

# Template Week 6 – Networking

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## **Assignment 6.1: Working from home**

Screenshot installation openssh-server:

Screenshot successful SSH command execution:

Screenshot successful execution SCP command:

Screenshot remmina:

## **Assignment 6.2: IP addresses websites**

Relevant screenshots nslookup command:

Screenshot website visit via IP address:

## **Assignment 6.3: subnetting**

How many IP addresses are in this network configuration 192.168.110.128/25?

What is the usable IP range to hand out to the connected computers?

Check your two previous answers with this calculator:

<https://www.calculator.net/ip-subnet-calculator.html>

Explain the above calculation in your own words.

## Assignment 6.4: HTML

Screenshot IP address Ubuntu VM:

Screenshot of Site directory contents:

Screenshot python3 webserver command:

Screenshot web browser visits your site

## Bonus point assignment – week 6

Remember that bitwise java application you've made in week 2? Expand that application so that you can also calculate a network segment as explained in the PowerPoint slides of week 6. Use the bitwise & AND operator. You need to be able to input two Strings. An IP address and a subnet.

IP: 192.168.1.100 and subnet: 255.255.255.224 for /27

Example: 192.168.1.100/27

Calculate the network segment

IP Address: 11000000.10101000.00000001.01100100

Subnet Mask: 11111111.11111111.11111111.11100000

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Network Addr: 11000000.10101000.00000001.01100000

This gives 192.168.1.96 in decimal as the network address.

For a /27 subnet, each segment (or subnet) has 32 IP addresses ( $2^5$ ).

The range of this network segment is from 192.168.1.96 to 192.168.1.127.

Paste source code here, with a screenshot of a working application.

```
import java.util.Scanner;

public class Main {
    public static void main(String[] args) {
        Scanner scanner = new Scanner(System.in);
        boolean exit = false;
```

```

while (!exit) {
    System.out.println("\nMenu:");
    System.out.println("1. Is number odd?");
    System.out.println("2. Is number a power of 2?");
    System.out.println("3. Two's complement of number?");
    System.out.println("4. Calculate Network Segment");
    System.out.println("5. Exit");
    System.out.print("Choose an option: ");
    int choice = scanner.nextInt();
    scanner.nextLine(); // Consume newline character
    switch (choice) {
        case 1:
            System.out.print("Enter a number: ");
            int number1 = scanner.nextInt();
            if (isOdd(number1)) {
                System.out.println("The number " + number1 + " is odd.");
            } else {
                System.out.println("The number " + number1 + " is even.");
            }
            break;

        case 2:
            System.out.print("Enter a number: ");
            int number2 = scanner.nextInt();
            if (isPowerOfTwo(number2)) {
                System.out.println("The number " + number2 + " is a power
of 2.");
            } else {
                System.out.println("The number " + number2 + " is not a
power of 2.");
            }
            break;

        case 3:
            System.out.print("Enter a number: ");
            int number3 = scanner.nextInt();
            int complement = twosComplement(number3);
            System.out.println("The two's complement of " + number3 + " is
" + complement + ".");
            break;

        case 4:
            System.out.print("Enter an IP address (e.g., 192.168.1.100):
");
            String ipAddress = scanner.nextLine();
            System.out.print("Enter a subnet mask (e.g., 255.255.255.224):
");
            String subnetMask = scanner.nextLine();

```

```

        String networkAddress = calculateNetworkAddress(ipAddress,
subnetMask);
        System.out.println("Network Address: " + networkAddress);
        System.out.println("Network Range: " +
calculateRange(networkAddress, subnetMask));
        break;

        case 5:
            System.out.println("Exiting the program.");
            exit = true;
            break;

        default:
            System.out.println("Invalid choice. Please try again.");
    }
}
scanner.close();
}

// Check if a number is odd
public static boolean isOdd(int number) {
    return (number & 1) != 0;
}

// Check if a number is a power of 2
public static boolean isPowerOfTwo(int number) {
    return number > 0 && (number & (number - 1)) == 0;
}

// Calculate the two's complement of a number
public static int twosComplement(int number) {
    return ~number + 1;
}

// Convert an IP or subnet string to an integer array
public static int[] convertToBinaryArray(String ipOrSubnet) {
    String[] parts = ipOrSubnet.split("\\.");
    int[] binary = new int[4];
    for (int i = 0; i < 4; i++) {
        binary[i] = Integer.parseInt(parts[i]);
    }
    return binary;
}

// Calculate the network address using bitwise AND
public static String calculateNetworkAddress(String ip, String subnet) {
    int[] ipBinary = convertToBinaryArray(ip);
    int[] subnetBinary = convertToBinaryArray(subnet);
    int[] networkBinary = new int[4];

    for (int i = 0; i < 4; i++) {

```

```

        networkBinary[i] = ipBinary[i] & subnetBinary[i];
    }

    return String.format("%d.%d.%d.%d", networkBinary[0], networkBinary[1],
networkBinary[2], networkBinary[3]);
}

// Calculate the range of the network
public static String calculateRange(String networkAddress, String subnet) {
    int[] networkBinary = convertToBinaryArray(networkAddress);
    int[] subnetBinary = convertToBinaryArray(subnet);
    int hostBits = 32;

    for (int i : subnetBinary) {
        hostBits -= Integer.bitCount(i);
    }

    int maxHosts = (int) Math.pow(2, hostBits);
    int lastAddress = networkBinary[3] + maxHosts - 1;

    return String.format("%s - %d.%d.%d.%d",
        networkAddress,
        networkBinary[0], networkBinary[1], networkBinary[2], lastAddress);
}
}

```

The screenshot shows an IDE with a Java file named 'Main.java' open. The code defines a 'Main' class with a 'main' method that uses a 'Scanner' to read user input and a 'while' loop to display a menu. The menu options are: 1. Is number odd?, 2. Is number a power of 2?, 3. Two's complement of number?, 4. Calculate Network Segment, 5. Exit. The user has selected option 4. The terminal output shows the program's execution, including the menu display and the calculation of the network range for the IP address 192.168.1.100 and subnet mask 255.255.255.224, resulting in the range 192.168.1.96 - 192.168.1.127.

```

Main.java
Main.java > Main > main(String[])
1 import java.util.Scanner;
2
3 public class Main {
4     public static void main(String[] args) {
5         Scanner scanner = new Scanner(System.in);
6         boolean exit = false;
7
8         while (!exit) {
9             System.out.println(x:"\nMenu:");
10            System.out.println(x:"1. Is number odd?");
11            System.out.println(x:"2. Is number a power of 2?");
12            System.out.println(x:"3. Two's complement of number?");
13            System.out.println(x:"4. Calculate Network Segment");
14            System.out.println(x:"5. Exit");
15            System.out.print(s:"Choose an option: ");
16            int choice = scanner.nextInt();
17            scanner.nextLine(); // Consume newline character
18            switch (choice) {
19                case 1:
20
21            }
22        }
23    }
24 }

```

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS COMMENTS

```

o michalmucha@mac Week 2 % /usr/bin/env /Library/Java/JavaVirtualMachines/jdk-23.jdk/Contents/Home/bin/java -e "
nable-preview -XX:+ShowCodeDetailsInExceptionMessages -cp /Users/michalmucha/Library/Application\ Support/Code
/User/workspaceStorage/ce28a63e10b492fe61b72cd4d167b989/redhat.java/jdt_ws/Week\ 2_f2ec5d80/bin Main

Menu:
1. Is number odd?
2. Is number a power of 2?
3. Two's complement of number?
4. Calculate Network Segment
5. Exit
Choose an option: 4
Enter an IP address (e.g., 192.168.1.100): 192.168.1.100
Enter a subnet mask (e.g., 255.255.255.224): 255.255.255.224
Network Address: 192.168.1.96
Network Range: 192.168.1.96 - 192.168.1.127

Menu:
1. Is number odd?
2. Is number a power of 2?
3. Two's complement of number?
4. Calculate Network Segment
5. Exit
Choose an option:

```

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