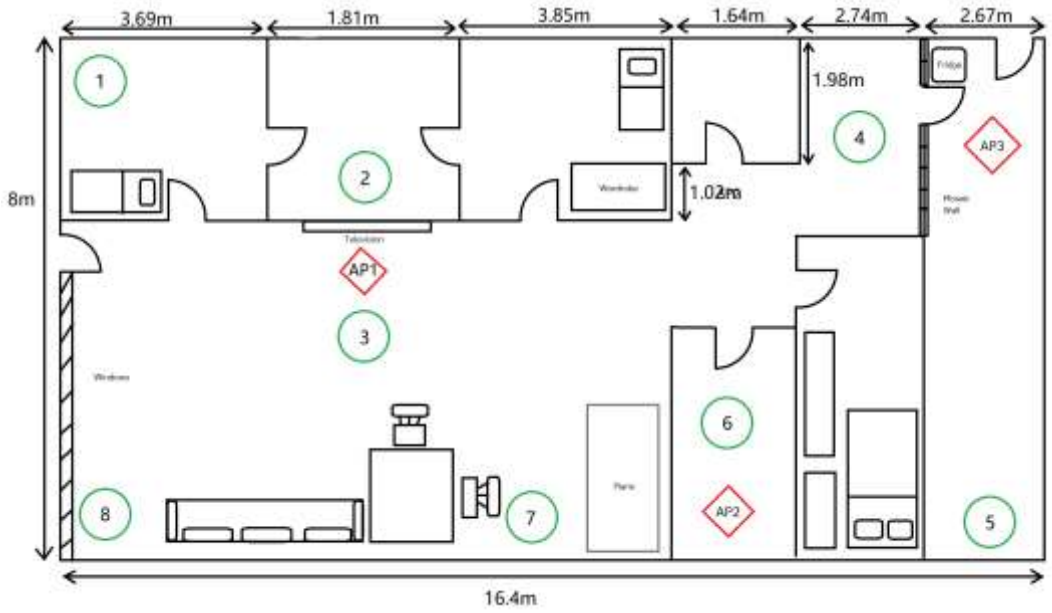
1 WLAN Network Design and Security



Task 1.1 Survey

Measuring Point 1

Access Point (AP)		AP1	AP2	AP3
SSID		Hengonghuat_5ghz@unifi	Chen Xi's iPhone	黃錦鳳的 iPhone
MAC Address		04:5E:A4:62:F2:FD	0E:45:E3:36:EE:2B	46:F4:F7:2B:6B:EC
Security		WPA2 Personal	WPA2 Personal	WPA2 Personal
802.11 version supported		802.11ac	802.11ax	802.11n-2009
Frequency Band (GHz)		5	5	2.4
Frequency Channel Used		44	149	6
Signal Strength	Signal (dBm)	-61	-73	-73
	Percentage of current signal (%)	41	27	27
	Minimum value of signal (dBm)	-65	-87	-83
	Maximum value of signal (dBm)	-54	-26	-28
	Average value of signal (dBm)	-57	-67	-62
Upload Speed (Mbps)		93.15	17.09	Connection poor
Download Speed (Mbps)		51.37	2.70	Connection poor

Measuring Point 2

Access Point (AP)		AP1	AP2	AP3
SSID		Hengonghuat_5ghz@unifi	Chen Xi's iPhone	黃錦鳳的 iPhone
MAC Address		04:5E:A4:62:F2:FD	0E:45:E3:36:EE:2B	46:F4:F7:2B:6B:EC
Security		WPA2 Personal	WPA2 Personal	WPA2 Personal
802.11 version supported		802.11ac	802.11ax	802.11n-2009
Frequency Band (GHz)		5	5	2.4
Frequency Channel Used		44	149	6
Signal Strength	Signal (dBm)	-41	-74	-69
	Percentage of current signal (%)	64	26	31
	Minimum value of signal (dBm)	-65	-87	-83
	Maximum value of signal (dBm)	-41	-26	-28
	Average value of signal (dBm)	-57	-69	-63
Upload Speed (Mbps)		84.30	9.63	Connection poor
Download Speed (Mbps)		51.24	2.29	Connection poor

Measuring Point 3

Access Point (AP)		AP1	AP2	AP3
SSID		Hengonghuat_5ghz@unifi	Chen Xi's iPhone	黃錦鳳的 iPhone
MAC Address		04:5E:A4:62:F2:FD	0E:45:E3:36:EE:2B	46:F4:F7:2B:6B:EC
Security		WPA2 Personal	WPA2 Personal	WPA2 Personal
802.11 version supported		802.11ac	802.11ax	802.11n-2009
Frequency Band (GHz)		5	5	2.4
Frequency Channel Used		44	149	6
Signal Strength	Signal (dBm)	-40	-61	-68
	Percentage of current signal (%)	65	41	33
	Minimum value of signal (dBm)	-66	-81	-96
	Maximum value of signal (dBm)	-39	-61	-28
	Average value of signal (dBm)	-58	-72	-69
Upload Speed (Mbps)		78.98	16.46	Connection poor
Download Speed (Mbps)		51.58	2.71	Connection poor

Measuring Point 4

Access Point (AP)		AP1	AP2	AP3
SSID		Hengonghuat_5ghz@unifi	Chen Xi's iPhone	黃錦鳳的 iPhone
MAC Address		04:5E:A4:62:F2:FD	0E:45:E3:36:EE:2B	46:F4:F7:2B:6B:EC
Security		WPA2 Personal	WPA2 Personal	WPA2 Personal
802.11 version supported		802.11ac	802.11ax	802.11n-2009
Frequency Band (GHz)		5	5	2.4
Frequency Channel Used		44	149	6
Signal Strength	Signal (dBm)	-76	-75	-68
	Percentage of current signal (%)	23	24	33
	Minimum value of signal (dBm)	-77	-81	-96
	Maximum value of signal (dBm)	-39	-61	-28
	Average value of signal (dBm)	-58	-70	-69
Upload Speed (Mbps)		19.41	6.81	10.65
Download Speed (Mbps)		49.17	1.95	1.65

Measuring Point 5

Access Point (AP)		AP1	AP2	AP3
SSID		Hengonghuat_5ghz@unifi	Chen Xi's iPhone	黃錦鳳的 iPhone
MAC Address		04:5E:A4:62:F2:FD	0E:45:E3:36:EE:2B	46:F4:F7:2B:6B:EC
Security		WPA2 Personal	WPA2 Personal	WPA2 Personal
802.11 version supported		802.11ac	802.11ax	802.11n-2009
Frequency Band (GHz)		5	5	2.4
Frequency Channel Used		44	149	6
Signal Strength	Signal (dBm)	-79	-69	-54
	Percentage of current signal (%)	20	31	49
	Minimum value of signal (dBm)	-81	-81	-85
	Maximum value of signal (dBm)	-39	-61	-54
	Average value of signal (dBm)	-58	-70	-72
Upload Speed (Mbps)		8.77	11.85	6.46
Download Speed (Mbps)		16.88	2.04	1.15

Measuring Point 6

Access Point (AP)		AP1	AP2	AP3
SSID		Hengonghuat_5ghz@unifi	Chen Xi's iPhone	黃錦鳳的 iPhone
MAC Address		04:5E:A4:62:F2:FD	0E:45:E3:36:EE:2B	46:F4:F7:2B:6B:EC
Security		WPA2 Personal	WPA2 Personal	WPA2 Personal
802.11 version supported		802.11ac	802.11ax	802.11n-2009
Frequency Band (GHz)		5	5	2.4
Frequency Channel Used		44	149	6
Signal Strength	Signal (dBm)	-63	-82	-77
	Percentage of current signal (%)	38	16	22
	Minimum value of signal (dBm)	-82	-82	-85
	Maximum value of signal (dBm)	-39	-46	-43
	Average value of signal (dBm)	-60	-69	-69
Upload Speed (Mbps)		73.60	38.30	Connection poor
Download Speed (Mbps)		51.00	2.71	Connection poor

Measuring Point 7

Access Point (AP)		AP1	AP2	AP3
SSID		Hengonghuat_5ghz@unifi	Chen Xi's iPhone	黃錦鳳的 iPhone
MAC Address		04:5E:A4:62:F2:FD	0E:45:E3:36:EE:2B	46:F4:F7:2B:6B:EC
Security		WPA2 Personal	WPA2 Personal	WPA2 Personal
802.11 version supported		802.11ac	802.11ax	802.11n-2009
Frequency Band (GHz)		5	5	2.4
Frequency Channel Used		44	149	6
Signal Strength	Signal (dBm)	-48	-82	-82
	Percentage of current signal (%)	56	16	16
	Minimum value of signal (dBm)	-82	-82	-85
	Maximum value of signal (dBm)	-39	-46	-43
	Average value of signal (dBm)	-59	-70	-70
Upload Speed (Mbps)		75.06	16.27	Connection poor
Download Speed (Mbps)		51.53	2.09	Connection poor

Measuring Point 8

Access Point (AP)		AP1	AP2	AP3
SSID		Hengonghuat_5ghz@unifi	Chen Xi's iPhone	黃錦鳳的 iPhone
MAC Address		04:5E:A4:62:F2:FD	0E:45:E3:36:EE:2B	46:F4:F7:2B:6B:EC
Security		WPA2 Personal	WPA2 Personal	WPA2 Personal
802.11 version supported		802.11ac	802.11ax	802.11n-2009
Frequency Band (GHz)		5	5	2.4
Frequency Channel Used		44	149	6
Signal Strength	Signal (dBm)	-61	-82	-80
	Percentage of current signal (%)	41	16	19
	Minimum value of signal (dBm)	-82	-82	-85
	Maximum value of signal (dBm)	-39	-46	-43
	Average value of signal (dBm)	-59	-72	-71
Upload Speed (Mbps)		69.51	21.36	Connection poor
Download Speed (Mbps)		51.27	4.96	Connection poor

Task 1.2 Report

1. Channel Occupancy

   From the data gathered, we can see that AP1 uses channel 44, AP2 uses channel 149, and AP3 uses channel 6. Therefore, the access points are not competing on the same channel and they are not configured to use overlapping channels. If two APs use overlapping channels (i.e. the same frequency to propagate data), it may cause interference, resulting in data collision. End users will also need to re-send packets and this will cause a delay in communication. The channel used by AP2 is displayed as 149+1. This is due to the bonding of two 20MHz channels to form a 40 MHz channel, in which consists of a primary channel and a secondary channel. The primary 20MHz channel is used for signalling and backwards compatibility (allows for interoperability with older systems), while the secondary is only used when sending data at full speed. Roaming is enabled for AP1. I observed that the computer automatically switches to AP1 if it detects weak signal strength while being connected to AP2 or AP3.

2. Interference

   On the observation of bit rate of AP1 at measuring points 2 and 3, we can see that standing in front of the AP has lower bit rate than standing at a point with a wall in between. This might be due to interference from signals reflected from the wall. The reflected signals cause destructive interference and therefore disrupts the Wi-Fi router's transmitted signal, thus its strength is decreased. The television behind AP1 also causes minor interference, but it does not affect the signal strength very much (about a decrease of ~2Mbps).

3. Attenuation

   The signals blocked by the wall however does not affect the Wi-Fi signal very much as the wall is only a dry wall (~4dB signal attenuation). In fact, the human body causes larger attenuation (~10dB) as a weaker signal is observed when I stand in between the computer and the Wi-Fi router (about a drop of 10dB in signal strength). I also found out that the drop of signal strength is even more distinct (~14dB) if the wall is mosaic tiled (signal strength of AP3 at measuring point 4 is -68dB and at measuring point 5 it is -54dB). I also found out that mobile hotspots experience great signal attenuation if it is placed in weak reception areas. (especially AP3, which its bit rate is untestable in most places despite having a signal strength of >-90Db)

4. Coverage

   The APs have good coverage of the area overall, but the bit rate is heavily influenced by surrounding noise (furniture, signal reflection on walls and doors, electrical appliances, etc.). For the APs to be fully efficient, they need to be placed in more open areas (such as the position of AP1), where there are less obstacles to block the wireless signals. For the APs with weaker signal strength (like AP3), I think that it needs to be placed in the middle of the area so that it has a better reception to increase its bit rate.

5. Download and Upload Speeds at Different Points

AP1

Measuring Point	Signal Strength (dBm)	Download Speed (Mbps)	Upload Speed (Mbps)
1	-61	93.15	51.37
2	-41	84.3	51.24
3	-40	78.98	51.58
4	-76	19.41	49.17
5	-79	8.77	16.88
6	-63	73.6	51.00
7	-48	75.06	51.53
8	-61	69.51	51.27

Measuring Point 1 measures the fastest download speed of AP1 despite it not having the strongest signal strength. This might be due to less signal interference in its surroundings (no other electronic appliances/ furniture). An interesting thing is that although Measuring Point 3 has the strongest signal strength, it is 20Mbps slower than the fastest download speed. This might be due to interference of the television and the reflection of signals from the Wi-Fi router itself.

AP2

Measuring Point	Signal Strength (dBm)	Download Speed (Mbps)	Upload Speed (Mbps)
1	-73	17.09	2.70
2	-74	9.63	2.29
3	-61	16.46	2.71
4	-75	6.81	1.95
5	-69	11.85	2.04
6	-82	38.30	2.71
7	-82	16.27	2.09
8	-82	21.36	4.96

Although the Download Speed at Measuring Point 6 is the fastest, it has a very low signal strength. Due to AP2 being a mobile hotspot, it may have greater fluctuations in signal strength, therefore the instantaneous reading might not be accurate. A very slow upload speed might be because of the phone using wireless signals instead of physical signals (like fibre optics used by Wi-Fi routers). Although Measuring Point 8 is further away from AP2 than Measuring Points 6 and 7, it has faster download and upload speed. This might be due to a Radio Frequency Shadow (the radio frequency signal being deflected off uneven surfaces) when the device is close to the AP, resulting in degraded signals and interference.

AP3

Measuring Point	Signal Strength (dBm)	Download Speed (Mbps)	Upload Speed (Mbps)
1	-73	Connection poor	Connection poor
2	-69	Connection poor	Connection poor
3	-68	Connection poor	Connection poor
4	-68	10.65	1.65
5	-54	6.46	1.15
6	-77	Connection poor	Connection poor
7	-82	Connection poor	Connection poor
8	-80	Connection poor	Connection poor

This AP has a relatively weak download and upload speed compared to the other two APs. This might be due to hardware limitations as the mobile hotspot is hosted on a rather old device.

2 Cyber Security

Topic : TikTok just gave itself permission to collect biometric data on US users, including 'faceprints and voiceprints'

2.1 Summary

Not long ago, TikTok US released a new section in its privacy policy stating that the app "*may collect biometric identifiers and biometric information*" from its users' content, including faceprints and voiceprints. Despite being rather extensive on the range of data gathering, TikTok claims that the part of the data collection is for non-personally-identifying operations such as ad recommendations and application enhancement. The section also contains a vague explanation of how TikTok would collect biometric information from the User's Content, which raised concerns about the ignorance of some users to this updated policy. Other than the policy problem, TikTok also faced a ban attempt by the US federal government due to it being a national security threat of being owned by a Chinese company, in which the final outcome still remains unclear. The new disclosure about biometric data collection also resulted in a lawsuit against TikTok, based on the violation of Illinois' Biometric Information Privacy Act. Although TikTok has made changes to its privacy policy, TikTok still has quite a number of user data on their hands as the app automatically collects information about users' devices, including location data, uploaded content, sent messages, etc.

2.2 Identify

Software: TikTok US v19.7.0

Hardware: Devices of end users (smartphones, tablets, etc.)

2.3 Describe the Problem

The problem emerged when TikTok US released its new privacy policy update on 2nd June 2021 in its official webpage. The earliest instance of this problem being published is on TechCrunch by Sarah Perez on 3rd June 2021. She found out that a new section introduced in the app's privacy policy states that the app might retrieve users' biometric data. TikTok did not explain in its privacy policy, how would this kind of data be used, nor how would it seek permissions from users, nor the laws it would abide; raising concern amongst the US users.

2.4 Estimate the Seriousness

The data retrieved by TikTok from its users would be stored in its database and is potentially exposed to outside threats such as hackers trying to steal the information from the database. This can be done by the hacker impersonating a genuine administrator to gain access to the database or even wiretapping during data collection. If the hacker gets hold of such private information, he may exploit such information to gain access to the users' devices (e.g. unlocking the users' phone) or even finance accounts (e.g. bypassing the biometric authentication).

(a) Technical
On a technical level, I think that TikTok should enforce some level of security on the data that it collects, such as encrypting the data communication with hashing algorithms (e.g. SHA-x), establishing admin authentication when retrieving data from the database (ticket/token based control or with digital certificates) , setting up data transmission via VPN connection, placing firewalls on its routers and using DMZs. Setting up a IPS can help detect and prevent malicious attacks as well.

(b) Human Behavior
Since TikTok users are given the option to deny the request to collect biometric data, they should consider to do so to prevent their biometric data from being leaked or obtained through illegal methods. Users should also be self-aware that their data might be collected when using the app and be extra cautious when posting or uploading anything onto the platform.

(c) Policy Level
TikTok should think about how to phrase and define certain words in their privacy policy so as not to create confusion in public. The states of a country should also introduce stricter privacy laws to protect its residents' private information and to enforce penalty and provide compensation in case of a data security breach.

Source

The primary 20MHz channel is used for signalling and backwards compatibility (allows for interoperability with older systems), while the secondary is only used when sending data at full speed.

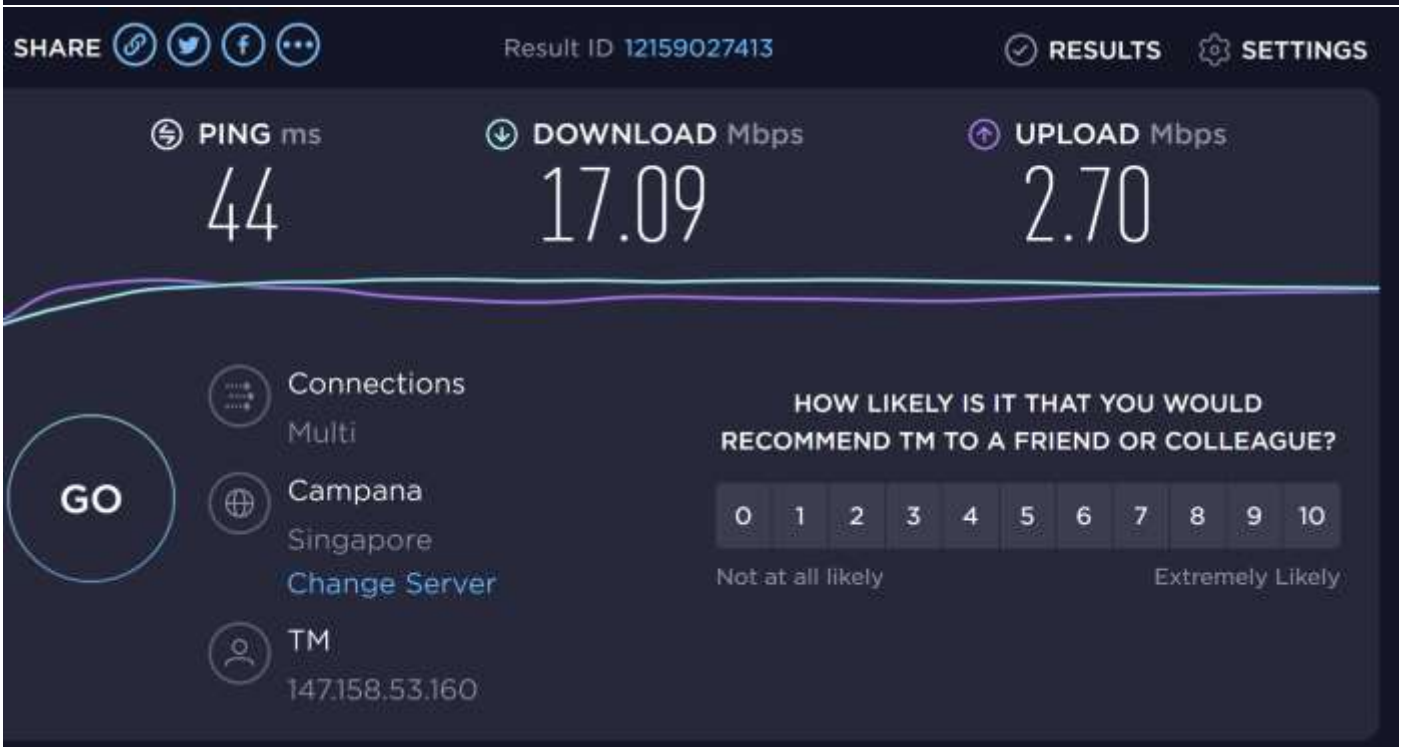
Wikimedia Foundation. (2021, October 6). *List of WLAN channels*. Wikipedia. Retrieved October 10, 2021, from https://en.wikipedia.org/wiki/List_of_WLAN_channels.

"*may collect biometric identifiers and biometric information*" from its users' content.

Perez, S. (2021, June 3). *TikTok just gave itself permission to collect biometric data on US users, including 'faceprints and voiceprints.'* Tech Crunch. Retrieved October 16, 2021, from https://techcrunch.com/2021/06/03/tiktok-just-gave-itself-permission-to-collect-biometric-data-on-u-s-users-including-faceprints-and-voiceprints/

Appendix

Measuring Point 1



Measuring Point 2

Measuring Point 3

NetSpot - Discover

DISCOVER | SURVEY

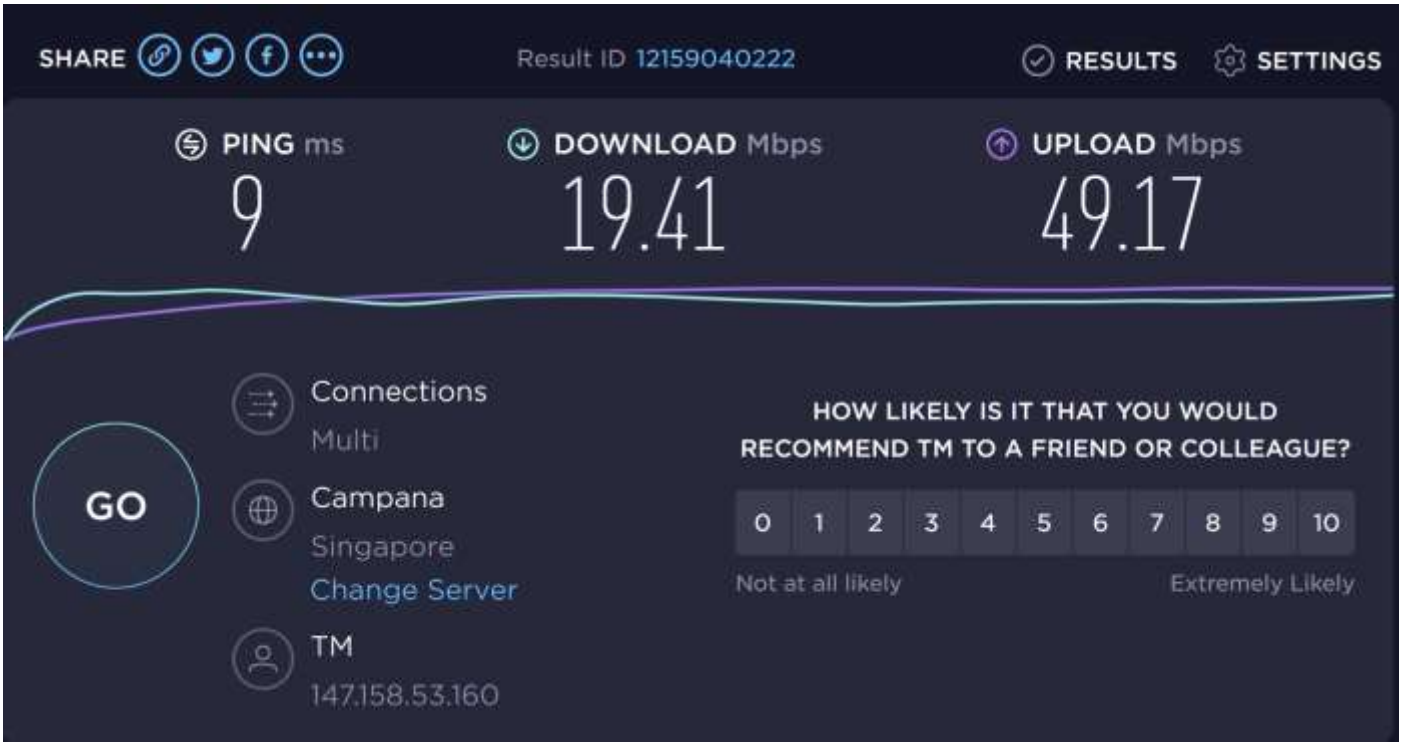
SSID	BSSID	Alias	Graph	Signal	%	Min.	Max.	Average	Level	Band	Channel	Width	Vendor	Security	Mode	Last seen
daniel&26_2.4G@unifi	CC:4F:5C:A0:A1:50			-	-	-96	-79	-79		2.4	2	20	IEEE	WPA2 Personal	n	4 m 24 s a...
Paragon Guest - 27 - R...	B0:BE:76:B5:3D:2A			-72	28	-72	-72	-72		2.4	3	40	TP-LINK	WPA2 Personal	ac	now
黃錦昌 的 iPhone	1E:5E:58:CE:C1:32			-76	23	-81	-74	-77		2.4	6	20	-	WPA2 Personal	n	now
黃錦昌 的 iPhone	46:F4:F7:2B:6B:EC			-68	33	-96	-28	-69		2.4	6	20	-	WPA2 Personal	n	now
SMA3006923067	90:9A:77:FD:B3:9D			-78	21	-96	-78	-81		2.4	8	20	Texas	WPA2 Personal	n	now
Hengonghuat@unifi	04:5E:A4:62:F2:F8			-39	66	-62	-32	-52		2.4	10	20	SHENZHEN	WPA2 Personal	n	now
Hengonghuat_5ghz@u...	04:5E:A4:62:F2:FD			-40	65	-66	-39	-58		5	44	80	SHENZHEN	WPA2 Personal	ac	now
jfw001007	44:D9:E7:0E:00:95			-83	15	-96	-83	-89		5	52	20	Ubiquiti	Open	n	now
Chen Xi's iPhone	0E:45:E3:36:EE:28			-	-	-96	-26	-72		5	149 + 1	40	-	WPA2 Personal	ax	2 m 34 s a...
Chen Xi's iPhone	3E:B3:96:0C:D6:2F			-61	41	-81	-61	-72		5	149 + 1	40	-	WPA2 Personal	ax	now
Chen Xi's iPhone	AE:91:0D:A2:41:B1			-	-	-96	-22	-35		5	149 + 1	40	-	WPA2 Personal	ax	13 m 11 s ...

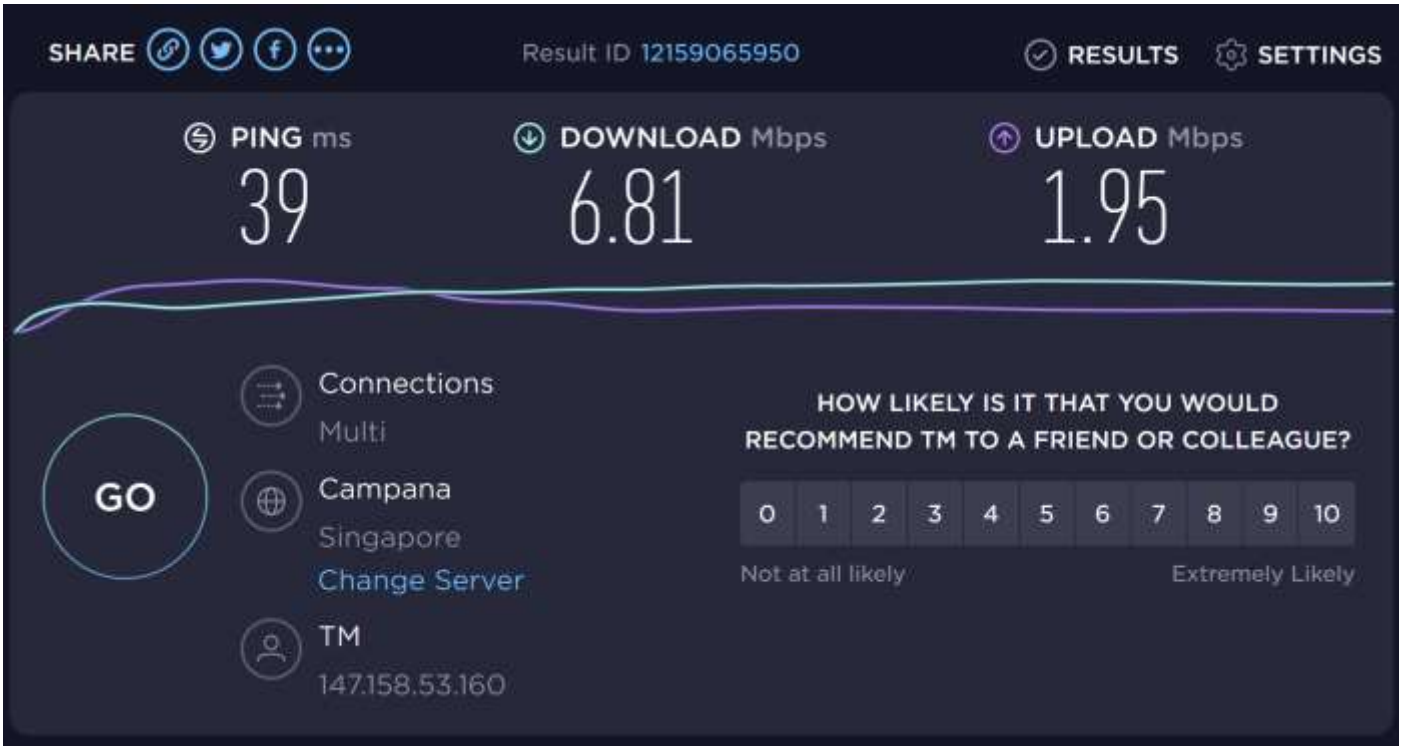
Measuring Point 4

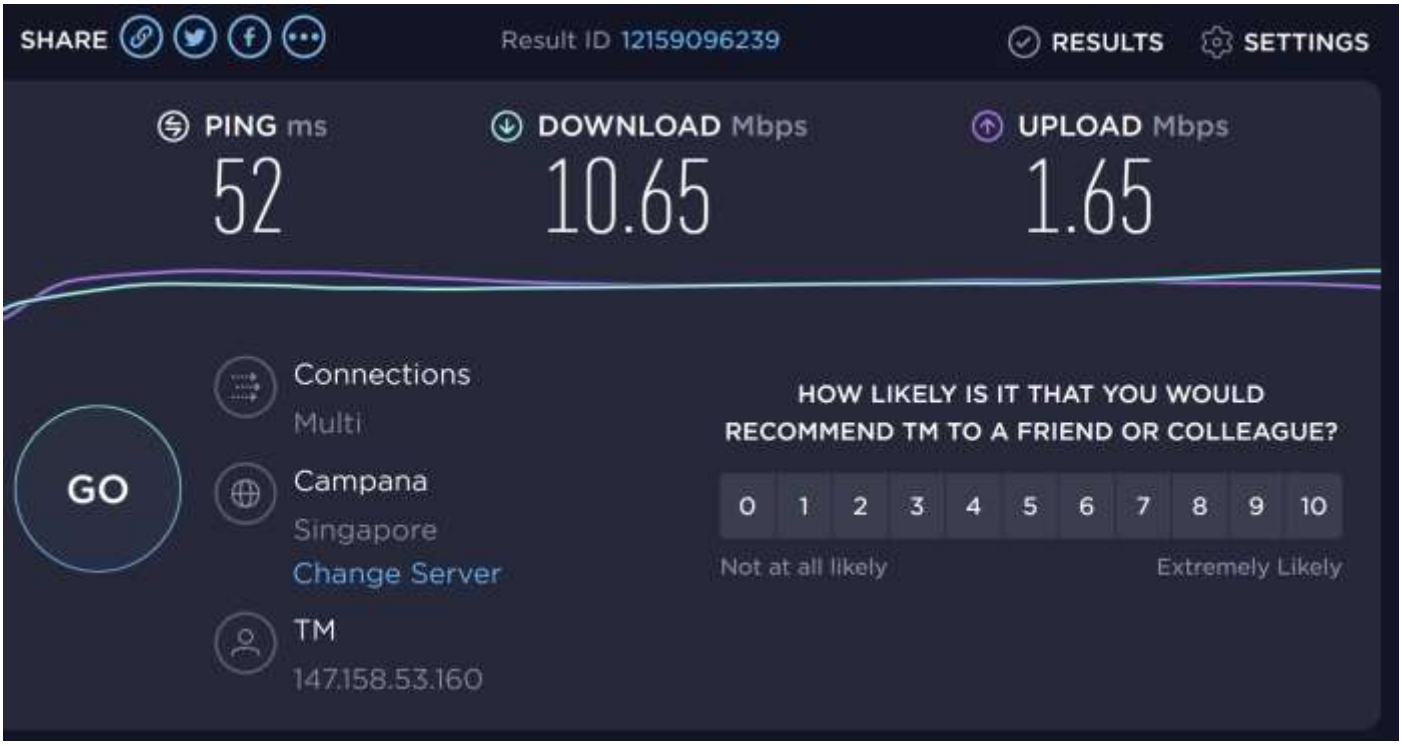
NetSpot - Discover

DISCOVER SURVEY

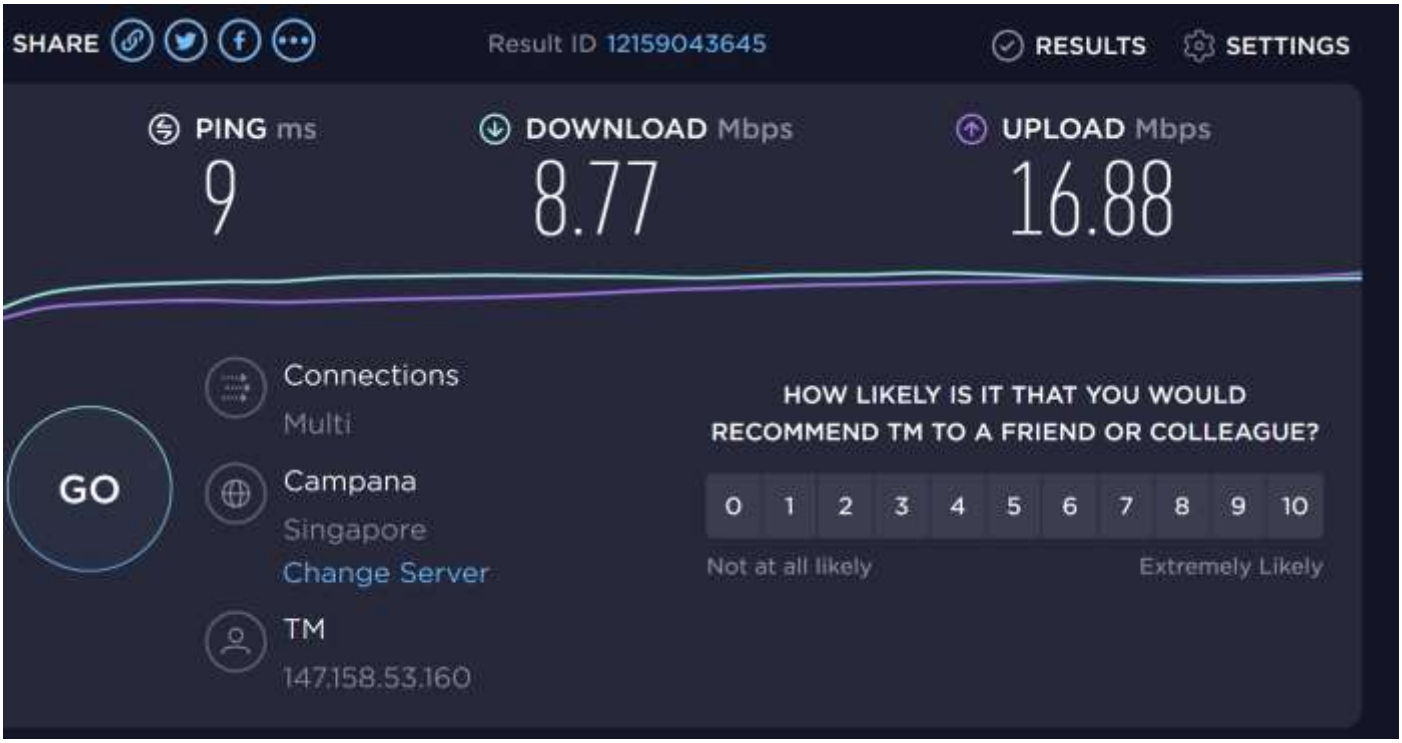
SSID	BSSID	Alias	Graph	Signal	%	Min.	Max.	Average	Level	Band	Channel	Width	Vendor	Security	Mode	Last seen
danielle26_2.4G@unifi	CC:4F:5C:A6:A1:50			-	-	-96	-79	-79		2.4	2	20	IEEE	WPA2 Personal	n	5 m 5 s ago
Paragon Guest - 27 - R...	B0:BE:76:85:3D:2A			-72	28	-72	-72	-72		2.4	3	40	TP-LINK	WPA2 Personal	ac	now
黃錦鳳 的 iPhone	1E:5E:58:CE:C1:32			-66	35	-85	-66	-76		2.4	6	20	-	WPA2 Personal	n	now
黃錦鳳 的 iPhone	46:F4:F7:2B:6B:EC			-68	33	-96	-28	-69		2.4	6	20	-	WPA2 Personal	n	now
SMA3006923067	90:9A:77:FD:B3:9D			-78	21	-96	-78	-81		2.4	8	20	Texas	WPA2 Personal	n	now
Hengonghuat@unifi	04:5E:A4:62:F2:F8			-70	30	-70	-32	-52		2.4	10	20	SHENZHEN	WPA2 Personal	n	now
Hengonghuat_5ghz@u...	04:5E:A4:62:F2:FD			-76	23	-77	-39	-58		5	44	80	SHENZHEN	WPA2 Personal	ac	now
jtw001007	44:D9:E7:0E:00:95			-90	7	-96	-83	-89		5	52	20	Ubiquiti	Open	n	now
Chen Xi's iPhone	0E:45:E3:36:EE:2B			-	-	-96	-26	-72		5	149 + 1	40	-	WPA2 Personal	ax	3 m 15 s a...
Chen Xi's iPhone	3E:B3:96:0C:D6:2F			-75	24	-81	-61	-70		5	149 + 1	40	-	WPA2 Personal	ax	now
Chen Xi's iPhone	AE:81:0D:A2:41:B1			-	-	-96	-22	-35		5	149 + 1	40	-	WPA2 Personal	ax	13 m 52 s ...






SHARE
Result ID 12159096239
RESULTS
SETTINGS
PING ms
52
DOWNLOAD Mbps
10.65
UPLOAD Mbps
1.65
GO
Connections
Multi
Campana
Singapore
Change Server
TM
147.158.53.160
HOW LIKELY IS IT THAT YOU WOULD RECOMMEND TM TO A FRIEND OR COLLEAGUE?
0 1 2 3 4 5 6 7 8 9 10
Not at all likely
Extremely Likely

Measuring Point 5




SHARE
Result ID 12159100439
RESULTS
SETTINGS
PING ms
48
DOWNLOAD Mbps
6.46
UPLOAD Mbps
1.15
GO
Connections
Multi
Campana
Singapore
Change Server
TM
147.158.53.160
HOW LIKELY IS IT THAT YOU WOULD RECOMMEND TM TO A FRIEND OR COLLEAGUE?
0 1 2 3 4 5 6 7 8 9 10
Not at all likely
Extremely Likely

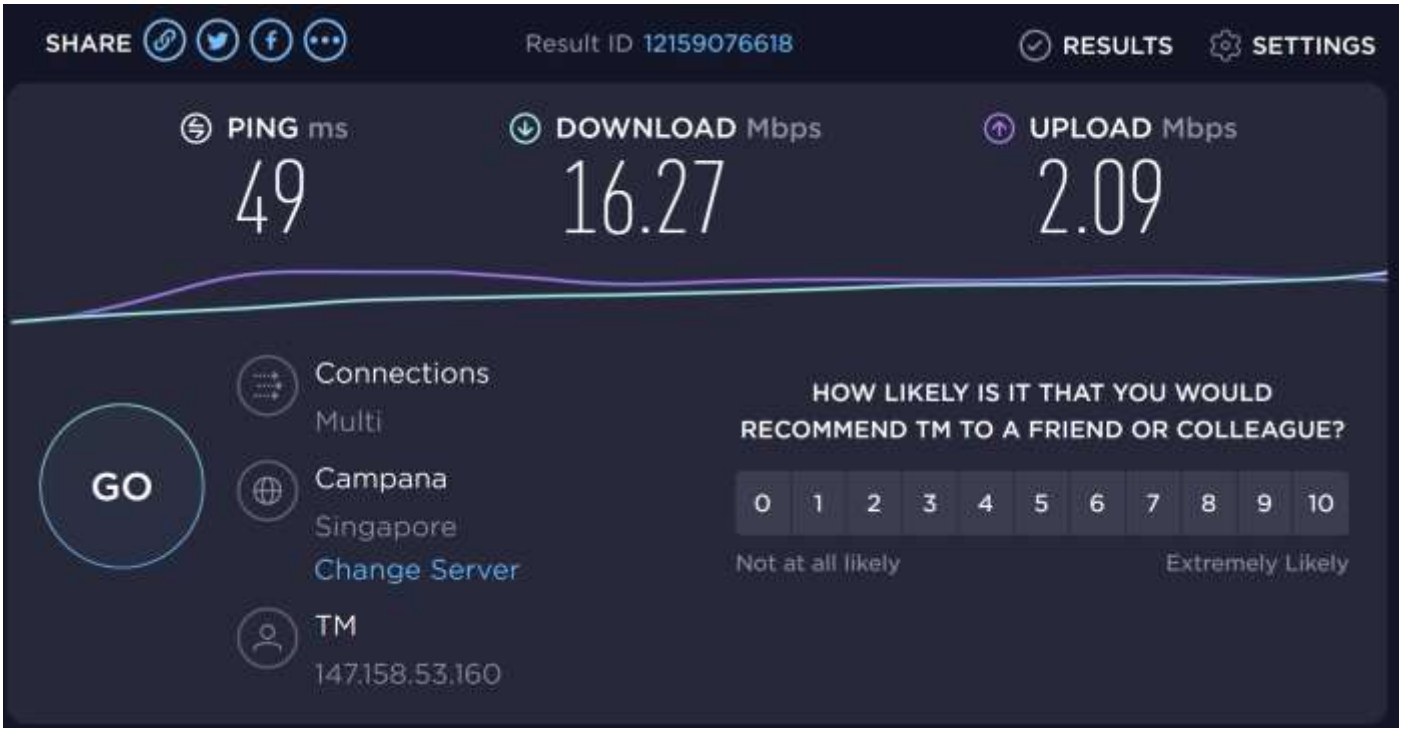
Measuring Point 6

Measuring Point 7

NetSpot - Discover

DISCOVER SURVEY

SSID	BSSID	Alias	Graph	Signal	%	Min.	Max.	Average	Level	Band	Channel	Width	Vendor	Security	Mode	Last seen
daniellie26_2.4G@unifi	CC:4F:5C:A0:A1:50			-	-	-96	-79	-79		2.4	2	20	IEEE	WPA2 Personal	n	7 m 50 s a...
B30-03-TIME_451F	6C:16:32:E6:45:28			-87	10	-87	-87	-87		2.4	3	20	HUAWEI	WPA2 Personal	n	now
Paragon Guest - 27	R... 80:BE:76:85:3D:2A			-	-	-96	-72	-72		2.4	3	40	TP-LINK	WPA2 Personal	ac	2 m 35 s a...
黃緯凱 的 iPhone	1E:5E:58:CE:C1:32			-82	16	-85	-43	-70		2.4	6	20	-	WPA2 Personal	n	now
黃緯凱 的 iPhone	46:F4:F7:2B:6B:1C			-	-	-96	-28	69		2.4	6	20	-	WPA2 Personal	n	2 m 40 s a...
SMA30069230B7	90:9A:77:FD:B3:9D			-	-	-96	-78	-80		2.4	8	20	Texas	WPA2 Personal	n	1 m 55 s a...
Hengonghuat@unifi	04:5E:A4:62:F2:F8			-40	65	-73	-32	-53		2.4	10	20	SHENZHEN	WPA2 Personal	n	now
Hengonghuat_5ghz@u...	04:5E:A4:62:F2:FD			-48	56	-82	-39	-55		5	44	80	SHENZHEN	WPA2 Personal	ac	now
jlw001007	44:D9:E7:0E:00:95			-87	10	-96	-83	-89		5	52	20	Ubiquiti	Open	n	now
Chen Xi's iPhone	0E:45:E3:36:EE:28			-	-	-96	-26	-72		5	149 + 1	40	-	WPA2 Personal	ax	6 m 0 s ago
Chen Xi's iPhone	3E:B3:96:0C:D6:2F			-82	16	-82	-46	-70		5	149 + 1	40	-	WPA2 Personal	ax	now
Chen Xi's iPhone	AE:91:8D:A3:41:B1			-	-	-96	-22	-35		5	149 + 1	40	-	WPA2 Personal	ax	16 m 37 s ...



Measuring Point 8

3 Reflective Journal

Week 6

In week 6 I learnt more about how processes are managed and scheduled inside the CPU, and an introduction to networking. I am fairly intrigued by how networking works as I didn't know that data goes through that many steps to be transferred from one end to the other. I also respect the effort that people have put in to minimize data corruption due to long distance data transfer and to maximize data transport efficiency. I am also amazed by how technology has progressed until this day as we can now send a 50 Gb file in 2 minutes whereas we have to wait hours for a file of 5 Mb to successfully send to another end back in the old days. In the tutorials, I learnt about the methods the CPU used to interact with I/O devices (i.e. programmed I/O, interrupt-based I/O and DMA), the difference between BIOS and UEFI and the structure of the computer motherboard. It has helped me to get a better understanding upon the topics learnt.

Week 7

In week 7 I learnt about computer networking. I learnt about how I as a user client, am connected to different servers through area networks such as LANs, MANs, RANs and WANs. Before I came into contact with computer networking, I only knew a little about LANs and WLANs as I came across these terms while gaming. I used to think that a WLAN only is sufficient to get me connected to the Internet. But now I know that my computer is connected to a series of switches and routers before it can transmit data to and from other servers connected to the Internet. Quiz 6 also introduced a few terms that were not yet taught such as Ethernet, bus topology and ring topology, etc. I searched up the terms in the Wikipedia and got some insight of the topic. I hope that it helps me to understand better in the lessons next week. The tutorial refreshed my memory on OS, the differences between a process and a program, the states of a process, context switching, system calls, the difference between user mode and kernel mode and how it protects the computer, and the variants of process switching. I also got the chance to understand about how the CPU performance is displayed in my computer's Task Manager application.

Week 8

This week I learnt about the physical layer of computer networking. I always thought that data is sent through 0s and 1s without giving it much thought, yet after the lessons I learnt that there are two ways of data transmission through the physical layer(digital and analog). I also learnt about the various problems encountered by physical data transmission and the ways of encoding and modulations to resolve the problems. The pre-recorded lectures about Data Link, Network, Transport and Application layers of computer networking helped me to understand how each protocol layer functions and how data is passed down each layer via encapsulation and how data is decapsulated on the other end. It is a marvel to learn how big amounts of data are sent in such a short amount of time without much error and the steps that people have taken to ensure that all the Internet users can enjoy low-traffic and high-efficiency networking. I revised about networking terms (bandwidth, bit rate, latency, protocol, etc.) and learnt about packet sniffing in this week's tutorial. Now I have a basic understanding of how to interpret the 5 layers of TCP/IP model in a real life situation.

Week 9

This week I learnt more in depth in the network layer and application layer of the TCP/IP model. I used to think that the way data is sent from one device to another is the same as long as the devices are connected to the Internet. Now I know that there are different ways that data can be sent based on how the devices are connected to one another (e.g. the use of a router is not needed when 2 devices belong to the same subnet). I also learnt about IPv4 and IPv6 addressing and how routers use IP addresses to forward data. Before I learnt about routing tables, I didn't know what the gateway means when the browser suddenly prompts a default gateway error. After learning about routing tables and routing algorithms, I have gained an understanding to what actually happens when the system raises such an error. I also learned about various protocols to handle the communication between a host and a client. I also learnt about what is DNS and how it provides feedback to each client request. I also gained some insight on how ISPs interact and cooperate with one another to provide the Internet services we have nowadays. In the tutorial, I learnt about the basics of packet sniffing and how each layer of the TCP/IP model looks like.

Week 10

I was exposed to network security this week. I gained some insight in the various types security attacks and learnt about basic data encryption methods such as AES and RSA. I have learnt about some mathematical theory in RSA previously in MAT1830 lectures, and I find it very interesting that how such relatively simple mathematical operations (compared to some complex encryption algorithms) can result in a hard to crack encrypted message. In the video provided in Moodle about cracking passwords, I am amazed by the computational power of computers nowadays to find passwords amongst the huge database in such a short time. It makes me wonder if my passwords are safe given how fast the GPUs take to crack a password. In the tutorial, I revised about the differences between various types of routing methods, TCP and UDP, and application layer address and data link layer address resolution. I also learnt about how to address hosts during the creation of a subnet.

Week 11

This week is mainly focused on how applications and networks are secured using different methods. For example, a network browser session may be protected by SSL and TLS enforced on HTTP. I also found out that the Diffie-Hellman key exchange works in quite a similar mathematical fashion as RSA message encryption. Ways to ensure a secure end-to-end connection with genuine end users and the concept of firewalls, NGFs, VPNs, IDPs, IPSs, and DMZs are also taught in the video lectures. I think that it is very hard to find a point of compromise between network security and its policy complexity and it will still be a tricky problem to resolve even in the future. In the tutorial, I learnt about basic message encryption methods and how to decrypt them, as well as the generation of a public key and private key with RSA.