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**Programme:** IT Technical Support

**COURSE NAME :** IT Support

# Network Mapping & Ping Test Task

## Networking layers, IP, DNS, routing, TCP/IP

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### Introduction

#### 1.1 Background and Context

In today's digitally connected environment, reliable computer networking is essential for effective communication, data access, and resource sharing. Understanding how devices connect within a local network and how they communicate with external networks is a fundamental skill for IT and networking professionals.

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## 1.2 Purpose of the Investigation

This report presents the findings of a practical network mapping and connectivity analysis conducted on a small home/office (SOHO) network. The objective of the investigation was to identify network components, analyse IP addressing information, and verify connectivity between devices, the default gateway, and the wider internet.

## 1.3 Tools and Methods Used

Standard networking tools available in the Microsoft Windows operating system, such as `ipconfig` and `ping`, were used to gather and validate network information. These tools enabled the inspection of IP configuration details and the testing of network connectivity and responsiveness.

## 1.4 Network Environment Overview

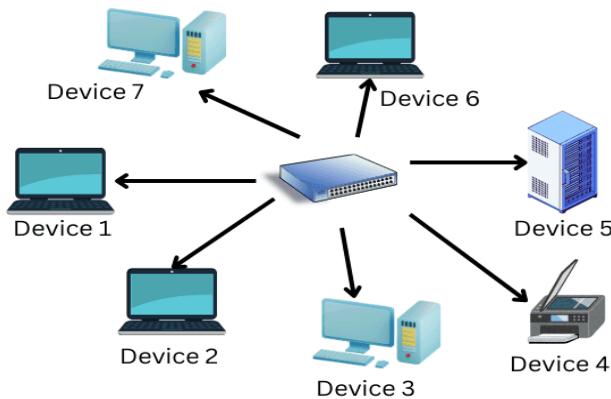
The network under investigation consists of an Internet Service Provider (ISP) connection, a router configured with Network Address Translation (NAT) and Dynamic Host Configuration Protocol (DHCP), and multiple end-user devices connected via a wireless local area network (WLAN).

## 1.5 Scope and Significance of the Report

The purpose of this report is not only to demonstrate practical networking skills, but also to develop a clear understanding of how local area networks (LANs) interact with wide area networks (WANs) in real-world environments. The findings presented provide insight into basic network architecture, troubleshooting techniques, and the importance of correct IP configuration for reliable network communication.

## Network Topology

The network uses a **star topology**, where all devices connect through a central router. This topology was selected due to its reliability, ease of management, and fault isolation. If one end device fails or disconnects, it does not affect the connectivity of other devices on the network.



## 2. IP Addressing Analysis (Very Strong Addition)IP

### Addressing Scheme Analysis

The device was assigned the IPv4 address **172.20.6.15** with a subnet mask of **255.255.254.0**, indicating a **/23** subnet. This subnet provides up to **510 usable host addresses**, making it suitable for medium-sized networks such as home or office environments.

The default gateway **172.20.6.1** serves as the routing point between the local network and the internet, enabling external communication.

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c:\ Command Prompt

Wireless LAN adapter Wi-Fi:

Connection-specific DNS Suffix . . . . . : Intel(R) Dual Band Wireless-AC 3165
Description . . . . . : Intel(R) Dual Band Wireless-AC 3165
Physical Address . . . . . : C0-B6-F9-30-FA-3E
DHCP Enabled. . . . . : Yes
Autoconfiguration Enabled . . . . . : Yes
Link-local IPv6 Address . . . . . : fe80::bc31:67d5:8862:7a57%15(Preferred)
IPv4 Address. . . . . : 172.20.6.15(Preferred)
Subnet Mask . . . . . : 255.255.254.0
Lease Obtained. . . . . : Tuesday, 17 February 2026 10:35:09
Lease Expires . . . . . : Thursday, 19 February 2026 10:30:58
Default Gateway . . . . . : 172.20.6.1
DHCP Server . . . . . : 172.20.6.1
DHCPv6 IAID . . . . . : 130070265
DHCPv6 Client DUID. . . . . : 00-01-00-01-30-75-AF-DE-98-EE-CB-86-27-B
DNS Servers . . . . . : 172.20.6.1
NetBIOS over Tcpip. . . . . : Enabled

Ethernet adapter Bluetooth Network Connection:

Media State . . . . . : Media disconnected
Connection-specific DNS Suffix . . . . . :
Description . . . . . : Bluetooth Device (Personal Area Network)
Physical Address. . . . . : C0-B6-F9-30-FA-42
DHCP Enabled. . . . . : Yes
Autoconfiguration Enabled . . . . . : Yes

C:\Users\CAPACITI-JHB>Z_
```

### 3. DHCP Explanation DHCP in the Network

Dynamic Host Configuration Protocol (DHCP) is used to automatically assign IP addresses to network devices. This reduces manual configuration errors and ensures efficient IP address management as devices join and leave the network.

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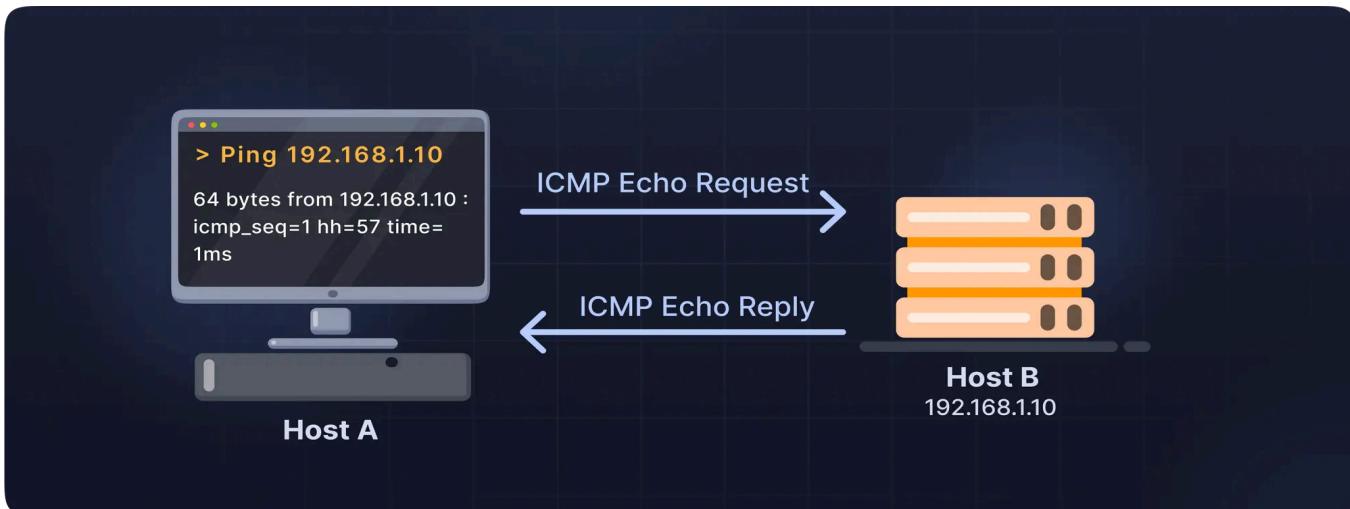
## 4. NAT Explanation (Distinction-Level Theory)



### Network Address Translation (NAT)

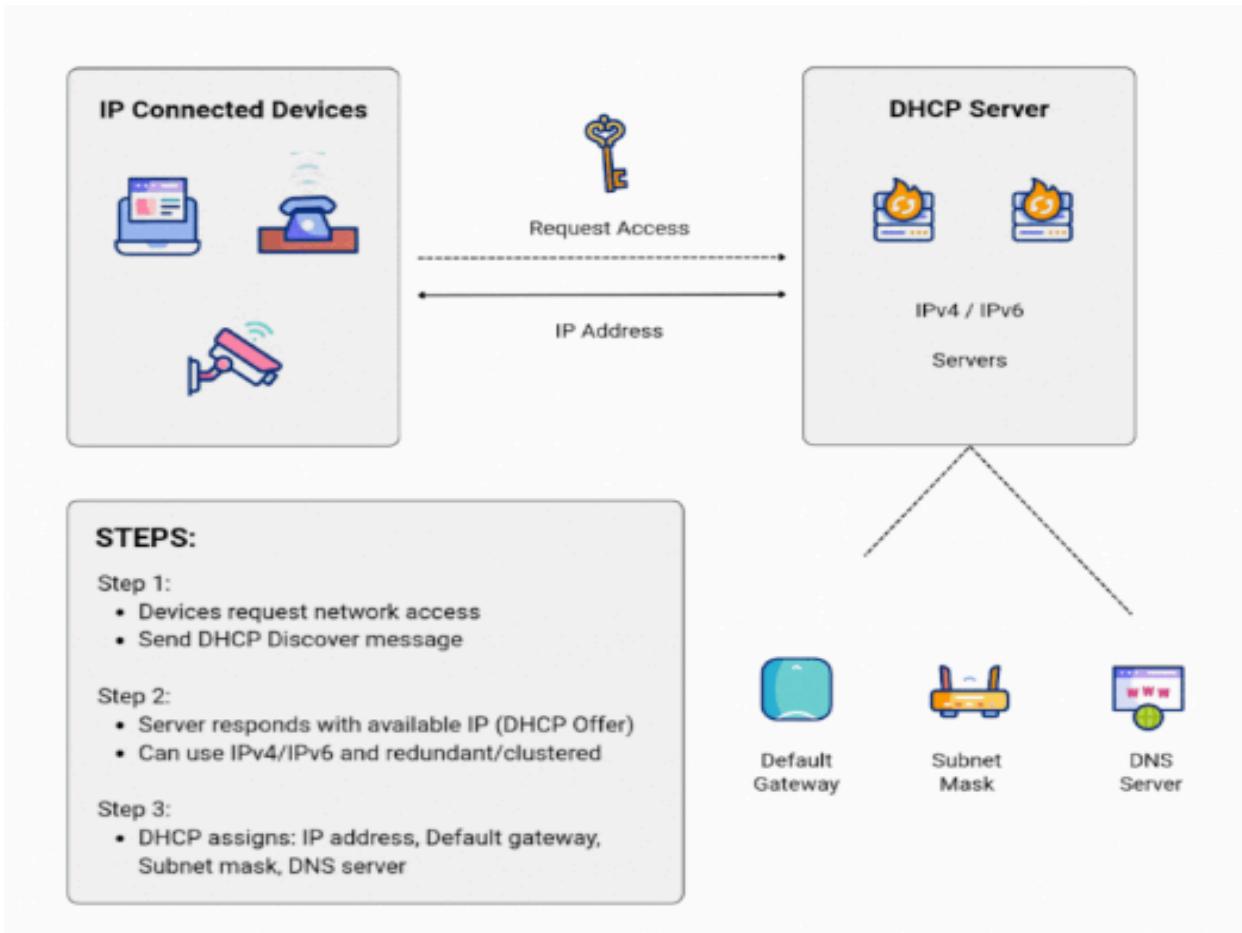
Network Address Translation (NAT) is implemented on the router to allow multiple devices within the private local network to share a single public IP address when accessing the internet. This enhances security by masking internal IP addresses from external networks.

## 5. Ping Test Interpretation (Not Just Results!)



### Interpretation of Ping Test Results

Successful ping responses to the default gateway confirmed local area network connectivity. Pings to the public IP address **8.8.8.8** verified internet access, while successful pings to **google.com** confirmed proper Domain Name System (DNS) resolution.



## 4. Findings and Analysis



### 4.1 IP Configuration Findings

The `ipconfig` command revealed that the active network interface on the device was the Wi-Fi adapter. The device was assigned the IPv4 address **172.20.6.15** with a subnet mask of **255.255.254.0**, indicating that the device is part of a **/23** subnet. This confirms that the IP address was dynamically assigned via DHCP, as no manual configuration was required.

The default gateway was identified as **172.20.6.1**, which represents the router responsible for forwarding traffic from the local area network (LAN) to external networks, including the internet. The presence of a valid default gateway confirms that the device is correctly configured for external communication.

An additional Ethernet adapter with the IP address **192.168.56.1** was also observed. This adapter did not have a default gateway assigned, indicating that it is a virtual or host-only

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interface used for internal or virtualised networking purposes rather than internet connectivity.

