

The aim of this room is to provide a beginner's introduction to the basic principles of networking. Networking is a *massive* topic, so this really will just be a brief overview; however, it will hopefully give you some foundational knowledge of the topic, which you can build upon for yourself.

The topics that we're going to cover in this room are:

- The OSI Model
- The TCP/IP Model
- How these models look in practice
- An introduction to basic networking tools

Answer the questions below

Let's get started!

No answer needed

✓ Correct Answer

Task 2 ✓ The OSI Model: An Overview

Task 3 ○ Encapsulation

Task 4 ✓ The TCP/IP Model

Task 5 ✓ Networking Tools Ping

Task 6 ✓ Networking Tools Traceroute

Task 7 ✓ Networking Tools WHOIS

Task 8 ○ Networking Tools Dig

Task 9 ○ Further Reading

The physical layer is right down to the hardware of the computer. This is where the electrical pulses that make up data transfer over a network are sent and received. It's the job of the physical layer to convert the binary data of the transmission into signals and transmit them across the network, as well as receiving incoming signals and converting them back into binary data.

For the "Which Layer" Questions below, answer using the layer number (1-7)

Answer the questions below

Which layer would choose to send data over TCP or UDP?

✓ Correct Answer

Which layer checks received information to make sure that it hasn't been corrupted?

✓ Correct Answer

In which layer would data be formatted in preparation for transmission?

✓ Correct Answer

Which layer transmits and receives data?

✓ Correct Answer

Which layer encrypts, compresses, or otherwise transforms the initial data to give it a standardised format?

✓ Correct Answer

Which layer tracks communications between the host and receiving computers?

✓ Correct Answer

Which layer accepts communication requests from applications?

✓ Correct Answer

Which layer handles logical addressing?

✓ Correct Answer

When sending data over TCP, what would you call the "bite-sized" pieces of data?

✓ Correct Answer

[Research] Which layer would the FTP protocol communicate with?

✓ Correct Answer

💡 Hint

Which transport layer protocol would be best suited to transmit a live video?

✓ Correct Answer

It's sorted out the inconsistency problems. Later the OSI model was also introduced by the International Organisation for Standardisation (ISO); however, it's mainly used as a more comprehensive guide for learning, as the TCP/IP model is still the standard upon which modern networking is based.

Answer the questions below

Which model was introduced first, OSI or TCP/IP?

TCP/IP

✓ Correct Answer

Which layer of the TCP/IP model covers the functionality of the Transport layer of the OSI model (Full Name)?

Transport

✓ Correct Answer

Which layer of the TCP/IP model covers the functionality of the Session layer of the OSI model (Full Name)?

Application

✓ Correct Answer

The Network Interface layer of the TCP/IP model covers the functionality of two layers in the OSI model. These layers are Data Link, and?.. (Full Name)?

Physical

✓ Correct Answer

Which layer of the TCP/IP model handles the functionality of the OSI network layer?

Internet

✓ Correct Answer

What kind of protocol is TCP?

Connection-based

✓ Correct Answer

🔍 Hint

What is SYN short for?

Synchronise

✓ Correct Answer

🔍 Hint

What is the second step of the three way handshake?

SYN/ACK

✓ Correct Answer

What is the short name for the "Acknowledgement" segment in the three-way handshake?

ACK

✓ Correct Answer

Task 5 ✓ Networking Tools Ping

Task 6 ✓ Networking Tools Traceroute

Task 7 ✓ Networking Tools WHOIS

Task 8 ○ Networking Tools Dig

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possible. Usually this will be a website on the internet, but it could also be for a computer on your home network if you want to check if it's configured correctly. Ping works using the ICMP protocol, which is one of the slightly less well-known TCP/IP protocols that were mentioned earlier. The ICMP protocol works on the Network layer of the OSI Model, and thus the Internet layer of the TCP/IP model. The basic syntax for ping is `ping <target>`. In this example we are using ping to test whether a network connection to Google is possible:

```
~$ ping google.com
PING google.com (216.58.198.174) 56(84) bytes of data.
```

Notice that the ping command actually returned the IP address for the Google server that it connected to, rather than the URL that was requested. This is a handy secondary application for ping, as it can be used to determine the IP address of the server hosting a website. One of the big advantages of ping is that it's pretty much ubiquitous to any network enabled device. All operating systems support it out of the box, and even most embedded devices can use ping!

Have a go at the following questions. Any questions about syntax can be answered using the man page for ping (`man ping` on Linux).

Answer the questions below

What command would you use to ping the bbc.co.uk website?

✓ Correct Answer

Ping *muirlandoracle.co.uk*

What is the IPv4 address?

✓ Correct Answer

💡 Hint

What switch lets you change the interval of sent ping requests?

✓ Correct Answer

💡 Hint

What switch would allow you to restrict requests to IPv4?

✓ Correct Answer

What switch would give you a more verbose output?

✓ Correct Answer

Task 6 ✓ Networking Tools Traceroute

Task 7 ✓ Networking Tools WHOIS

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Task 9 ○ Further Reading

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The internet is made up of many, many different servers and end-points, all networked up to each other. This means that, in order to get to the content you actually want, you first need to go through a bunch of other servers. Traceroute allows you to see each of these connections -- it allows you to see every intermediate step between your computer and the resource that you requested. The basic syntax for traceroute on Linux is this: `traceroute <destination>`

By default, the Windows traceroute utility (`tracert`) operates using the same ICMP protocol that ping utilises, and the Unix equivalent operates over UDP. This can be altered with switches in both instances.

```
-$ traceroute google.com
traceroute to google.com (216.58.205.46), 30 hops max, 60 byte packets
 1 _gateway (172.16.255.254) 14.883 ms 15.401 ms 15.551 ms
 2 193.60.160.253 (193.60.160.253) 1.464 ms 1.872 ms 2.026 ms
 3 193.60.168.92 (193.60.168.92) 3.084 ms 4.093 ms 4.814 ms
 4 ge-0-3-2.dund-ban1.ja.net (146.97.128.85) 4.768 ms 4.253 ms 4.715 ms
 5 ae1.dund-ban3.ja.net (146.97.64.97) 10.320 ms 5.114 ms 10.589 ms
 6 ae24.leedaa-sbr2.ja.net (146.97.37.181) 11.160 ms 10.855 ms 10.766 ms
 7 ae29.lowdss-sbr1.ja.net (146.97.33.50) 11.992 ms 11.048 ms 10.746 ms
 8 ae31.londtw-sbr2.ja.net (146.97.33.30) 13.558 ms 13.245 ms 13.561 ms
 9 ae28.londtt-sbr1.ja.net (146.97.33.61) 13.541 ms 13.229 ms 11.410 ms
10 72.14.205.74 (72.14.205.74) 15.143 ms 14.607 ms 13.865 ms
11 74.125.242.97 (74.125.242.97) 13.263 ms 74.125.242.65 (74.125.242.65) 12.553 ms 12.904 ms
12 172.253.71.191 (172.253.71.191) 13.943 ms 12.833 ms 172.253.71.189 (172.253.71.189) 12.631 ms
13 lhr48s23-in-f14.1e100.net (216.58.205.46) 13.227 ms 12.258 ms 12.482 ms
```

You can see that it took 13 hops to get from my router (`_gateway`) to the Google server at 216.58.205.46

Now it's your turn. As with before, all questions about switches can be answered with the man page for traceroute (`man traceroute`).

Answer the questions below

Use traceroute on tryhackme.com

Can you see the path your request has taken?

No answer needed

✓ Correct Answer

What switch would you use to specify an interface when using Traceroute?

-i

✓ Correct Answer

🔒 Hint

What switch would you use if you wanted to use TCP SYN requests when tracing the route?

-T


✓ Correct Answer

[Lateral Thinking] Which layer of the *TCP/IP* model will traceroute run on by default (Windows)?

Internet

✓ Correct Answer

Task 7  Networking Tools WHOIS

Task 8  Networking Tools Dig

Task 9  Further Reading

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This is comparatively a very small amount of information as can often be found. Notice that we've got the domain name, the company that registered the domain, the last renewal, and when it's next due, and a bunch of information about nameservers (which we'll look at in the next task).

Your Turn

Answer the questions below

Perform a whois search on **facebook.com**

No answer needed

✓ Correct Answer

What is the registrant postal code for facebook.com?

94025

✓ Correct Answer

When was the facebook.com domain first registered (Format: DD/MM/YYYY)?

29/03/1997

✓ Correct Answer

Perform a whois search on **microsoft.com**

(Note: Please ensure you have read the task above before attempting the next questions.)

No answer needed

✓ Correct Answer

Which city is the registrant based in?

Redmond

✓ Correct Answer

[OSINT] What is the name of the golf course that is near the registrant address for microsoft.com?



Bellevue Golf Course

✓ Correct Answer

What is the registered Tech Email for microsoft.com?

msnhst@microsoft.com

✓ Correct Answer

Task 8  Networking Tools Dig 

Task 9  Further Reading 

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