the previous display indicate that NTP messages are being received from the server, and that the messages are being correctly authenticated, which is a good start. So what is preventing the local router from synchronizing with the NTP server? The answer lies in the NTP specification and the fact that it will not allow the NTP protocol to make gross adjustments in a system's clock. According to the NTP specification, synchronization requires that the two system clocks be off by at least 128 milliseconds, but no more than 128 seconds, before synchronization can begin. Use of the `boot-server` option will set the system's clock at boot time, regardless of how far off it may be from that of the specified server, but this option requires a reboot to take effect, and automatic clock setting at reboot is not permitted in this example.

So, it would seem that the solution to this dilemma is the manual setting of your router's clock to bring it to within 128 seconds of the server's clock. To obtain the NTP server's view of the time, you could manually decode NTP messages using tcpdump or `monitor traffic`, or you could take the easy route of telnetting into the NTP server to issue a `date` command. The following commands demonstrate the latter approach:

```
lab@r1> telnet 10.0.200.2
Trying 10.0.200.2...
Connected to 10.0.200.2.
Escape character is '^]'.

Red Hat Linux release 6.0 (Hedwig)
Kernel 2.2.17 on an i686
login: lab
Password:
Last login: Mon Apr  1 08:23:21 from yoda
[lab@ntp]$ date
Mon Apr  1 15:45:29 PST 2002
 [lab@ntp]$ exit
logout
Connection closed by foreign host.
```

Now that you know the server's view of the current time, you can manually set your router's clock as shown next:

```
lab@r1> set date 200204011545
Mon Apr  1 15:45:00 UTC 2002
```

Now, assuming that you have set the local router's clock accurately (and quickly), the two clocks should be within the limits needed for NTP synchronization. However, since the NTP protocol requires several successful packet exchanges before allowing synchronization, you will have to wait approximately five minutes to determine your relative success in this matter. Because NTP slowly steps a system's clock into synchronization, it may take a seemingly inordinate amount of time to get the proper NTP synchronization on all of your routers. You can tell when things are working correctly when you see a display containing an asterisk in the left margin, as shown next:

```
lab@r1> show ntp associations
     remote           refid          st t when poll reach   delay   offset  jitter
==============================================================================
*10.0.200.2       LOCAL(0)        11 u   10   64   17    0.491   12.991  10.140
```

NTP operation is confusing to many exam candidates, and the delays associated with normal NTP operation have been known to cause some candidates to assume that they have made a mistake when things do not work as expected right away. When all else fails, remember that NTP works slowly, and that the system clocks have to be within 128 seconds of each other to get things synchronizing. Also, keep in mind that time zone settings will affect your local clock, and remember that non-zero values in the offset and delay fields of the `show ntp associations` command indicate successful communication and, when in use, authentication between your router and the NTP server. As a final tip, when all else has failed, you may want to try deactivating and reactivating the NTP configuration stanza to ensure that recent changes are in fact being put into effect after you commit them.

TIP

A possible shortcut to the problem of manual clock setting would be the use of the `boot-server` option coupled with a reboot to get your router's clocks initially synchronized to the NTP server's. Once you have obtained synchronization, you can simply remove the `boot-server` statement and move on with your life, with no one being the wiser as to how initial synchronization was achieved.

Set Your Local Time Zone

Even though your router is now synchronized with the NTP server, you will likely find that the local time is being displayed incorrectly because of the router's default use of the UTC time zone. The following commands show the router's view of the local time before and after the correct local time zone is configured:

```
lab@r1> show system uptime
Current time:      2002-04-02 01:35:42 UTC
System booted:     2002-04-01 18:33:27 UTC (07:02:15 ago)
Protocols started: 2002-04-01 18:33:17 UTC (07:02:25 ago)
Last configured:   2002-04-02 01:25:14 UTC (00:10:28 ago) by lab
 1:35AM  up  7:02, 2 users, load averages: 0.00, 0.00, 0.00
```

Though this author often works well past 6:00 P.M., it would be rare to see me working at 1:35 A.M.! The following commands correctly set the router's time zone based on the location of the test bed:

```
[edit]
lab@r1# set system time-zone America/Los_Angeles
lab@r1# commit and-quit
commit complete
Exiting configuration mode

lab@r1> show system uptime
Current time:      2002-04-02 01:36:00 UTC
System booted:     2002-04-01 18:33:27 UTC (07:02:33 ago)
Protocols started: 2002-04-01 18:33:17 UTC (07:02:43 ago)
Last configured:   2002-04-02 01:35:57 UTC (00:00:03 ago) by lab
5:36PM  up  7:03, 2 users, load averages: 0.08, 0.02, 0.01
```

The router's time of day now shows the correct value of 5:36 P.M.

Task 6: Perform General Maintenance and Software Upgrade

At this stage, your basic system configuration should be completed and its operational status confirmed. If you have not already looked for hardware anomalies or alarms, now might be a good time to issue some chassis/hardware related `show` commands to confirm that all is good to go with your gear. You should also take note of the JUNOS software version on each router, because an upgrade or a downgrade may be necessary to meet the requirements of your scenario. The following commands illustrate the most common ways of accessing the state of your hardware. The syntax and output can vary depending on M-series router type, but the general concept and results are similar for all Juniper Networks routers.

First, verify that there are no chassis alarms:

```
lab@r1> show chassis alarms

No alarms currently active
```

The lack of alarms indicates the router is free from serious hardware and environmental defects. Next, check out the general hardware environment of each router:

```
lab@r1> show chassis environment
Class Item                   Status     Measurement
```

```
Power Power Supply A        OK
      Power Supply B        Absent
Temp  FPC Slot 0            OK          33 degrees C / 91 degrees F
      FEB                   OK          34 degrees C / 93 degrees F
      PS Intake             OK          29 degrees C / 84 degrees F
      PS Exhaust            OK          31 degrees C / 87 degrees F
Fans  Left Fan 1            OK          Spinning at normal speed
      Left Fan 2            OK          Spinning at normal speed
      Left Fan 3            OK          Spinning at normal speed
      Left Fan 4            OK          Spinning at normal speed
Misc  Craft Interface       OK
```

The missing power supply B is generally not an issue in a test bed, so all looks normal here. For even more information on the router's hardware, issue the following command:

```
lab@r1> show chassis hardware
Hardware inventory:
Item             Version  Part number  Serial number     Description
Chassis                                50779             M5
Midplane         REV 03   710-002650   HF2739
Power Supply A   Rev 04   740-002497   LK23083           AC
Display          REV 04   710-001995   AV8231
Host                                   bb00000792cd4801  teknor
FEB              REV 09   710-002503   HF2037            Internet Processor II
FPC 0
  PIC 0          REV 04   750-002992   HD4121            4x F/E, 100 BASE-TX
  PIC 1          REV 03   750-002971   HE5549            4x OC-3 SONET, MM
```

Based on this display, you can confirm you are working on an M5 router, with a single FPC (only one FPC is supported on an M5), equipped with a four-port Fast Ethernet PIC and a four-port OC-3 SONET PIC. It is worth noting that this router, as with all M5s, M10s, M160s, and M40e platforms, is IP II equipped. Because the IP II is needed for various enhanced functions, such as firewalls and VPNs, the absence of an IP II in any router making up your test bed is certainly worth noting. Similarly, you should take note of any service PICs available in your test bed. For instance, noting what routers have a tunnel PIC installed can be real handy if you later find yourself trying to decide on which pair of routers to use when a tunnel application is thrown your way.

Next, let's check the software versions on all the machines:

```
lab@r2> show version
Hostname: r2
Model: m5
JUNOS base [4.4R1.5]
```

```
JUNOS Kernel Software Suite [4.4R1.5]
JUNOS Routing Software Suite [4.4R1.5]
JUNOS Packet Forwarding Engine Support [4.4R1.5]
JUNOS Online Documentation Files [4.4R1.5]
. . .
```

While `r2` is probably free from rust, it is running a rather old version of JUNOS software. Candidates taking the JNCIP exam are expected to know how to perform command line–based FTP transfers, and should be prepared to perform JUNOS software upgrades (or downgrades) using `jinstall`, `jbundle`, and individual `jbundle` components such as a `jroute` package, when called for. In this sample scenario, all routers must be running some form of 5.*x* release, so it looks like `r2` is in line for some new bits pretty quickly.

Upgrading or downgrading an M-series router between 4.*x* and 5.*x* releases requires the use of a `jinstall` package due to the resulting change from a.out to ELF binaries; use of a `jinstall` package will affect both the system binaries and the JUNOS software components. Within a 4.*x* or 5.*x* release, the operator should use either a `jbundle` or individual j-package for upgrade or downgrade. Attempting to upgrade or downgrade between 4.*x* and 5.*x* releases using a `jbundle` package will result in wasted time, as the install script will abort without making any modifications to the system being upgraded or downgraded.

Since `r2` is running a 4.*x* release, we know that we need to locate a 5.*x* related `jinstall` on the FTP server. The following capture illustrates typical FTP session commands and the actual file transfer. The capture begins by showing the initial FTP login:

```
lab@r2> ftp 10.0.200.2
Connected to 10.0.200.2.
220-cert-lab NcFTPd Server (free personal license) ready.
220-Warning!!!
220-This is a restricted computer system.
220-
220-ALL ACTIONS ARE LOGGED!
220
Name (10.0.200.2:lab): lab
331 User lab okay, need password.
Password:
230-You are user #1 of 3 simultaneous users allowed.
230-
230-Welcome to the FTP site.
230 Restricted user logged in.
Remote system type is UNIX.
Using binary mode to transfer files.
```

Now that we are logged into the FTP server, let's see what packages are available by obtaining a file listing:

```
ftp> ls
200 PORT command successful.
150 Opening ASCII mode data connection for /bin/ls.
-rw-r--r--   1 ftpuser  ftpusers  19538662 Apr  2 04:23 4.1R1.5-domestic.ls120.tgz
-rw-r--r--   1 ftpuser  ftpusers  19512433 Apr  2 04:23 4.1R1.5-domestic.pcm110.tgz
-rw-r--r--   1 ftpuser  ftpusers    433758 Apr  2 04:23 jbase-4.0B3-domestic.tgz
-rw-r--r--   1 ftpuser  ftpusers   7927224 Apr  2 04:23 jbundle-3.4R3.2.tgz
-rw-r--r--   1 ftpuser  ftpusers   6530202 Apr  2 04:23 jbundle-4.0R4.tgz
-rw-r--r--   1 ftpuser  ftpusers   7774361 Apr  2 04:23 jbundle-4.1R1.5.tgz
-rw-r--r--   1 ftpuser  ftpusers   8687924 Apr  2 04:23 jbundle-4.2R2.4-domestic.tgz
-rw-r--r--   1 ftpuser  ftpusers   9187867 Apr  2 04:23 jbundle-4.3R1.4-domestic.tgz
-rw-r--r--   1 ftpuser  ftpusers   9202130 Apr  2 04:23 jbundle-4.3R2-domestic.tgz
-rw-r--r--   1 ftpuser  ftpusers   9208526 Apr  2 04:23 jbundle-4.3R3-domestic.tgz
-rw-r--r--   1 ftpuser  ftpusers   9871826 Apr  2 04:23 jbundle-4.4B1.2-domestic.tgz
-rw-r--r--   1 ftpuser  ftpusers  10094406 Apr  2 04:23 jbundle-4.4R1.5-domestic.tgz
-rw-r--r--   1 ftpuser  ftpusers   6530202 Apr  2 04:23 jbundle-4_0R4.tgz
-rw-r--r--   1 ftpuser  ftpusers  24217723 Apr  2 04:23 jbundle-5.2R2.3-
domestic-signed.tgz
-rw-r--r--   1 ftpuser  ftpusers  19685721 Apr  2 04:23 jinstall-4.4R1.5-
domestic.tgz
-rw-r--r--   1 ftpuser  ftpusers  21543210 Apr  2 04:23 jinstall-5.2R2.3-
domestic.tgz
-rw-r--r--   1 ftpuser  ftpusers  21530984 Apr  2 04:23 jinstall-5.0B1.2-
domestic.tgz
226 Listing completed.
```

In this example, there are many packages from which to choose, but it has already been determined that a *5.x* version of `jinstall` package is needed to satisfy the requirements of this example. In this case, the operator takes the "easy" way out by using the globbing character (*) in conjunction with the `mget` FTP transfer option, which results in a prompt for the transfer of each matching file:

```
ftp> mget jinstall*
mget jinstall-4.4R1.5-domestic.tgz? n
mget jinstall-5.2R2.3-domestic.tgz? y
200 PORT command successful.
150 Opening BINARY mode data connection for jinstall-5.2R2.3-domestic.tgz
(21543210 bytes)
```

```
226 Transfer completed.
21543210 bytes received in 22.07 seconds (953.15 Kbytes/s)
ftp>quit
```

Now that the correct *5.x* `jinstall` package has been transferred to `r2`, the operator instructs the router to load the new software and to automatically reboot so that the new code is put into effect:

```
lab@r2> request system software add jinstall-5.2R2.3-domestic.tgz reboot
Installing package '/var/home/lab/jinstall-5.2R2.3-domestic.tgz' ...

WARNING:     This package will load JUNOS 5.2R2.3 software.
WARNING:     It will save JUNOS configuration files, log files, and SSH keys
WARNING:     (if configured), but erase all other files and information
WARNING:     stored on this machine.  This is the pre-installation stage
WARNING:     and all the software is loaded when you reboot the system.

Saving the config files ...
NOTICE: uncommitted changes have been saved in /var/db/config/juniper.conf.pre-
install
. . .
```

After the two reboots associated with `jinstall` package installation, `r2` comes back up and the new code installation is confirmed:

```
lab@r2 show version
Hostname: r2
Model: m5
JUNOS Base OS boot [5.2R2.3]
JUNOS Base OS Software Suite [5.2R2.3]
JUNOS Kernel Software Suite [5.2R2.3]
JUNOS Routing Software Suite [5.2R2.3]
JUNOS Packet Forwarding Engine Support [5.2R2.3]
JUNOS Crypto Software Suite [5.2R2.3]
JUNOS Online Documentation [5.2R2.3]
```

Task 7: Configure Chassis Alarms and Redundancy

Some M-series routers support Routing Engine (RE) and system control board redundancy options. You should be familiar with the configuration and operation of the various redundancy features available on the M20, M160, M40e, and T640 platforms, and you should be familiar with the ways in which various problems can be mapped to system alarm states. An example system alarm and redundancy scenario might consist of the following requirements:

- Configure the router to generate a yellow alarm when the fxp0 interface goes down.
- Set RE0 to be the primary, and configure RE failover in the event of routing daemon failure. You may assume that the configuration files have already been mirrored on the two REs for this task.
- Ensure that failure of router flash will not affect the operation of your initial configuration.

Configure alarms Alarms are configured at the `[edit chassis alarms]` configuration hierarchy. The following command is used to configure a yellow alarm upon detection of an fxp0 link down event:

```
[edit chassis alarm]
lab@r2# set management-ethernet link-down yellow
```

Configure redundancy System redundancy is configured at the `[edit chassis redundancy]` configuration hierarchy. The following commands are used to explicitly configure RE0 as the primary RE, which is the default, and to evoke a switchover to RE1 in the event of routing daemon (`rpd`) failure. The following commands were issued on a M20 router, because the M5 platform does not support RE redundancy:

```
[edit]
lab@m20# set chassis redundancy routing-engine 0 master

[edit]
lab@m20# set system processes routing failover other-routing-engine
```

Perform a system snapshot To ensure that a failure of the router's flash will not cause the loss of your initial system configuration, you must perform a system snapshot to mirror the contents of the router's flash onto the router's hard drive:

```
lab@r1> request system snapshot
umount: /altroot: not currently mounted
Copying / to /altroot.. (this may take a few minutes)
```

```
umount: /altconfig: not currently mounted
Copying /config to /altconfig.. (this may take a few minutes)

The following filesystems were archived: / /config
```

Resulting alarms and redundancy configuration The configuration stanzas that resulted from the tasks in this example are shown next:

```
[edit]
lab@sanjose# show system processes
routing failover other-routing-engine;

[edit]
lab@sanjose# show chassis redundancy
routing-engine 0 master;

[edit]
lab@sanjose# show chassis alarm
management-ethernet {
    link-down yellow;
}
```

Your Initial System Configuration

After performing the configuration tasks outlined in this chapter, you have a configuration that resembles the complete router configuration example shown in Listing 1.4. If you have not already done so, you will now need to replicate the common portions of this configuration in all of the routers that make up your test bed so that this baseline functionality is available throughout your entire network before proceeding to the next chapter. The highlighted redundancy options shown in this example are supported only on the M20, M40e, M160, and T640 platforms.

Listing 1.4: *r1*'s Initial Configuration

```
[edit]
lab@r1# show | no-more
system {
    host-name r1;
    time-zone America/Los_Angeles;
    authentication-order [ radius password ];
```

```
    root-authentication {
        encrypted-password "$1$j5nxWQ9r$p6XQ9eKqpgsGe51DYySGI/"; # SECRET-DATA
        ssh-rsa "1024 65537
145075218392827984324825218350230553263814016634520586690808864914655447007843928
811140558223761982907223206662680202117634298573484563786961031999869154619624944
354796928944374177808980174834403138411073671226700804399728941956793207967534107
312228338991418693275832311709060479858146825449419051074168398032 83 root"; #
SECRET-DATA
    }
    radius-server {
        10.0.1.102 secret "$9$.fQnEhrevL"; # SECRET-DATA
    }
    login {
        class ops {
            idle-timeout 5;
            permissions network;
            allow-commands "show interfaces";
            deny-commands "traceroute|telnet|ssh";
        }
        user lab {
            uid 2000;
            class superuser;
            authentication {
                encrypted-password "$1$nNISN$o7OGTEhEF5sOcgjS9p0Lf0"; # SECRET-DATA
            }
        }
        user ops {
            uid 2002;
            class ops;
            authentication {
                encrypted-password "$1$SgJQQ$VYXXLPf9/TMOnb2ohWxOJ."; # SECRET-DATA
            }
        }
        user proctor {
            uid 2001;
            class superuser;
        }
    }
    services {
        ssh;
        telnet;
    }
```

```
        syslog {
        user * {
            any emergency;
        }
        file messages {
            any notice;
        }
        file auth {
            authorization info;
            archive size 5m files 5;
        }
    }
    processes {
        routing failover other-routing-engine;
    }
    ntp {
        authentication-key 101 type md5 value "$9$fQ39SyKM87"; # SECRET-DATA
        server 10.0.200.2 key 101;
        trusted-key 101;
    }
}
chassis {
    redundancy {
        routing-engine 0 master;
    }
    alarm {
        management-ethernet {
            link-down yellow;
        }
    }
}
interfaces {
    fxp0 {
        unit 0 {
            family inet {
                address 10.0.1.1/24;
            }
        }
    }
}
```

```
snmp {
    interface fxp0.0;
    community test {
        clients {
            10.0.200.2/32;
        }
    }
    trap-group interface {
        categories link;
        targets {
            10.0.200.2;
        }
    }
}
routing-options {
    static {
        route 10.0.200.0/24 {
            next-hop 10.0.1.102;
            no-readvertise;
        }
    }
}
```

The Case for Cut and Paste on the Exam

Time is a critical factor in the JNCIP examination, and any technique that can save time is well worth deploying during the lab. Deciding when a configuration is common enough to warrant pasting into the remaining routers is a decision that has to be made by each individual, and should be based on factors such as your familiarity with using `load (merge|override) terminal`, and the potential time savings that are expected. Cut and paste is a double-edged sword, and as with any such tool, you can cause serious problems by using it incorrectly in an effort to save time. For example, forgetting to change a lo0 address can result in duplicate router IDs (RIDs) in a subsequent OSPF scenario, and this type of problem can be very difficult to diagnose in the heat of battle. Generally speaking, it is advisable to paste configurations (or particular stanzas) into a text editor such as Word Pad, where you can easily edit the variables to suit the router that you plan to paste the configuration into.

Using Cut and Paste

The following commands illustrate how an edited version of the previous configuration can be pasted into r2. In this example, the only fields that required modification between the various routers are the hostname and fxp0 addressing:

```
root@host> configure
Entering configuration mode

[edit]
lab@host# load override terminal
[Type ^D to end input]
<select paste in emulation program>
system {
    host-name r2;
    time-zone America/Los_Angeles;
    authentication-order [ radius password ];

    . . .

        route 10.0.200.0/24 {
            next-hop 10.0.1.102;
            no-readvertise;
        }
    }
} <carriage return>
<control d>

load complete

[edit]
lab@host# commit and-quit
commit complete
Exiting configuration mode

lab@r2>
```

In the previous capture, operator input that is not echoed back is displayed in italics with "< >" delimiters. The first such occurrence is when the user selects Paste from their terminal emulation program after entering the `load override terminal` command. At the end of the capture, the operator enters a single carriage return to place a new line after the last curly brace, and then terminates the paste operation with the Ctrl+d key sequence (per the instructions provided at the beginning of the terminal paste operation). Because no errors are reported, the paste operation appears to have been successful. You now commit the new configuration, which results in the router's hostname becoming `r2`, as highlighted.

Pasting Individual Stanzas or Stanza Components

Using load override is pretty straightforward, but there are many instances when the wholesale replacement of the entire router configuration is not desired. It is also possible to paste in complete stanzas, or components from a particular stanza, though this can be a bit tricky. The following example shows the cut and paste of just the routing-options stanza. We start on `r2` where we display the contents of its `routing-options` stanza:

```
[edit]
lab@r2# show routing-options
static {
    route 10.0.200.0/24 {
        next-hop 10.0.1.102;
        no-readvertise;
    }
}
```

The contents of the stanza, which is highlighted, are then selected and copied into your emulation program's capture buffer. To paste this snippet into `r1`, we use `load merge terminal`, and must be careful to include the configuration hierarchy `routing-options` before performing the paste operation so the router knows where to put the information that is pasted. In this example, we first delete the existing routing-options stanza on `r1` to demonstrate that the paste was successful:

```
[edit]
root@r1# delete routing-options

[edit]
root@r1# show routing-options

[edit]
root@r1# load merge terminal
[Type ^D to end input]
routing-options static {
    route 10.0.200.0/24 {
        next-hop 10.0.1.102;
        no-readvertise;
    }
}-<carriage return>
```

```
<control-d>
load complete

[edit]
root@r1# show routing-options
static {
    route 10.0.200.0/24 {
        next-hop 10.0.1.102;
        no-readvertise;
    }
}
```

The procedure is similar when the goal is to paste a portion of a stanza, such as an individual static route. In this example, a static route to 1.1.1.1 has been added to `r2`, and this route will be pasted into `r1`:

```
[edit]
lab@r2# show routing-options
static {
    route 10.0.200.0/24 {
        next-hop 10.0.1.102;
        no-readvertise;
    }
    route 1.1.1.1/32 discard;
}
```

After copying the 1.1.1.1 static route into the capture buffer, it is pasted into `r1` using the following commands. Note that the operator has correctly specified the destination of the pasted data by manually entering **`routing-options static`** before performing the paste:

```
[edit]
root@r1# load merge terminal
[Type ^D to end input]
routing-options static  route 1.1.1.1/32 discard;
/<carriage return>
<control-d>
load complete

[edit]
root@r1# show routing-options
```

```
static {
    route 10.0.200.0/24 {
        next-hop 10.0.1.102;
        no-readvertise;
    }
    route 1.1.1.1/32 discard;
}
```

Summary

This chapter provided configuration and operational mode examples for a variety of initial system configuration scenarios that are similar to the type of tasks that will confront a JNCIP candidate. At this stage, you should have a good idea of what types of configuration tasks will confront you as you begin your JNCIP examination, and you should now be comfortable with terminal server use and OoB management network establishment; creating user accounts and permissions; configuring SNMP, NTP, chassis alarms, system redundancy, and syslog; and general software maintenance procedures.

Case Study: Initial System Configuration

This section presents a list of initial system-configuration tasks that resemble the examples demonstrated throughout this chapter. For each configuration task, the relevant portions of a typical router configuration are shown and described. The complete configuration from one of the routers is provided at the end, to illustrate a known good solution for the configuration requirements provided in the case study.

Configuration Requirements

To complete this case study, you must configure all seven routers in your test bed to comply with the following criteria. It should take approximately 45 minutes to complete your configuration, and you should start with a factory-fresh JUNOS software install. A reasonable approximation of such an install will result if you load and commit the skeleton configuration found at the following location on routers running a *5.x* JUNOS software version: `/packages/mnt/jbase/sbin/install/default-juniper.conf`.

Whether you opt to flash your routers, or load the skeleton configuration file, your starting configuration should be similar to the following:

```
root@r1# show
system {
    syslog {
        user * {
            any emergency;
        }
        file messages {
            any notice;
            authorization info;
        }
    }
}
```

- Assign each router a hostname of the form **`rn`**, where *n* is a router number in the range of 1 through 7 inclusive.
- Configure the fxp0 network according to Figure 1.1, and ensure that you and the proctor station will have telnet access to all seven routers using the OoB management network.
- Modify the syslog parameters to log all interactive CLI commands to a file called `rn-cli`, where *n* is equal to the router number. Configure the CLI log to permit four archived copies that will be no larger than 128K, and ensure that CLI-related logging is also sent to

10.0.200.2, which is providing a remote syslog service. All other syslog parameters should be left at their default setting.

- Create user accounts and permissions based on Table 1.2.

TABLE 1.2 Case Study User Accounts

User/Password	Permissions	Notes
`lab`	`superuser`	Telnet, SSH version 2 only with password, and console
`root`	`superuser`	Console only
`noc`	View only	Telnet, SSH version 2 only with password, and console

- Ensure that all users are first authenticated through RADIUS, and that the local password database is not automatically consulted should the RADIUS server become unreachable. The RADIUS secret is `juniper`.
- Allow SNMP access from all IP addresses, but only allow SNMP request over the fxp0 interface. Use a community value of `public` for read-only access and `private` for read/write access. Send only version 1 authentication–related traps to the SNMP server.
- Configure all routers as broadcast NTP clients, and authenticate all messages using MD5, key ID 200, and key value `juniper`. Ensure that manual clock synchronization steps are not required. For this example, the NTP service is provided by 10.0.1.102.
- Ensure that all routers display the correct value for local time. You should assume that you are testing in Sunnyvale, California.
- Without using DNS, ensure that you can ping the proctor workstation using the name `proctor`.
- Configure the router to ignore management interface link status and enable the auxiliary console port for vt100 terminals.

Configuration Examples

Each of the case study requirements will now be echoed back along with the configuration commands that would typically be used to correctly meet the operational criteria. Due to the innate flexibility of JUNOS software, multiple solutions to the case study requirements will normally exist; for example, the operator could opt to deploy configuration groups for common configuration elements such as the RADIUS server and authentication order. The examples shown next attempt to show the most common and straightforward solutions to the configuration tasks. An example of configuration group usage to support RADIUS will be provided to demonstrate this flexibility and, indirectly, to demonstrate why a JNCIP candidate is graded on results and not on their particular configuration approach.

- Assign each router a hostname of the form ***rn***, where *n* is a router number in the range of 1 through 7 inclusive:

```
[edit]
root@host# set system host-name r2
[edit]
root@host# show system host-name
host-name r2;
```

- Configure the fxp0 network according to Figure 1.1, and ensure that you and the proctor station will have telnet access to all seven routers using the OoB management network:

```
[edit]
root@r2# set system services telnet

[edit interfaces]
root@r2# set fxp0 unit 0 family inet address 10.0.1.2/24

[edit routing-options]
root@r2# set static route 10.0.200.0/24 next-hop 10.0.1.102 no-readvertise
```

The resulting OoB-related configuration is now as follows:

```
[edit]
root@r2# show system services
telnet;

[edit]
root@r2# show interfaces fxp0
unit 0 {
    family inet {
        address 10.0.1.2/24;
    }
}
root@r2# show routing-options
static {
    route 10.0.200.0/24 {
```

```
        next-hop 10.0.1.102;
        no-readvertise;
    }
}
```

- Modify the syslog parameters to log all interactive CLI commands to a file called `rn-cli`, where *n* is the router number. Configure the CLI log to permit four archived copies that will be no larger than 128K, and ensure that CLI-related logging is also sent to 10.0.200.2, which is providing a remote syslog service. All other syslog parameters must be left at their default setting:

```
[edit system syslog]
root@r2# set file r2-cli interactive-commands any

[edit system syslog]
root@r2# set file r2-cli archive files 4

[edit system syslog]
lab@r1# set host 10.0.200.2 interactive-commands any
```

The modified syslog parameters are now displayed:

```
[edit system syslog]
lab@r1# show
user * {
    any emergency;
}
host 10.0.200.2 {
    interactive-commands any;
}
file messages {
    any notice;
    authorization info;
}
file r2-cli {
    interactive-commands any;
    archive files 4;
}
```

- Create user accounts and permissions based on Table 1.3.

TABLE 1.3 Case Study User Accounts

User/pass	permissions	Notes
lab	superuser	Telnet, SSH version 2 only with password, and console
root	superuser	Console only
noc	View only	Telnet, SSH version 2 only with password, and console

The commands used to correctly configure and display user account and permission settings are shown in Listing 1.5.

Listing 1.5: User Account Configuration

```
[edit system]
root@r2# set root-authentication plain-text-password
New password:
Retype new password:

[edit system login]
root@r2# set user lab class superuser

root@r2# set user lab authentication plain-text-password
New password:
Retype new password:

[edit system login]
root@r2# set class noc permissions view

[edit system login]
root@r2# set user noc class noc

[edit system login]
root@r2# set user noc authentication plain-text-password
New password:
Retype new password:

[edit]
root@r1# set system services ssh protocol-version v2

[edit]
lab@r2# set system services ssh root-login deny
```

```
[edit]
lab@r2# show system services
ssh {
    root-login deny;
    protocol-version v2;
}
telnet;

[edit]
root@r2# show system root-authentication
encrypted-password "$1$RTyGDGYG$ukqr37VGRgtohedSlruOk/"; # SECRET-DATA

[edit]
root@r2# show system login
class noc {
    permissions view;
}
user lab {
    class superuser;
    authentication {
        encrypted-password "$1$L6ZKKWYI$GxEI/7YzXes2JXDcHJvz7/"; # SECRET-DATA
    }
}
user noc {
    class noc;
    authentication {
        encrypted-password "$1$Z5Sb1eVg$R8.iZMCAMAOTdEeS2svvd0"; # SECRET-DATA
    }
}
```

By default, all users except `root` can log in via console, telnet, or SSH. The `root` user can log in by using either the console or SSH by default, so to meet the criteria for this case study you must disable `root`'s ability to log in using SSH. The correct SSH version must also be set in this example, because the default JUNOS software behavior will support SSH versions 1 and 2.

- Ensure that all users are first authenticated through RADIUS, and that the local password database is not automatically consulted should the RADIUS server become unreachable. The RADIUS secret is `juniper`.

```
[edit system]
root@r2# set authentication-order radius
```

```
[edit system]
root@r2# set radius-server 10.0.200.2 secret juniper
```

The resulting system authentication configuration is now displayed:

```
[edit system]
root@r2# show radius-server
10.0.200.2 secret "$9$-UbYoDi.z39JG39ApREdbs"; # SECRET-DATA

[edit system]
root@r2# show authentication-order
authentication-order radius;
```

By omitting the password option from the system's authentication order statement, you ensure that the local password database is not automatically consulted when the RADIUS server becomes unreachable, which results in the operator being prompted for a local password in the event of RADIUS connectivity problems.

Configuration Groups

As previously mentioned, JUNOS software is extremely flexible, and this flexibility can translate to the ability to satisfy a configuration requirement using what can appear to be orthogonal approaches. Configuration groups provide excellent proof of this concept in that they allow common elements of a configuration to be specified at the `[edit groups]` configuration hierarchy. Once configured, these groups can then be applied to the appropriate level of the system's configuration to affect the inheritance of group-related configuration. You can override this group inheritance through explicit configuration where needed. For example, consider the following configuration group called `authentication`, which will result in the required RADIUS and authentication order behavior when applied as shown:

```
[edit]
lab@r1# show groups
authentication {
    system {
        authentication-order radius;
        radius-server {
            10.0.1.201 secret "$9$9ftBtOIylMNdsEcds24DjCtu"; # SECRET-DATA
        }
    }
}
```

```
[edit]
lab@r1# set system apply-groups authentication
```

To confirm the correct application of a configuration group, you should pipe configuration output through the `inheritance` filter as shown here:

```
[edit]
lab@r1# show system | match radius

[edit]
lab@r1# show system | display inheritance | match radius
## 'radius' was inherited from group 'authentication'
authentication-order radius;
radius-server {
```

You should practice with the effects of configuration group usage before deciding to deploy the technique on a live examination. Some candidates have been burned by failing to completely anticipate the effects of configuration group usage. For example, the inadvertent configuration (and operation) of an IGP on your fxp0 OoB management interface (which is never a good idea) can easily result when a configuration group is used to add protocol families to your interfaces in conjunction with a command such as `set protocol isis interface all`.

- Allow SNMP access from all IP addresses, but only allow SNMP request over the fxp0 interface. Use a community value of `public` for read-only access and `private` for read/write access. Send only version 1 authentication–related traps to the SNMP server:

```
[edit snmp]
root@r2# set interface fxp0

[edit snmp]
root@r2# set community public

[edit snmp]
root@r2# set trap-group foo categories authentication

[edit snmp]
root@r2# set trap-group foo targets 10.0.200.2

[edit snmp]
root@r2# set community private authorization read-write
```

The resulting configuration changes are now confirmed:

```
[edit snmp]
root@r2# show
interface fxp0.0;
community public;
community private {
    authorization read-write;
}
trap-group foo {
    version v1;
    categories authentication;
    targets {
        10.0.200.2;
    }
}
```

By including interface fxp0, you disallow access from all other interfaces. The lack of a `client` statement results in the default of access being allowed from all clients. The default for SNMP traps is to send both version 1 and version 2, so version 1 traps must be specified.

- Configure your routers as broadcast NTP clients, and authenticate all messages using MD5, key ID 200, key value `juniper`. Ensure that manual clock synchronization steps are not required. For this example, you may assume that the NTP service is provided by 10.0.1.102:

```
[edit system ntp]
root@r2# set authentication-key 200 type md5 value juniper

[edit system ntp]
root@r2# set trusted-key 200

[edit system ntp]
root@r2# set broadcast-client

[edit system ntp]
root@r2# set boot-server 10.0.1.102
```

Once again, the changes to the configuration are confirmed:

```
[edit system ntp]
root@r2# show
boot-server 10.0.1.102;
```

```
authentication-key 200 type md5 value "$9$KoAWX-YgJHqfVwqfTzCAvWL"; # SECRET-DATA
broadcast-client;
trusted-key 200;
```

Because manual synchronization is not permitted in this example, you must include the `boot-server` statement to allow initial clock synchronization at boot. You must also configure your router as a broadcast client to tell it to listen to NTP broadcasts. If all goes according to plan, you should have NTP associations like the following example on all your routers after they are rebooted; it should be noted that the server type (`t`) is now set to broadcast (`b`):

```
root@r1> show ntp associations
     remote           refid      st t when poll reach   delay   offset  jitter
==============================================================================
*10.0.1.102      LOCAL(1)        11 b    -   64  377    0.000   39.204   1.045
```

- Ensure that all routers display the correct value for local time. You should assume that you are testing in Sunnyvale, California:

```
[edit system]
root@r2# set time-zone America/Los_Angeles
```

There is no CLI option for America/Sunnyvale, but Los Angeles and the San Francisco Bay Area are both on Pacific Time so this does the trick.

- Without using DNS, ensure that you can ping the proctor workstation using the name `proctor`.

You must configure a static host mapping to accomplish this task because DNS services are not available in this example:

```
[edit system]
lab@r2# set static-host-mapping proctor inet 10.0.200.1
```

- Configure the router to ignore management interface link status and enable the auxiliary console port for vt100 terminals.

```
[edit chassis alarm]
lab@r2# set management-ethernet link-down ignore

[edit system ports]
lab@r2# set auxiliary type vt100
```

The Completed Case Study Configuration

The configuration of `r2` is shown in Listing 1.6. This configuration satisfies all case study requirements.

Listing 1.6: Case Study Configuration for *r2*

```
[edit]
lab@r2# show | no-more
version 5.2R2.3;
system {
    host-name r2;
    time-zone America/Los_Angeles;
    authentication-order radius;
   ports {
    auxiliary type vt100;
   }
    root-authentication {
        encrypted-password "$1$RTyGDGYG$ukqr37VGRgtohedSlruOk/"; # SECRET-DATA
    }
    radius-server {
        10.0.200.2 secret "$9$-UbYoDi.z39JG39ApREdbs"; # SECRET-DATA
    }
    login {
        class noc {
            permissions view;
        }
        user lab {
            uid 2000;
            class superuser;
            authentication {
                encrypted-password "$1$L6ZKKWYI$GxEI/7YzXes2JXDcHJvz7/"; #
SECRET-DATA
            }
        }
        user noc {
            uid 2001;
            class noc;
            authentication {
                encrypted-password "$1$Z5Sb1eVg$R8.iZMCAMAOTdEeS2svvd0"; #
SECRET-DATA
            }
        }
    }
    static-host-mapping {
        proctor inet 10.0.200.1;
    }
```

```
    services {
        ssh {
            root-login deny;
            protocol-version v2;
        }
        telnet;
    }
    syslog {
        user * {
            any emergency;
        }
        host 10.0.200.2 {
            interactive-commands any;
        }
        file messages {
            any notice;
            authorization info;
        }
        file r2-cli {
            interactive-commands any;
            archive files 4;
        }
    }
    ntp {
        boot-server 10.0.1.102;
        authentication-key 200 type md5 value "$9$KoAWX-YgJHqfVwqfTzCAvWL"; #
SECRET-DATA
        broadcast-client;
        trusted-key 200;
    }
}
chassis {
    alarm {
        management-ethernet {
            link-down ignore;
        }
    }
}
interfaces {
    fxp0 {
        unit 0 {
```

```
            family inet {
                address 10.0.1.2/24;
            }
        }
    }
}
snmp {
    interface fxp0.0;
    community public;
    community private {
        authorization read-write;
    }
    trap-group foo {
        version v1;
        categories authentication;
        targets {
            10.0.200.2;
        }
    }
}
routing-options {
    static {
        route 10.0.200.0/24 next-hop 10.0.1.102;
    }
}
```

You should now ensure that the remaining routers in your test bed have a similar initial system configuration. The use of cut and paste using `load override terminal` is recommended as a time-saving technique. You should attempt to validate as much of your initial configuration as possible using the techniques demonstrated in this chapter because “silly” mistakes such as fat-fingering the IP address associated with the proctor subnet are hard to spot when simply viewing the router’s configuration.

Spot the Issues: Review Questions

1. Will the following login class provide `superuser` privileges while preventing the user's ability to enter the configuration mode?

```
[edit system login]
lab@t1# show class test
permissions all;
deny-commands "^config$";
```

2. Will this syslog configuration alter the default size of the messages file?

```
[edit system syslog]
lab@t1# show
archive size 10m files 5;
user * {
    any emergency;
}
file messages {
    any notice;
    authorization info;
    archive size 128m files 10;
}
file r1-cli {
    interactive-commands any;
    archive files 5;
}
```

3. You must ensure that your router's cold start trap is sent to a non–directly attached SNMP server. What command is needed?

4. Your router is not synchronizing with the NTP server after a reboot. What could be wrong with this NTP configuration? (You may assume that the secret is correctly configured.)

```
lab@t1# show system ntp
boot-server 10.0.1.201;
authentication-key 10 type md5 value "$9$2XoJDn6AIEy"; # SECRET-DATA
server 10.0.1.201 key 10 version 3; # SECRET-DATA
```

5. How can you configure an M-series router to source all SNMP trap messages from its lo0 interface without affecting the source addresses of other traffic?

```
[edit]
lab@r4# show snmp
community public {
    clients {
        0.0.0.0/0 restrict;
        10.0.1.102/32;
    }
}
trap-options {
    source-address lo0;
}
```

Spot the Issues: Answers

1. No. The deny-commands regular expression incorrectly matches on the exact sequence config, which is not a valid command. A user in this class would still be able to use the configure command. The correct regular expression would be ^configure$.

2. Yes. The global syslog archive parameters have been set to retain five 10MB files, and the operator's attempt at returning the messages file archive settings to the default setting of ten 128KB files has failed due to incorrect use of the Mega (m) suffix.

3. You will need to use the backup-router statement with the correct gateway address. The backup-router is used while the system is booting, and in the event that the routing daemon cannot be started.

4. The NTP configuration is missing the trusted-key definition. Without a list of trusted keys, the router will not use, or accept, key-id *10* in NTP messages.

5. You must use the source-address option at the [edit snmp trap-options] hierarchy when configuring SNMP. Use of default-address-selection at the [edit system] hierarchy affects all locally generated packets, not just SNMP.