Template Week 6 – Networking

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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
-----------------------------------------------
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.
```

```
import java.util.Scanner;

public class bitwiseMenu {

   public static void main(String[] args) {
      Scanner scanner = new Scanner(System.in);

      while (true) {
         showMenu();
         int choice = scanner.nextInt();

         if (choice == 5) {
            System.out.println("Goodbye!");
            break;
         }

         if (choice == 4) {
            System.out.print("Enter IP address (example: 192.168.1.100): ");
            String ip = scanner.next();
            System.out.print("Enter subnet mask (example: 255.255.255.224): ");
            String subnet = scanner.next();
            System.out.println("Network segment starts at: " + calculateNetworkSegment(ip, subnet));
            continue;
         }
```

```
            System.out.print("Enter a number: ");
            int number = scanner.nextInt();

            switch (choice) {
                case 1 -> System.out.println(number + " is odd? " + isOdd(number));
                case 2 -> System.out.println(number + " is a power of 2? " + isPowerOfTwo(number));
                case 3 -> System.out.println("Two's complement of " + number + ": " +
twosComplement(number));
                default -> System.out.println("Invalid choice, try again.");
            }
        }

        scanner.close();
    }

    private static void showMenu() {
        System.out.println("\n --  Bitwise Operations Menu --");
        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: ");
    }

    private static boolean isOdd(int number) {
        return (number & 1) == 1;
    }

    private static boolean isPowerOfTwo(int number) {
        return number > 0 && (number & (number - 1)) == 0;
    }

    private static int twosComplement(int number) {
        return ~number + 1;
    }

    private static String calculateNetworkSegment(String ip, String subnet) {
        int ipInt = ipToInt(ip);
        int subnetInt = ipToInt(subnet);

        int networkInt = ipInt & subnetInt;

        return intToIp(networkInt);
    }
```

```
    private static int ipToInt(String ip) {
        String[] parts = ip.split("\\.");
        int result = 0;
        for (int i = 0; i < 4; i++) {
            result |= (Integer.parseInt(parts[i]) << (24 - (8 * i)));
        }
        return result;
    }

    private static String intToIp(int ipInt) {
        return ((ipInt >> 24) & 0xFF) + "." +
                ((ipInt >> 16) & 0xFF) + "." +
                ((ipInt >> 8) & 0xFF) + "." +
                (ipInt & 0xFF);
    }
}
```