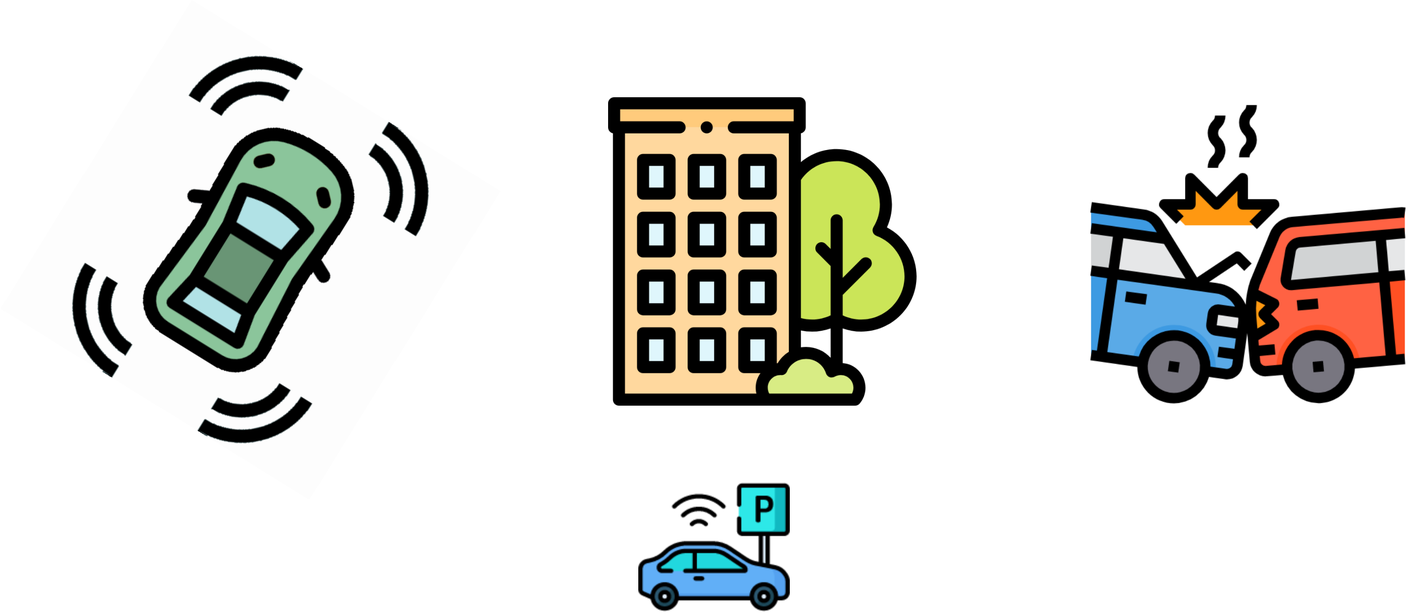
EPFL

CS-438

Simulation of a Decentralized Network of Autonomous Cars.



Torstein Meyer
Fernando Monje
Carlos Villa

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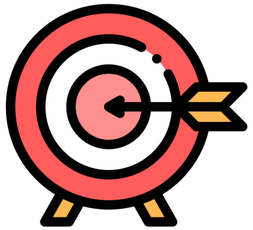
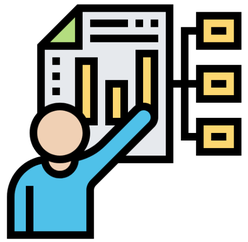
Introduction

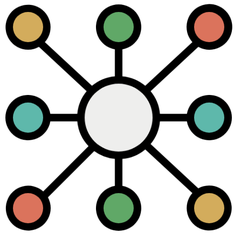
Demo



Objectives



Conclusions



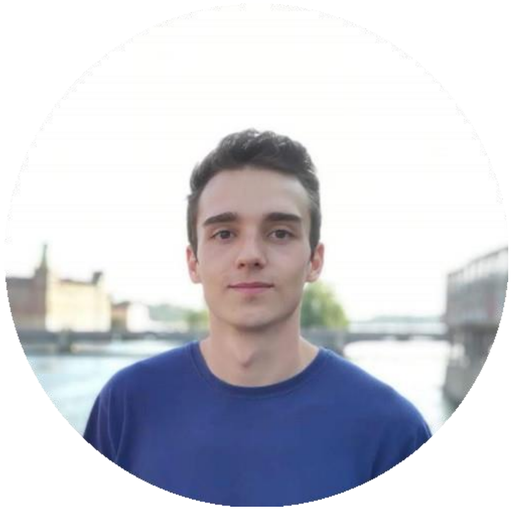
Architecture
& Protocol

Introduction

EPFL

Carlos Villa

Design the system
Simulation server and GUI
Security



Fernando Monje

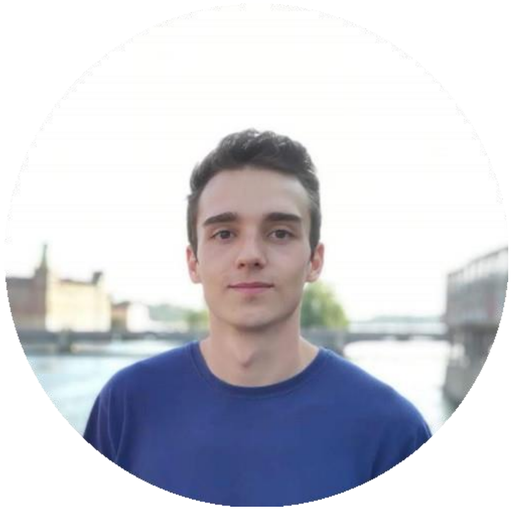
Design the system
Car protocol
Events handling

Torstein Meyer

Design the system
Car protocol
Path finding

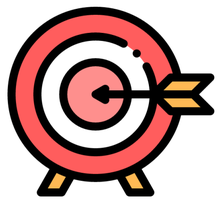
Introduction

EPFL



Carlos Villa **Fernando Monje** **Torstein Meyer**

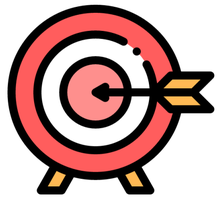
The truth is we all have participated in everything
Team work makes the dream work!



Objectives

Simulation of decentralized cars:

- Move in a map avoiding collisions.
- Alert of parking spots.
- Alert of accidents to the police.
- Optimum path planning.
- Web of trust.
- Scalable system.
- Visualization and user interaction.

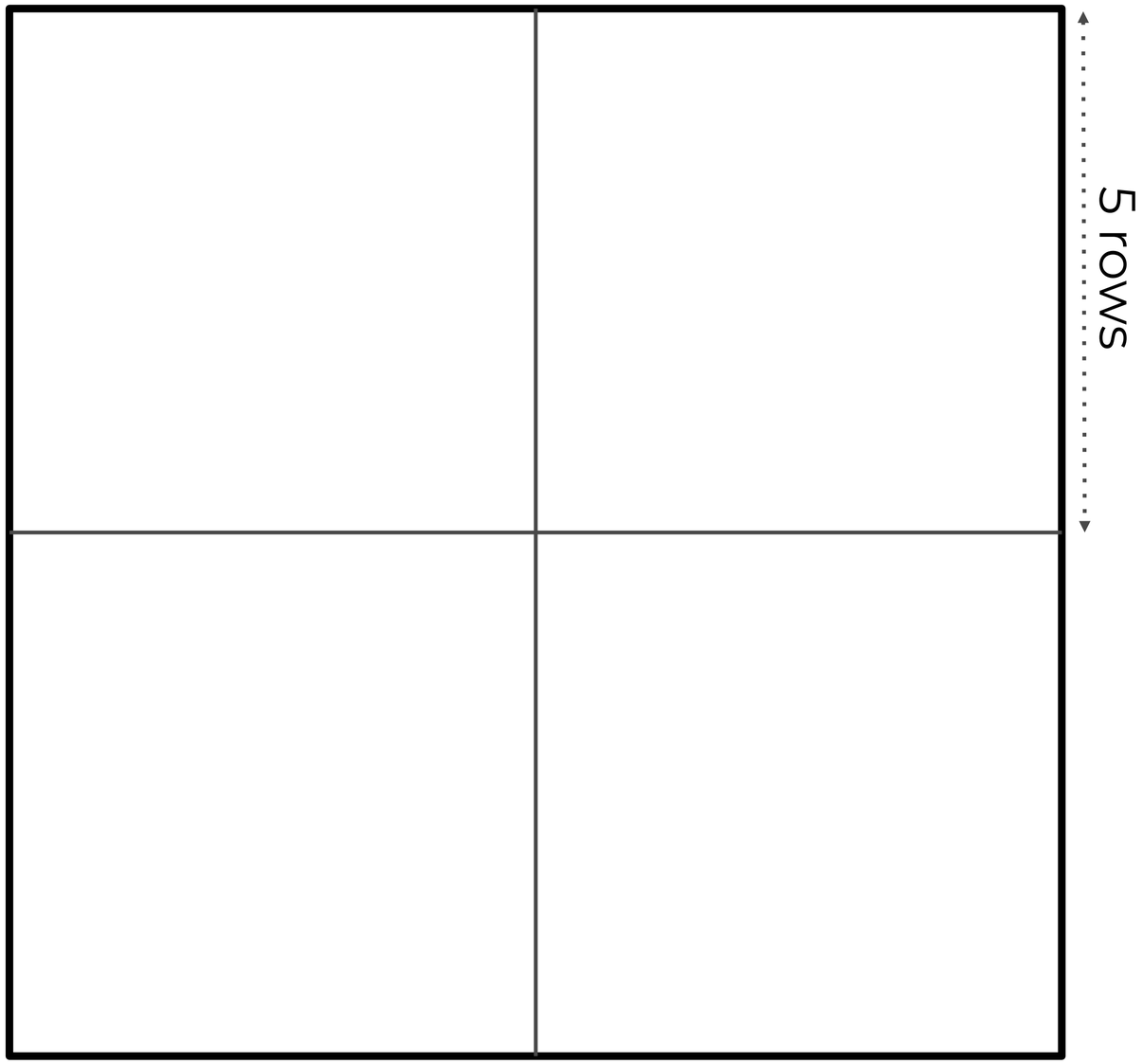


Objectives

Peerster Homework 2

- 3 layered communication
- Newsgroups
- Dynamic management of known peers
- Web of trust
- Encryption of private messages
- Pathfinding

Map



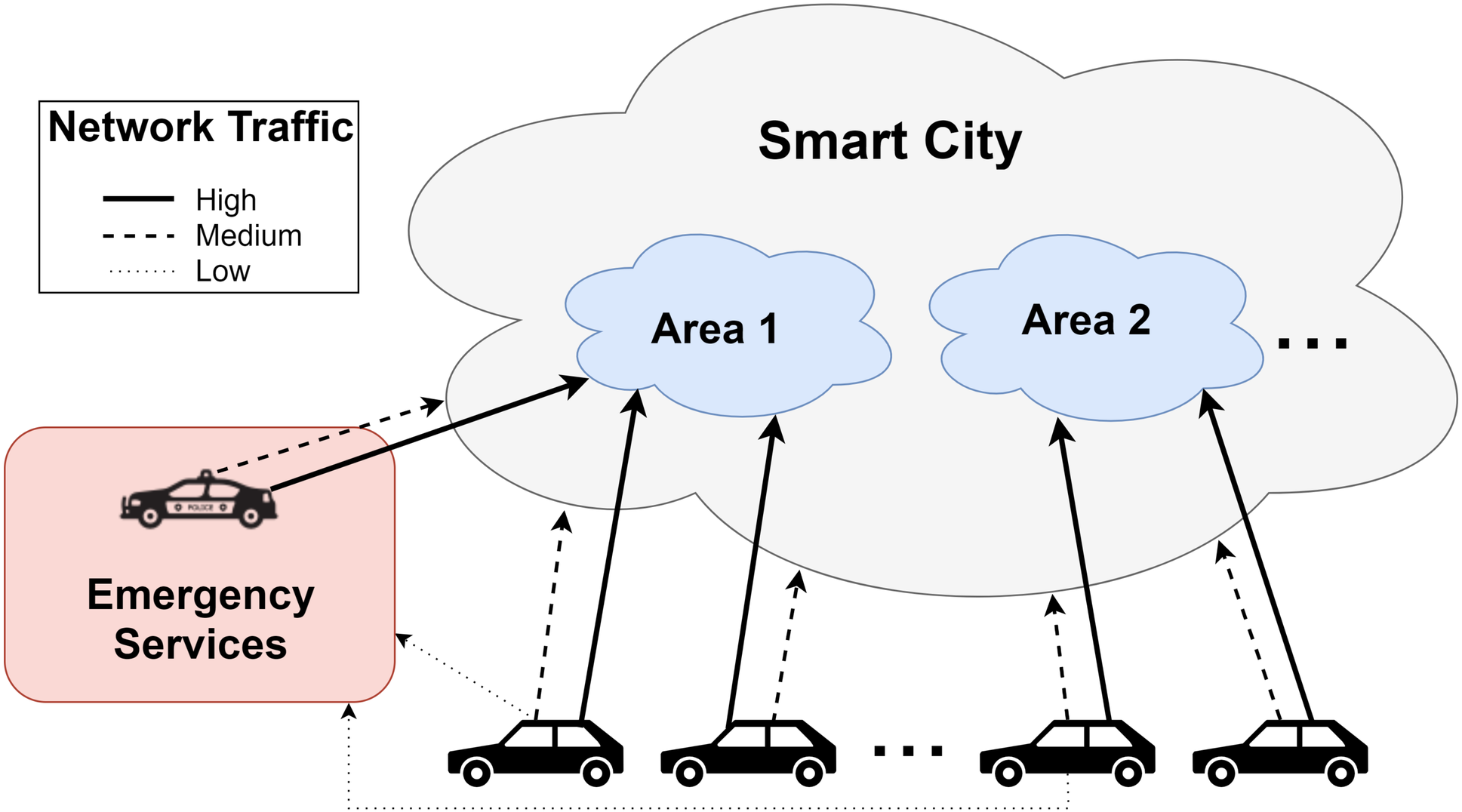
Cars

Buildings

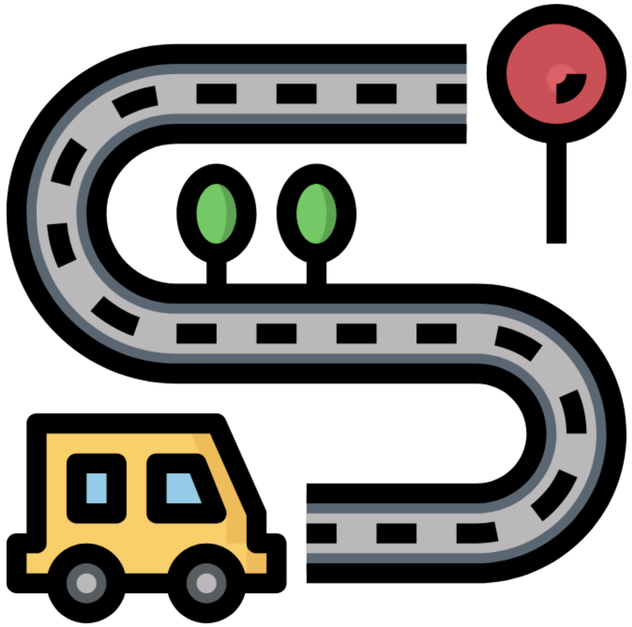
Accidents

Parking spots

Architecture



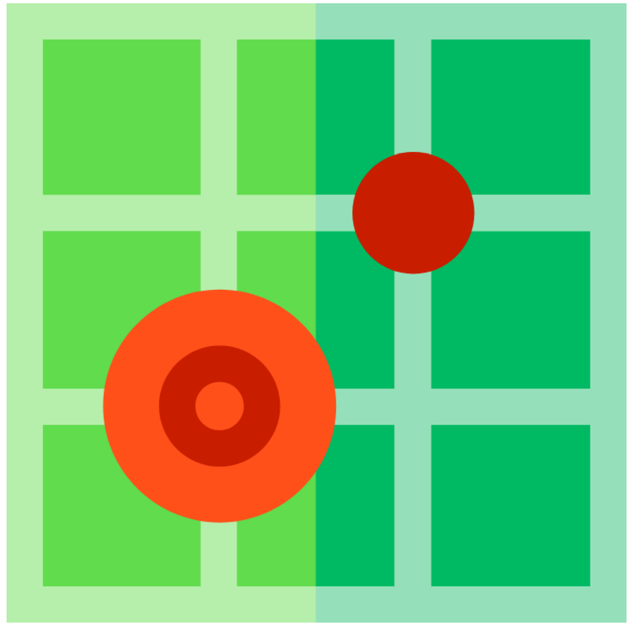
Protocol



Pathfinding

Dijkstra's algorithm

Protocol

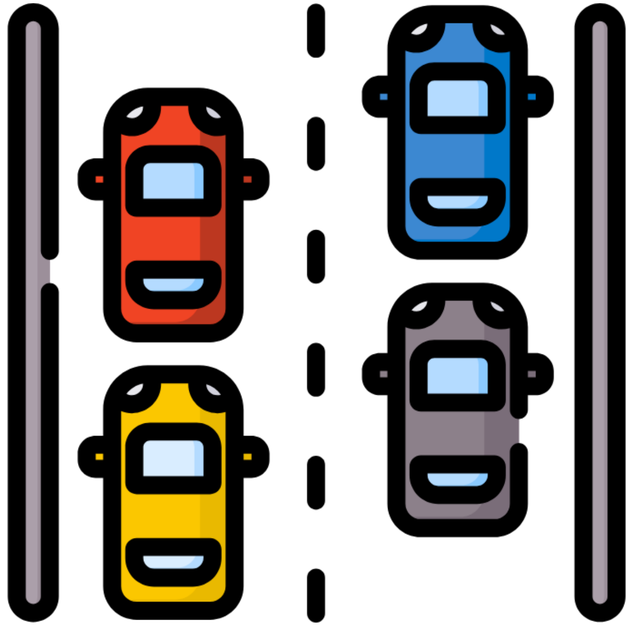


Moving inside an area

Multicast position in layer 2

Wait for people to move if they are in your way

Protocol



Avoiding a car crash

Coinflip to decide who moves

Looser repaths

Protocol

Changing of area

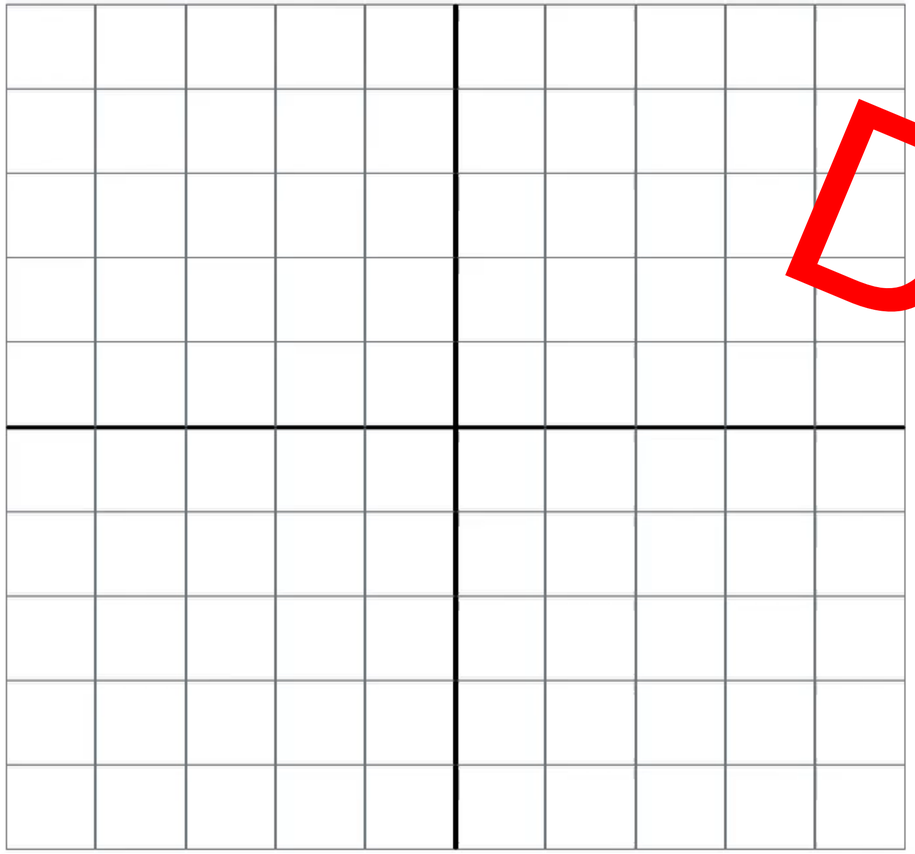
Rumormonger in the news group of new area

Decentralized cars

localhost:8086

General | Individual

Clear map



If you do not choose "random position", you will have to specify the origin and destination of the car.

Random position

Add new car

Buildings are obstacles that cars will avoid while moving in the map.

Random position

Add new building

If a car discovers an accident, it will inform the police, which moves in the map like additional cars.

Random position

Add new accident

If a car discovers a parking spot, it will inform those cars subscribed to the news group.

Random position

Add new parking spot

DEMO

Start simulation

When starting the simulation, all nodes (cars) are deployed and they will start moving in the map. During the simulation you will be able to add new cars, accidents and parking spots. Buildings are not allowd.

Start simulation

Protocol

Parking spot

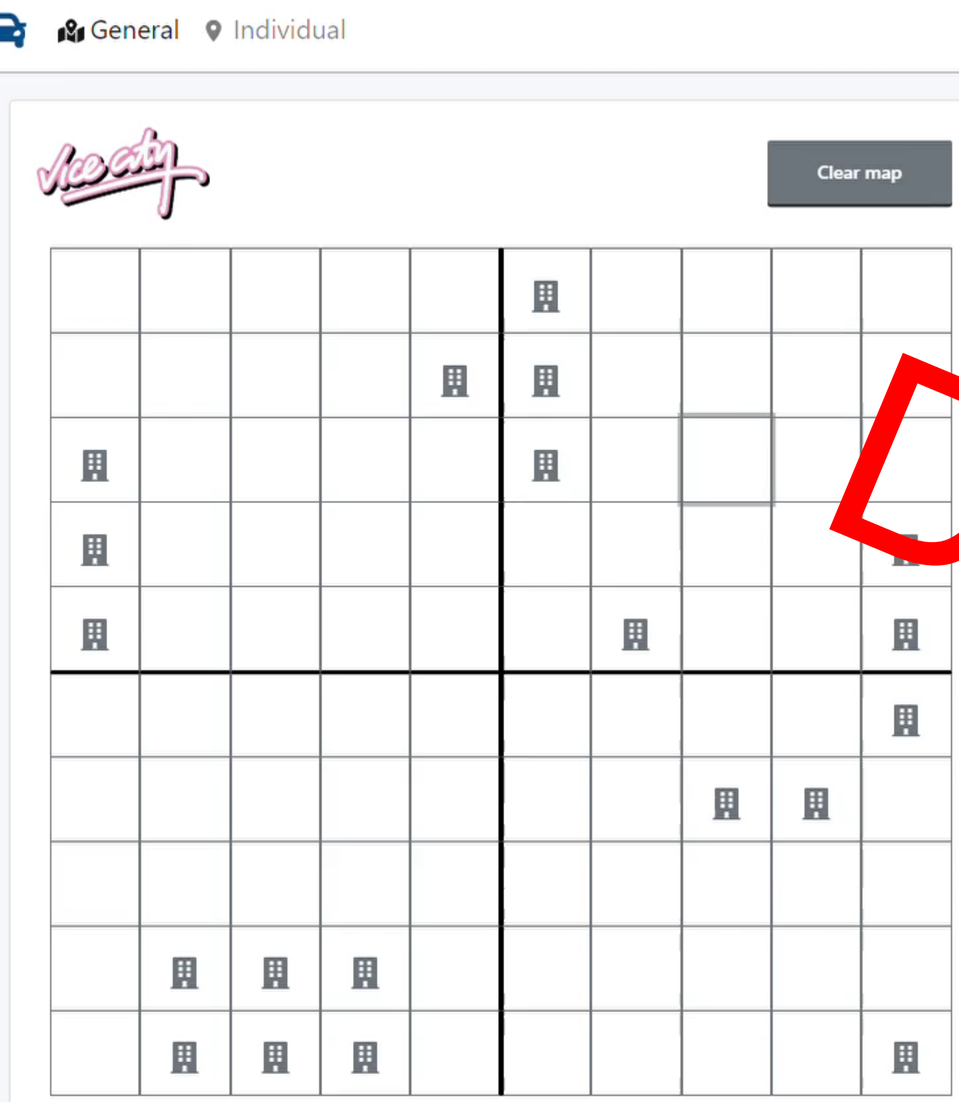
Discoverer rumormongers spot in newsgroup

Random winner from participants

Decentralized cars | My Drive - Google Drive | Presentation.pptx - Google Slides

localhost:8086

General | Individual



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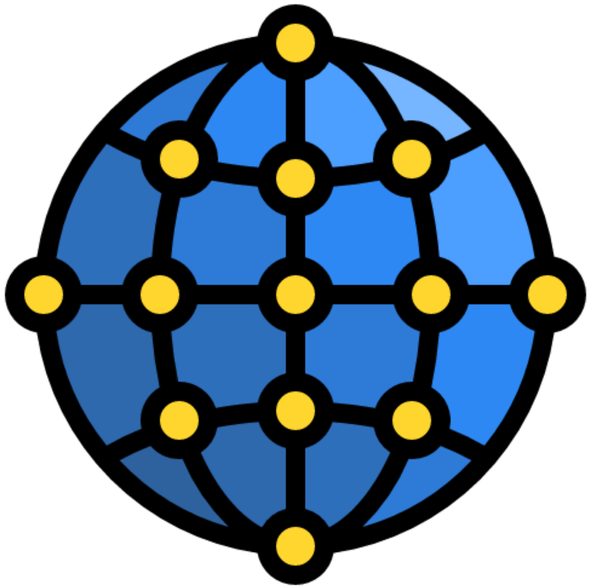


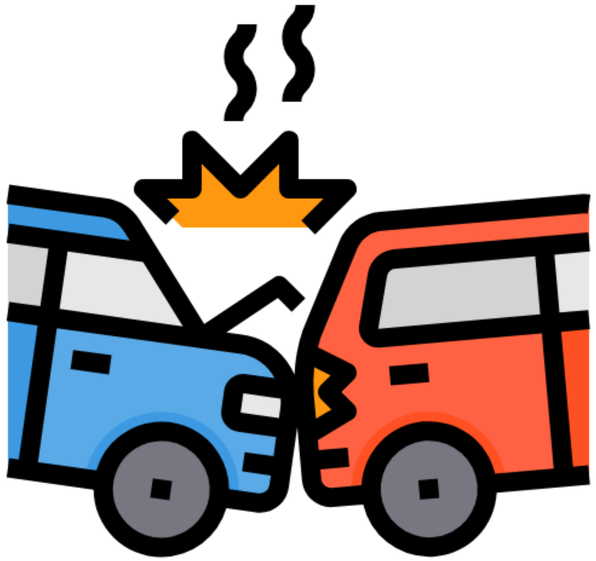
Web of trust

Private/public key system

Cars from the same producer trust each other by default

Cars successfully avoiding a collision trust each other

Protocol



Accident alerts

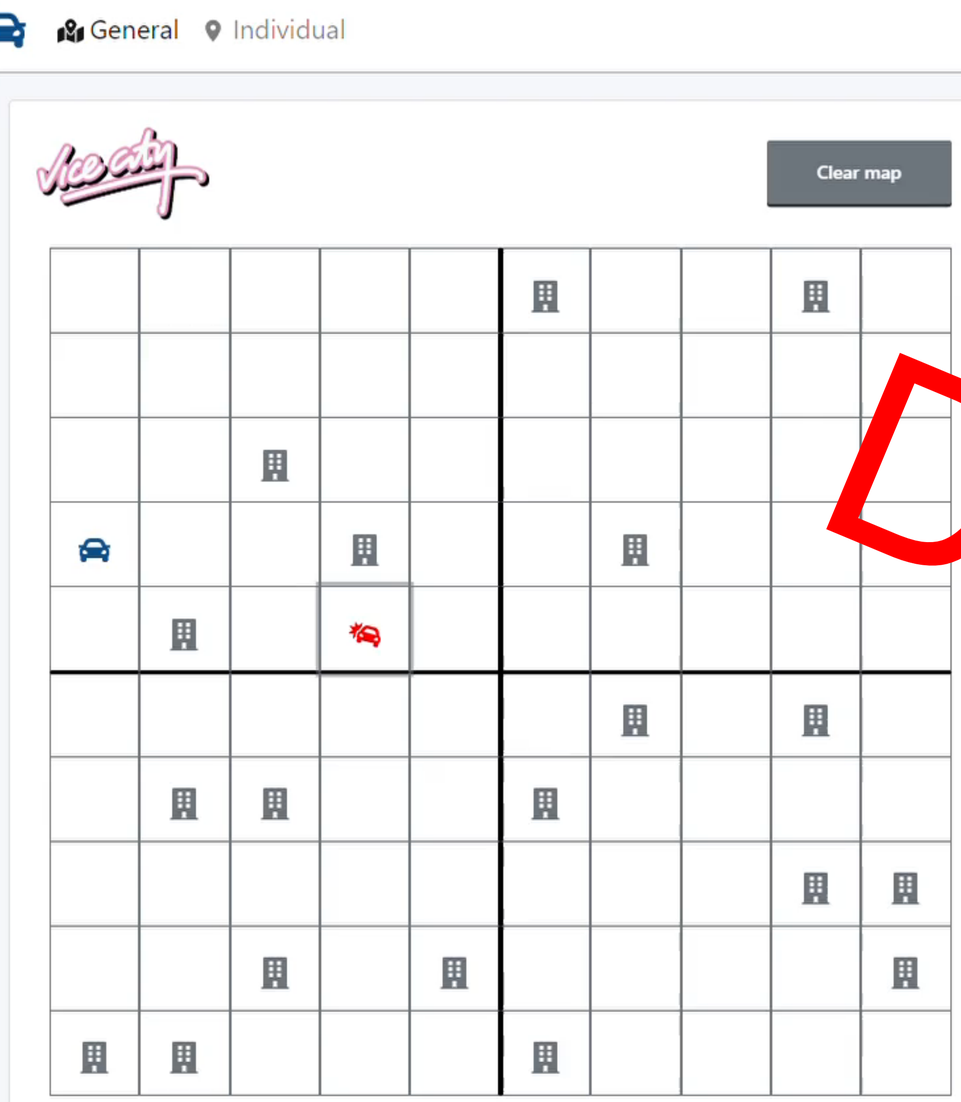
Private encrypted alert to police

Police downloads an image of the accident from the announcer

Decentralized cars | My Drive - Google Drive | Presentation.pptx - Google Slides

localhost:8086

General | Individual



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DEMO

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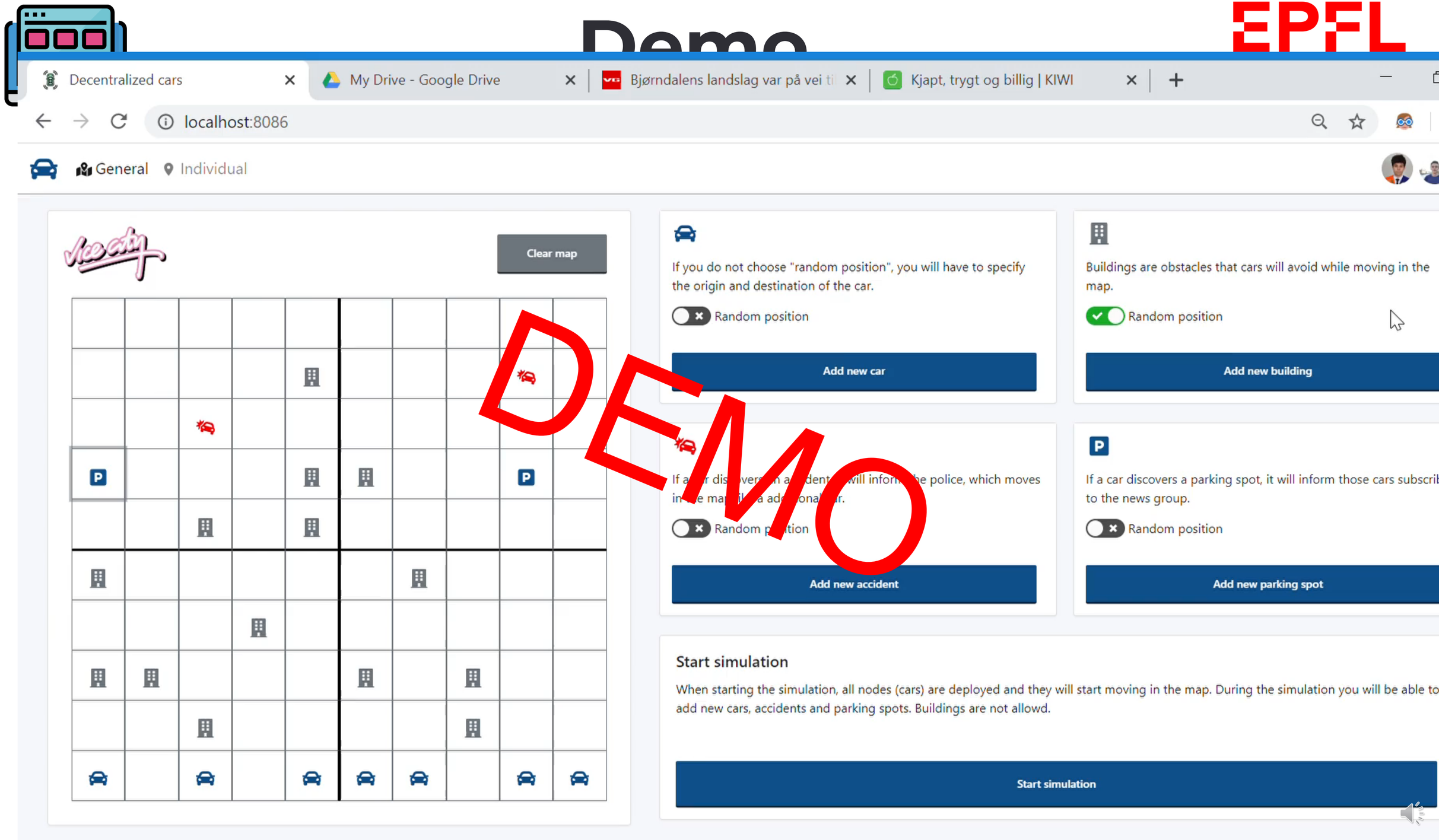
Start simulation

Demo

EPFL


Decentralized cars
My Drive - Google Drive
Bjørndalens landslag var på vei ti
Kjapt, trygt og billig | KIWI
localhost:8086
General
Individual
Clear map
If you do not choose "random position", you will have to specify the origin and destination of the car.
Random position
Add new car
Buildings are obstacles that cars will avoid while moving in the map.
Random position
Add new building
Random position
Add new accident
If a car discovers a parking spot, it will inform those cars subscrib to the news group.
Random position
Add new parking spot
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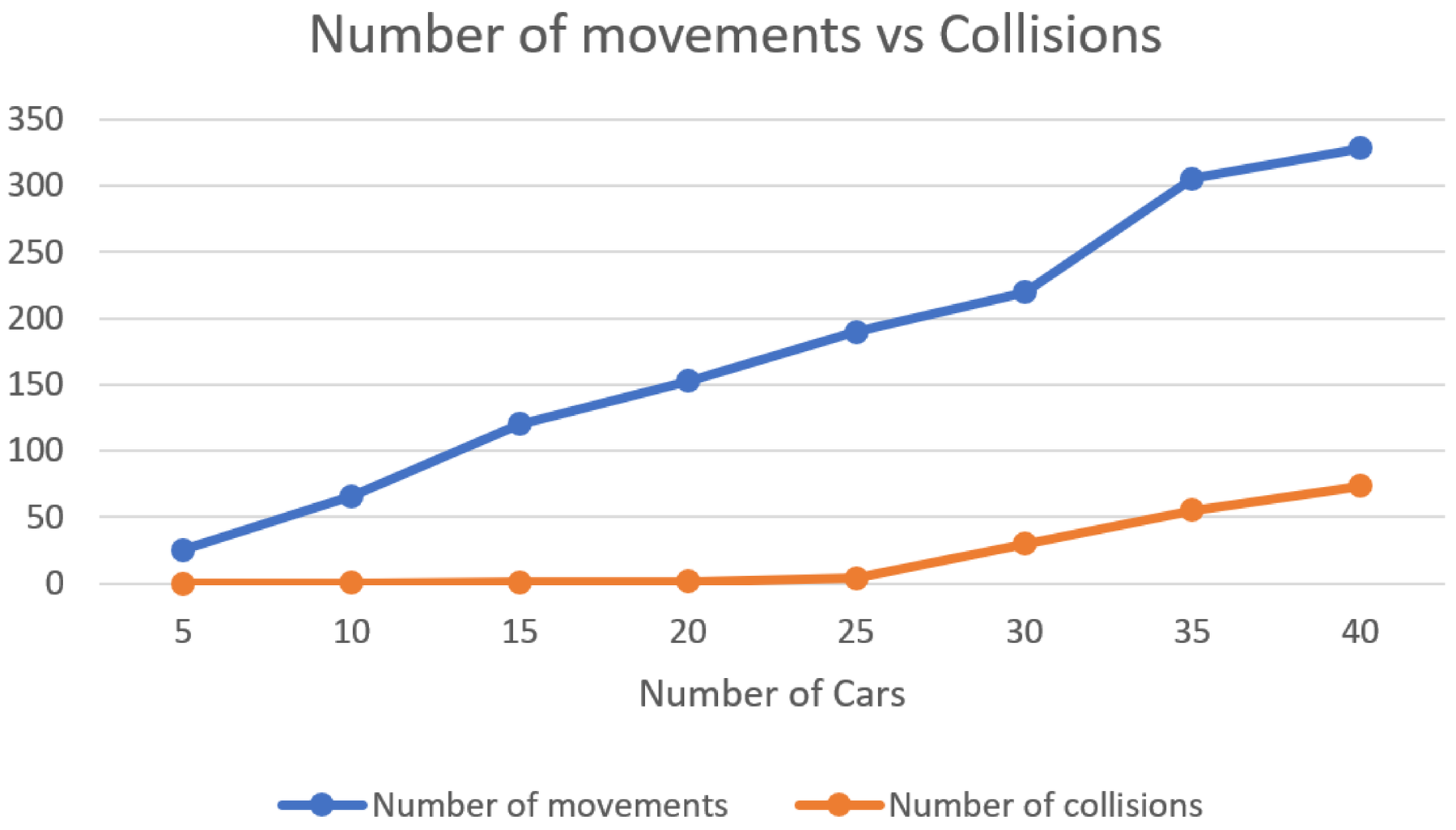
When starting the simulation, all nodes (cars) are deployed and they will start moving in the map. During the simulation you will be able to add new cars, accidents and parking spots. Buildings are not allowd.
Start simulation
DEMO

Results


Number of movements vs Collisions
350
300
250
200
150
100
50
0
5
10
15
20
25
30
35
40
Number of Cars
Number of movements
Number of collisions

Conclusions

- Protocol working with 25 cars.
- Well structured communication.
- Events handling successful.
- Good level of security.
- Visualization.