Goals:

**1) Violations and tickets function:**

***Users:***

1. People must be allowed to report parking violations (missing parking disk, not paid parking meter, illegally parked vehicles).
   1. The system must allow people to register to it providing personal data (name, surname, birthdate, identity card number, fiscal code) and selecting a username and a password
   2. The system must verify the correctness of the provided personal data of a registered user checking them from the identity card number, blocking the registration if they are not correct
   3. The system must allow registered users to login through their username and password
   4. The system must allow logged user to fill a report violation form
   5. The system must let the user select the type of violation detected
   6. The system must allow the user to insert the license plate in a violation report
   7. While reporting the violation, the system must allow users to take one or more pictures of the potential violation
   8. The system must not allow users to choose pictures not taken in the moment of the report
   9. The system must collect the current position of the user, using GPS
   10. The system must allow user to confirm or delete the current report
   11. After confirmation, the system must add the current date and time to the report
   12. The system must store confirmed report.

*Municipality agents:*

1. Municipality agents must be notified about potential violations, which are reported in their area of interest and are used to generate traffic tickets.
   1. The system must check reports to try to find if the pictures of the violations have been modified
   2. The system must try to find, according to the GPS position of the user and the pictures sent, if the position is fake or not
   3. The system must try to automatically recognize the license plate in the photo, possibly with the help of the value inserted by the user
   4. The system must discard the report if it has been recognized as fake according to the previous requirements (R1-R3)
   5. The system must store into stable memory the reported violation if correct (i.e. not recognized as fake)
   6. The involved municipality must be calculated considering in which city the reported violation has been found, based on the GPS of the client that has sent the report
   7. The system must send the reported violation to the involved municipality
   8. The system must allow an agent to issue a traffic ticket to a certain person (i.e. license plate) through the correspondent municipality service
   9. The system must allow an agent to put on hold a violation report if it needs to be checked in person
   10. The system must allow an agent to discard a violation if it has been verified as fake or it cannot be verified (the vehicle is not there anymore)
   11. The system must allow an agent to retrieve the data of the author of a violation report
   12. The system must allow an agent to create an account, asking the municipality services to verify its identity
   13. The system must allow an agent to login, inserting its username and password

2) Statistic functions:

*Everybody*

1. People must be allowed to retrieve information about streets or areas with the highest frequency of violations
   1. The system must mine this information from the reported violations.
   2. The system must allow the users (even if not authenticated) to select the see information for a city. The user can choose either the city where he is, using the GPS position, or an arbitrary selected location
   3. The system must allow the user to select information about streets or areas in the city selected
   4. The system must show the areas or the streets, according to the selection, with the highest frequency of violations, in the selected city.
2. People must be able to retrieve statistics and trends about the accidents correlated to the parking violations, the effectiveness of SafeStreet initiatives and the issuing of traffic tickets
   1. The system must take information about accidents from the municipality
   2. The system must use this information to build statistics, crossing them with reported violations
   3. The system must not allow user to see confidential data about other people
   4. The system must allow the user to choose a topic: areas with most accidents, areas with the highest number of traffic tickets issued, areas where there have been the best improvements
   5. The system must show to the user the information about the topic selected

Municipality supervisors:

1. Municipality supervisors must be able to retrieve data about the vehicles with the highest number of violations
   1. The system must allow authenticated supervisors to retrieve information about the vehicles with the highest number of violations in a selected area.
   2. The system must allow supervisors to see what areas or streets has seen the best improvements in the ticket emissions.
   3. The system must allow supervisors to access only to information about their own area of competence.
   4. The system must allow a supervisor to create an account, asking the municipality services to verify its identity
   5. The system must allow a supervisor to login, inserting its username and password
2. Municipalities must be suggested for possible interventions about the mostly unsafe areas
   1. The system must take information about accidents and street networks (bike lanes, sidewalks, parking areas…) from the municipality, exploiting the municipality services
   2. The system must elaborate this information and try to find possible solutions for problems
   3. The system must notify the municipality supervisors about the solutions it has found

UML

SEQUENCE DIAGRAM

USE CASE

Scenarios

1.Reports a violation

Mark is a man in his thirties. He’s an employee at Esselunga supermarkets. One day, walking down the main street of his city he finds a car parked illegally in the middle of the bike lane. Mark is registered in the application SafeStreet. He takes out his smartphone and opens the application. After writing his credentials and logging in, he clicks the button “Report a violation” in the home page. He inserts the type of violation, so in this case he just writes “car illegally parked in bike lane”, and takes three different pictures of the car: one of the front of the car, clearly showing the license plate; the second showing the entire car and, in the background, the signal of bike lane; the third one highlighting important elements of the streets where the potential violation occurred, to help the matching of the photo with the GPS position of the user. He then confirms clicking on the “Confirm” button. The potential violation is now sent to the server for a verification. Finally, he closes the application and continues his walk.

2.The agent receives a notification and issues a traffic ticket

Lukas is a municipality agent that is working as usual at his desk and has the SafeStreet Web app opened in the background on his PC. While checking his papers he receives a notification from the SafeStreet. He opens the window of the app and finds that a new report has been made about a violation. Lukas clicks on the row linked to the new violation. He observes that the violation has been reported by a certain Gianluca Verdi. The pictures of the report clearly show the vehicle that has made the violation (not paid parking meter), his license plate and the place where the violation occurred. There is now enough evidence that allows Lukas to issue a traffic ticket to the owner of the vehicle.

2b. The policeman receives a notification and send an agent to control because the picture is not clear

Laura is a municipality agent that has just started her new day at work. She works in Milan’s police station. She starts her PC at her desk, opens Internet Browser and search for SafeStreet Web App. After logging in, the reported violation queue is filled with 10 notifications of new potential violations reported. She opens the first one and she discovers that the system wasn’t able to correctly identify the vehicle involved and the user hasn’t inserted the license plate as plain text to help recognition. She checks the pictures but she can’t find out what is written on the license plate. She tells his supervisor the problem, in order to send an agent to directly check in the place of the supposed violation (based on the GPS position sent by the user) and, possibly, to issue a traffic ticket.

3. Checks for unsafe streets in his zone

Bob is a curious user that has the SafeStreet application installed in his iPhone 8 but is not registered in the SafeStreet database. One day, he witnesses an accident in the streets while driving his car, where a car hits a biker during a parking manoeuvre on a ~~runs over a biker correctly biking in his~~ bike lane.

As he goes home, he’s curious about the most dangerous and unsafe areas and streets in his city and he wants to see if the street where he saw the accident is one of them. He opens the SafeStreet application and clicks the button “Check statistics in a city”. After this, a new page opens in which Bob clicks on the “Check for most dangerous areas/streets”. The last click he does is on the “Search for a city using your GPS position” button. Now the screen shows a map with highlighted the most unsafe areas (with most accidents) in his city. Bob selects then the area in which he is interested in and he sees which are the most dangerous streets in the area. Bob discovers that the street he was searching for is the most dangerous one. Finally, Bob closes the application.

4. Needs to travel and searches for safe places for a car

Marie is a woman who often travels for work. She typically travels by car. She lives in Milan and this week she needs to go to Turin. He wants to know where she can safely park the car and take an hotel reservation. Before searching for an hotel, she takes out her Huawei and opens the SafeStreet application. She clicks the button “Check statistics in a city”. After this, a new page opens in which Bob clicks on the “Check for most dangerous areas/streets”. The last click he does is on the “Select a city you want” button. She chooses “Turin” among all the possible ones. Now she can use found information to look for safe zones near her workplace.

5. New intervention in an unsafe street

Marco is a local police supervisor in the municipality of Varese. He logins in the SafeStreet application and he sees a notification about a suggestion for an intervention to improve safety. He opens it and he reads that in Via Roma there have been a lot of reports and consequent tickets in the last months due to cars parked on the sidewalk. The system is suggesting to add barriers to prevent cars from going on the sidewalk. This seems a good suggestion for him, he will discuss it with the competent municipality sector.

6.the user registers to the application

Luke and Walter are two close friends. Luke doesn’t know about SafeStreet application while Walter is a regular registered user of it. One day, Walter and Luke are walking down a road. Walter notices a potential violation and stops. He takes out his phone and opens the SafeStreet application. Luke asks Walter what he’s doing and Walter explains what SafeStreet is. Walter is pretty convincing and makes Luke install the application. Luke learns that to report violations he needs to register. So, he starts the process of registration providing his name, surname, birthdate, fiscal code and number of the identity card. After this, he creates his own unique username and the password. On screen, Luke sees that the registration has been successful.

7. A supervisor wants to check see what areas are registering improvements since the municipality has started to use SafeStreet

Giulio is a local police supervisor in the municipality of Milan. It’s six months since they have started to use the SafeStreet application to receive report from citizens about parking violations and he want to check what benefits it has brought. He opens the web application, he logins inserting his credentials and he clicks on *Improvements* under the *Statistics* section. Here he can see what streets have seen the best reduces in the number of issued tickets. He sees that a lot of central zones have seen reductions from 20 to 50%, while in the peripheral areas the numbers are much less substantial. He is happy because of this result, but he wants to improve it and he thinks to start a marketing campaign to encourage more people to use the application, especially in the peripherals.

8. Marco wants to make a joke to a friend and send a fake report

Marco and Luigi are two very close friends. One day Marco decides it’s time to make a very not funny joke to his friend and he decides to use the SafeStreet application to make him receive a traffic ticket. He finds an illegally parked car, he photographs it and then he tries to modify the license plate in the photo with Luigi’s car license plate. He sends the report with the modified photo thinking about the face of Luigi when he will receive the ticket.

Some weeks later he receives a letter from the judicial authority stating that they have started a criminal proceeding against him for the crime of slander (see *[SLANDER]*).

Probably he won’t do it another time.

[SLANDER] : see art. 368, 370, 69 c.p.p.

**Use case:**

1. **User log in**   
   Name: User log in  
   Actors: User  
   Entry condition:

* The User needs to have the application opened

Flow of events:

* The User clicks on the login button
* The user input his username (ID) and his password.
* The user clicks on the “confirm” button.
* The system redirects the taxi driver to his personal homepage.

Exit conditions: The user is successfully redirected to his personal homepage.

Exceptions: The code and password provided by the user are not correct. In this case, the system does not redirect the user to his personal homepage but notifies him that an error has been made and allows to input his code and password again.

1. **User reports a violation**  
   Name: User reports a violation  
   Actors: User  
   Entry condition: The user must be logged in and on his personal homepage.  
   Flow of events:

* The user input clicks on the “Report violation” button.
* The user sets the “type of violation” button to a desired value, chosen from a choice list.
* The user clicks on the “take photos” button and complete the operation.
* The user eventually fills the form “license plate”.
* The user clicks on the “confirm” button and is redirected to his personal home page.

Exit conditions:

* The system checks the report and manages it, checking if images are corrupted and eventually forwarding the report to the municipality agent.
* Before confirming, the User clicks on the "Back” button and cancels the current report. Pictures are cancelled too.

Exceptions: There are no exceptions for this use case. (//todo simo, ask an opinion)

1. **Agent logs in**   
   Entry condition: There are no entry conditions  
   Flow of events:

* The agent opens the application and arrives at the homepage.
* The agent clicks on the “Login” button.
* The agent input his username and password.
* The agent clicks on the log in button.
* The system redirects the agent to his personal page.

Exit conditions: The agent is successfully redirected to his personal page.  
Exceptions: The username and password furnished by the agent are not correct. In this case, the system does not redirect the agent to his personal page, but notifies him that an error has been made and allows to input his username and password again.

1. **Checking statistics**

Entry condition: The user needs to have the application opened

Flow of events:

* The user clicks on the Checking statistics button in the main page
* The user chooses to get statistics either from his city or from another one
* The user clicks on the statistics he wants to know
* After checking, user presses the Back button to return to the home page
* The system asks the user if he wants to confirm with a “Yes” or “No” choice
* The user presses the button he wants, confirming his choice

Exit conditions:

* User is successfully brought back to the home page

Exceptions: There are no exception in this case

1. **Supervisor checks potential intervention**Entry condition: The supervisor must be logged in. Possibly he have received a notification about a new available suggestion.   
   Flow of events:

* The supervisor clicks on the “Recent Suggestions” button or clicks on the new suggestion notification.
* The system redirects the supervisor to a page where he can choose between the ten most recent suggestions.
* The supervisor chooses a suggestion.
* The system shows the supervisor the whole text of the suggestion.
* The supervisor clicks the “Done” button and is redirected again to his personal homepage.

Exit conditions: The supervisor is successfully brought back to his personal home page.  
Exceptions: There are no recent suggestions, so the system notifies the supervisor about this exception. The system redirect the supervisor to his personal page.

1. Agent checks a notified violation

Entry condition:

* The agent needs to be logged in the municipality Web App

Flow of events:

* If the reported violation queue is not empty,
* The agent receives the notification through the Web App of a new incoming report violation
* The agent clicks on the small rectangle in the main page to see more about the violation
* The pictures are clear enough (helped by the info provided by the user) and the agent issues the traffic ticket.
* The pictures are not clear enough and the agent contacts the supervisor to send an agent in the streets to check and issue the traffic ticket.
* The agent clicks the “File” button to file the report

Exit conditions:

* The violation is filed and the agent

Exceptions: No

1. User registers to the Application

Entry condition:

* User needs to have the application opened in the main page

Flow of events:

* User clicks on the “sign in” button.
* User provides the required information: fiscal code, identity card number, name username and birthdate;
* User provides a Username and a password;
* User clicks on “Confirm” button

Exit conditions:

* The registration is completed and a message of confirmation is sent to the user, redirecting him to the main page of the application

Exceptions:

* The username provided is already in use the system shows an error message to the user; he has to insert a new Username (and password);
* The sensitive information inserted are not correct (fiscal code or identity card number). The system shows an error message and the user has to insert again all his informations.
* User doesn’t complete the registration process by pressing the “back” button in the page. He’s redirected to the main page.

Domain assumption:

//GPS is always precise, giving the position with an error of maximum 5 meters.

// smartphone cameras have enough resolution to enable recognizing algorithms

//Reported violation are always checked by an agent

// The identity card is unique for each person.

//Each person has only one identity card.

// The municipalities always issue traffic tickets if the reported violation is real and either pictures are clear or the agent on the street witnesses it directly.

//every registered municipality agent is associated with a unique ID.

//every municipality that uses Safestreet has at least 1 Agent and 1 supervisor that are in charge for managing SafeStreet services.

//every agent and supervisor works for exactly one municipality.