



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

CHITKARA
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Signal Module

Simulate **Red/Yellow/Green** traffic signals



Threads



Vehicle Module

Represent **vehicles waiting** at signals



Synchronization



Controller Module

Manage **timing and transitions** between signals



Exception Handling

HOW DATA IS STORED



log.csv

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



Timestamp



SignalState



VehicleCount



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

ALGORITHMIC FLOW



1



Start traffic simulation

2



Thread changes light every few seconds

3



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

logslog.csv

out\com\traffic

mainTrafficSimulation.class

modelSignal.classSignal\$SignalState.classVehicle.classVehicle\$VehicleType.class

service

src\com\traffic

mainTrafficSimulation.java

modelSignal.javaVehicle.java

service

Run&compile.txt

TrafficSimulation.java

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     }
```

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
3 vehicle(s) departed. Remaining: 2
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