Setting up for this course

To do the exercises in this course, you will need access to a Linux machine you can log into with SSH. There are a couple of ways you can get one without installing Linux on your computer: you can use a hosting service that gives you a Linux shell environment; or you can install a Linux-based virtual machine on your own computer.

Regardless of which path you are taking, follow the instructions below (under **"Installing networking tools"**) to set up the networking tools for this course.

Your Linux machine (Hosted option)

You can use a Linux-based hosting service such as Amazon Lightsail. There are a lot of services you can use here; Lightsail is just the one that we have tested.

To use Lightsail you will need to create an Amazon AWS account if you don't have one already. You'll then need to create an instance using an Ubuntu Linux image. You can choose the lowest-cost option for the instance, which will be free for the first month.

Once you have created the instance, you will be able to log into it via SSH from your browser. Follow the instructions below under **"Installing networking tools"** next.

Your Linux machine (Local VM option)

If you prefer to work on your own computer instead of a commercial service, you can run a Linux virtual machine (VM) on top of your regular operating system.

You will need to install two pieces of software:

- VirtualBox, which you can get from this download page.
- Vagrant, which you can get from this download page.

You will also need a Unix-style terminal program. On Mac or Linux systems, you can use the built-in Terminal. On Windows, we recommend Git Bash, which is installed with the Git version control software.

Once you have VirtualBox and Vagrant installed, open a terminal and run the following commands:

```
mkdir networking
cd networking
vagrant init ubuntu/trusty64
vagrant up
```

This will create a new directory for this course and begin downloading a Linux image into this directory. It may take a long time to download, depending on your Internet connection.

When it is complete, you can log into the Linux instance with `vagrant ssh`. You are now ready to continue with the course.

If you log out of the Linux instance or close the terminal, the next time you want to use it you only need to run `cd networking` and `vagrant ssh`.

Installing networking tools

Regardless of whether you're using the local or remote option, you'll need to install some networking tools to do this course.

SSH into your Linux machine. Then take a moment to bring it up to date with any package updates: `sudo apt-get update && sudo apt-get upgrade`

Depending on how recently that machine was set up, you may get messages asking whether it's OK to install various packages or change various files. It should be safe to accept any changes the updater proposes to make.

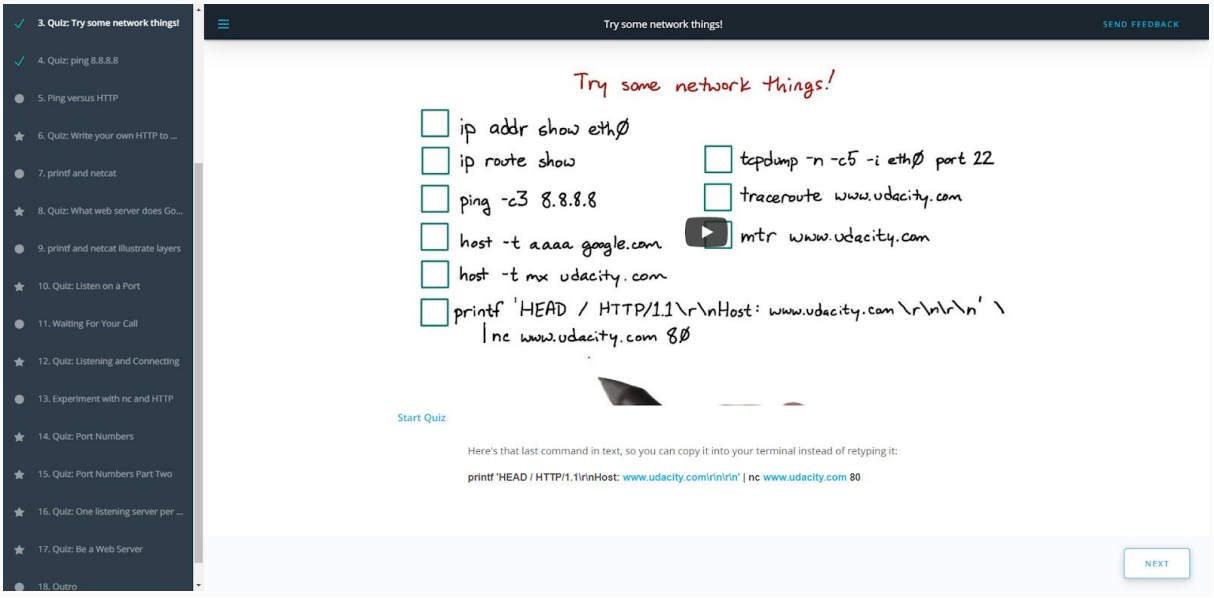
(If you haven't seen it before, the `&&` in the above command means "run the first program; then if that succeeds, run the second program." Useful shell trick.)

There are two reasons to do this update now: first, it's a good practice to keep your servers up to date; and second, if you don't update it, the new software for this course may not install correctly.

You'll be using several network utility programs in this course. Some of them may already be installed, but just to make sure, let's install them all:

```
sudo apt-get install netcat-openbsd tcpdump traceroute mtr
```

Once this installation completes, your machine is ready to do the exercises in this course.



```
[ec2-user@ip-172-31-26-198 ~]$ ip addr show eth0
2: eth0: mtu 9001 qdisc pfifo_fast state UP gr
oup default qlen 1000
    link/ether 06:ff:1b:09:13:12 brd ff:ff:ff:ff:ff:ff
    inet 172.31.26.198/20 brd 172.31.31.255 scope global eth0
       valid_lft forever preferred_lft forever
    inet6 fe80::4ff:1bff:fe09:1312/64 scope link
       valid_lft forever preferred_lft forever
```

```
[ec2-user@ip-172-31-26-198 ~]$ ip addr show eth0
2: eth0: mtu 9001 qdisc pfifo_fast state UP gr
oup default qlen 1000
    link/ether 06:ff:1b:09:13:12 brd ff:ff:ff:ff:ff:ff
    inet 172.31.26.198/20 brd 172.31.31.255 scope global eth0
       valid_lft forever preferred_lft forever
    inet6 fe80::4ff:1bff:fe09:1312/64 scope link
       valid_lft forever preferred_lft forever
[ec2-user@ip-172-31-26-198 ~]$ ^C
[ec2-user@ip-172-31-26-198 ~]$ ip route show
default via 172.31.16.1 dev eth0
169.254.169.254 dev eth0
172.31.16.0/20 dev eth0  proto kernel  scope link  src 172.31.26.198
```

```
[ec2-user@ip-172-31-26-198 ~]$ ip route show
default via 172.31.16.1 dev eth0
169.254.169.254 dev eth0
172.31.16.0/20 dev eth0  proto kernel  scope link  src 172.31.26.198
[ec2-user@ip-172-31-26-198 ~]$ ping -c3 8.8.8.8
PING 8.8.8.8 (8.8.8.8) 56(84) bytes of data.
64 bytes from 8.8.8.8: icmp_seq=1 ttl=39 time=10.9 ms
64 bytes from 8.8.8.8: icmp_seq=2 ttl=39 time=10.9 ms
64 bytes from 8.8.8.8: icmp_seq=3 ttl=39 time=10.9 ms

--- 8.8.8.8 ping statistics ---
3 packets transmitted, 3 received, 0% packet loss, time 2002ms
rtt min/avg/max/mdev = 10.902/10.940/10.963/0.123 ms
```

```
[ec2-user@ip-172-31-26-198 ~]$ host -t aaaa google.com
google.com has IPv6 address 2607:f8b0:4009:802::200e
```

```
[ec2-user@ip-172-31-26-198 ~]$ host -t mx udacity.com
udacity.com mail is handled by 20 alt2.aspmx.l.google.com.
udacity.com mail is handled by 30 aspmx2.googlemail.com.
udacity.com mail is handled by 30 aspmx3.googlemail.com.
udacity.com mail is handled by 10 aspmx.l.google.com.
udacity.com mail is handled by 20 alt1.aspmx.l.google.com.
```

```
[ec2-user@ip-172-31-26-198 ~]$ printf 'HEAD / HTTP/1.1\r\nHost: www.udacity.com\
r\n\r\n' | nc www.udacity.com 80
HTTP/1.1 301 Moved Permanently
Server: CloudFront
Date: Wed, 03 Jul 2019 07:21:33 GMT
Content-Type: text/html
Content-Length: 183
Connection: keep-alive
Location: https://www.udacity.com/
X-Cache: Redirect from cloudfront
Via: 1.1 740422079533490337d86a2ad56bb19e.cloudfront.net (CloudFront)
X-Amz-Cf-Pop: YTO50-C1
X-Amz-Cf-Id: W-gmYayEbkGFO4wJmYR37gwNrGpioCzAzQlOCw9RZmlvFYdHusEzwg==
```

```
[ec2-user@ip-172-31-26-198 ~]$ tcpdump -n -c5 -i eth0 port 22
tcpdump: eth0: You don't have permission to capture on that device
(socket: Operation not permitted)
```

```
[ec2-user@ip-172-31-26-198 ~]$ traceroute www.udacity.com
traceroute to www.udacity.com (52.84.134.39), 30 hops max, 60 byte packets
 1  ec2-52-15-0-72.us-east-2.compute.amazonaws.com (52.15.0.72)  28.295 ms ec2-5
2-15-0-68.us-east-2.compute.amazonaws.com (52.15.0.68)  15.066 ms ec2-52-15-0-64
.us-east-2.compute.amazonaws.com (52.15.0.64)  28.262 ms
 2  100.64.2.204 (100.64.2.204)  19.945 ms 100.64.3.202 (100.64.3.202)  16.156 m
s 100.64.3.142 (100.64.3.142)  13.421 ms
 3  100.66.2.172 (100.66.2.172)  21.524 ms 100.66.3.0 (100.66.3.0)  18.452 ms 10
0.66.3.238 (100.66.3.238)  19.072 ms
 4  100.66.7.79 (100.66.7.79)  16.068 ms 100.66.6.9 (100.66.6.9)  16.067 ms 100.
66.7.69 (100.66.7.69)  16.036 ms
 5  100.66.4.17 (100.66.4.17)  17.942 ms 100.66.4.233 (100.66.4.233)  19.511 ms
100.66.4.99 (100.66.4.99)  18.357 ms
 6  100.65.11.161 (100.65.11.161)  0.391 ms 100.65.8.129 (100.65.8.129)  0.328 m
s 100.65.10.65 (100.65.10.65)  0.343 ms
 7  52.95.3.135 (52.95.3.135)  22.792 ms 52.95.1.19 (52.95.1.19)  22.127 ms 52.9
5.1.23 (52.95.1.23)  21.730 ms
 8  52.95.1.252 (52.95.1.252)  31.418 ms 52.95.1.112 (52.95.1.112)  22.709 ms 52
.95.1.168 (52.95.1.168)  28.130 ms
 9  52.95.1.151 (52.95.1.151)  21.592 ms 52.95.2.33 (52.95.2.33)  21.644 ms 52.9
5.1.151 (52.95.1.151)  21.539 ms
10  100.91.39.48 (100.91.39.48)  22.153 ms  21.556 ms 100.91.39.54 (100.91.39.54
)  38.431 ms
11  52.93.128.221 (52.93.128.221)  22.176 ms  22.435 ms  21.989 ms
12  54.239.44.170 (54.239.44.170)  21.787 ms  21.773 ms  21.536 ms
13  176.32.124.53 (176.32.124.53)  21.442 ms  21.366 ms  21.420 ms
14  * * *
15  * * *
16  * * *
17  * * *
18  * * *
19  * * *
20  * * *
21  * * *
22  * * *
23  * * *
24  * * *
25  * * *
26  * * *
27  * * *
28  * * *
29  * * *
30  * * *
```

ip-172-31-26-198 (172.31.26.198)
2019-07-03T07:26:34+0000
Keys: elp isplay mode estart statistics rder of fields uit

Packets Ping-
Host
Loss% Snt Last Avg Best Wrst StDev
 1. ???
 2. ???
 3. ???
 4. ???
 5. ???
 6. 100.65.11.33
0.0% 92 0.4 0.6 0.4 2.4 0.5
 7. 52.95.1.23
0.0% 92 21.7 22.4 21.5 41.5 2.7
 8. 52.95.1.112
0.0% 92 23.5 26.8 21.3 55.3 4.9
 9. 52.95.1.117
0.0% 92 21.4 22.2 21.3 58.7 3.9
10. 100.91.39.0
0.0% 92 31.1 27.4 21.5 53.5 6.6
  100.91.39.64
11. 52.93.129.165
0.0% 92 22.3 22.7 21.8 32.8 1.7
  52.93.129.167
12. 54.239.43.189
0.0% 92 22.2 22.2 21.2 34.9 1.6
  54.239.44.188
13. 52.93.3.48
0.0% 92 22.1 22.4 21.2 29.7 1.7
  52.93.3.82
14. 52.93.3.19
0.0% 92 22.3 22.8 20.9 34.7 3.3
  52.93.3.183
15. ???
16. ???
17. ???
18. ???
19. ???
20. server-99-86-58-48.yto50.r.cloudfront.net

```
[ec2-user@ip-172-31-26-198 ~]$ printf 'HEAD / HTTP/1.1\r\nHost: en.wikipedia.org
\r\n\r\n' | nc en.wikipedia.org 80
HTTP/1.1 301 TLS Redirect
Date: Wed, 03 Jul 2019 07:44:39 GMT
Server: Varnish
X-Varnish: 678319365
X-Cache: cp1077 int
X-Cache-Status: int-front
Server-Timing: cache;desc="int-front"
Set-Cookie: WMF-Last-Access=03-Jul-2019;Path=/;HttpOnly;secure;Expires=Sun, 04 A
ug 2019 00:00:00 GMT
Set-Cookie: WMF-Last-Access-Global=03-Jul-2019;Path=/;Domain=.wikipedia.org;Http
Only;secure;Expires=Sun, 04 Aug 2019 00:00:00 GMT
X-Client-IP: 3.17.143.80
Location: https://en.wikipedia.org/
Content-Length: 0
Connection: keep-alive
```