UNIVERSITI KUALA LUMPUR

ASSESSMENT BRIEF

COURSE DETAILS	
INSTITUTE	UniKL BRITISH MALAYSIAN INSTITUTE
COURSE NAME	WIRELESS NETWORK ARCHITECTURE
COURSE CODE	BTB37303
COURSE LEADER	MOHD RAZIFF ABD RAZAK
LECTURER	MOHD RAZIFF ABD RAZAK
SEMESTER & YEAR	OCTOBER 2025

ASSESSMENT DETAILS	
TITLE/NAME	LAB 1
WEIGHTING	20%
DATE/DEADLINE	9/11/2025, 11.59PM
COURSE LEARNING OUTCOME(S)	CLO 2: **Perform** wireless network Installation, configuration, testing and troubleshooting. **(P3, PLO4).**
INSTRUCTIONS	Perform the following tasks: 1. Submit the individual report as instructed by Course Lecturer. 2. All answers must be in English language only. 3. Submission of report through eLearning.

Student Name:	**ID:**	**Group:**
AHMAD NAFIS BIN MOHD ZULKIFLI	**51224125264**	**L01**
`Assessor's Comment:		**Marks:**

Verified by: Course Leader [MRAR] **Prepared by: [MRAR]**	**QSC format verification**	**PC/HOS content validation**
I hereby declare that all my team members have agreed with this assessment. All team members are certain that this assessment complies with the Course Syllabus. Signature: _____ Date : 10/10/2025		Nor Khairiah Ibrahim Head of Section Communication Technology XX/XX/2025

COVER PAGE

BTB37303 WIRELESS NETWORK ARCHITECTURE

EXPERIMENT: WIRELESS NETWORK INSTALLATION, CONFIGURATION, TESTING AND TROUBLESHOOTING

LECTURER: MR MOHD RAZIFF B. ABD RAZAK

DUE DATE: 9 NOVEMBER 2025

STATION 6

STUDENT NAME	STUDENT ID
AHMAD NAFIS BIN MOHD ZULKIFLI	51224125264

Table of Contents

1. Introduction

This experiment demonstrates the architecture of a wireless network designed for a small or domestic environment. The setup involves configuring two wireless routers and a switch to establish both wired and wireless connections, forming a complete local area network (LAN) that interfaces with a wide area network (WAN) through the main router. The goal is to understand how multiple devices can communicate efficiently across different network layers using proper topology design and configuration techniques.

The key components used in this lab include two TP-Link routers (TL-WR841N and AC1200), a TP-Link switch, a desktop PC, and a smartphone. These devices are connected in a hybrid topology combining both wired and wireless connections to simulate a real-world networking scenario.

In this experiment, a wireless network is designed and configured to set up an Extended Service Set (ESS) consisting of two Basic Service Sets (BSS). The first BSS is formed between the TP-Link TL-WR841N router and its connected wireless clients, while the second BSS involves the router TP-Link AC1200 acting as a secondary access point to extend wireless coverage. These two BSSs are interconnected via a switch, forming the ESS that allows seamless communication between all devices.

The configuration process involves installing and setting up both wireless devices according to the network specifications through their web interfaces, assigning IP addresses, SSIDs and security settings. Once configured, the network is tested and troubleshooted to ensure proper connectivity and performance between wired and wireless nodes.

The correlation between BSS and ESS in this lab illustrates how wireless networks can be expanded using multiple access points under a single network identity. The BSS provides the foundational link between clients and access points, while the ESS integrates multiple BSSs into one extended network domain.

To visualise this design, Figure 1 presents the Physical Network Diagram, showing the physical interconnections between routers, switch and end devices. Figure 2 presents

the Logical Network Diagram, illustrating IP configurations, routing paths and the logical flow of data across the network.

2. Objectives

1. To illustrate wireless network.
2. To install wireless device base on the wireless network specification.
3. To configure wireless device base on the wireless network specification.
4. To test and troubleshoot wireless network

3. Theory/Background

A wireless local area network (WLAN) connects devices using radio signals, commonly applied in small-scale environments. It allows seamless communication between wired and wireless hosts under a unified network structure.

A LAN provides local interconnection between devices, while a WAN connects the LAN to the Internet through a router. The routers in this setup follow the IEEE 802.11n/ac standard, operating at 2.4 GHz and 5 GHz frequencies.

Each Basic Service Set (BSS) consists of one access point (router) and its clients. Multiple BSSs linked through a switch form an Extended Service Set (ESS), allowing roaming and consistent network access. The Physical Topology (Figure 1) shows real device connections, while the Logical Topology (Figure 2) represents IP addressing and data flow. The design demonstrates a hybrid topology, combining both wired and wireless structures.

Routers manage IP assignment through DHCP and switch direct packets locally within the LAN. Connectivity verification is performed using the *ping* command to test communication and response between network nodes. These concepts together form the theoretical foundation of this experiment.

4. Equipment and Software

Equipment	Model	Function
Router	TPLink TL-WR 841N	Main router managing DHCP and WAN connection
Router	TP-Link AC1200	Secondary router for extended Wi-Fi coverage
Switch	TPLink OT259 Network Switch 8 Ports	Connects LAN devices via Ethernet
PC	Custom dekstop	Used for network configuration and testing
Smartphone	iPhone 16 Pro	Wireless client device
Software	Web Browser (Chrome)	Used for router configuration and monitoring

Table 1: Equipment and Software Used

5. Experimental Setup/ Network Diagram

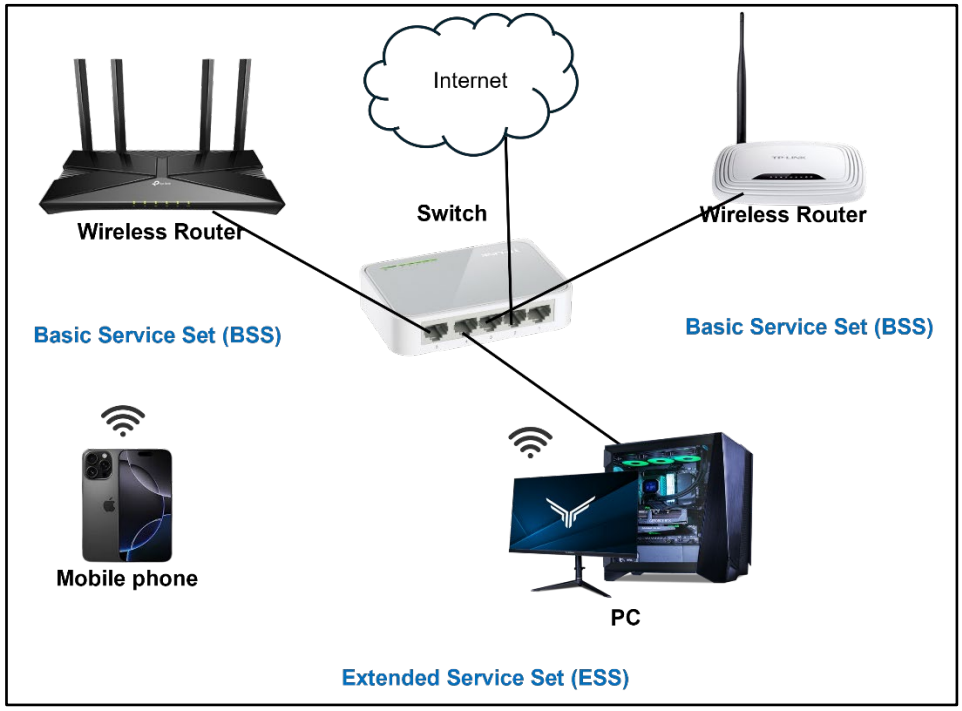

Figure 1: Physical Network Diagram

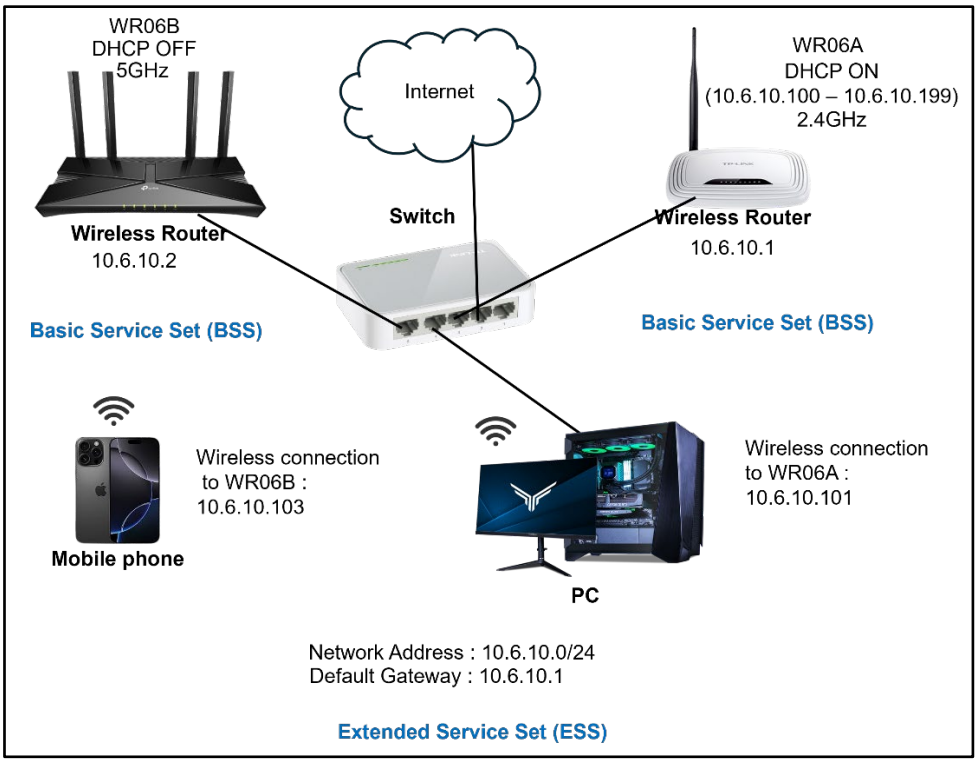

Figure 2: Logical Network Diagram

6. Methodology

This section describes the step-by-step process for configuring and testing both routers to establish an Extended Service Set (ESS) consisting of two Basic Service Sets (BSS). The configuration was performed using a web browser interface and verified through physical and logical testing.

Step 1: Physical Layer Connection

1. Connect Router 1 (TP-Link TL-WR841N, 2.4 GHz) to the network switch using a Cat6 Ethernet cable.
2. Connect the switch to the PC using another Cat6 Ethernet cable.
3. Observe the LED indicators on the switch, once the lights begin blinking, it confirms successful communication between devices (refer to Figure 3: Network Connections – Ethernet 6, Station 6).

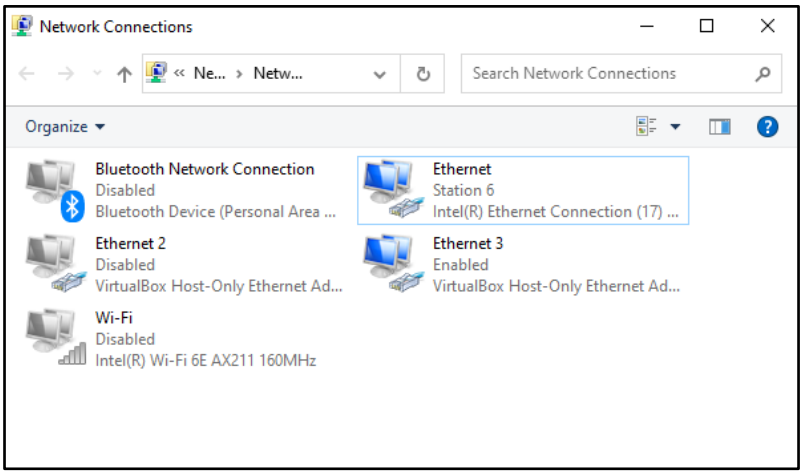

Figure 3: Network Connections

Step 2: Identify Router IP Address

4. On the connected PC, open Command Prompt and type ipconfig to view the network configuration.
5. Record the Default Gateway IP address, which represents the router's default IP (see Figure 4).
6. Use the ping command (e.g. ping 192.168.0.1) to verify connectivity between the PC and Router 1. If replies are received, communication is established.

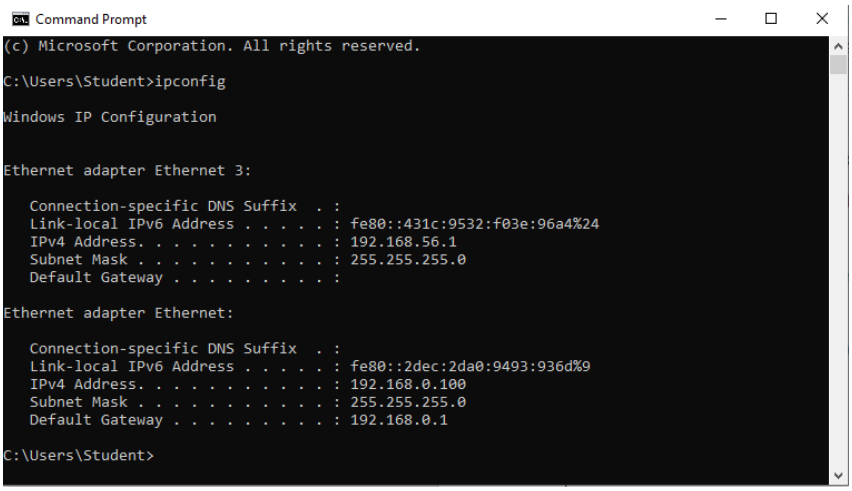

Figure 4: ipconfig for the first router

Step 3: Access Router Configuration Interface

7. Open a web browser and enter the router's default IP address into the address bar to access the login page.
8. Navigate to Wireless > Wireless Settings, then change the SSID to WR06A to identify Router 1 (see Figure 5).
9. In Network > LAN, change the router's IP address to avoid conflicts with other devices (refer to Figure 6). The router will reboot automatically after this change.

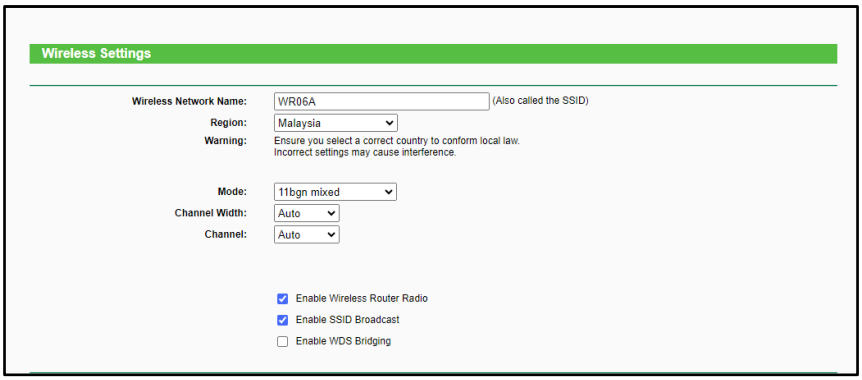

Figure 5: Change the SSID of 2.4GHz Wireless Router

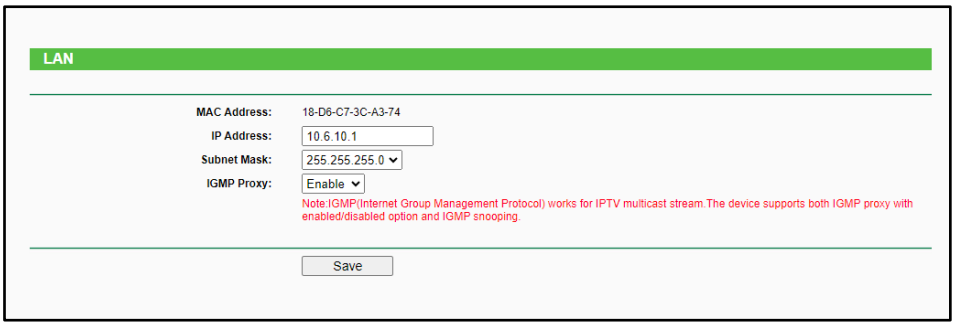

Figure 6: Change the IP Address and Subnet Mask

Step 4: Configure DHCP Settings

10. After rebooting, access the router again using the new IP address.
11. Go to DHCP > Settings and set the DHCP address range from 10.6.10.100 – 10.6.10.199, limiting the network to 100 available clients (see Figure 7).
12. The DHCP range automatically updates according to the new LAN IP configuration.
13. Disable wireless security under Wireless > Wireless Security to allow open access during testing (see Figure 8).
14. Check the PC's Network Connection Details to confirm that the assigned IP matches the new configuration (see Figure 9).

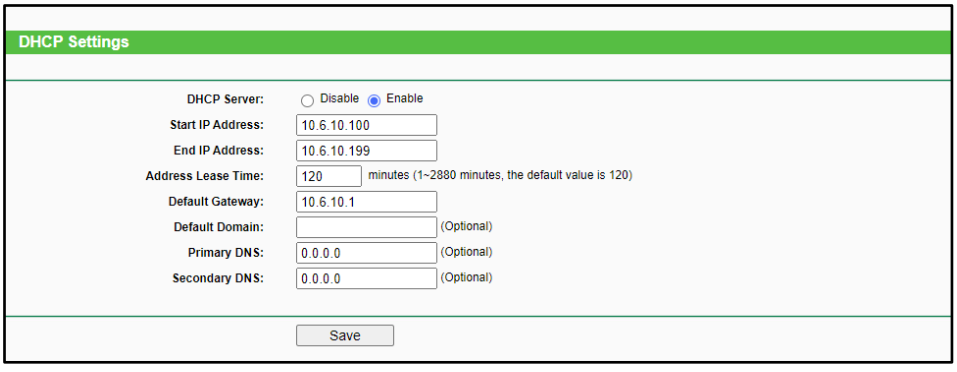

Figure 7: Set a range for the IP Address

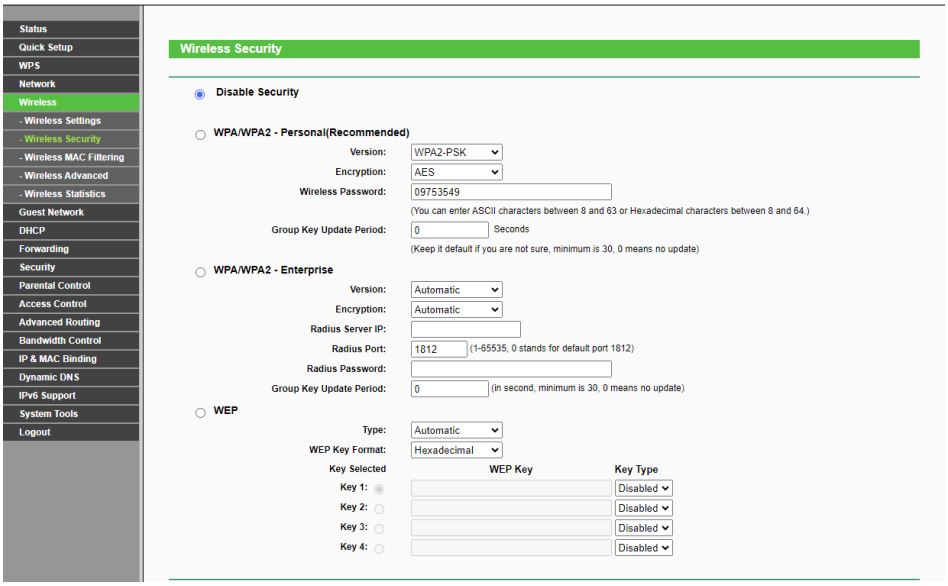

Figure 8: Security was disabled

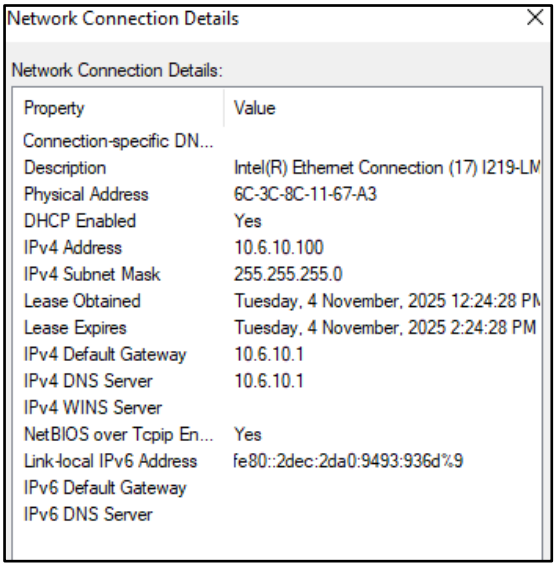

Figure 9: Check the default gateway configured in Network Connection Details

Step 5: Configure the Second Router (Router 2 - TP-Link AC1200, 5 GHz)

15. Repeat the same procedure for Router 2, ensuring that:

- The SSID is changed to identify Router 2 (refer to Figure 10).
- The IP address is different from Router 1 (e.g. Router 1 = 10.6.10.1, set Router 2 = 10.6.10.2) shown in Figure 11.
- Only the 5 GHz band is enabled (see Figure 13), and 2.4 GHz is disabled.

- The DHCP range is configured as shown in Figure 12, or DHCP is fully disabled if Router 1 already manages IP assignment.

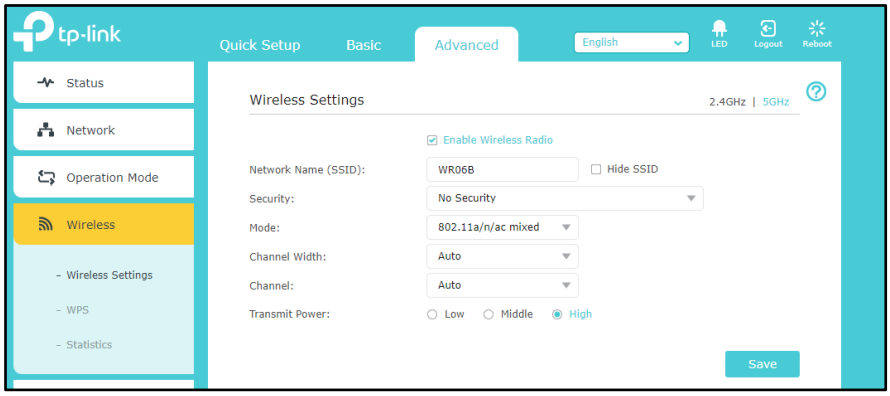

Figure 10: Change the SSID of 5GHz Wireless Router

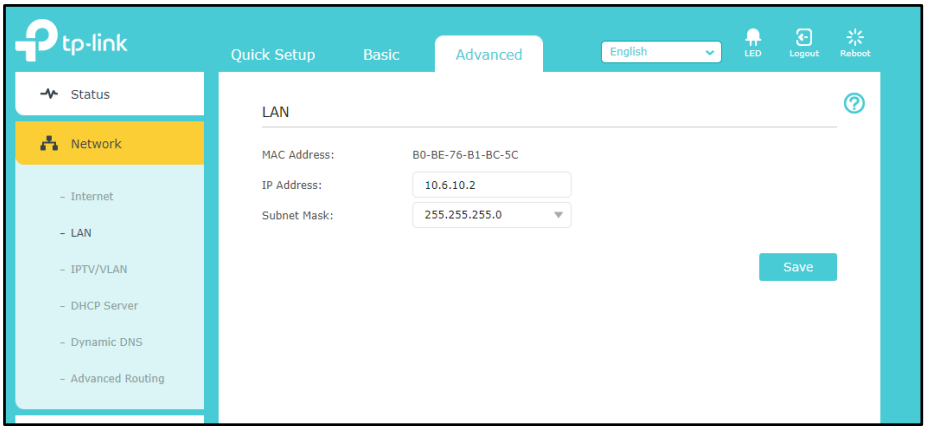

Figure 11: Change the IP Address and Subnet Mask

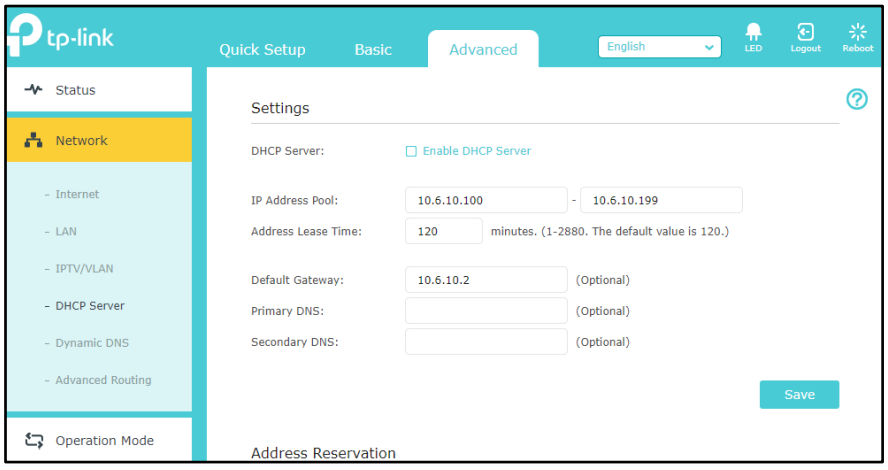

Figure 12: Set a range for the IP Address

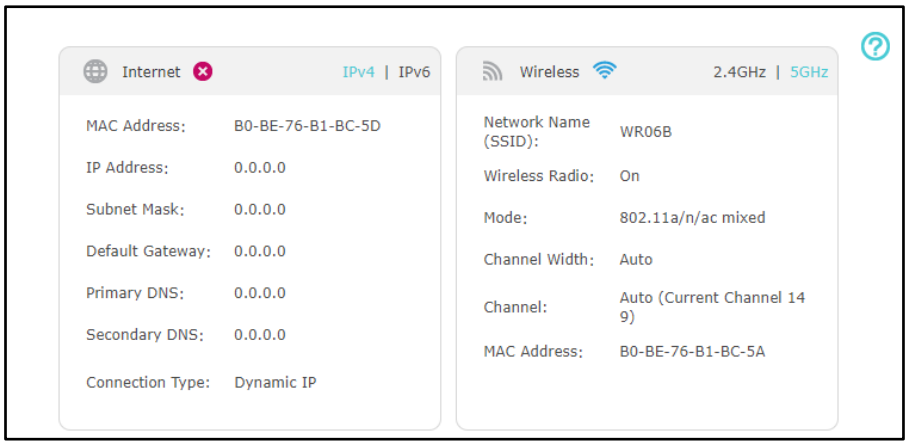

Figure 13: Enable and configure only on 5GHz

Step 6: Connectivity Verification

16. From the PC, ping both routers to verify communication between Router A and Router B (note: screenshots were not captured during this step).
17. Connect the PC wirelessly to Router A (2.4 GHz) and ensure connectivity (see Figure 14).

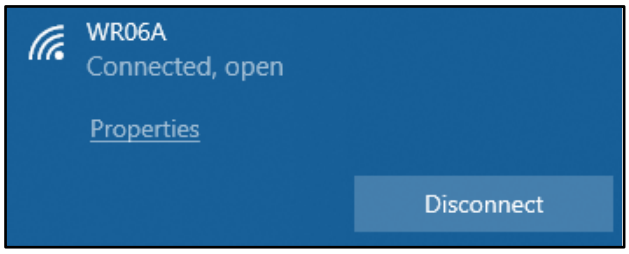

Figure 14: Wireless connected

Step 7: Verify Internet Access

18. Connect the cable to the WAN port (Internet port) of Router A (main router) shown in Figure 23 and Figure 24.
19. Observe the Internet LED indicator, it should turn orange briefly and then green, confirming Internet connection establishment.
20. Navigate to Network > WAN in the Router A web interface and verify that a valid WAN IP address appears (see Figure 15).
21. Ensure that DHCP on Router B remains disabled to maintain a single DHCP domain across the ESS (refer to Figure 12).

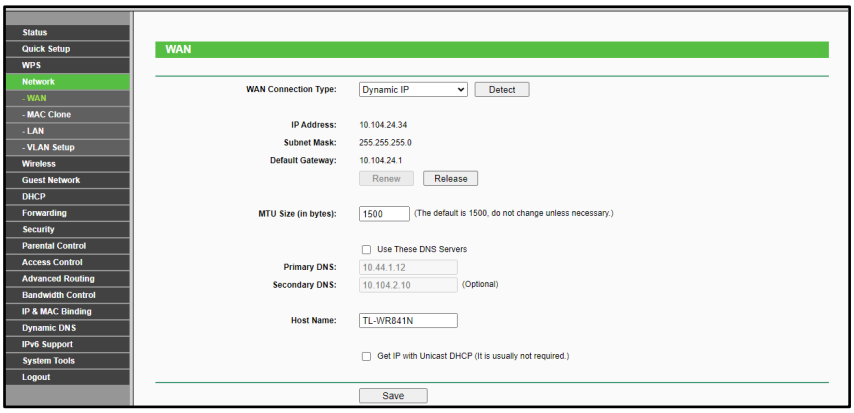

Figure 15: Dynamic IP assignment

7. Result & Analysis

7.1 Network Interface Verification

Before testing connectivity, the network configuration of the PC was verified using the ipconfig.

The output (shown in Figure 16) confirmed that the Wireless LAN adapter (Wi-Fi) obtained an IPv4 address of 10.6.10.101 with a Default Gateway of 10.6.10.1, assigned automatically by Router A through DHCP.

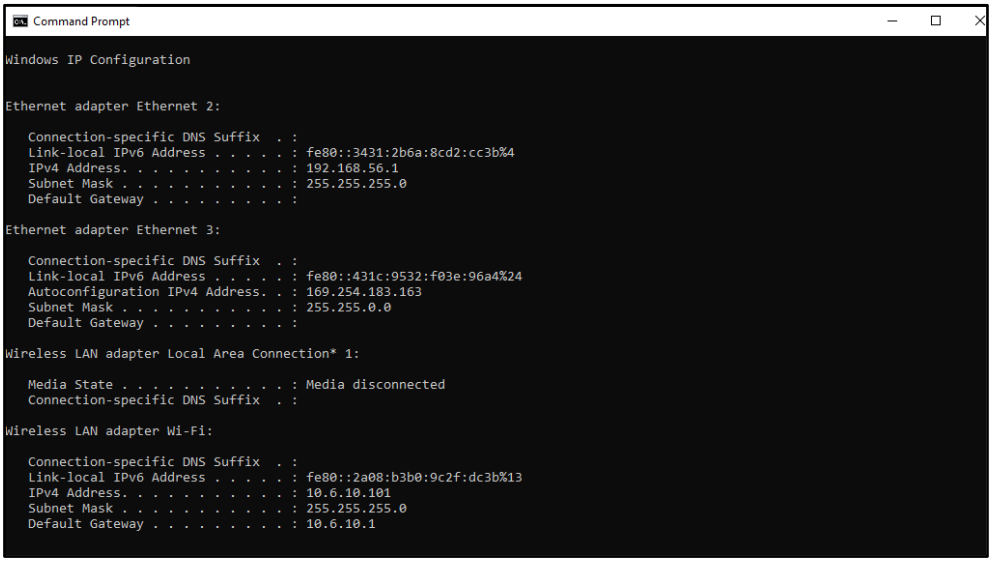

Figure 16: ipconfig after the configuration

Command Prompt output showing active network adapters and IP configuration (Wireless LAN adapter connected to 10.6.10.1).

This indicates that the DHCP service on Router A was successfully distributing IP addresses within the intended range.

Before conducting the Internet connectivity tests, the PC was connected to Router B (WR06B) via its 5 GHz Wi-Fi interface.

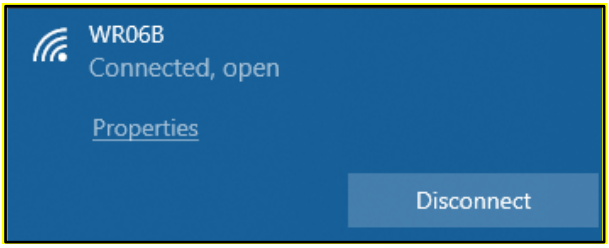

Figure 17: PC connected to Router B (WR06B), confirming 5 GHz connectivity prior to Internet testing.

7.2 Internet Connectivity Testing

To confirm Internet access, two ping tests were conducted from the PC to external domains based on Table 2. Both tests returned positive replies, verifying that Router A had a valid WAN connection.

Test	Destination	Response	Packet Loss	Average Latency (ms)
1	google.com (see Figure 18)	Successful	0%	14
2	youtube.com (see Figure 18)	Successful	0%	5

Table 2: Internet Connectivity Testing

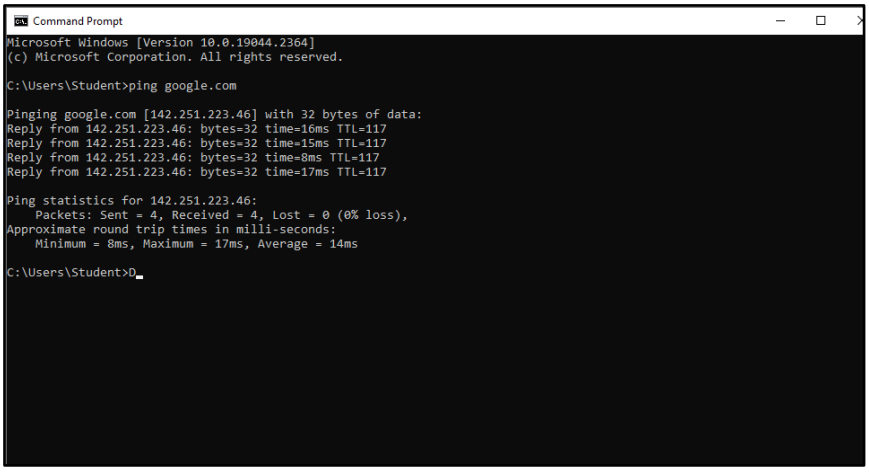

Figure 18: Ping to google.com showing successful Internet connectivity

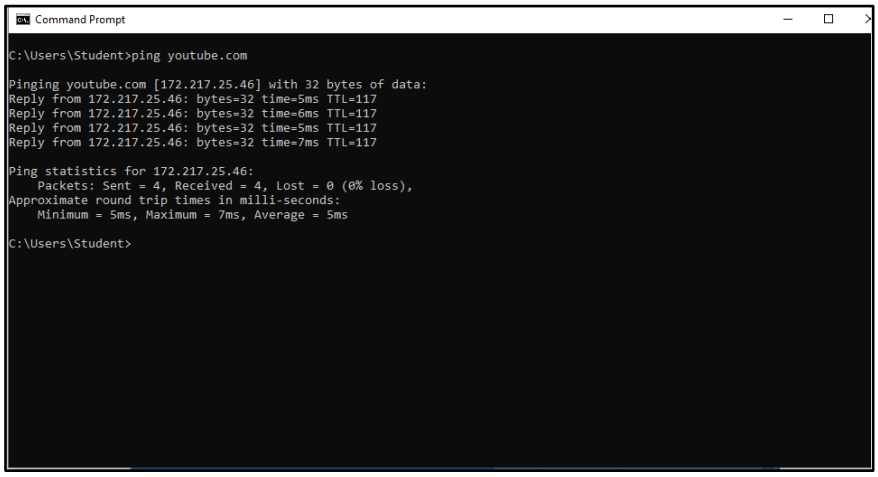

Figure 19: Ping to youtube.com verifying stable WAN access

These results confirm that the WAN port of Router A was configured correctly and that DNS resolution and routing were functioning properly.

7.3 Wireless Client Connectivity

The wireless connection was tested using an iPhone connected to both routers.

- When connected to Router A (WR06A, 2.4 GHz), the iPhone received IP details consistent with the configured DHCP range (see Figure 20).
- When connected to Router B (WR06B, 5 GHz), the device obtained IP 10.6.10.103 with gateway 10.6.10.1 (see Figure 21).

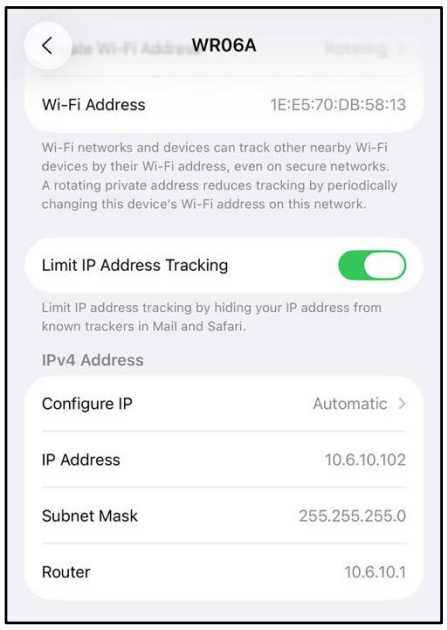

Figure 20: iPhone connection details for WR06A

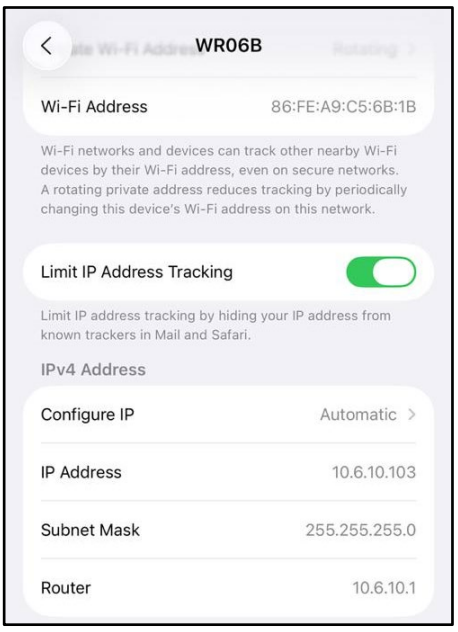

Figure 21: iPhone connection details for WR06B

This confirms that both routers shared the same network scheme, indicating proper ESS operation and uniform DHCP management from Router A.

7.4 ESS Communication Validation

A final ping test was conducted from the PC to the iPhone's IP address (10.6.10.103) while it was connected to WR06B (see Table 3).

The ping returned successful replies, proving end-to-end connectivity across the ESS.

Test	Source	Destination	Status	Remarks
3	PC (wired)	iPhone (10.6.10.103)	Successful	Wireless host reachable across ESS

Table 3: Ping to iPhone

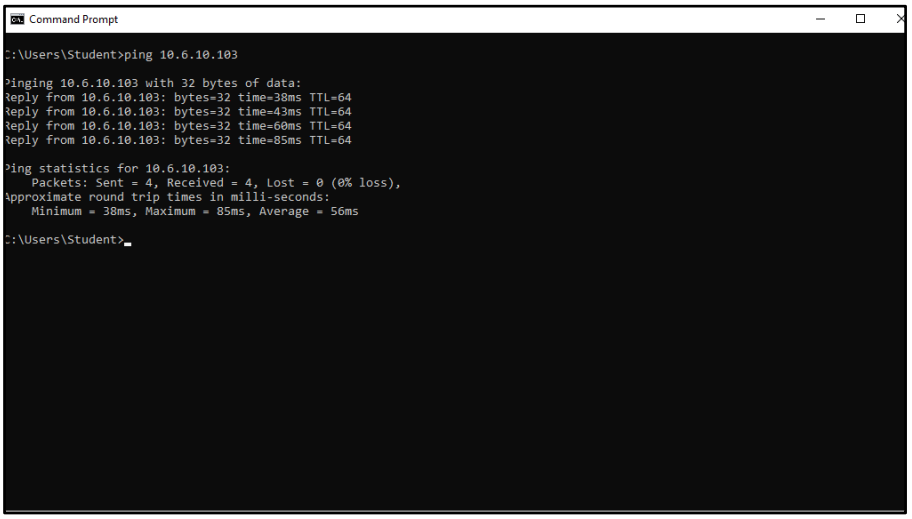

Figure 22: Successful ping from PC to iPhone (10.6.10.103), confirming internal network connectivity

This result demonstrates that both routers, though configured with different frequency bands, operated under a single broadcast domain, enabling seamless communication between wired and wireless clients.

8. Discussion

When configuring a single router, enabling DHCP is crucial since it automatically assigns IP addresses to all connected devices, simplifying network management. In this experiment, the main router (TL-WR841N) served as the DHCP provider. When adding another router (AC1200), DHCP was disabled to prevent IP conflicts, ensuring only one active DHCP domain across the entire network.

Implementing an Extended Service Set (ESS) instead of a single Basic Service Set (BSS) significantly improved wireless coverage and connection stability. The two routers which is WR06A (TL-WR841N, 2.4 GHz) and WR06B (AC1200, 5 GHz) were configured under the same subnet but assigned different SSIDs for identification. Router A operated exclusively on the 2.4 GHz band, while Router B operated solely on the 5 GHz band after its 2.4 GHz radio was disabled. This arrangement extended network coverage and minimized interference by separating frequency usage. The 2.4 GHz band provided broader range and wall penetration, whereas the 5 GHz band offered higher throughput and lower latency, ensuring balanced performance and signal reliability across the network.

Testing confirmed stable communication between wired and wireless hosts, validating the ESS configuration. The IEEE 802.11 BSS/ESS model applied in this setup reflects real-world wireless architecture, emphasizing effective DHCP management and channel distribution. Compared to mesh networks, the ESS provided better control and lower interference, ideal for small environments where wired interconnection is available.

9. Conclusion

The experiment successfully deployed an Extended Service Set (ESS) with two interconnected Basic Service Sets (BSS). Both routers were correctly configured with proper SSID, IP addressing, and frequency bands. A single DHCP domain was verified, ensuring automatic and conflict-free IP allocation.

Stable wireless connectivity was achieved across 2.4GHz and 5GHz bands, and Internet access was validated for both wired and wireless devices. The experiment highlighted practical differences between theoretical ESS/BSS models and real configurations, demonstrating the importance of correct router setup, DHCP management, and signal optimization.

Overall, the experiment proved a clear understanding of wireless network installation, testing, and optimization principles for small-scale environments.

10. Appendix

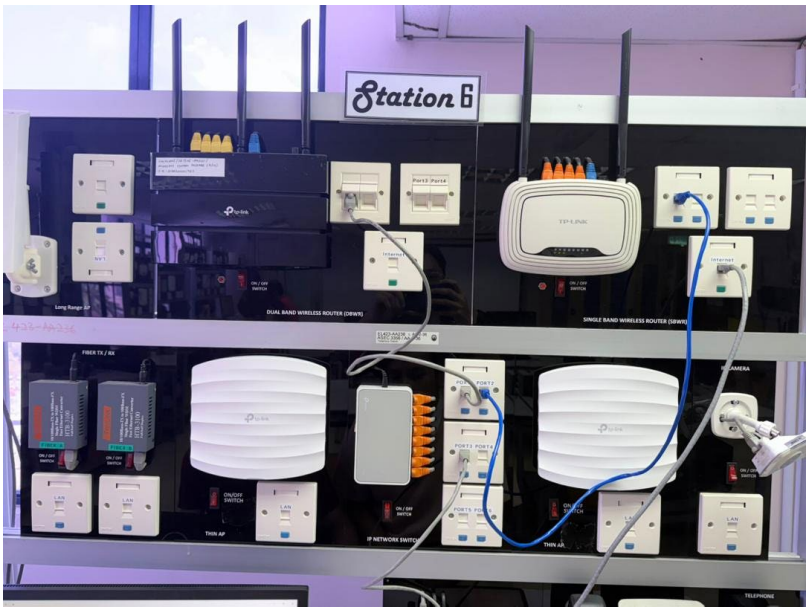

Figure 23: Connection cable

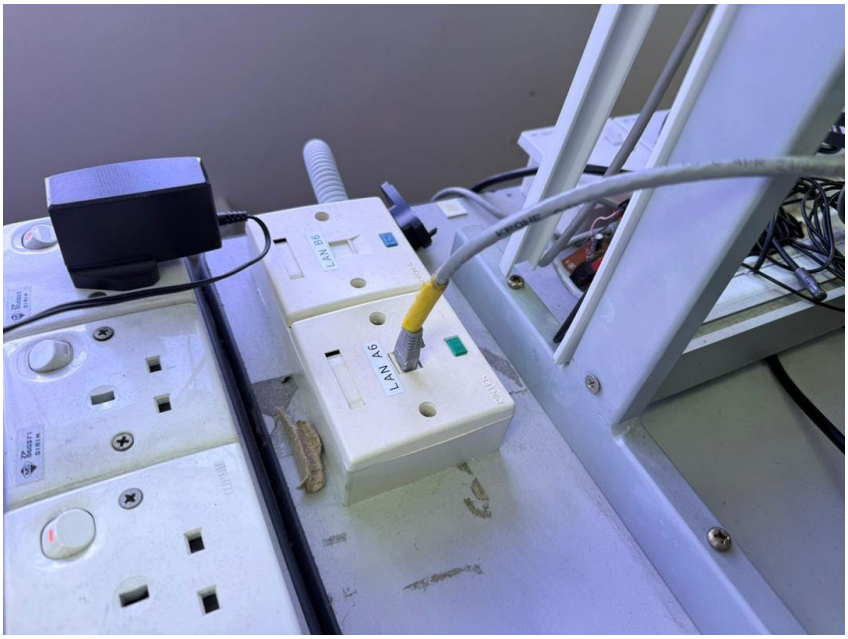

Figure 24: Connection from Internet Port of Router 1 to LAN A6

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RUBRIC FOR LABORATORY REPORT

COURSE CODE & NAME	BTB37303 & WIRELESS NETWORK ARCH.
STUDENT NAME	AHMAD NAFIS BIN MOHD ZULKIFLI
STUDENT ID	51224125264

GROUP
L01

PERFORMANCE CRITERIA		**QUALITY OF WORK**					
		VERY POOR 1	**POOR** 2	**GOOD** 3	**VERY GOOD** 4	**EXCELLENT** 5	**TOTAL**
TASK 1: (20 marks) (SK8, SP4),							
1.1	Draw Physical Diagram using application (x2)						
1.2	Draw Logical Diagram using application (x1)						
1.3	Completely label (x1)						
TASK 2: (25 marks) (SK8, SP1),							
2.1	Setup and configure (x2)						
2.2	Follow specification (x2)						
2.3	Complete configuration Evidence (x1)						
TASK 3: (20 marks) (SK8, SP1)							
3.1	Complete Network Testing Evidence (x3)						
3.2	Internet Connection Evidence (x1)						
TASK 4: (15 marks)							
4.1	Introduction (x1)						
4.2	Conclusion (x1)						
4.3	Report writing and organization. (x1)						
TASK 5: (20 marks)							
5.1	Demo (x4)						
	Total marks						

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ASSESSMENT COVERSHEET

Attach this coversheet as the cover of your submission. All sections must be completed.

Section A: Submission Details

Programme	:	BACHELOR OF TELECOMMUNICATION ENGINEERING TECHNOLOGY WITH HONOURS
Course Code & Name	:	BTB37303 WIRELESS NETWORK ARCHITECTURE
Course Lecturer(s)	:	MR MOHD RAZIFF ABD RAZAK
Submission Title	:	LAB 1 REPORT
Deadline	:	Day _____ Month _____ Year _____ Time _____
Penalties	:	• 5% will be deducted per day to a maximum of four (4) working days, after which the submission will **not** be accepted. • Plagiarised work is an Academic Offence in University Rules & Regulations and will be penalised accordingly.

Section B: Academic Integrity

Tick (√) each box below if you agree:

☐ I have read and understood the UniKL's policy on Plagiarism in University Rules & Regulations.

- [ ] This submission is my own, unless indicated with proper referencing.
- [ ] This submission has not been previously submitted or published.
- [ ] This submission follows the requirements stated in the course.

Section C: Submission Receipt

(must be filled in manually)

Office Receipt of Submission

Date & Time of Submission (stamp)	Student Name(s)	Student ID(s)
9 NOVEMBER 2025	AHMAD NAFIS BIN MOHD ZULKIFLI	51224125264

Student Receipt of Submission

This is your submission receipt, the only accepted evidence that you have submitted your work. After this is stamped by the appointed staff & filled in, cut along the dotted lines above & retain this for your record.

Date & Time of Submission (stamp)	Course Code	Submission Title	Student ID(s) & Signature(s)
9 NOVEMBER 2025	BTB37303	LAB 1 REPORT	51224125264