Computer Networks Assignment 1

Aayush Adhikari (PAS077BCT003)
Roshan Tiwari (PAS077BCT030)
Shishir Rijal (PAS077BCT037)
Sudip Acharya (PAS077BCT041)

Date: May 23, 2024

Contents

1 Introduction

This report presents a detailed analysis of the concepts covered in Assignment 1, focusing on IP addressing, subnetting, network configuration, and practical tools like `ifconfig` and Packet Tracer.

2 Questions and Answers

2.1 Question 1

The `ifconfig` command provides detailed information about the network configuration of a machine. For the IP address 192.168.1.2 with a subnet mask of 255.255.255.0 (or 0xffffff00 in hexadecimal), let's delve into the specifics:

2.1.1 IP Address Classification

The IP address 192.168.1.2 falls within the Class C range of IP addresses. Class C addresses are typically used for small to medium-sized networks, as they provide up to 254 usable host addresses per subnet.

2.1.2 Subnetting Explanation

IP addresses are divided into classes (A, B, C, D, E) based on their initial bits. Class C addresses have their first octet in the range 192-223, which is evident in 192.168.1.2. Class C addresses are suited for smaller networks due to their capacity to support up to 254 hosts per subnet, making them ideal for organizations with moderate network requirements.

The subnet mask 255.255.255.0 (or /24 in CIDR notation) specifies that the first 24 bits of the IP address represent the network part, while the remaining 8 bits represent the host part. This configuration is crucial for routing data packets within and outside the network, ensuring proper communication between devices.

In binary, the subnet mask 255.255.255.0 is represented as:

11111111.11111111.11111111.00000000

Here: - The first 24 bits (all '1's) denote the network part. - The last 8 bits (all '0's) denote the host part.

2.1.3 Calculating Usable IP Addresses

To determine the number of usable IP addresses in this network:

$$2^{\text{number of host bits}} - 2$$

In this case, there are 8 host bits (from the subnet mask), allowing:

$$2^8 - 2 = 256 - 2 = \mathbf{254}$$

Therefore, there are **254 usable IP addresses** available for devices within this subnet. This calculation excludes the network address (192.168.1.0) and the broadcast address (192.168.1.255), which are reserved addresses used for network identification and broadcast communication, respectively.

2.1.4 Bitwise Operations for Network Address Calculation

To find the network address and broadcast address using bitwise operations:

Finding Network Address: Performing **AND** operation:

$$\begin{array}{c} 11000000.10101000.00000001.00000010 \\ \text{AND} \\ 11111111.11111111.11111111.00000000 \\ \hline 11000000.10101000.00000001.00000000 \\ (192.168.1.0) \end{array}$$

Finding Broadcast Address: Inverting subnet mask and performing **OR** operation:

$$\begin{array}{c} 11000000.10101000.00000001.00000000 \\ \text{OR} \\ 00000000.00000000.00000000.11111111 \\ \hline 11000000.10101000.00000001.11111111 \\ (192.168.1.255) \end{array}$$

3 Conclusion

This assignment provided insights into IP addressing, subnetting, and network configuration, using practical tools like `ifconfig` to analyze and understand network setups. The classification of the IP address as Class C and the subnetting calculations illustrate fundamental concepts in computer networking, essential for designing and managing modern networks.