

DUBLIN CITY UNIVERSITY

ELECTRONIC AND COMPUTER ENGINEERING

Title

Subtitle



Author

Michael Lenehan michael.lenehan4@mail.dcu.ie
Student Number: 15410402

xx/xx/20xx

Declaration

I declare that this material, which I now submit for assessment, is entirely my own work and has not been taken from the work of others, save and to the extent that such work has been cited and acknowledged within the text of my work. I understand that plagiarism, collusion, and copying are grave and serious offences in the university and accept the penalties that would be imposed should I engage in plagiarism, collusion or copying. I have read and understood the Assignment Regulations set out in the module documentation. I have identified and included the source of all facts, ideas, opinions, and viewpoints of others in the assignment references. Direct quotations from books, journal articles, internet sources, module text, or any other source whatsoever are acknowledged and the source cited are identified in the assignment references. This assignment, or any part of it, has not been previously submitted by me or any other person for assessment on this or any other course of study.

I have read and understood the DCU Academic Integrity and Plagiarism at https://www4.dcu.ie/sites/default/files/policy/1%20-%20integrity_and_plagiarism_ovpaa_v3.pdf and IEEE referencing guidelines found at <https://loop.dcu.ie/mod/url/view.php?id=448779>.

Signed: _____

Date: xx/xx/20xx

Michael Lenehan

Title

Title

Michael Lenehan

Abstract

Contents

1	Introduction	2
2	Part 1: Data Transmission over the WiFi Network	2
2.1	Question A:	2
2.1.1	Part 1:	2
2.1.2	Part 2:	3
2.2	Question B:	4
2.3	Question C:	4
2.3.1	Part 1:	4
2.3.2	Part 2:	4
2.3.3	Part 3:	4
3	Part 2: Results and Comparison and Analysis	4
4	Conclusion	4

1 Introduction

2 Part 1: Data Transmission over the WiFi Network

2.1 Question A:

2.1.1 Part 1:

Within the wifi-example-sim.cc file, the simulation is given a run time of 20 seconds, a packet size of 1000 bytes and a 0.05 second delay between the transmission of packets. This corresponds to a total of 400 packets sent over the space of 20 seconds.

$$\begin{aligned} R &= \frac{rxPackets * packetSize * 8}{txTime} \\ &= \frac{400 * 1000 * 8}{20} \\ &= \frac{3,200,000}{20} \\ &= 1,600,000 \\ &= 1,600Kbps \end{aligned}$$

Equation 1: Bitrate of Data Traffic (Kbps)

test

Equation 2: Average Throughput (Kbps)

Delay time is given within the wifi-example-sim.cc file as measured in nanoseconds. Form the output, this value is 490381ns. This can be calculated as follows:

$$\begin{aligned} \overline{delay} &= \frac{delaySum}{rxPackets} \\ &= \frac{196,152,732}{400} \\ &= 490,381.83ns \\ &= 4.9 \times 10^{-4}s \end{aligned}$$

Equation 3: Average Delay (s)

Packet loss ratio is given by the following formula:

$$PLR = \frac{lostPackets}{rxPackets + lostPackets}$$

$$= \frac{0}{400 + 0}$$

$$= 0$$

Equation 4: Average Packet Loss Ratio

2.1.2 Part 2:

Within the wifi-example-sim.cc file, the transmission bitrate can be modified in one of two ways. By modifying the size of the packets being transmit, or by modifying the delay between packet transmissions. This is shown in the following calculations:

$$R = \frac{rxPackets \times packetSize \times 8}{txTime}$$

$$\frac{R \times txTime}{packetSize \times 8} = rxPackets \quad \text{or} \quad \frac{R \times txTime}{rxPackets \times 8} = packetSize$$

$$rxPackets = \frac{txTime}{delay}$$

Equation 5: Calculation for Bitrate Modification

The following table shows the number of packets to be sent (modified by the delay between packet transmissions), or the size of packet to be sent in order to meet the required data rates.

Table 1: Bitrate Calculation Results

Bitrate	rxPackets	Delay	packetSize
1Mbps	2,500	8×10^{-3}	625
1Mbps	3,750	5.3×10^{-3}	937.5
5Mbps	12,500	1.6×10^{-3}	3125
10Mbps	25,000	8×10^{-4}	6250
20Mbps	50,000	4×10^{-4}	12,500

For the purposes of this section, the delay between the packet transmissions will be modified. Modifying packet sizes requires using half bytes for packet sizes.

test

Equation 6: Bitrate of Data Traffic (Kbps)

test

Equation 7: Average Throughput (Kbps)

test

Equation 8: Average Delay (s)

test

Equation 9: Average Packet Loss Ratio

2.2 Question B:

2.3 Question C:

2.3.1 Part 1:

test

Equation 10: Average Throughgput (Kbps)

test

Equation 11: Average Delay (s)

test

Equation 12: Average Packet Loss Ratio

2.3.2 Part 2:

2.3.3 Part 3:

3 Part 2: Results and Comparison and Analysis

4 Conclusion