Template Week 2 – Logic

Student number: 583168

Assignment 2.1: Parking lot

Which gates do you need?

We only need a single 3-input AND gate to trigger the full sign

Complete this table

Parking lot 1	Parking lot 2	Parking lot 3	Result (full)
0	0	0	0
0	0	1	0
0	1	0	0
1	0	0	0
1	1	0	0
0	1	1	0
1	1	0	0
1	1	1	1

Assignment 2.2: Android or iPhone

Which gates do you need?

We need a XOR gate to ensure the employee can only choose an iphone or android.

Complete this table

Android phone	iPhone	Result (Phone in possession)
0	0	0
0	1	1
1	0	1
1	1	0

Assignment 2.3: Four NAND gates

Complete this table

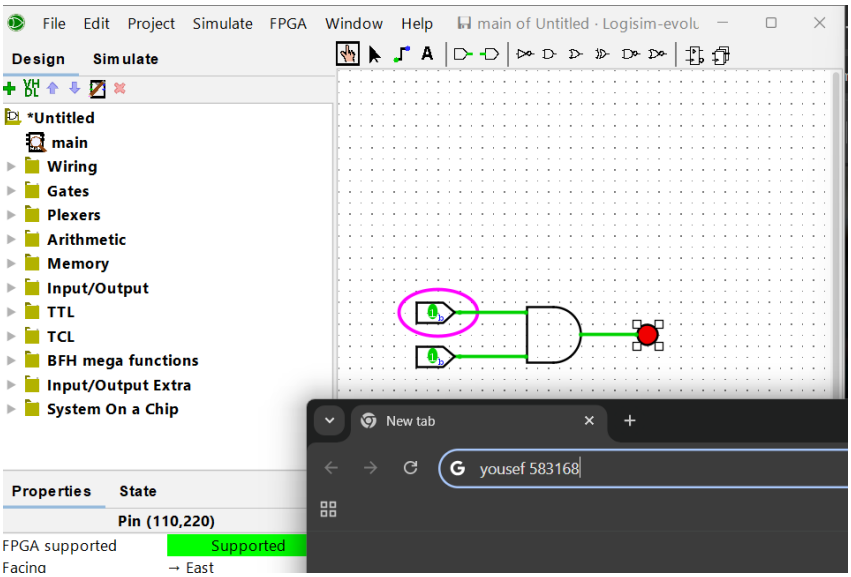
A	B	Q
0	0	0
1	0	1
0	1	1
1	1	1

How can the design be simplified?

We can simply replace the 4 NAND gates with one OR gate

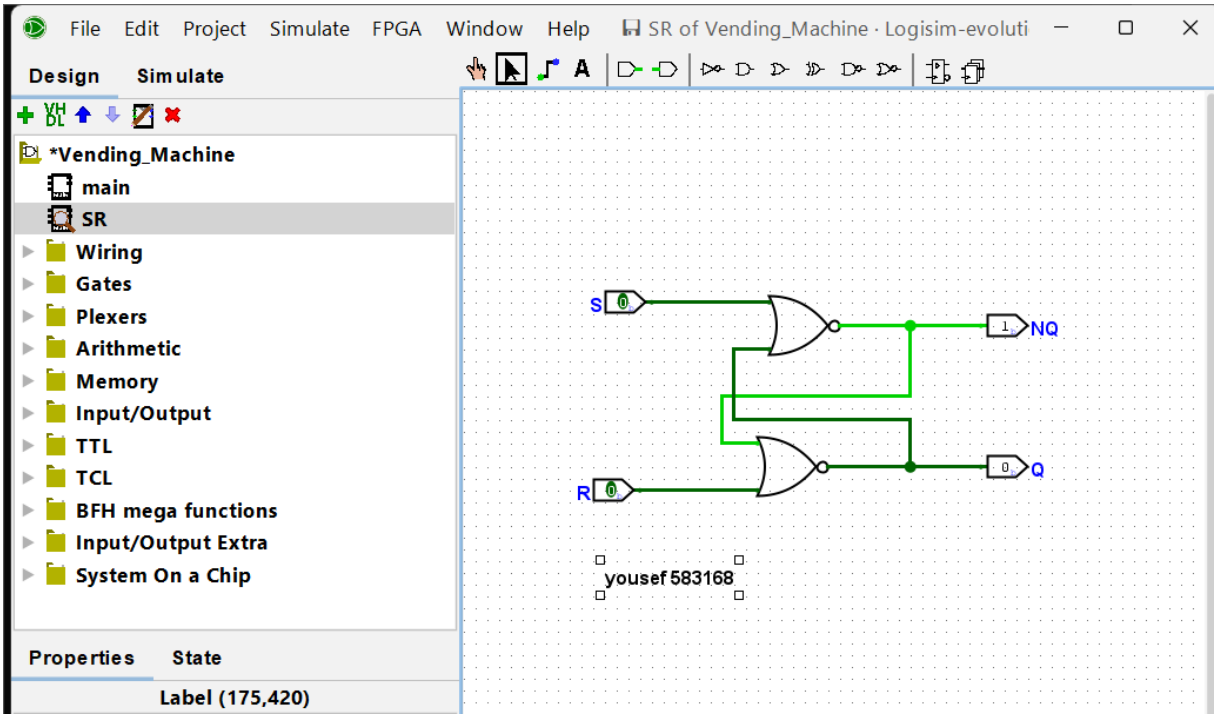
Assignment 2.4: Getting to know Logisim evolution

Screenshot of the design with your name and student number in it:



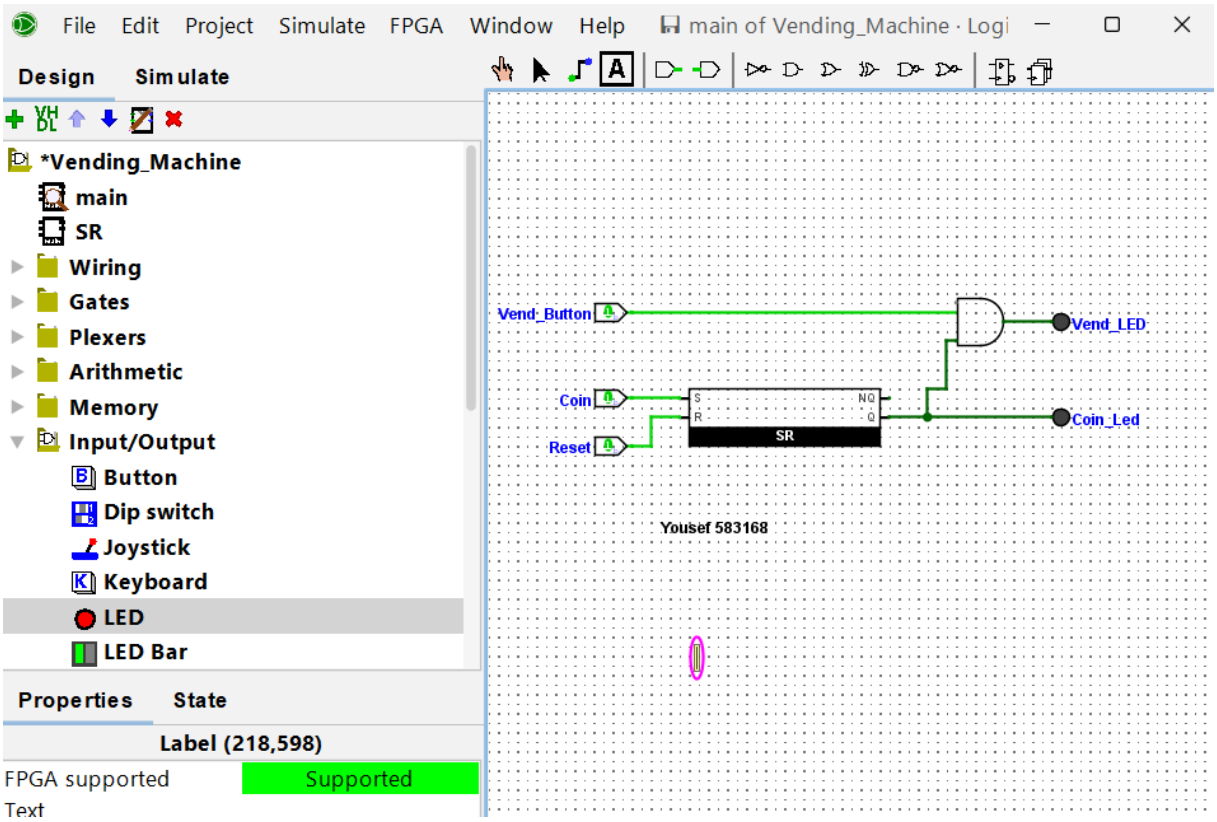
Assignment 2.5: SR Latch

Screenshot SR Latch in Logisim with your name and student number:



Assignment 2.6: Vending Machine

Screenshot Vending Machine in Logisim with your name and student number:



Assignment 2.7: Bitwise operators

```
public class Main {


    public static void main(String[] args) {
        checkOddEven();
        checkPowerOfTwo();
        checkReadPermission();
        showUserPermissions();
        toggleWritePermission();
        complementNumber();
        displayNumberFormats();
        System.out.println("Network address: " + getNetworkAddress("192.168.1.100",
"255.255.255.224"));
    }
```

```
// Exercise 1: Check if a number is odd or even
public static void checkOddEven() {
    int num = 5;
    if ((num & 1) == 1) {
        System.out.println(num + " is odd");
    } else {
        System.out.println(num + " is even");
    }
}

// Exercise 2: Check if a number is a power of 2
public static void checkPowerOfTwo() {
    int num = 3;
    if ((num & (num - 1)) == 0) {
        System.out.println(num + " is a power of 2");
    } else {
        System.out.println(num + " is NOT a power of 2");
    }
}

// Exercise 3: Check if user has read permission
public static void checkReadPermission() {
    final int READ = 4;
    final int WRITE = 2;
    final int EXECUTE = 1;

    int permissions = 7;
    if ((permissions & READ) != 0) {
        System.out.println("User has read permission");
    } else {
```

```
        System.out.println("User cannot read");
    }
}

// Exercise 4: Display combined user permissions
public static void showUserPermissions() {
    final int READ = 4;
    final int WRITE = 2;
    final int EXECUTE = 1;

    int permissions = READ | EXECUTE;
    System.out.println("Current user permissions: " + permissions);
}

// Exercise 5: Toggle write permission
public static void toggleWritePermission() {
    final int WRITE = 2;
    int permissions = 6; // example permission set
    permissions ^= WRITE; // toggle write
    System.out.println("Updated user permissions: " + permissions);
}

// Exercise 6: Bitwise complement example
public static void complementNumber() {
    int num = 5;
    num = ~(num - 1);
    System.out.println("Complemented number: " + num);
}

// Exercise 7: Show number in different formats
public static void displayNumberFormats() {
```

```
        int num = 10;
        System.out.println("Decimal: " + num);
        System.out.println("Binary: " + Integer.toBinaryString(num));
        System.out.println("Octal: " + Integer.toOctalString(num));
        System.out.println("Hexadecimal: " + Integer.toHexString(num));
    }

    // Calculate network address from IP and subnet
    public static String getNetworkAddress(String ip, String subnet) {
        String[] ipParts = ip.split("\\.");
        String[] maskParts = subnet.split("\\.");
        StringBuilder network = new StringBuilder();

        for (int i = 0; i < ipParts.length; i++) {
            int part = Integer.parseInt(ipParts[i]) & Integer.parseInt(maskParts[i]);
            network.append(part);
            if (i < ipParts.length - 1) {
                network.append(".");
            }
        }

        return network.toString();
    }
}
```

Assignment 2.8: Java Application Bit Calculations

Create a java program that accepts user input and presents a menu with options.

1. Is number odd?
2. Is number a power of 2?
3. Two's complement of number?

Implement the methods by using the bitwise operators you have just learned.

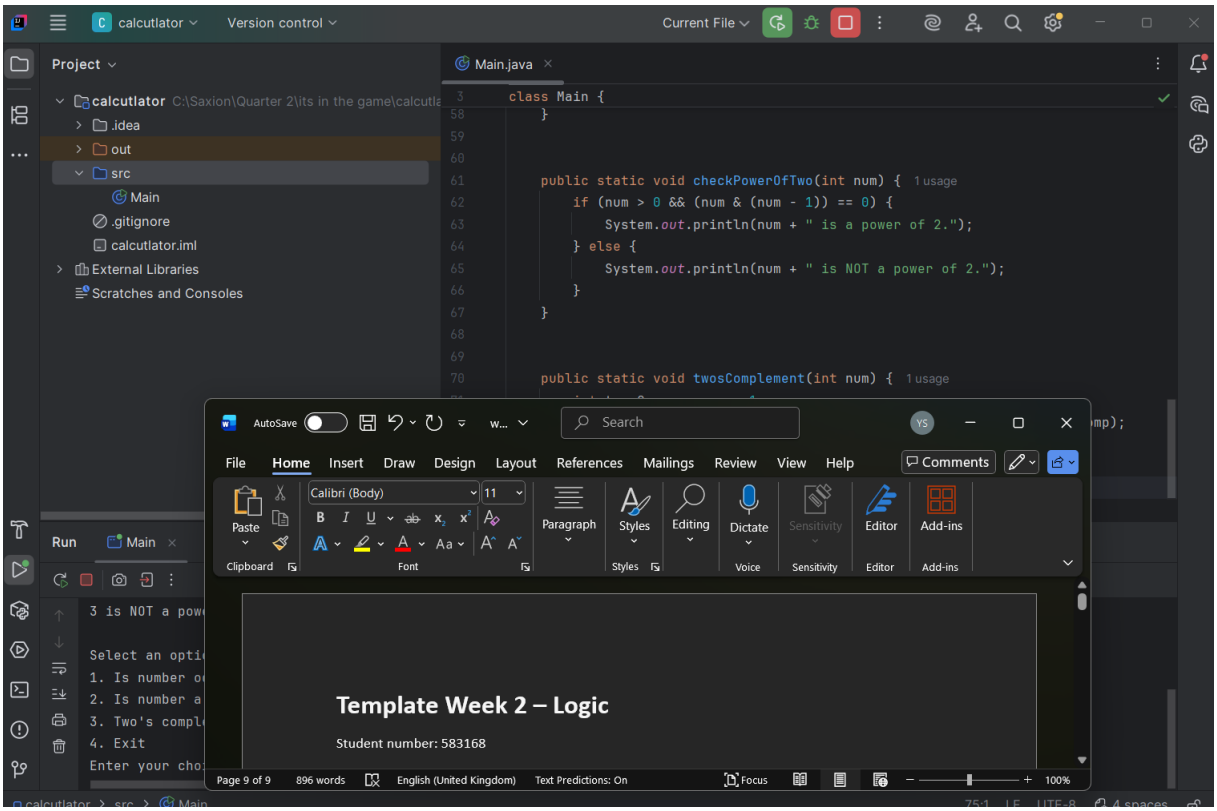
Organize your source code in a readable manner with the use of control flow and methods.

Keep this application because you need to expand it in week 6 for calculating network segments.

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

```
import java.util.Scanner;

class Main {

   public static void main(String[] args) {
      Scanner sc = new Scanner(System.in);
      boolean running = true;

      while (running) {

         System.out.println("Select an option:");
         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. Exit");
         System.out.print("Enter your choice (1-4): ");
         int choice = sc.nextInt();

         switch (choice) {
            case 1:
            case 2:
            case 3:

               System.out.print("Enter an integer number: ");
               int number = sc.nextInt();


               if (choice == 1) {
                  checkOdd(number);
               } else if (choice == 2) {
                  checkPowerOfTwo(number);
               } else {
                  twosComplement(number);
               }
               break;

            case 4:
               System.out.println("Exiting program.");
               running = false;
               break;

            default:
               System.out.println("Invalid choice! Please enter 1-4.");
```

```
            }

            System.out.println();       }

        sc.close();
    }


    public static void checkOdd(int num) {
        if ((num & 1) == 1) {
            System.out.println(num + " is odd.");
        } else {
            System.out.println(num + " is even.");
        }
    }


    public static void checkPowerOfTwo(int num) {
        if (num > 0 && (num & (num - 1)) == 0) {
            System.out.println(num + " is a power of 2.");
        } else {
            System.out.println(num + " is NOT a power of 2.");
        }
    }


    public static void twosComplement(int num) {
        int twosComp = ~num + 1;
        System.out.println("Two's complement of " + num + " is " + twosComp);
    }
}
```



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