
RESEARCH EXHIBITION IN MATHEMATICS & COMPUTER SCIENCES

REMACS 5.0



CS240 - BACHELOR OF INFORMATION TECHNOLOGY [HONS.]
CS248 - BACHELOR OF SCIENCES [HONS.]
MANAGEMENT IN MATHEMATICS
CS251 - BACHELOR OF COMPUTER SCIENCE [HONS]
NETCENTRIC COMPUTING
CS255 - BACHELOR OF COMPUTER SCIENCE [HONS]
DATA COMMUNICATION & NETWORKING

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Universiti Teknologi MARA Perlis Branch

**Research Exhibition in Mathematics and Computer Sciences
(REMACS 5.0)**

Research Exhibition in Mathematics and Computer Sciences (REMACS 5.0)

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Preface

It is with great pleasure that we present this extended abstract book, titled "The 5th Research Exhibition in Mathematics and Computer Sciences (REMACS 5.0)". This book is a collection of research work in the fields of Computer Science and Mathematics, contributed by the final year students from Universiti Teknologi MARA, Perlis Branch. The aim of this book is to showcase the diversity and depth of research in these two interrelated fields.

Mathematics and Computer Science are two fields that have seen tremendous growth and advancement in recent years. With the rise of new technologies and the increasing demand for data-driven solutions, researchers in these fields have been working hard to develop new theories, algorithms, and models that can help solve some of the most pressing problems of our time. This book is a testament to their hard work and dedication.

The abstracts in this book cover a wide range of topics, including algebra, analysis, logic, computer architecture, algorithms, artificial intelligence, machine learning, computer network, netcentric computing and many more. The work presented here is both theoretical and practical, and has the potential to impact many areas of society, from finance and healthcare to education and security.

We hope that this book will serve as a valuable resource for future students in the fields of Mathematics and Computer Science. We also hope that it will inspire more students to pursue innovative and groundbreaking research in these two fields. Finally, we would like to express our gratitude to all the contributors for their hard work and dedication, without which this book would not have been possible.



RESEARCH EXHIBITION IN MATHEMATICS & COMPUTER SCIENCES
REMACS 5.0

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EVENT SCHEDULE

8:00 – 8:30 am

- Registration

8:00 am – 12:00 pm

- FYP Project Presentation

12:00 - 2:00pm

- Lunch Break

2:15 – 2:35 pm

- National & Wawasan Setia Anthems
- Doa Recitation

2:35 – 2:45 pm

- Welcoming Address by Director of REMACS 5.0

2:45 – 2:55 pm

- Officiating & Closing Remarks from Rector of UiTM Perlis

2:55 – 3:00 pm

- REMACS 5.0 Montage

3:00 – 4:00 pm

- Awarding of Winners:
 - Best Poster
 - Best Project Award
- Photo Session
- End of Ceremony

Dress Code: Formal / Corporate

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EXTENDED ABSTRACTS

RESEARCH EXHIBITION IN MATHEMATICS & COMPUTER SCIENCES
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PERFORMANCE ANALYSIS OF DOS ATTACK AT MAC LAYER IN WLAN

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Abstract

Wireless LAN are based on the most widely used computer networks, the IEEE 802.11 standards – commonly known as Wi-Fi. The MAC layer of IEEE 802.11 provides a protocol that specifies the set of media access control (MAC) and physical layer (PHY) protocols for implementing wireless local area network computer communication. In IEEE 802.11 protocol, many vulnerabilities are present at the MAC layer which give rise to a lot of Denial of Service (DoS) attacks. Furthermore, 802.11 standards use frames for communication between NICs and APs and for controlling and managing wireless links. The three main types of frames are data, control and management. Data frames are authenticated and encrypted but control and management frames are neither authenticated nor encrypted. So, they can be easily spoofed by the attacker to perform denial of service attacks. The goal of this article is to study various types of DoS attack at the MAC layer in WLAN and to evaluate the performance of the network using throughput and packet loss ratio (PLR). In addition, this project will be conducted in a real testbed environment with 3 different scenarios, each with a different type of layer 2 DoS attack. Finally, the result shows that deauthentication attack and ARP spoofing attack to be very successful as it manages to cripple the victim's connection to the AP or the internet. Both attacks result in a steep decline of packet loss and network throughput during the attack. On the other hand, the authentication flooding attack seems to show no result on the packet loss ratio and network throughput whatsoever. In conclusion, de-authentication and ARP spoofing attacks are very much capable of disrupting any WLAN network connection.

Keywords: MAC Layer, WLAN, DoS, Performance Analysis

1. Introduction

A wireless Local Area Network (WLAN) is a form of network that connects two or more devices to form a Local Area Network (LAN). Wireless LAN are based on the most widely used computer networks, the IEEE 802.11 standards – commonly known as Wi-Fi. The MAC layer of IEEE 802.11 provides a protocol that specifies the set of media access control (MAC) and physical layer (PHY) protocols for implementing wireless local area network computer communication. In IEEE 802.11 protocol, many vulnerabilities are present at the MAC layer which give rise to a lot of Denial of Service (DoS) attacks. The goal of this article is to study various types of DoS attack at the MAC layer in WLAN and to evaluate the performance of the network using throughput and packet loss ratio (PLR). In addition, this project will be conducted in a real testbed environment with a different type of layer 2 DoS attack.

2. Methodology

The waterfall model of System Development life Cycle will be utilized to specify the project's process flow in this proposed project (SDLC). The System Development Life Cycle (SDLC) consists of a total of six phases, beginning with the initiation phase and continuing through the planning phase, design and development phase, testing phase, data analysis phase and documentation phase.

3. Results and Discussion

To summarize all of the previous analysis, all of the testing without attack and the testing with the deauthentication attack, ARP spoofing attack and Authentication attack give different results as expected. All of the testing is done in a 60 second time frame. For the deauthentication attack, we can see right after the attack commences, it completely disrupts the victim connection to the AP. For the ARP spoofing attack, it also proves to be lethal. Right after the attack commences, we can see that the packet loss and network throughput for the network are heavily disrupted. This leads to a loss of connection from the victim computer to the internet. Finally, for the Authentication flooding attack, we clearly see that the attack is completely harmless as it didn't have any effect on the network packet loss and network throughput whatsoever. This may be due to many reasons, but we believe that the APs are somewhat protected from unencrypted authentication packets.

4. Novelty of Research / Product

There has been a number of research that shows a rise of internet users daily (Johnson, 2022). Additionally, research was done about the growing threat of Wireless network and how its fundamental characteristic exposes it to many vulnerabilities (Gao, Wang, Et al, 2021). There was also other research that focused on the type of major layer 2 DoS attack and how it can affect the network (Chan Aung & Thant, 2017; Kadripathi, 2020; Xi, 2017). There have also been several studies that focus on the layer 2 and 802.11 protocol weakness and its vulnerabilities (Mahmood & Mohsin, 2020; Kaur, 2016).

5. Conclusion

Based on the project, we can see how certain types of DoS attack affect the overall network performance of a WLAN router. Some are proved to be lethal and some are proved to be somewhat unlethal. The De-authentication and ARP spoofing attack proved to be capable of disrupting a router that works on 802.11n technology. However, the authentication flooding attack are proven to be unreliable as it doesn't affect the router connection whatsoever.

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