# Linux Lab 9 Unnecessary services

An important part of securing a computer is making sure that only necessary daemons/services (I tend to use the two terms interchangeably) are running. Anything that you don’t need presents an unnecessary security risk, especially if listens on the network. So, it’s important to be able to find and remove unnecessary services. You do have to be careful, however. You will break things if you turn off daemons that are more important than you thought…do this in a test environment first!

## Locate listening network services

### Note: netstat vs. ss

The venerable and useful application netstat has been deprecated and replaced by ss. It appears that netstat was [not being maintained](https://dougvitale.wordpress.com/2011/12/21/deprecated-linux-networking-commands-and-their-replacements/). You can still run netstat if you install the net-tools package.  
sudo apt install net-tools

The ss app can do everything netstat can do, so you do not need netstat at all, unless you work with old Linux versions. The usage and output for netstat and ss are similar. We’ll show both.

### netstat

Unneeded services that listen to the network are potentially dangerous. If they are poorly configured or out of date, they may make the computer vulnerable to attack. The command below will find **TCP** and **UDP** ports that are **listening**, show the **Process ID** (if run with sudo), and **not replace** port numbers with names (i.e., don’t change 53 to DNS.)   
netstat -tulpn  
to locate listening ports. The ports that are listening, with a local address of 0.0.0.0, are the ones that allow connections from the outside. When the local address is 127.0.0.1, the computer is listening for connections from itself (inter process communication.) Record the listening ports.

A computer screen shot of a computer

Description automatically generated

In the example above, the first two lines show tcp processes that are listening on 127.0.0.1 (loopback interface), so they will only hear traffic from within the computer, or inter-process communication. We can usually ignore those.

The local address in the third line is 0.0.0.0:22, which means it is listening for any outside connection on TCP port 22, SSH. The local address in line 4 is 0::1:631, which is the IPv6 version of the loopback address (127.0.0.1) and can be ignored.

The local address in line 5 is :::22, which is the IPv6 version of 0.0.0.0:22; it is listening for outside connections on port 22 as well.

There are several UDP ports open and listening for connections: 631, 5353, 44437. If you use your browser to search for these port numbers or the program name, you will find that 631 (CUPS) is the Linux print server. Ports 5353 and 44437 (Avahi-daemon) are used for plug and play services with other computers using the Apple Bonjour protocol. On a secure computer you would want to disable these services.

Note: If you use netstat without the **t** or **u** options you will see Unix STREAM connections. These are internal connections, and there are a lot of them. If you’re only interested in external network connections, they clutter the output.

### ss

The same options work for ss. Note that you must use sudo to see the process information  
ss -tulpn

A screenshot of a computer program

Description automatically generated

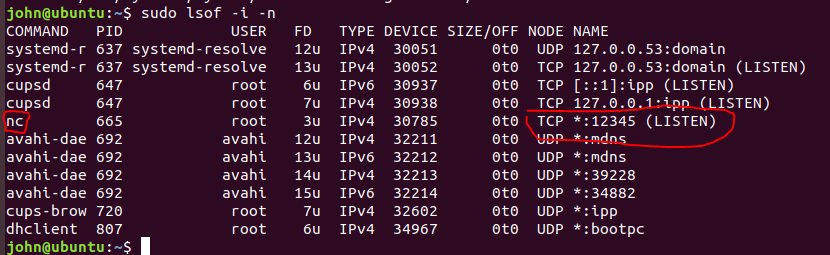
If you have a connection in progress, you will see ESTABLISHED connections. In the example below, the command, ss -tupn (removed the l) was run just after the VM’s browser connected to <https://www.nasa.gov>.

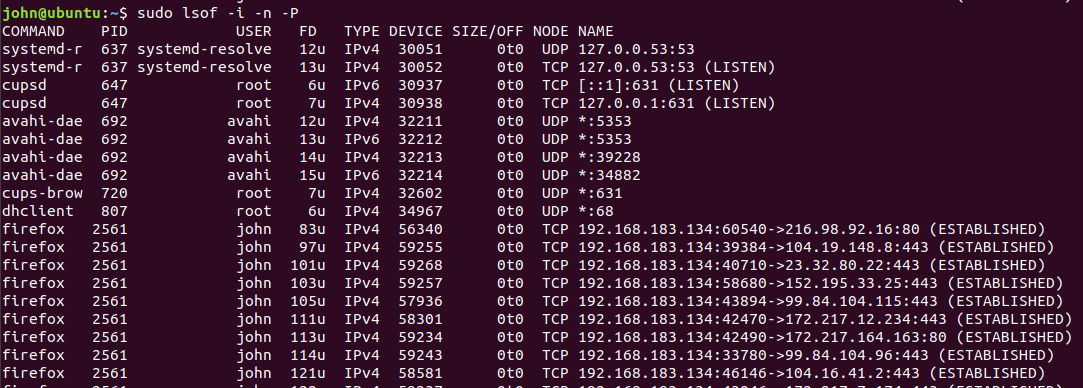
A screenshot of a computer screen

Description automatically generated

It shows many connections from the VM (192.168.86.129) to various servers (port 80 is HTTP and port 443 is HTTPS) associated with the NASA web site. (The first line shows a connection between the VM and the gateway router for DHCP.)

### lsof

Another command that will help is lsof (list open files). With the -i option, lsof lists files that have open IP connections. The data in the NAME column in the lsof output begins with \*: and contains (LISTEN), for services that are listening for outside connections. Inside connections will have 127.0.0.1 (IP version 4) or [::1] (IP version 6) instead of \*. In the example below, you will see that I have nc (netcat) listening on port 12345; not good. I was playing with a netcat backdoor and forgot to turn it off. Oops.  


Use lsof with and without the -P option, so you can see both the port name and port number. Note: Be sure to run lsof with root privileges.  
sudo lsof -i -n  
This shows lsof output when Firefox has connected to the Nasa web site (ESTABLISHED connections).  


Run lsof and record the listening ports, port names, and command (service names) you see.

*(This command only applies to Ubuntu 15 and higher--skip this if you are using Ubuntu 14)*We can see which services opened sockets (network connections) through systemd by using the command,  
systemctl list-units --type socket  
The list of services may not be identical to the list of ports from the netstat command if services opened sockets outside of systemd.

A final way to locate or confirm listening ports is to scan your VM from another computer. Find the IP address of your VM by executing either ifconfig (interface configuration, different from Windows ipconfig) or the newer command, ip address. Then ping your VM from your Windows host machine. Once you’ve verified connectivity, run a scan of your VM using nmap (or Zenmap) from your Windows host. Note: It is possible for your VM to be listening on a port, but the VM’s firewall is configured to block it. Also, by default nmap only scans the 1000 most popular ports. If you have time, you can scan all 65535 ports by adding -p 0-65535 to your nmap command and running it again.

With the data you have, and assistance from your favorite search engine, determine what the listening services are doing, and whether you should shut them down. A search for “shut down xyz service” may be helpful, as there are usually questions asking what happens when the service is shut down.

# Hand in 1

What listening services did you find, what do they do, and should you shut them down?

A screenshot of a computer screen

Description automatically generated

Avahi is based on Apple BonJour, used for discovering other hosts on the local subnet. If this were a secure server I would uninstall it. For casual home use, not so bad

CUPS is the Linux printing service. If I’m not using printers…see above.

A screenshot of a computer

Description automatically generated

This can be removed without breaking anything. Depends on how secure/paranoid you need to be.

https://gist.github.com/zoilomora/f7d264cefbb589f3f1b1fc2cea2c844c

## Make your own unnecessary service.

Netcat is a simple program that you can use to connect to other computers. You can think of it as **cat** things to the **net**work, although it can receive things as well. We will discuss netcat more in our networking classes. Netcat is often used by contests to simulate a back door. Run this command:

nc -l portNumberOfYourChoice

The -l is a lower-case L, for listen. The portNumberOfYourChoice should be a number between 1024 and 65535. If you use a port number below 1024, you’ll have to use sudo.

Open a new terminal and use the ss command to verify that the nc (netcat) listening on the port you used.

A screenshot of a computer program

Description automatically generated

## Hand in 2

Turn in a screenshot of your ss output that shows your nc (netcat) listener.

## Other unnecessary services

This section works on Linux that is based on systemd, instead of upstart or SysV. Ubuntu 15 and later uses systemd.

The command to list all services running under systemd is,  
systemctl list-units --type service  
This puts the output into less. If you want to make a list that contains only the service names, you can use  
systemctl list-units --type service --full | cut -f3 -d' '  
The option, --full, causes systemctl to output results in a format that cut can read. After experimenting, I found that the delimiter is space, instead of the default tab, and there are two spaces before the service name (in Ubuntu 20).

The list of services is long, and it is difficult for a person new to an operating system to determine which services are necessary, and which are not. You could research each service to determine which services you need. You could also consult a security benchmark (<https://www.cisecurity.org/cis-benchmarks/> for example) to create a final list. Once you are familiar with the operating system, you can create a baseline installation and keep a copy of that installation. Then as things change, you can compare your OS to the baseline installation you’ve changed and locate unneeded (or attacker’s) service quicker.

## Shut down unnecessary services

Once you have decided to shut down services, we need to do two things: shut them down and prevent them from starting when the computer reboots. The commands are,  
systemctl stop [service name]  
systemctl disable [service name]

Be careful here. You may find listening ports that are listed as systemd, but actually run as another service under systemd. Don’t shut down systemd.