

Internet

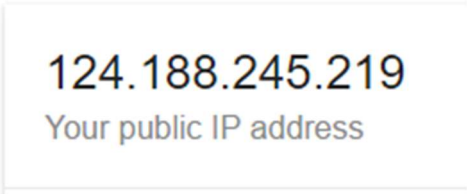
5 The Internet

The Internet is basically a giant version of your home network. It uses public IP addresses instead of private ones. It consists mostly of networks of servers (usually large computers) and routers.

Information (data) travels around the Internet as packets of binary data. Routers forward the data packets between networks connected to the Internet.

5.1 The public side of your router

In order to play on the Internet your router has to present a public IP address to the world. To find this address type “my ip address” in to Google:



124.188.245.219
Your public IP address

5.2 Communicating with the Internet

Servers are just computers that provide web, mail, file, etc services to the network they are connected to. Any computer could be used for these purposes although specialised servers are generally used (think big, powerful and expensive).

Computer services are offered by way of TCP/IP ports (logical not physical ports). For example, port 80 is the default port for web (HTTP) services.

TCP/IP is the name of the transmission protocol used on the Internet. It basically describes how data is broken into packets containing a sequence number, routing address and data. The packets are then sent across the Internet individually. One of the great strengths of this system is that individual packets may be sent by different routes (hence router) and may arrive in a random order, only to be reassembled into the original data at the recipient end. A failure on one route can be easily bypassed and lost packets can be resent.

5.3 Common TCP/IP Ports

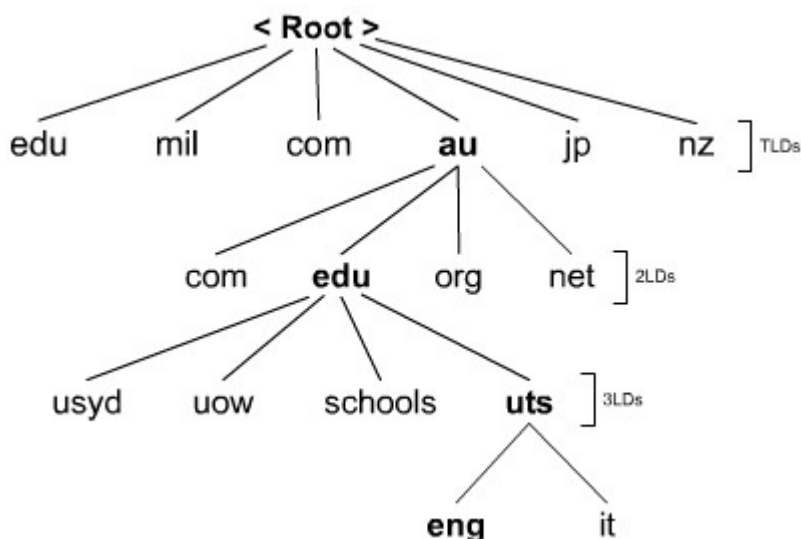
Protocol	Port	Reference
HTTP	80	
HTTPS	443	
IMAP	143	
POP	110	https://en.wikipedia.org/wiki/Post_Office_Protocol
SMTP	25	https://en.wikipedia.org/wiki/Simple_Mail_Transfer_Protocol
FTP	20	
Telnet	23	
DNS	53	
NetBIOS	137, 138, 139	

5.4 Domain Names

IP addresses are to the Internet like phone numbers are to the telephone network. If you want to call someone you will usually look them up in a phone book (usually an electronic one these days).

Like telephone numbers, IP addresses are difficult to remember. The Internet equivalent of a phone book is a DNS (Domain Name System) server. Internet services are organised into domains. Anyone who wants to offer an Internet service of any kind can register a domain name. For example: *uts.edu.au*.

5.4.1 Domain name hierarchy



The DNS hierarchy is comprised of the following elements:

1. Root Level
2. Top Level Domains (TLDs)
3. Second Level Domains (2LDs)
4. Third Level Domains (3LDs, except USA)
5. Sub-Domain or host

The domain name is written from the bottom up. In the example above the domain name would be *eng.uts.edu.au*.

Level	Name	Explanation
Top	au	Country: Australia
2 nd	edu	Type of organisation: Education
3 rd	uts	Organisation: University of Technology, Sydney
4 th	eng	Subdomain: Section or machine within organisation, probably Engineering.

The domain name for UTS is written: *uts.edu.au*. Anything to the left of *uts* is a sub-domain or machine name (or both). For example, you could have something like *pc123.eng.uts.edu.au*, which refers to a PC (pc123) in the Engineering Department at UTS Sydney. It is up to the organisation how they organise things to the left of the domain name. The domain name itself is registered with the appropriate authority in the host country (probably *esa.edu.au* in this case)

Other sub-domains operated by UTS include *www.uts.edu.au* and *email.itd.uts.edu.au*

5.4.2 Investigating DNS records

If you go to <http://ultratools.com/tools/dnsLookup> and enter *u3amanningham.org.au* you will see the DNS record for U3A Manningham. Buried in there you will find the IP address:

118.127.45.45.

Whilst *u3amanningham.org.au* may be easier to remember than *118.127.45.45* it's still not something that is always going to spring to mind.

Luckily, there are search engines (eg Google) that will help you out.

Let's use ping to confirm the IP address (Windows and Mac):

```
C:\WINDOWS\system32\cmd.exe

C:\>ping u3amanningham.org.au

Pinging u3amanningham.org.au [118.127.45.45] with 32 bytes of data:
Reply from 118.127.45.45: bytes=32 time=22ms TTL=53
Reply from 118.127.45.45: bytes=32 time=24ms TTL=53
Reply from 118.127.45.45: bytes=32 time=39ms TTL=53
Reply from 118.127.45.45: bytes=32 time=24ms TTL=53

Ping statistics for 118.127.45.45:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 22ms, Maximum = 39ms, Average = 27ms
```

5.4.3 Special addresses

Every networked computer has one special IP address: 127.0.0.1. This is the IP address of the computer as viewed from inside. This address also has the name *localhost*.

```
C:\WINDOWS\system32\cmd.exe

C:\>ping 127.0.0.1

Pinging 127.0.0.1 with 32 bytes of data:
Reply from 127.0.0.1: bytes=32 time<1ms TTL=128
Reply from 127.0.0.1: bytes=32 time<1ms TTL=128
Reply from 127.0.0.1: bytes=32 time<1ms TTL=128
Reply from 127.0.0.1: bytes=32 time<1ms TTL=128

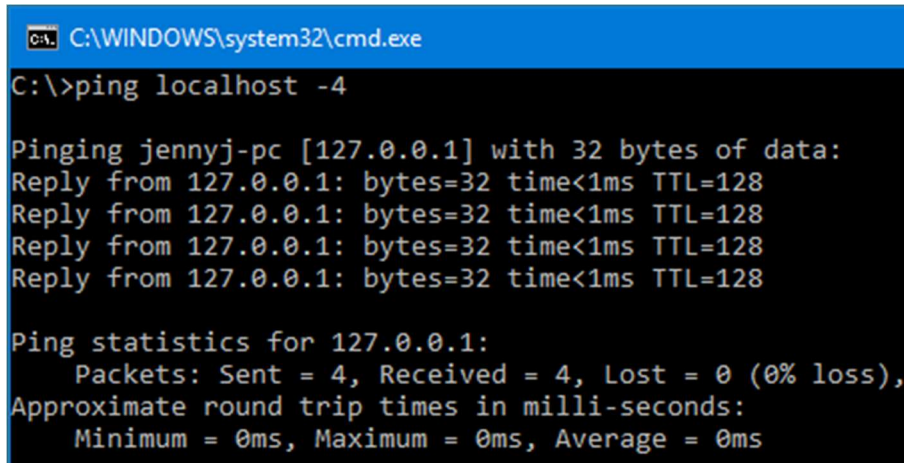
Ping statistics for 127.0.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

```
C:\WINDOWS\system32\cmd.exe

C:\>ping localhost

Pinging jennyj-pc [::1] with 32 bytes of data:
Reply from ::1: time<1ms
Reply from ::1: time<1ms
Reply from ::1: time<1ms
Reply from ::1: time<1ms

Ping statistics for ::1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
```



```
C:\WINDOWS\system32\cmd.exe
C:\>ping localhost -4

Pinging jennyj-pc [127.0.0.1] with 32 bytes of data:
Reply from 127.0.0.1: bytes=32 time<1ms TTL=128
Reply from 127.0.0.1: bytes=32 time<1ms TTL=128
Reply from 127.0.0.1: bytes=32 time<1ms TTL=128
Reply from 127.0.0.1: bytes=32 time<1ms TTL=128

Ping statistics for 127.0.0.1:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 0ms, Maximum = 0ms, Average = 0ms
```

5.5 Other issues

5.5.1 Geo-blocking

Geo-blocking is a form of Internet censorship where content is restricted or altered according to geographic location.

For example, you may attempt to view a video of a favourite TV show on a US website, only to find that it is blocked to Australian users. US software companies frequently use geo-blocking to charge Australian customers more for their services than US customers, although it costs no more to deliver the content to Australia.

5.5.2 VPN

A Virtual Private Network (VPN) is a private and secure network that extends across the (insecure) public Internet. It allows remote users to securely join another network as though they were locally attached. VPNs are commonly used in large organisations to connect regional offices to the head office so that everybody appears to be on the same network.

For an Australian user, a VPN service can be used to overcome geo-blocking. For example, you might want to view the US version of Netflix to get access to content not available in Australia. Using a VPN to connect to a US network will make your computer appear to be in the USA from Netflix's point of view, thus allowing you to view US content (so long as you can get around the joining and payment hurdles).

A VPN can also be used to create a secure connection on a public Wi-Fi hotspot.

5.5.3 Cloud computing and storage

Cloud computing is the name given to a variety of computing services made available on the Internet. Services offered include data storage, web hosting and virtual computers. Examples include:

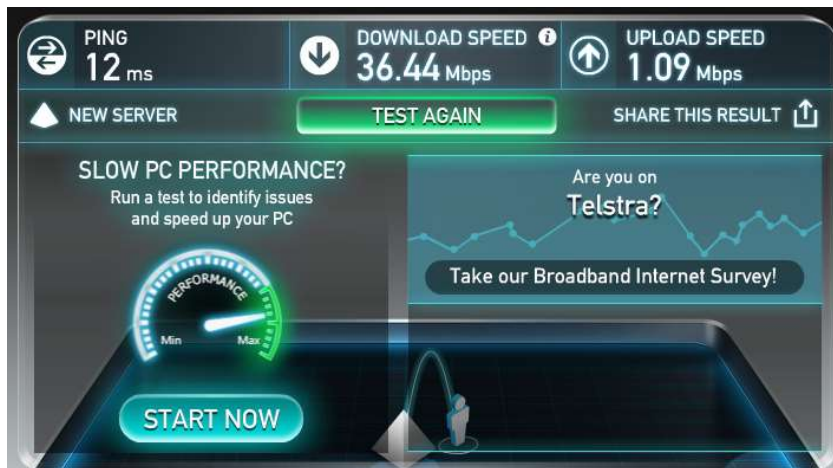
- Email – Google mail,
- Storage – Dropbox, Google Drive, Microsoft OneDrive
- Word processing, spreadsheets – Microsoft Office 365

Typically, the services are hosted on large computer systems, sometimes networked together and distributed around the world.

5.5.4 Internet speed

Internet speed (or lack of it) is usually measured in megabits per second (MBPS). See section 2.7.2.

Look at <http://www.speedtest.net/> to check the speed of your Internet connection – download speed is usually considerably greater than upload speed.



36 Mbps (megabits per second) is approximately 3.6 megabytes per second

5.5.5 Bandwidth

Bandwidth is a measure of the total capacity (speed) of an Internet connection. The term *broadband* is used to indicate a high-speed connection.

Bandwidth	Technology
56 kbit/s	Modem / Dialup
10 Mbit/s	Ethernet
11 Mbit/s	Wireless 802.11b
24 Mbit/s	ADSL2+
30 Mbit/s	Telstra cable
54 Mbit/s	Wireless 802.11g
100 Mbit/s	NBN FTTN
600 Mbit/s	Wireless 802.11n
1 Gbit/s	Gigabit Ethernet
1.3 Gbit/s	Wireless 802.11ac
5 Gbit/s	USB 3.0
10 Gbit/s	10 Gigabit Ethernet, USB 3.1
40 Gbit/s	Thunderbolt 3