Template Week 2 – Logic

Student number: 593250

Assignment 2.1: Parking lot

Which gates do you need?

Het bord moet **FULL** aangeven wanneer alle drie de parkeerplaatsen bezet zijn.
De uitgang (**FULL**) moet **alleen 1 worden wanneer A = B = C = 1** is.
dus een AND-Gate

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
0	1	1	0
1	0	0	0
1	0	1	0
1	1	0	0
1	1	1	1

Alleen wanneer **alle drie** de parkeerplaatsen bezet zijn, geeft de AND-poort een **1**.

Assignment 2.2: Android or iPhone

Which gates do you need?

Je hebt een **XOR-poort (Exclusive OR)** nodig.

Een XOR-poort geeft alleen een **1** als exact één van de twee ingangen 1 is.

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

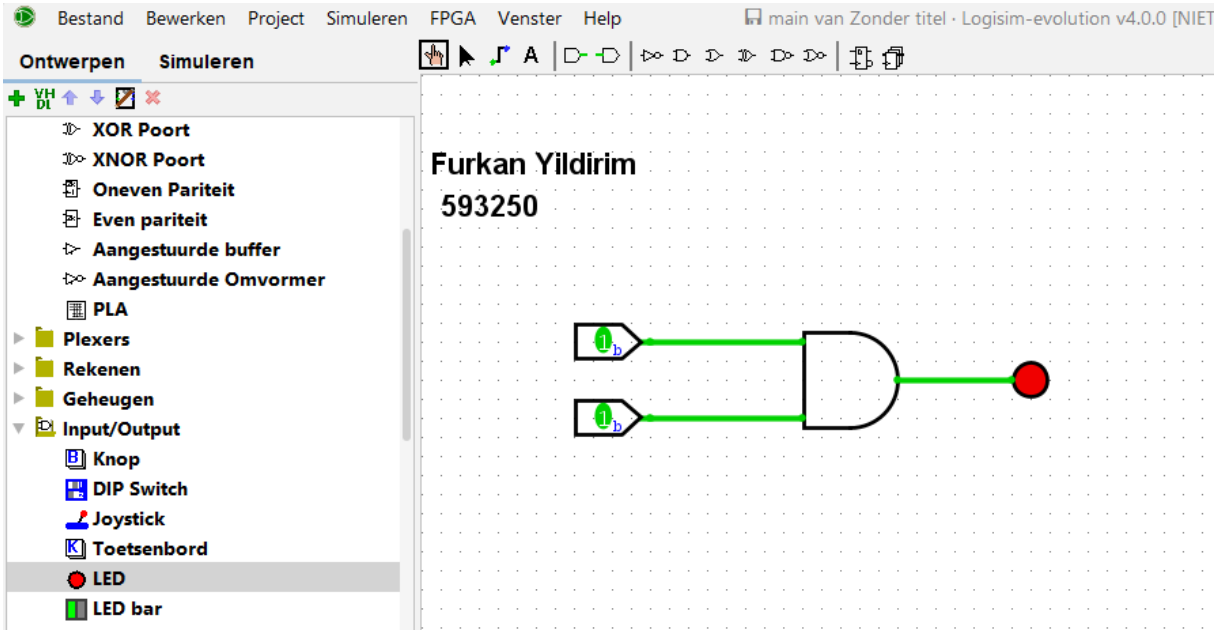
A	B	Q
0	0	0
0	1	1
1	0	1
1	1	1

How can the design be simplified?

Omdat deze schakeling hetzelfde resultaat geeft als een OR-poort, is het mogelijk om het ontwerp te vereenvoudigen tot slechts één OR-poort in plaats van vier NAND-poorten.

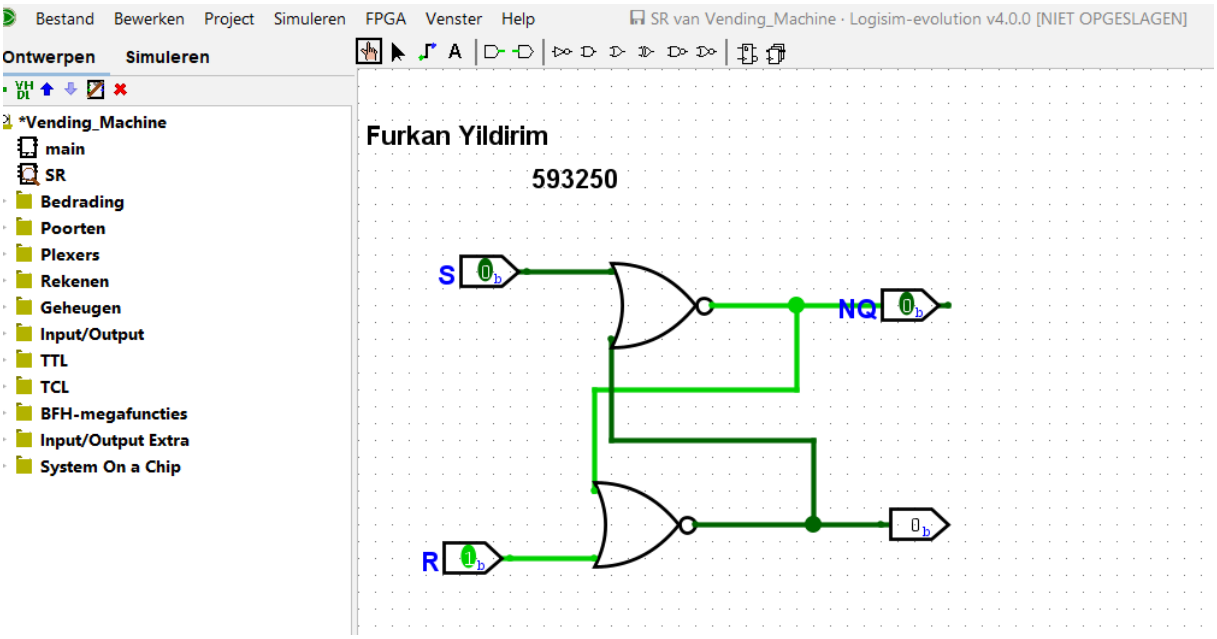
Assignment 2.4: Getting to know Logisim evolution

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



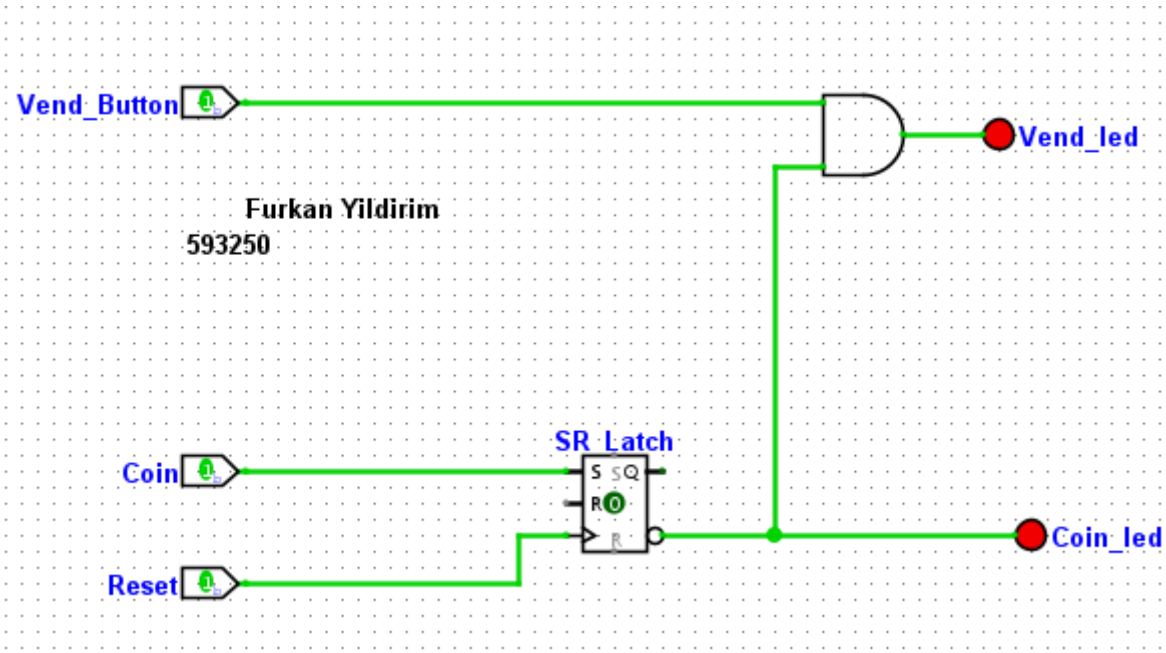
Assignment 2.5: SR Latch

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

Complete the java source code for bitwise operators. Put the source code here.

```
import nl.saxion.app.SaxionApp;

public class Application implements Runnable {

    public static void main(String[] args) {
        SaxionApp.start(new Application(), 800, 800);
    }

    @Override
    public void run() {

        System.out.println("=== Assignment 1: Even or Odd ===");
        int number = 5;
        if ((number & 1) == 1)
            System.out.println(number + " is odd");
        else
            System.out.println(number + " is even");


        System.out.println("\n=== Assignment 2: Power of 2 ===");
        int number2 = 4;
        if (number2 > 0 && (number2 & (number2 - 1)) == 0)
            System.out.println(number2 + " is a power of 2");
        else
            System.out.println(number2 + " is NOT a power of 2");


        System.out.println("\n=== Assignment 3: Check Permissions (READ) ===");
        final int READ = 4;
        final int WRITE = 2;
        final int EXECUTE = 1;

        int userPermissions = 7;
        if ((userPermissions & READ) != 0)
            System.out.println("User has READ permissions");
        else
            System.out.println("User does NOT have READ permissions");
```

```
        System.out.println("\n=== Assignment 4: Assign Permissions ===");
        int userPermissions2 = 0;
        userPermissions2 = userPermissions2 | READ | EXECUTE;
        System.out.println("User permissions assigned: " + userPermissions2);


        System.out.println("\n=== Assignment 5: Update Permissions (Remove WRITE) ===");
        int userPermissions3 = 6; // read + write
        userPermissions3 = userPermissions3 ^ WRITE;
        System.out.println("Updated user permissions: " + userPermissions3);


        System.out.println("\n=== Assignment 6: Two's Complement ===");
        int num = 5;
        num = ~num + 1;
        System.out.println("Two's complement result: " + num);


        System.out.println("\n=== Assignment 7: Display Binary, Octal, Hexadecimal ===");
        int n = 10;
        System.out.println("Decimal number: " + n);
        System.out.println("Binary representation: " + Integer.toBinaryString(n));
        System.out.println("Octal representation: " + Integer.toOctalString(n));
        System.out.println("Hexadecimal representation: " + Integer.toHexString(n));

        System.out.println("\n=== END OF PROGRAM ===");
    }
}
```

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.

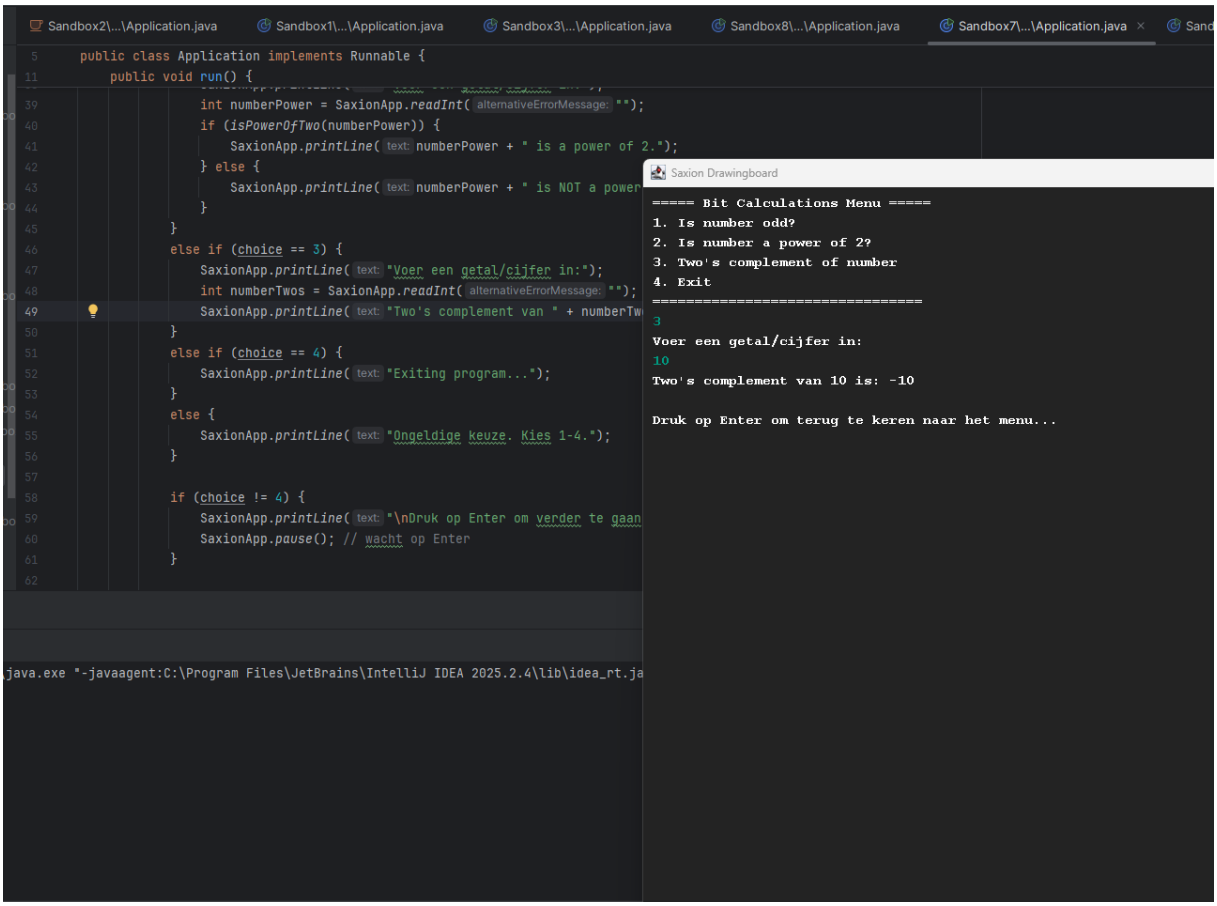
Keep this application because you need to expand it in week 6 for calculating network segments.

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

```
import nl.saxion.app.SaxionApp;

import java.awt.*;

public class Application implements Runnable {

   public static void main(String[] args) {
      SaxionApp.start(new Application(), 800, 800);
   }

   public void run() {
      int choice;

      do {
         SaxionApp.clear(); // scherm leegmaken

         // Menu tonen
         SaxionApp.printLine("===== Bit Calculations Menu =====");
         SaxionApp.printLine("1. Is number odd?");
         SaxionApp.printLine("2. Is number a power of 2?");
         SaxionApp.printLine("3. Two's complement of number");
         SaxionApp.printLine("4. Exit");
         SaxionApp.printLine("================================");

         // Keuze van gebruiker
         choice = SaxionApp.readInt("Enter your choice (1-4): ");
```

```
        if (choice == 1) {
            SaxionApp.printLine("Voer een getal/cijfer in:");
            int numberOdd = SaxionApp.readInt("");
            if (isOdd(numberOdd)) {
                SaxionApp.printLine(numberOdd + " is odd.");
            } else {
                SaxionApp.printLine(numberOdd + " is even.");
            }
        }
        else if (choice == 2) {
            SaxionApp.printLine("Voer een getal/cijfer in:");
            int numberPower = SaxionApp.readInt("");
            if (isPowerOfTwo(numberPower)) {
                SaxionApp.printLine(numberPower + " is a power of 2.");
            } else {
                SaxionApp.printLine(numberPower + " is NOT a power of 2.");
            }
        }
        else if (choice == 3) {
            SaxionApp.printLine("Voer een getal/cijfer in:");
            int numberTwos = SaxionApp.readInt("");
            SaxionApp.printLine("Two's complement van " + numberTwos + " is: " +
twosComplement(numberTwos));
        }
        else if (choice == 4) {
            SaxionApp.printLine("Exiting program...");
        }
        else {
            SaxionApp.printLine("Ongeldige keuze. Kies 1-4.");
        }

        if (choice != 4) {
            SaxionApp.printLine("\nDruk op Enter om verder te gaan...");
            SaxionApp.pause(); // wacht op Enter
        }

    } while (choice != 4);
  }

  // Controleer of een getal oneven is
  public static boolean isOdd(int num) {
    return (num & 1) == 1;
  }

  // Controleer of een getal een macht van 2 is
  public static boolean isPowerOfTwo(int num) {
    return num > 0 && (num & (num - 1)) == 0;
  }
```

```
    // Bereken twee's complement
    public static int twosComplement(int num) {
        return ~num + 1;
    }
}
```



Ready? Then save this file and export it as a pdf file with the name: **week2.pdf**