
**KULLIYYAH OF INFORMATION & COMMUNICATION TECHNOLOGY**

# CSCI 2301 COMPUTER NETWORKING

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## SECTION 1

# Wireless Networking in a IIUM Environment: Principles, Protocols, and Security Considerations

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**ABSTRACT**

Wireless networking is very important in every modern university because it allows for continuous connectivity, mobility, and access to educational resources especially in accessing resources or engaging in a learning and teaching medium through online platforms. The purpose of this research is to investigate the concepts, protocols, and security issues unique to wireless networks used in a university setting. It will cover the underlying ideas, functioning, and applications of the numerous wireless technologies utilised in universities, such as Wi-Fi. Furthermore, the study will concentrate on the special security difficulties confronting university wireless networks, taking into account variables such as authentication, data privacy, and network scalability.

**INTRODUCTION**

Wireless networking has transformed the way students, teachers, and staff connect and access educational materials in modern colleges. The purpose of this study is to investigate the relevance of wireless networks in the university setting especially in IIUM, focusing on their critical role in providing seamless connectivity and mobility when the IIUM community uses the Wi-Fi. When wired and wireless networks are compared, the benefits of wireless technology varied in terms of flexibility, scalability, and adaptation to dynamic campus contexts are highlighted and also beneficial to everyone in usability. However, it is critical to recognise the issues that wireless networks provide, such as coverage constraints and potential security threats. This paper will discover the aspects that will aid in the construction of durable and efficient wireless networks that satisfy the unique requirements of most universities.

# WIRELESS TECHNOLOGY IN UNIVERSITY NETWORK

Wireless technologies are essential components of university networks, providing seamless connectivity and supporting a wide range of educational activities which are used often by the IIUM community. One of the primary wireless technologies used in universities is Wi-Fi, based on the IEEE 802.11 standards. Basically, Wi-Fi allows for wireless communication between devices, providing internet access and enabling seamless connectivity across various locations within the IIUM. The research focuses on different generations of Wi-Fi standards, including 802.11a, 802.11b, 802.11g, 802.11n, 802.11ac, and the latest which is 802.11ax (Wi-Fi 6). Each standard operates on specific frequency bands, such as the 2.4 GHz and 5 GHz bands, and offers different data rates, range, and compatibility. Hence, understanding the features and capabilities of these standards is crucial for designing and deploying wireless networks that meet the specific requirements of universities. Additionally, this research explores the deployment considerations for Wi-Fi networks in university campuses, one of which is IIUM. It investigates factors such as coverage, capacity, and interference mitigation techniques. Moreover, achieving comprehensive coverage across large and diverse campus environments poses challenges due to the presence of physical obstacles, varying building materials, and outdoor areas especially when IIUM Gombak is one of the universities that have the largest area compared to other IIUM. The study delves into best practices for access point placement, antenna configurations, and signal propagation optimization techniques to ensure reliable and consistent connectivity throughout the university.

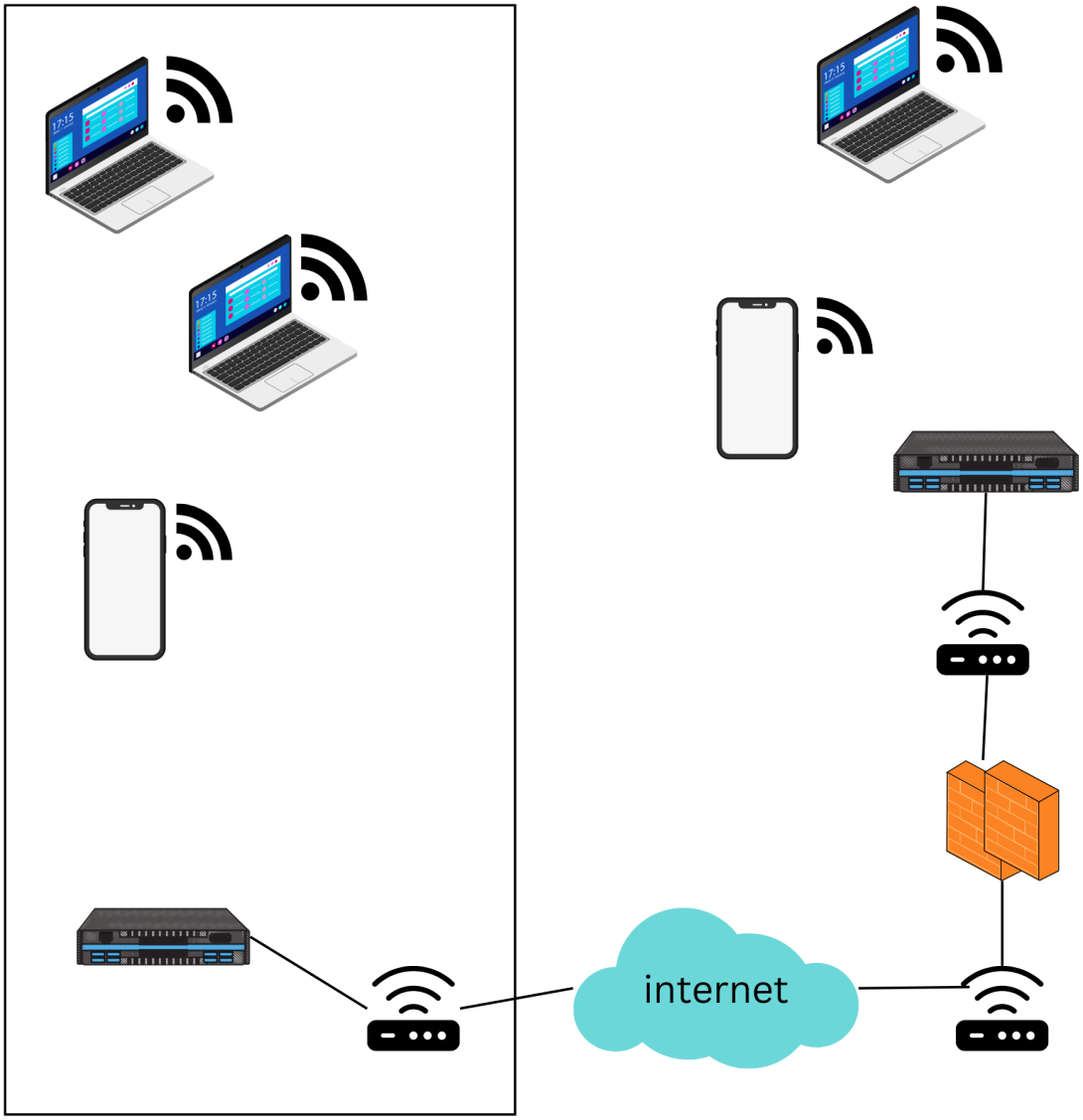


*Figure 1: Wireless Network*

Apart from Wi-Fi, another wireless technology of interest in university networks is wireless mesh networks. These networks utilize multiple access points interconnected wirelessly to create a unified network infrastructure. This architecture allows for extended coverage and improved scalability, making it suitable for large campuses with numerous buildings like different kulliyyah and outdoor areas. The research investigates the concepts, architecture, and benefits of wireless mesh networks within a university context, highlighting

their ability to provide robust and seamless connectivity across expansive campus environments. By examining these wireless technologies in university networks, the research contributes to understanding the underlying principles, protocols, and deployment considerations. It provides insights into selecting the appropriate wireless technology, optimizing coverage, and ensuring reliable connectivity to support the diverse needs of students, faculty, and staff in a university setting.

Wireless networks provide unique security issues. It investigates technologies for authentication and access control such as EAP and 802.1X, encryption protocols such as WPA2-Enterprise and WPA3, and security measures for guest network access and isolation. The study's goal is to discover and resolve any vulnerabilities, as well as to put in place strong security measures to safeguard wireless networks from unauthorised access, data breaches, and other security risks. Meanwhile,  as for the Wireless Network Management and Performance Optimization in IIUM involves strategies like network planning, QoS implementation, monitoring, capacity planning, security measures, seamless roaming, scalability, optimization techniques, user education, and integration with wired infrastructure. These ensure efficient network operation, prioritize educational applications, troubleshoot issues, accommodate growth, safeguard the network, enable mobility, maximize performance, promote best practices, and provide a unified network experience.

## CONCLUSION

In conclusion, this study has offered significant insights on wireless networking in a university setting in IIUM. We obtained a better grasp of the relevance and problems of wireless networks by investigating its concepts, protocols, and security issues. The research studied the implementation of Wi-Fi and wireless mesh networks in institutions. Furthermore,

it addressed security problems, emphasising the importance of strong authentication, encryption, and guest network control. This research helps to improve the design, administration, and security of wireless networks in universities, allowing for seamless connectivity and supporting instructional activities.