

SC4022/CE/CZ4022 Assignment

Deadline of Submission: 17 Nov 2023 (Fri) 2359 hours

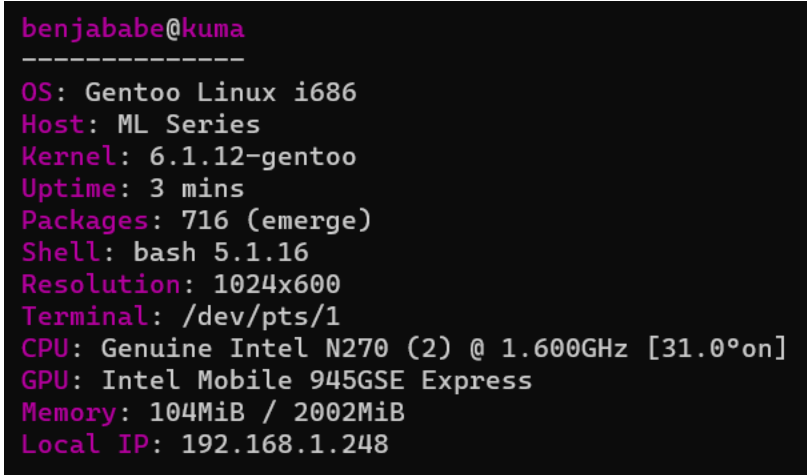

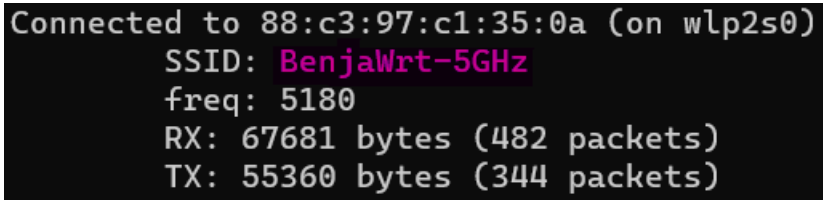
Total Marks = 20

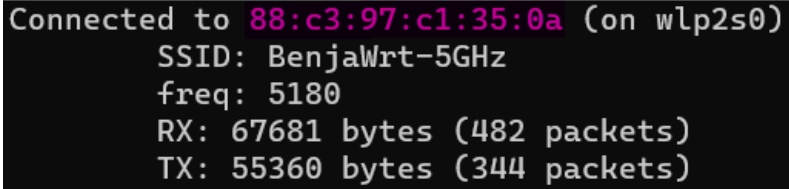
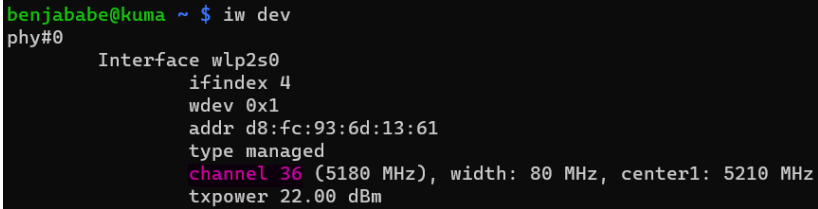
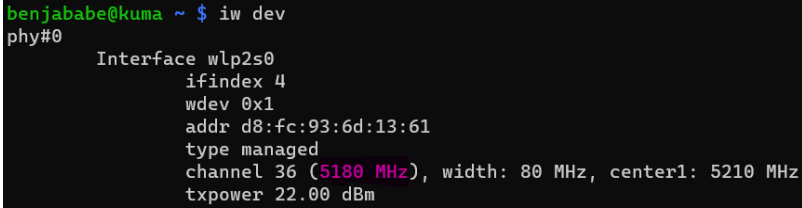
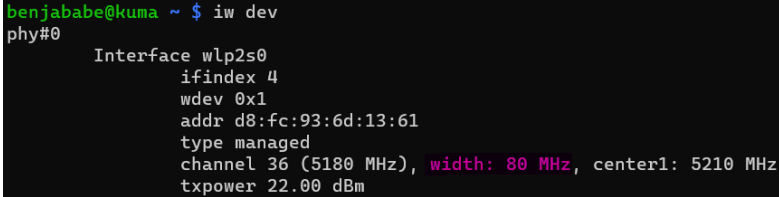
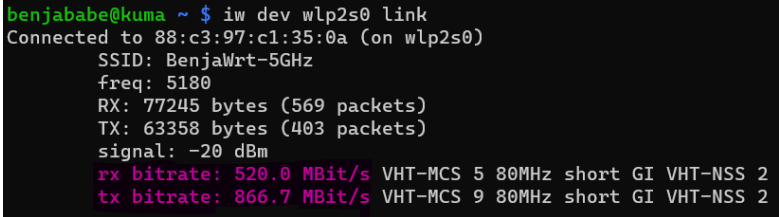
Mode of Submission:

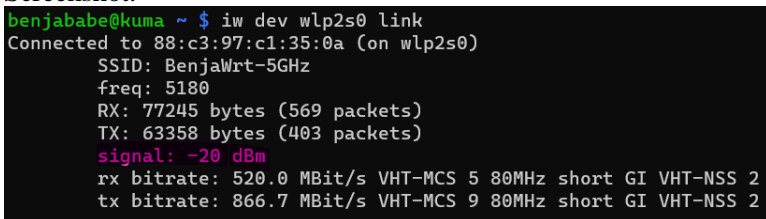
- Complete the Table starting from page 2 and submit (either in Microsoft Word or pdf) via Wi-Fi Experiment link in Assignments on the left tab menu of NTULearn.
- A maximum of 3 submissions is allowed. Grading will be based on the last submission.

Instructions:

1. Hardware resource required: Wi-Fi enabled smartphone or laptop or desktop.
2. Software resource required: Any suitable free Wi-Fi Analyzer app(s) you can download from Apple App Store or Google Play Store or from the Web which can allow you to conduct the experiment and answer the questions set out in this assignment.
3. If your phone/laptop/desktop has basic/advanced features (either in normal mode or in developer's mode) to monitor the Wi-Fi networks such that you can populate the following Table without the need to download any app, it will be most convenient.
4. **Populate the Table based on the experiment you have performed. Attach the relevant screenshot for each of Items 1 through 9 so that your answers can be verified. A completed Table without the respective screenshots means your answers cannot be verified and no marks will be awarded for those Items with missing screenshots.**

		Fill in your data and insert the relevant screenshot
Name of Student		Goh Zongye Benjamin
Date of Experiment		4 November 2023
1.	Your smartphone/laptop/desktop brand and/or model and/or name.	<div>Kohjinsha ML6SL16A</div> <div> Screenshot:  </div>
2.	MAC address of your device.	<div>D8:FC:93:6D:13:61</div> <div> Screenshot:  </div>
3.	Wi-Fi network name (SSID).	<div>BenjaWrt-5Ghz</div> <div> Screenshot:  </div>
4.	MAC address of the	88:C3:97:C1:35:0A

	Access Point (AP).	<p>Screenshot:</p> 
5.	Wi-Fi channel number used by your device.	<p>36</p> <p>Screenshot:</p> 
6.	Frequency of the Wi-Fi channel used by your device. State the unit. NB: The exact frequency has to be given. Stating 2.4 or 5 GHz is not an acceptable answer.	<p>5180 MHz</p> <p>Screenshot:</p> 
7.	Width of the frequency channel used by your device. State the unit.	<p>80 MHz</p> <p>Screenshot:</p> 
8.	Link speed of the Wi-Fi channel used by your device. State the unit.	<p>520Mbps Down / 866.7Mbps Up</p> <p>Screenshot:</p> 
9.	Wi-Fi signal strength	-20dBm

	received by your device. State the unit.	Screenshot: 																																																																																																																																																																																																																																																																																																									
10.	<p>State the Wi-Fi standard of the network (e.g. 802.11g, 802.11n, 802.11ac etc). Give a reason for your answer based on your understanding of the various Wi-Fi standards.</p> <p>NB: Stating that it is shown in the app or the router supports a particular standard is not an acceptable answer.</p>	<p>802.11ac. Output from ‘iw dev’ indicates VHT-MCS index 5 and 9 for RX and TX respectively at the 80MHz bandwidth, with short (0.4 μs) GI and 2 spatial streams and with speeds of 520 and 866.7 Mbps for RX and TX respectively.</p> <p>Referring to the MCS table here: https://mcsindex.com/, the values match with the speeds provided.</p> <table><tr><th colspan="6"></th><th colspan="6">OFDM (Prior 11ax)</th></tr><tr><th colspan="3">MCS Index</th><th rowspan="2">Spatial Stream</th><th rowspan="2">Modulation</th><th rowspan="2">Coding</th><th colspan="2">20MHz</th><th colspan="2">40MHz</th><th colspan="2">80MHz</th></tr><tr><th>HT</th><th>VH T</th><th>HE</th><th>0.8μs GI</th><th>0.4μs GI</th><th>0.8μs GI</th><th>0.4μs GI</th><th>0.8μs GI</th><th>0.4μs GI</th></tr><tr><td>0</td><td>0</td><td>0</td><td>1</td><td>BPSK</td><td>1/2</td><td>6.5</td><td>7.2</td><td>13.5</td><td>15</td><td>29.3</td><td>32.5</td></tr><tr><td>1</td><td>1</td><td>1</td><td>1</td><td>QPSK</td><td>1/2</td><td>13</td><td>14.4</td><td>27</td><td>30</td><td>58.5</td><td>65</td></tr><tr><td>2</td><td>2</td><td>2</td><td>1</td><td>QPSK</td><td>3/4</td><td>19.5</td><td>21.7</td><td>40.5</td><td>45</td><td>87.8</td><td>97.5</td></tr><tr><td>3</td><td>3</td><td>3</td><td>1</td><td>16-QAM</td><td>1/2</td><td>26</td><td>28.9</td><td>54</td><td>60</td><td>117</td><td>130</td></tr><tr><td>4</td><td>4</td><td>4</td><td>1</td><td>16-QAM</td><td>3/4</td><td>39</td><td>43.3</td><td>81</td><td>90</td><td>175.5</td><td>195</td></tr><tr><td>5</td><td>5</td><td>5</td><td>1</td><td>64-QAM</td><td>2/3</td><td>52</td><td>57.8</td><td>108</td><td>120</td><td>234</td><td>260</td></tr><tr><td>6</td><td>6</td><td>6</td><td>1</td><td>64-QAM</td><td>3/4</td><td>58.5</td><td>65</td><td>121.5</td><td>135</td><td>263.3</td><td>292.5</td></tr><tr><td>7</td><td>7</td><td>7</td><td>1</td><td>64-QAM</td><td>5/6</td><td>65</td><td>72.2</td><td>135</td><td>150</td><td>292.5</td><td>325</td></tr><tr><td></td><td>8</td><td>8</td><td>1</td><td>256-QAM</td><td>3/4</td><td>78</td><td>86.7</td><td>162</td><td>180</td><td>351</td><td>390</td></tr><tr><td></td><td>9</td><td>9</td><td>1</td><td>256-QAM</td><td>5/6</td><td>N/A</td><td>N/A</td><td>180</td><td>200</td><td>390</td><td>433.3</td></tr><tr><td></td><td></td><td>10</td><td>1</td><td>1024-QAM</td><td>3/4</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td>11</td><td>1</td><td>1024-QAM</td><td>5/6</td><td></td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>8</td><td>0</td><td>0</td><td>2</td><td>BPSK</td><td>1/2</td><td>13</td><td>14.4</td><td>27</td><td>30</td><td>58.5</td><td>65</td></tr><tr><td>9</td><td>1</td><td>1</td><td>2</td><td>QPSK</td><td>1/2</td><td>26</td><td>28.9</td><td>54</td><td>60</td><td>117</td><td>130</td></tr><tr><td>10</td><td>2</td><td>2</td><td>2</td><td>QPSK</td><td>3/4</td><td>39</td><td>43.3</td><td>81</td><td>90</td><td>175.5</td><td>195</td></tr><tr><td>11</td><td>3</td><td>3</td><td>2</td><td>16-QAM</td><td>1/2</td><td>52</td><td>57.8</td><td>108</td><td>120</td><td>234</td><td>260</td></tr><tr><td>12</td><td>4</td><td>4</td><td>2</td><td>16-QAM</td><td>3/4</td><td>78</td><td>86.7</td><td>162</td><td>180</td><td>351</td><td>390</td></tr><tr><td>13</td><td>5</td><td>5</td><td>2</td><td>64-QAM</td><td>2/3</td><td>104</td><td>115.6</td><td>216</td><td>240</td><td>468</td><td>520</td></tr><tr><td>14</td><td>6</td><td>6</td><td>2</td><td>64-QAM</td><td>3/4</td><td>117</td><td>130</td><td>243</td><td>270</td><td>526.5</td><td>585</td></tr><tr><td>15</td><td>7</td><td>7</td><td>2</td><td>64-QAM</td><td>5/6</td><td>130</td><td>144.4</td><td>270</td><td>300</td><td>585</td><td>650</td></tr><tr><td></td><td>8</td><td>8</td><td>2</td><td>256-QAM</td><td>3/4</td><td>156</td><td>173.3</td><td>324</td><td>360</td><td>702</td><td>780</td></tr><tr><td></td><td>9</td><td>9</td><td>2</td><td>256-QAM</td><td>5/6</td><td>N/A</td><td>N/A</td><td>360</td><td>400</td><td>780</td><td>866.7</td></tr></table> <p>Since 802.11n doesn’t support 80MHz, it must be 802.11ac.</p>							OFDM (Prior 11ax)						MCS Index			Spatial Stream	Modulation	Coding	20MHz		40MHz		80MHz		HT	VH T	HE	0.8μs GI	0.4μs GI	0.8μs GI	0.4μs GI	0.8μs GI	0.4μs GI	0	0	0	1	BPSK	1/2	6.5	7.2	13.5	15	29.3	32.5	1	1	1	1	QPSK	1/2	13	14.4	27	30	58.5	65	2	2	2	1	QPSK	3/4	19.5	21.7	40.5	45	87.8	97.5	3	3	3	1	16-QAM	1/2	26	28.9	54	60	117	130	4	4	4	1	16-QAM	3/4	39	43.3	81	90	175.5	195	5	5	5	1	64-QAM	2/3	52	57.8	108	120	234	260	6	6	6	1	64-QAM	3/4	58.5	65	121.5	135	263.3	292.5	7	7	7	1	64-QAM	5/6	65	72.2	135	150	292.5	325		8	8	1	256-QAM	3/4	78	86.7	162	180	351	390		9	9	1	256-QAM	5/6	N/A	N/A	180	200	390	433.3			10	1	1024-QAM	3/4									11	1	1024-QAM	5/6							8	0	0	2	BPSK	1/2	13	14.4	27	30	58.5	65	9	1	1	2	QPSK	1/2	26	28.9	54	60	117	130	10	2	2	2	QPSK	3/4	39	43.3	81	90	175.5	195	11	3	3	2	16-QAM	1/2	52	57.8	108	120	234	260	12	4	4	2	16-QAM	3/4	78	86.7	162	180	351	390	13	5	5	2	64-QAM	2/3	104	115.6	216	240	468	520	14	6	6	2	64-QAM	3/4	117	130	243	270	526.5	585	15	7	7	2	64-QAM	5/6	130	144.4	270	300	585	650		8	8	2	256-QAM	3/4	156	173.3	324	360	702	780		9	9	2	256-QAM	5/6	N/A	N/A	360	400	780	866.7
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11.	<p>What does the acronym RSSI stand for in Wi-Fi networks?</p> <p>Explain what is RSSI.</p>	<p>Stands for Received Signal Strength Indicator.</p> <p>It is the received signal strength from the Access Point after loss over the air or antenna. RSSI is measured in dBm and a higher measurement indicates stronger signal strength which can either mean the device is near the Access Point or there is little noise in the area.</p>																																																																																																																																																																																																																																																																																																									

Legend: One mark each for Items 1 to 5. Two marks each for Items 6 to 9. 3 marks for Item 10 and 4 marks for Item 11.