



# Project Presentation of Exploratory Project (EP)

## On

# Traffic Signal Simulation System

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# OBJECTIVE

To simulate traffic lights and vehicle flow using **Java threads** and **synchronization**



Thread-based signal control



Synchronization mechanisms



Vehicle flow simulation



Real-time signal transitions



Vehicle 1



Vehicle 2



Vehicle 3

# MODULE OVERVIEW



## Signal Module

Simulate Red/Yellow/Green traffic signals



## Vehicle Module

Represent vehicles waiting at signals



## Controller Module

Manage timing and transitions between signals



## Threads



## Synchronization



## Exception Handling

# HOW DATA IS STORED



Stores simulation data in **CSV format** for analysis and debugging



	Timestamp	SignalState	VehicleCount
	2023-10-29 10:00:00	RED	5
	2023-10-29 10:00:30	YELLOW	5
	2023-10-29 10:01:00	GREEN	3
	2023-10-29 10:01:30	YELLOW	2
	2023-10-29 10:02:00	RED	7



Timestamp



SignalState



VehicleCount

# ALGORITHMIC FLOW



Start traffic simulation



Thread changes light every few seconds



Log signal states and vehicle data

## Simulation Process



Initialize system components



Execute signal transitions



Record simulation data

# SUGGESTED CLASS STRUCTURE



com.traffic



model



Signal.java



Vehicle.java



service

Suggested Class Structure



TrafficService.java



FileService.java



LogService.java



main



TrafficApp.java

# CODE SNIPPET FROM THE PROJECT

TRAFFIC-SIMULATION

TrafficSimulation.java X

src > com > traffic > main > TrafficSimulation.java

```
1 package com.traffic.main;
2
3
4 import com.traffic.model.Signal;
5 import com.traffic.service.TrafficService;
6 import java.util.Scanner;
7
8 public class TrafficSimulation {
9     public static void main(String[] args) {
10         System.out.println("🚦 Traffic Signal Simulation System 🚦");
11         System.out.println("=====");
12
13         // Create traffic signal
14         Signal signal = new Signal("SIGNAL-001");
15
16         // Create and start traffic service
17         TrafficService trafficService = new TrafficService(signal);
18         trafficService.startTrafficSignal();
19
20         // Add shutdown hook for graceful termination
21         Runtime.getRuntime().addShutdownHook(new Thread(() -> {
22             System.out.println("\nShutting down simulation...");
23             trafficService.stopSimulation();
24         }));
25
26         // User interface for manual control
27         Scanner scanner = new Scanner(System.in);
28         System.out.println("\nCommands:");
29         System.out.println(" 'stop' - Stop simulation");
30         System.out.println(" 'exit' - Exit program");
31         System.out.println("Press Enter to stop...");
32 }
```

logs log.csv

out\com\traffic

main TrafficSimulation.class

model Signal.class Signal\$SignalState.class Vehicle.class Vehicle\$VehicleType.class

service FileService.class LogService.class TrafficService.class

src\com\traffic

main TrafficSimulation.java

model Signal.java Vehicle.java

service FileService.java LogService.java TrafficService.java

Run&compile.txt

# OUTPUT

```
PS C:\Users\Acer\Desktop\traffic-signal-simulator\traffic-simulation> javac -d out src/com/traffic/model/*.java src/com/traffic/service/*.java src/com/traffic/main/*.java
PS C:\Users\Acer\Desktop\traffic-signal-simulator\traffic-simulation>
PS C:\Users\Acer\Desktop\traffic-signal-simulator\traffic-simulation> java -cp out com.traffic.main.TrafficSimulation
? Traffic Signal Simulation System ?
=====
Traffic signal simulation started...
Signal SIGNAL-001 changed to: RED

Commands:
'stop' - Stop simulation
'exit' - Exit program
Press Enter to stop...
Logged: 2025-11-26 17:28:22,RED,0
New vehicle arrived: Vehicle{vehicleId='V1', type=MOTORCYCLE} | Total vehicles: 1
New vehicle arrived: Vehicle{vehicleId='V2', type=TRUCK} | Total vehicles: 2
New vehicle arrived: Vehicle{vehicleId='V3', type=MOTORCYCLE} | Total vehicles: 3
Signal SIGNAL-001 changed to: GREEN
Logged: 2025-11-26 17:28:27,GREEN,3
New vehicle arrived: Vehicle{vehicleId='V4', type=BUS} | Total vehicles: 4
2 vehicle(s) departed. Remaining: 2
New vehicle arrived: Vehicle{vehicleId='V5', type=CAR} | Total vehicles: 3
3 vehicle(s) departed. Remaining: 0
New vehicle arrived: Vehicle{vehicleId='V6', type=CAR} | Total vehicles: 1
1 vehicle(s) departed. Remaining: 0
Signal SIGNAL-001 changed to: YELLOW
Logged: 2025-11-26 17:28:34,YELLOW,0
New vehicle arrived: Vehicle{vehicleId='V7', type=BUS} | Total vehicles: 1
Signal SIGNAL-001 changed to: RED
Logged: 2025-11-26 17:28:36,RED,1
New vehicle arrived: Vehicle{vehicleId='V8', type=TRUCK} | Total vehicles: 2
New vehicle arrived: Vehicle{vehicleId='V9', type=CAR} | Total vehicles: 3
New vehicle arrived: Vehicle{vehicleId='V10', type=TRUCK} | Total vehicles: 4
Signal SIGNAL-001 changed to: GREEN
Logged: 2025-11-26 17:28:41,GREEN,4
New vehicle arrived: Vehicle{vehicleId='V11', type=BUS} | Total vehicles: 5
5 vehicle(s) departed. Remaining: 0
op
Stopping traffic simulation...
Simulation ended. Check logs/log.csv for details.
New vehicle arrived: Vehicle{vehicleId='V12', type=CAR} | Total vehicles: 3
3 vehicle(s) departed. Remaining: 0
Signal SIGNAL-001 changed to: YELLOW
Logged: 2025-11-26 17:28:48,YELLOW,0

Shutting down simulation...
Stopping traffic simulation...
```



**Thank You**