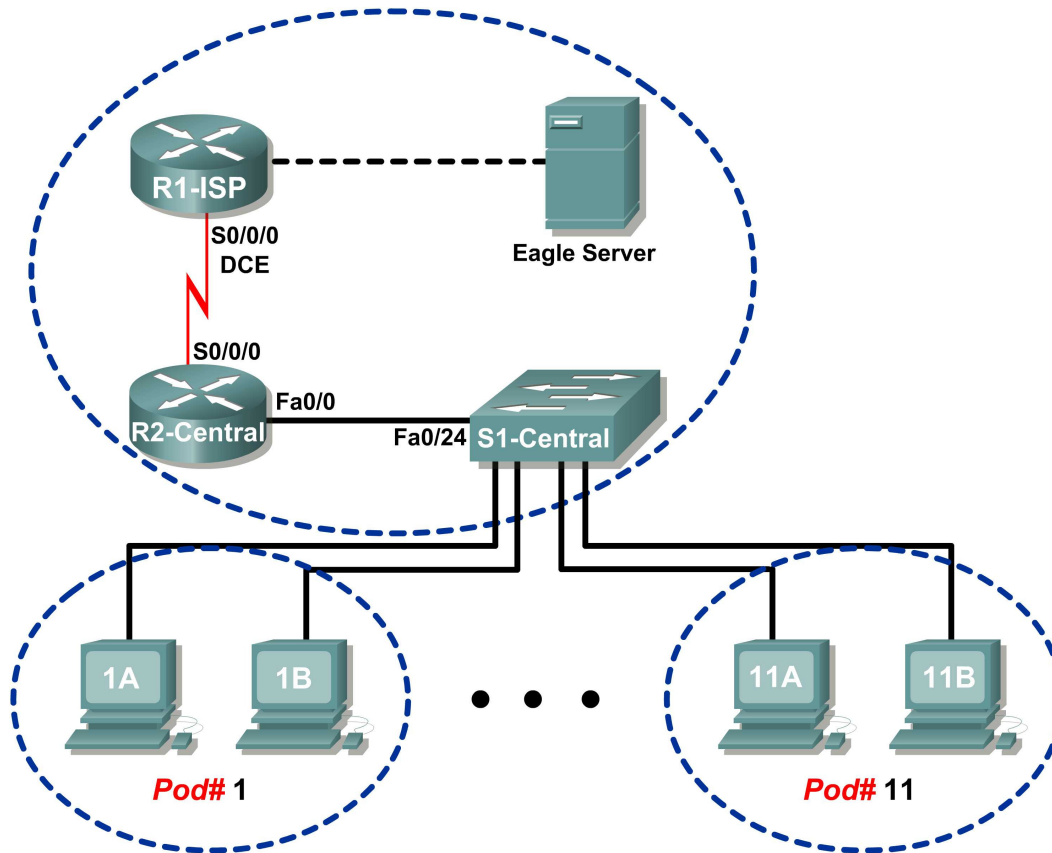


Lab 4.5.1: Observing TCP and UDP using Netstat

Topology Diagram



Addressing Table

| Device | Interface | IP Address | Subnet Mask | Default Gateway |
|--------------|-----------|-----------------|-----------------|-----------------|
| R1-ISP | S0/0/0 | 10.10.10.6 | 255.255.255.252 | N/A |
| | Fa0/0 | 192.168.254.253 | 255.255.255.0 | N/A |
| R2-Central | S0/0/0 | 10.10.10.5 | 255.255.255.252 | 10.10.10.6 |
| | Fa0/0 | 172.16.255.254 | 255.255.0.0 | N/A |
| Eagle Server | N/A | 192.168.254.254 | 255.255.255.0 | 192.168.254.253 |
| | N/A | 172.31.24.254 | 255.255.255.0 | N/A |
| hostPod#A | N/A | 172.16.Pod#.1 | 255.255.0.0 | 172.16.255.254 |
| hostPod#B | N/A | 172.16.Pod#.2 | 255.255.0.0 | 172.16.255.254 |
| S1-Central | N/A | 172.16.254.1 | 255.255.0.0 | 172.16.255.254 |

Learning Objectives

- Explain common **netstat** command parameters and outputs.
- Use **netstat** to examine protocol information on a pod host computer.

Background

netstat is an abbreviation for the network statistics utility, available on both Windows and Unix / Linux computers. Passing optional parameters with the command will change output information. **netstat** displays incoming and outgoing network connections (TCP and UDP), host computer routing table information, and interface statistics.

Scenario

In this lab the student will examine the **netstat** command on a pod host computer, and adjust **netstat** output options to analyze and understand TCP/IP Transport Layer protocol status.

Task 1: Explain common **netstat** command parameters and outputs.

Open a terminal window by clicking on Start | Run. Type **cmd**, and press **OK**.

To display help information about the **netstat** command, use the **/?** options, as shown:

```
C:\> netstat /? <ENTER>
```

Use the output of the **netstat /?** command as reference to fill in the appropriate option that best matches the description:

| Option | Description |
|--------|---|
| | Display all connections and listening ports. |
| | Display addresses and port numbers in numerical form. |
| | Redisplay statistics every five seconds. Press CTRL+C to stop redisplaying statistics. |
| | Shows connections for the protocol specified by proto; proto may be any of: TCP, UDP, TCPv6, or UDPv6. If used with the -s option to display per-protocol statistics, proto may be any of: IP, IPv6, ICMP, ICMPv6, TCP, TCPv6, UDP, or UDPv6. |
| | Redisplay all connections and listening ports every 30 seconds. |
| | Display only open connections. This is a tricky problem. |

When **netstat** statistics are displayed for TCP connections, the TCP state is displayed. During the life of a TCP connection, the connection passes through a series of states. The following table is a summary of TCP states, compiled from RFC 793, Transmission Control Protocol, September, 1981, as reported by **netstat**:

| State | Connection Description |
|--------------|--|
| LISTEN | The local connection is waiting for a connection request from any remote device. |
| ESTABLISHED | The connection is open, and data may be exchanged through the connection. This is the normal state for the data transfer phase of the connection. |
| TIME-WAIT | The local connection is waiting a default period of time after sending a connection termination request before closing the connection. This is a normal condition, and will normally last between 30 - 120 seconds. |
| CLOSE-WAIT | The connection is closed, but is waiting for a termination request from the local user. |
| SYN-SENT | The local connection is waiting for a response after sending a connection request. The connection should transition quickly through this state. |
| SYN_RECEIVED | The local connection is waiting for a confirming connection request acknowledgment. The connection should transition quickly through this state. Multiple connections in SYN_RECEIVED state may indicate a TCP SYN attack. |

IP addresses displayed by **netstat** fall into several categories:

| IP Address | Description |
|----------------|--|
| 127.0.0.1 | This address refers to the local host, or this computer. |
| 0.0.0.0 | A global address, meaning "ANY". |
| Remote Address | The address of the remote device that has a connection with this computer. |

Task 2: Use **netstat** to Examine Protocol Information on a Pod Host Computer.

Step 1: Use **netstat** to view existing connections.

From the terminal window in Task 1, above, issue the command **netstat -a**:

```
C:\> netstat -a <ENTER>
```

A table will be displayed that lists protocol (TCP and UDP), Local address, Foreign address, and State information. Addresses and protocols that can be translated into names are displayed.

The **-n** option forces **netstat** to display output in raw format. From the terminal window, issue the command **netstat -an**:

```
C:\> netstat -an <ENTER>
```

Use the window vertical scroll bar to go back and forth between the outputs of the two commands. Compare outputs, noting how well-known port numbers are changed to names.

Write down three TCP and three UDP connections from the **netstat -a** output, and the corresponding translated port numbers from the **netstat -an** output. If there are fewer than three connections that translate, note that in your table.

| Connection | Proto | Local Address | Foreign Address | State |
|------------|-------|---------------|-----------------|-------|
| | | | | |
| | | | | |
| | | | | |
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| | | | | |
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| | | | | |

Refer to the following **netstat** output. A new network engineer suspects that his host computer has been compromised by an outside attack against ports 1070 and 1071. How would you respond?

```
C:\> netstat -n
Active Connections
Proto Local Address           Foreign Address         State
TCP    127.0.0.1:1070           127.0.0.1:1071         ESTABLISHED
TCP    127.0.0.1:1071           127.0.0.1:1070         ESTABLISHED
C:\>
```

Step 2: Establish multiple concurrent TCP connections and record **netstat** output.

In this task, several simultaneous connections will be made with Eagle Server. The venerable **telnet** command will be used to access Eagle Server network services, thus providing several protocols to examine with **netstat**.

Open an additional four terminal windows. Arrange the windows so that all are visible. The four terminal windows that will be used for telnet connections to Eagle Server can be relatively small, approximately $\frac{1}{2}$ screen width by $\frac{1}{4}$ screen height. The terminal windows that will be used to collect connection information should be $\frac{1}{2}$ screen width by full screen height.

Several network services on Eagle Server will respond to a telnet connection. We will use:

- DNS- domain name server, port 53
- FTP- FTP server, port 21
- SMTP- SMTP mail server, port 25
- TELNET- Telnet server, port 23

Why should telnet to UDP ports fail?

To close a telnet connection, press the <CTRL>] keys together. That will bring up the telnet prompt, Microsoft Telnet>. Type **quit** <ENTER> to close the session.

In the first telnet terminal window, telnet to Eagle Server on port 53. In the second terminal window, telnet on port 21. In the third terminal window, telnet on port 25. In the fourth terminal window, telnet on port 23. The command for a telnet connection on port 21 is shown below:

```
C:\> telnet eagle-server.example.com 53
```

In the large terminal window, record established connections with Eagle Server. Output should look similar to the following. If typing is slow, a connection may close before all connections have been made. Eventually, connections should terminate from inactivity.

| Proto | Local Address | Foreign Address | State |
|-------|--------------------|--------------------|-------------|
| TCP | 192.168.254.1:1688 | 192.168.254.254:21 | ESTABLISHED |
| TCP | 192.168.254.1:1691 | 192.168.254.254:25 | ESTABLISHED |
| TCP | 192.168.254.1:1693 | 192.168.254.254:53 | ESTABLISHED |
| TCP | 192.168.254.1:1694 | 192.168.254.254:23 | ESTABLISHED |

Task 3: Reflection.

The **netstat** utility displays incoming and outgoing network connections (TCP and UDP), host computer routing table information, and interface statistics.

Task 4: Challenge.

Close Established sessions abruptly (close the terminal window), and issue the **netstat -an** command. Try to view connections in stages different from ESTABLISHED.

Task 5: Cleanup.

Unless directed otherwise by the instructor, turn off power to the host computers. Remove anything that was brought into the lab, and leave the room ready for the next class.