

COMP40660: Advances in Wireless Networking

School of Computer Science, University College Dublin, Ireland

Spring 2023

Assignment 4: Throughput

This assignment is worth 10% of the overall grade.

In this assignment, you are required to calculate the actual MAC throughputs for **802.11g / ac_w2 / ax** standards, at each of their minimum and maximum available data rates, for both UDP and TCP.

For this, create a simple program to automatically calculate these standards using the information provided in the presentation.

Calculate amount of time needed to transfer 15×10^9 bytes of data for each of the above three standards (**802.11g / ac_w2 / ax**).

Your program should calculate both the throughputs and the time to transfer data.

You may write your program using one of the following languages: **Python (preferred)**, C / C++, Java only.

Please note you must only use **standard source files**. For example, in the case of Python, there must be **.py** files, **NOT** something like a Jupyter Notebook project.

Code must compile & run with no errors and be appropriately commented throughout for full marks.

Your program is to accept 3 arguments (selected only by menu):

- Given standards (802.11g, 802.11ac_w2, and 802.11ax)
- Data rates for each standard (e.g., in 802.11a: 54 and 6). We only want the maximum and minimum of the data rates.
- Protocol (UDP and TCP)

Your program must present the user with menu-driven options, as follows:

- The first menu presents the standards.
e.g., typing an option number (1, 2, 3) selects a standard, and presents a second menu.
- The second menu presents the data rate choice. (only at the standard's minimum and maximum data rate).
e.g., typing the option number (1 or 2) selects the data rate, and presents a third menu.
- The third menu presents the protocol choice (UDP and TCP).
e.g. typing the option number (1 or 2) selects the protocol.

To find the values required for the calculation, you are required to refer the tutorial presentation related to the assignment.

Your code must compute the values corresponding to the menu choices selected by the user and display them neatly to the screen.

Values should be clearly labeled and rounded to 2 places of decimal.

Your final program must show results for your assigned scenario:

- The actual MAC throughput [Mbps] in the **normal case** (20MHz and 1SS) AND the **best case**:
 - 40MHz/4SS for .11n
 - 80MHz/3SS for .11ac_w1
 - 160MHz/8SS for .11ac_w2
 - 160MHz/8SS for .11ax
- The amount of time needed to transfer **15 x 10⁹ bytes of data**.
Example: time needed to transfer **15 x 10⁹ bytes of data**
 for 802.11a @ 54Mbps using UDP:
 $15,000,000,000 / 1,500 = 10 \times 10^6$ packets
 - So transfer time = $(10 \times 10^6) * (406 \times 10^{-6}) = \mathbf{4,060 \text{ seconds}}$
 - Or: transfer time = $(15 \times 10^9 \times 8) / (29.56 \times 10^6) = \mathbf{4,060 \text{ seconds}}$

Clearly put your results to a **brief report (maximum 3 pages)** with screenshots of the results. In the report, Indicate a table at the end showing all the outputs in your calculations similar to following format:

Standard	Case (normal or best)	channel width (MHz)	Nss	Nbits	CRate	NChan	SDur (µsec)	Rate (Mbps)	MAC Throughput		Time to transfer data	
									UDP (Mbps)	TCP (Mbps)	UDP (seconds)	TCP (seconds)
802.11ac_w1	Normal case - min											
	Normal case - max											
	Best case - min											
	Best case - max											

Please submit the Pdf file of the report + source code of your program in a zip file.

Submit your file through the COMP40660 page on Brightspace.

You can submit as many times as you like – your last submission before the deadline is the one that will be graded.

This is an **individual assignment**: no group submissions will be accepted and there should be no collaboration on the assignment.

Anti-plagiarism tools and techniques will be used to check your submission.

Submission deadline: Monday 03rd April 2023, 23:59 sharp!!

End of the assignment
