

IoT Final Workshop

Members:

- Daniel Rong Chen
- Diego Esteban Zepeda Ceballos
- Iván Santiago Hernández Mendoza
- Javier Valente Rodríguez
- José Roberto Garduño Cerecedo
- Moisés Arturo Badillo Álvarez
- Gabriel Augusto Magaton
- Leonardo Henrique de Melo
- Rafael Cenato dos Santos Silva



What is the
problem?



Scenario Description

Every year, disasters and crises devastate people, communities, and entire societies worldwide. Worryingly, they are predicted to become more common in the future. Preparing for, responding to, and recovering from disasters and traumatic events is essential to individuals' and communities' behavioral health.

No one can predict the exact time and how a disaster will strike and they destroy the local infrastructure, and there are no telecommunication resources available to provide the essential communication necessities.



WHY?

Therefore in this project we use a flooding scenario to support the course in the project development, because the changes to our climate and environment are already contributing to the increased frequency, intensity, and unpredictability of severe weather events. This makes that this type of disasters become more frequent in tropical countries like Brazil and Mexico, generating many victims and causing fatalities and incalculable losses (financial and social) for the population.



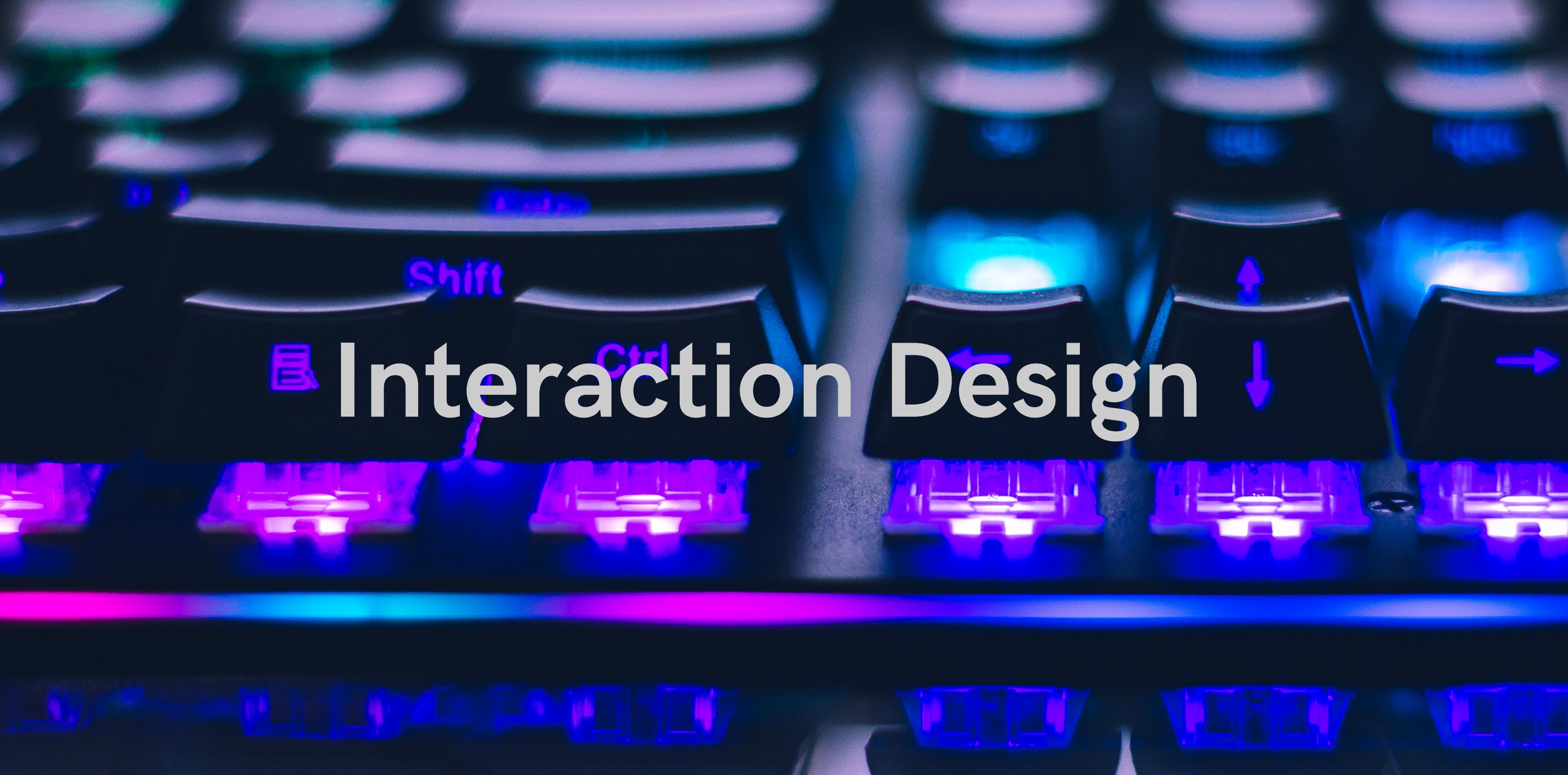
Itajaí (BR)



Monterrey (MEX)

For example, in November of 2008, Santa Catarina, a state in the south of Brazil, had a period of heavy rainfall. The state had suffered constant rains for over two months, which turned the soil wet enough to cause a landslide during the storm that hit the state in late November. Around 60 towns and over 1.5 million people were affected. At least 128 people have been killed, with over 78,700 forced to evacuate their homes because water levels in the Vale do Itajaí had risen to eleven meters above normal.

Because of the electrical blackout, many communities were left without communication, which made it difficult for people to call for help and inform where they were.



Interaction Design

SAYS

She likes to keep in touch with her fiancee and family.

She gets stressed when disasters happen.

THINKS

Need to reply back to my messages

Hopes it doesn't rain

DOES



FEELS

Moves her hands a lot

Talks very calmly

Checks her phone a lot

Enthusiastic

Frustrated

Vanuza Camara Guimarães



"I get very stressed in disaster situations because usually communication infrastructures collapse and therefore I can't contact my close ones or call for help if there's any tragedy."

- Age: 29
- Occupation: secretary
- Status: engaged
- Location: Río de Janeiro, Brasil
- Lives with her fiancee

Bio

Vanuza is a person who spends a lot of time with her close ones and communicates with them all the time. She lives with her fiancee, but when they are not together, they message each other to communicate. Also she's in touch constantly with her parents. However, where she lives it is very common for natural disasters to happen. So when this happens, the communication infrastructure fails and she can't reach to her beloved ones through messages neither calls. What she does in this cases is to wait until they restore the communication services and hopefully nothing happened to her fiancee and family.

Scenario

"When it's raining season, it's very common in the city to have floods due to the lack of a good draining system but also because a lot of trash gets caught in the drainers. The floods cause a lot of problems, one of them being the that it causes the communication infrastructure to fail and collapse for many reasons. Many people had no communication at all, and this collapse in the communication infrastructure caused the death of people because it occurred tragedies and there was no way to contact anyone nor the authorities to call for help."

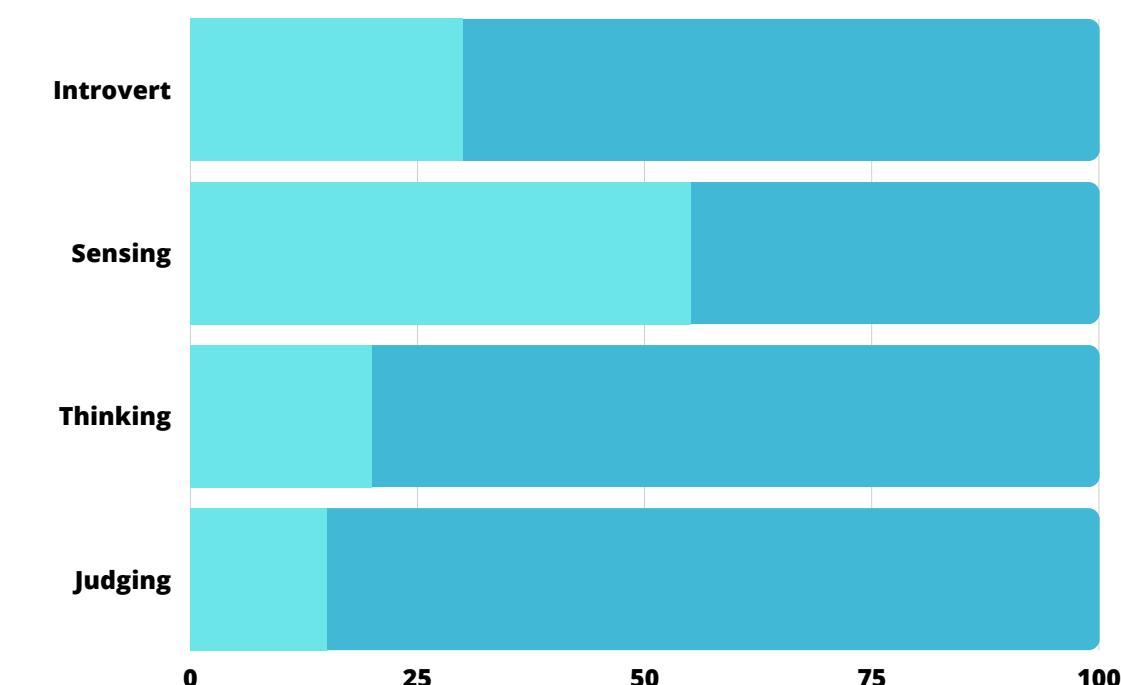
Objectives

- Communicate her status when a disaster happens.
- Ask for help in case that a tragedy happens in a disaster scenario.

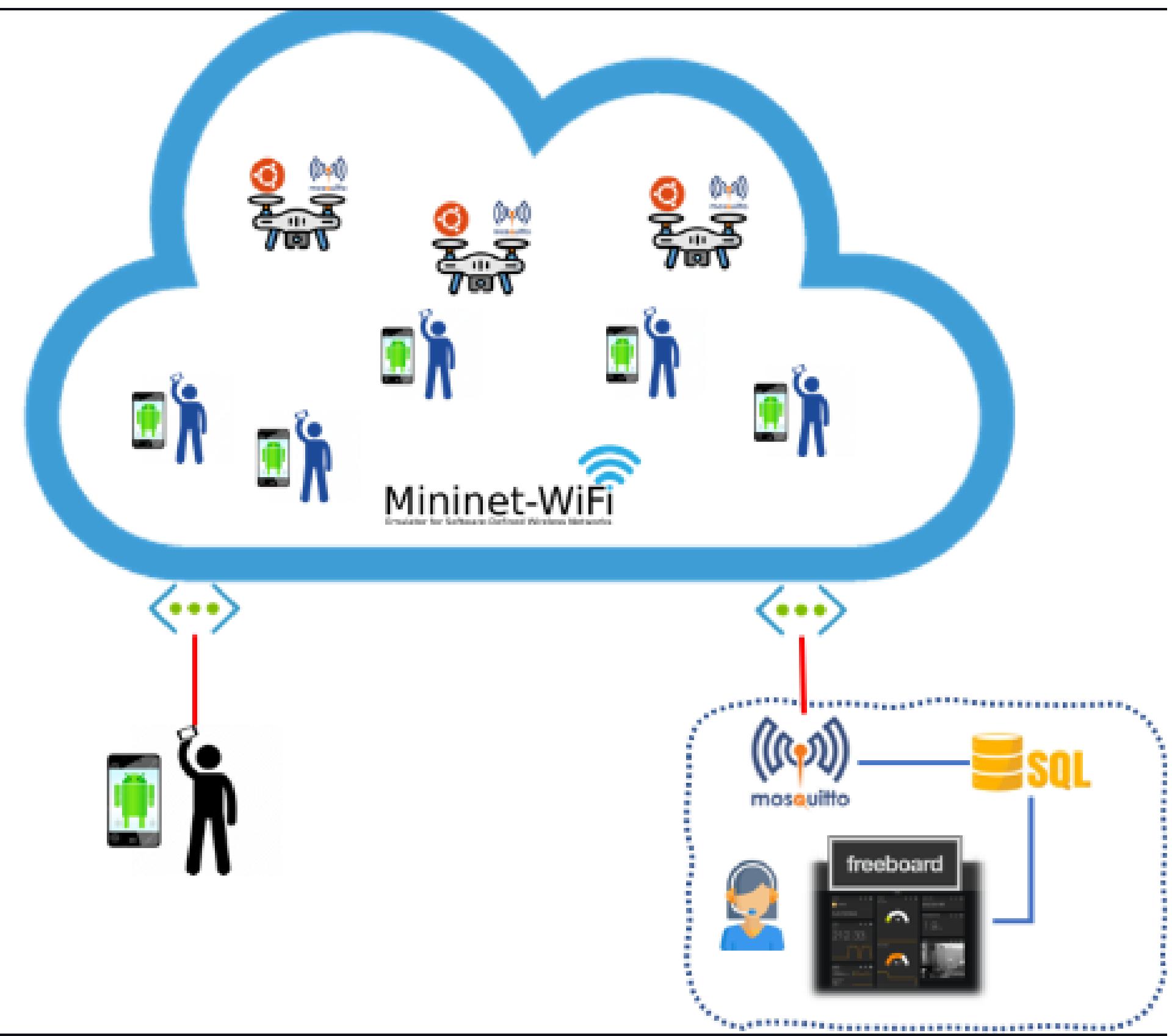
Frustrations

- Can't be able to communicate with her beloved ones when a disaster occurs.
- Receive no help in case of a tragedy due to failures in the communication infrastructure.
- No way to communicate how she is when a disaster occurs or to know how are her close ones.

Personality



Solution description



RESCUE APP

Victims in the flood will have a rescue app which enables to send their position and their severity (low, medium, high) continuously.

APPLICATION SERVER

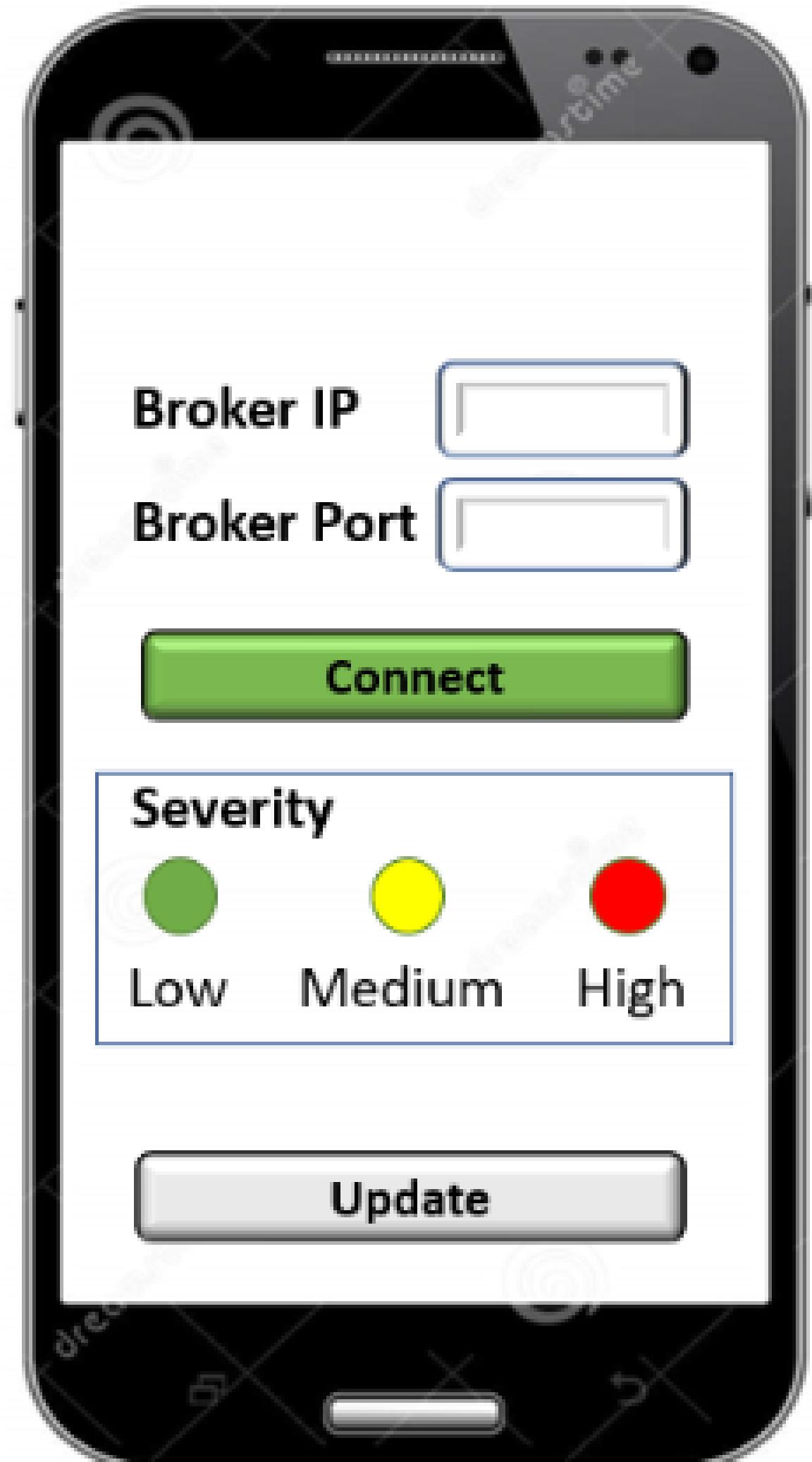
A real node that runs on a server box. This server has a Mosquitto broker which receives all messages and persists them in a SQL database.

DASHBOARD

Implementation of a dashboard using Grafana, that presents the information in a map visualization

STAGE 1

Client Stage Android Device



Use Android to implement the rescue app because people that get affected in this type of disasters do not have money to have an expensive device, like iphone.

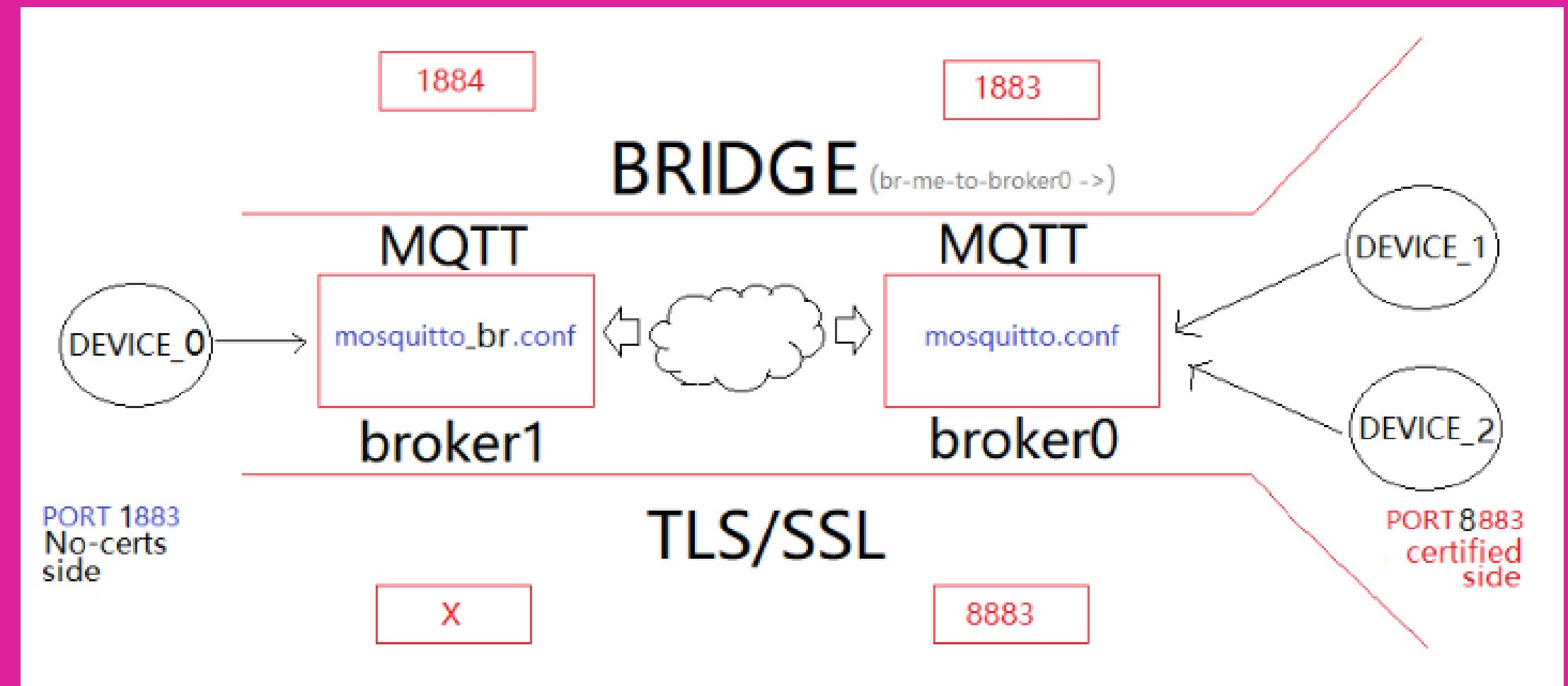
THE USER WILL START HIS APP, SET THE BROKER ADDRESS, REPORT HIS SEVERITY AND PRESS THE UPDATE BUTTON

An example of string to be define a message in the broker

- **ID:** is the id of node
- **Severity:** Low||Medium||High
- **Position:** LAT-LONG

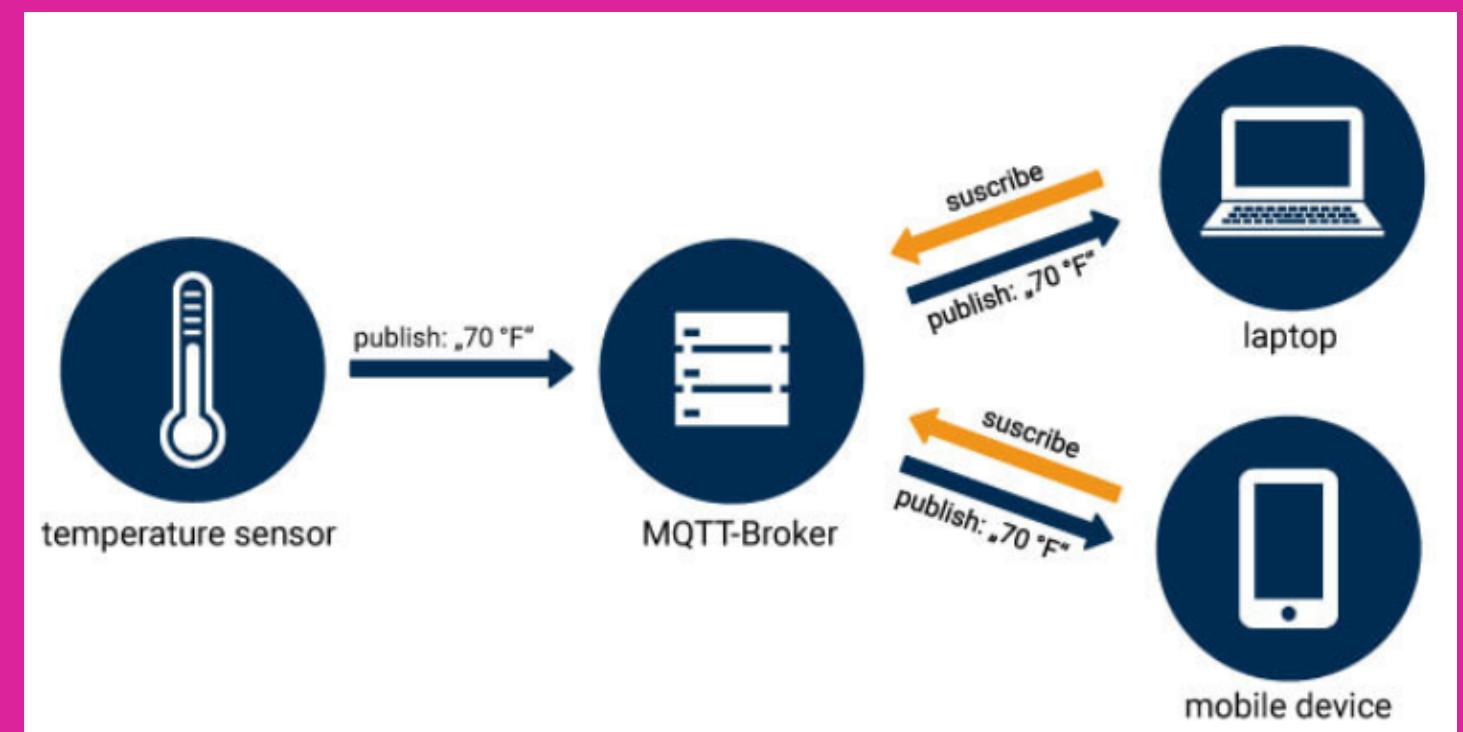
STAGE 2

Edge Stage Mosquitto Broker



MQTT protocol is a Machine to Machine (M2M) protocol widely used in IoT (Internet of things). This uses the publish-subscribe paradigm in contrast to HTTP based on the request/response paradigm. The critical component in MQTT is the broker. It receives messages from the publisher and dispatches these messages to the subscribers.

Eclipse Mosquitto is an open-source (EPL/EDL licensed) message broker that implements the MQTT protocol. In our project, it will be used in the emulated drones, which receive the "publish" messages from the Android devices and send them to the primary broker, which is installed in the cloud.

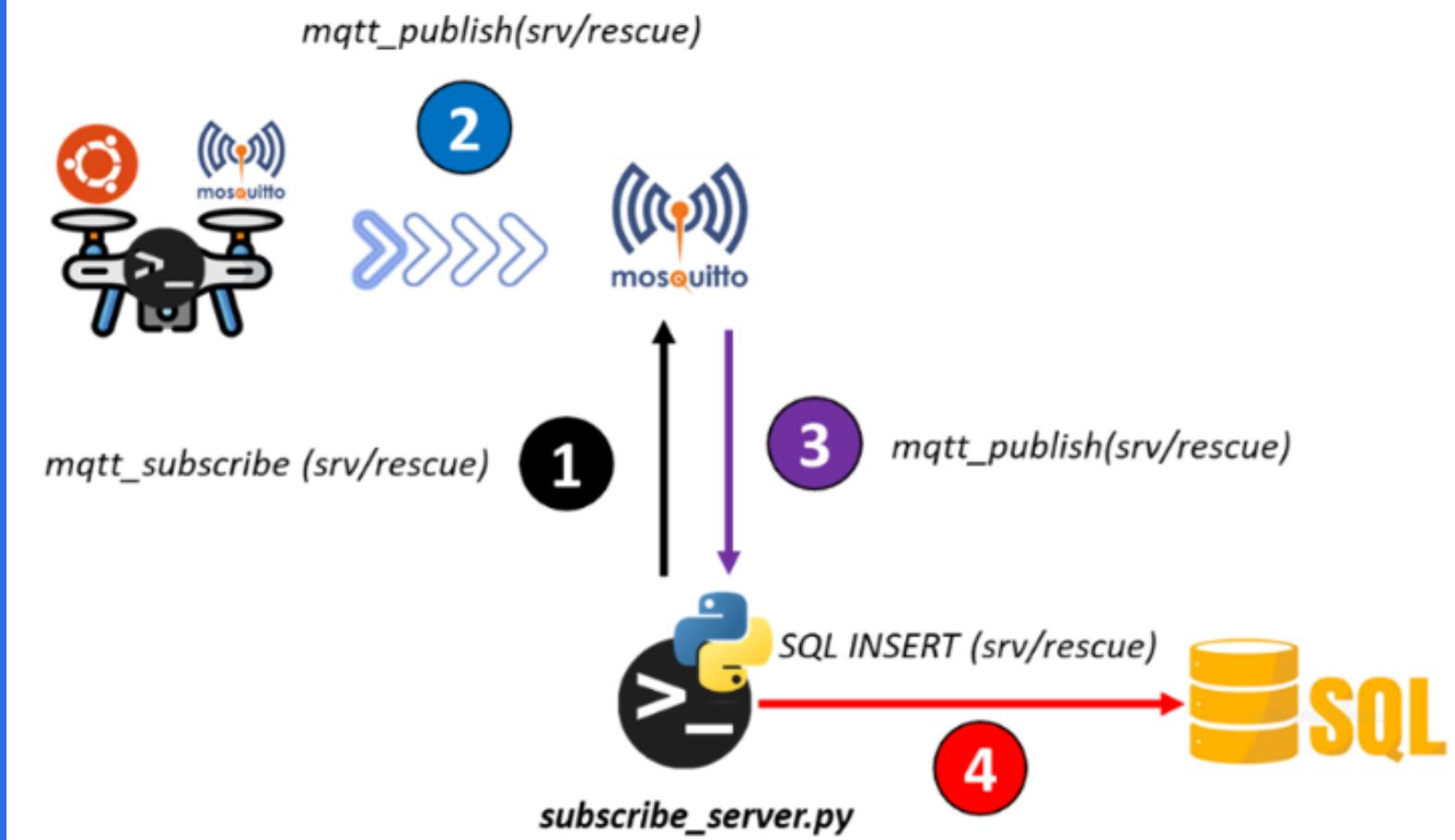
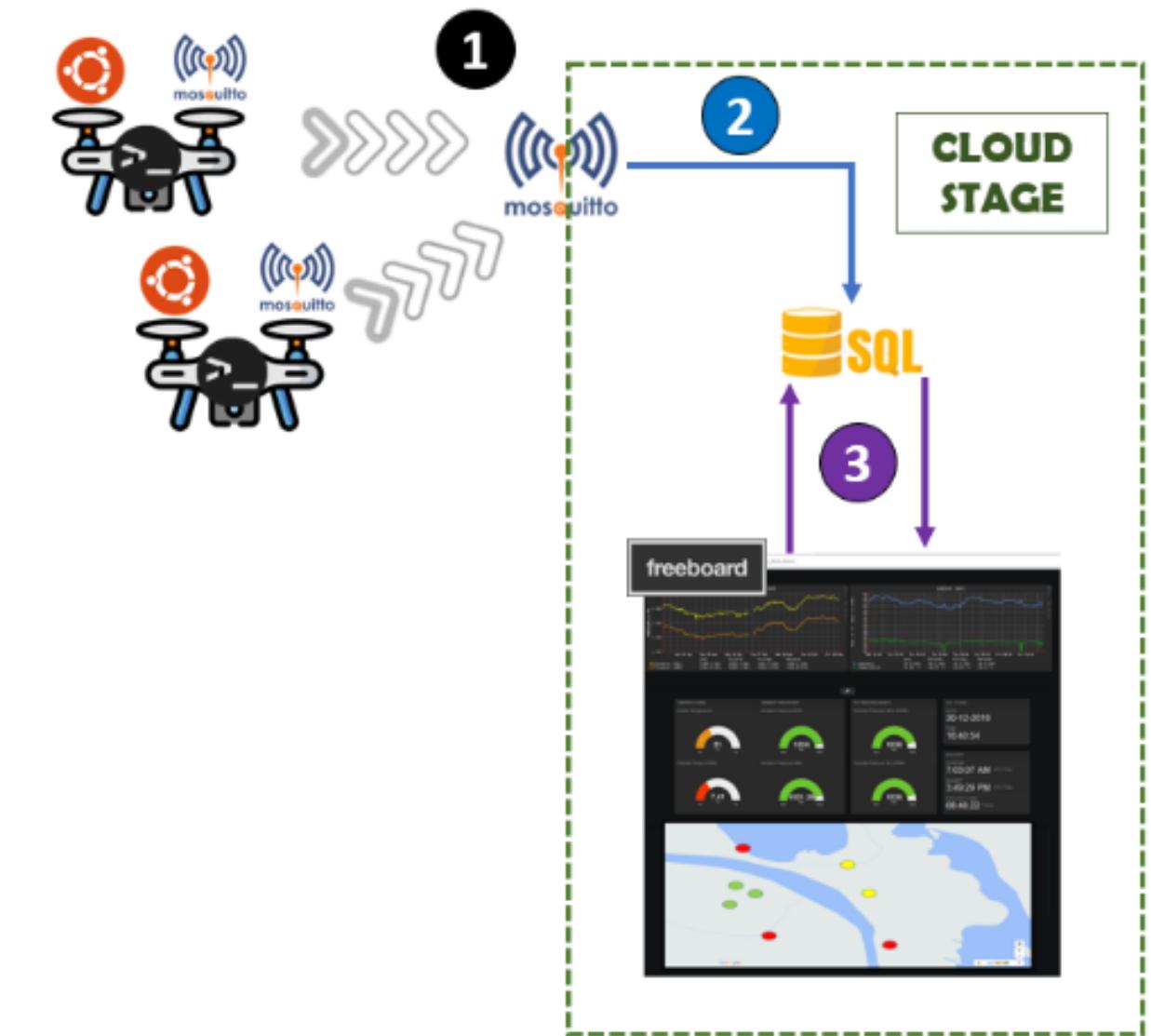


STAGE 3 - 4

Client Stage Android Device

Create a subscriber (write in Python, for example) that receives all the central broker messages about the target topic (srv/rescue) and persist them in a SQL database.

1. A Python client starts and subscribes to the target topic in the central broker. To provide security, this client needs to authenticate with the main broker.
2. Central broker receives messages from the publisher's node (emulated and real smartphones).
3. Python client receives the messages from the central broker.
4. Python client parses the message and persists in the SQL database using an INSERT expression.

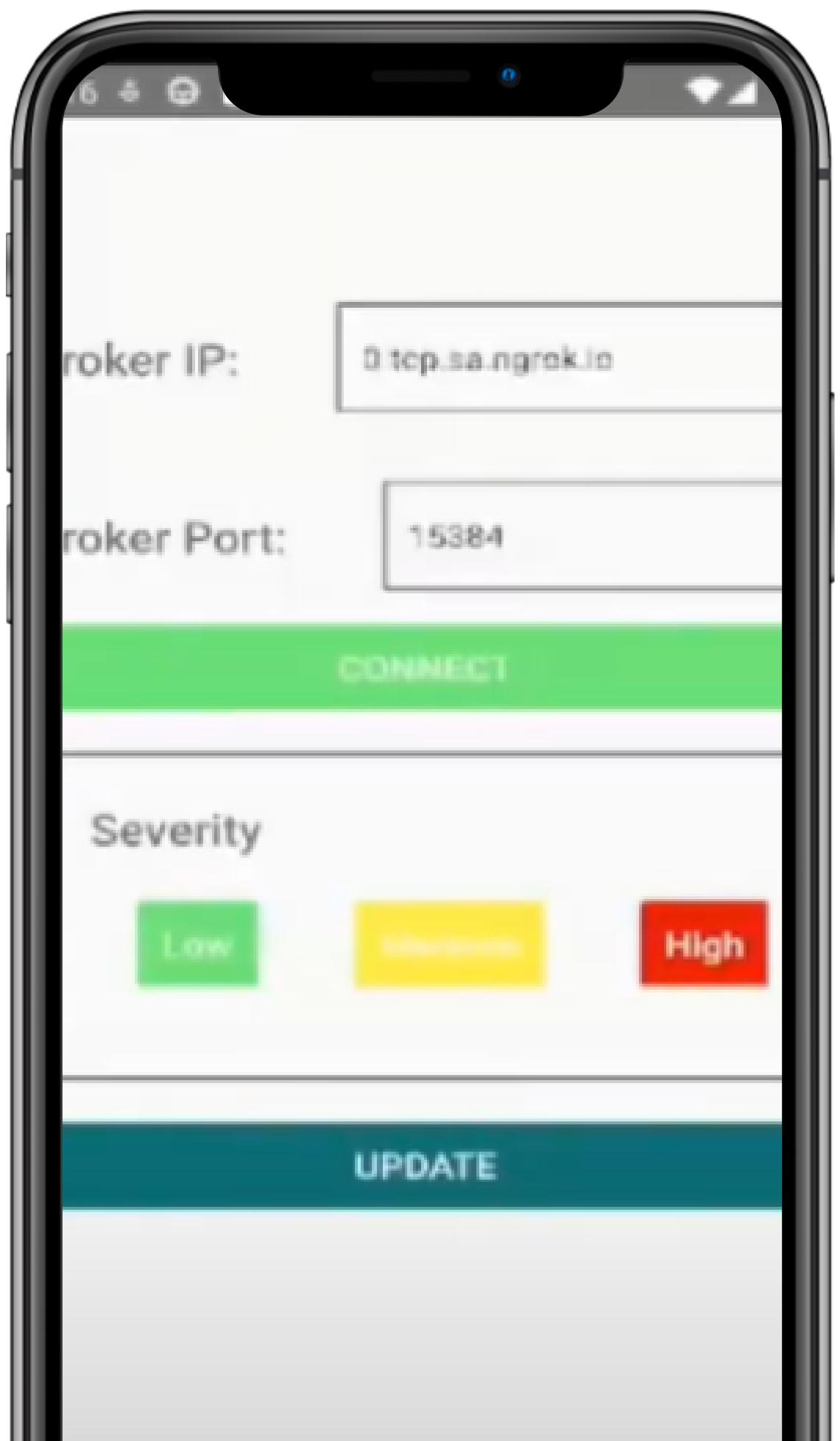




How to configure the solution

It is necessary to explain the tools that we use to develop the entire architecture, since some tips were necessary for it to work correctly.

Android Client



We had a lot of trouble making this stage, but in the end we got support from our colleagues in Brazil and got it working by downloading and accessing to the "client_mqtt" folder from our GitHub portfolio from a virtual machine using Oracle Virtual Machine.

Then write the following commands in the terminal:

npm start ----> That will start the react native

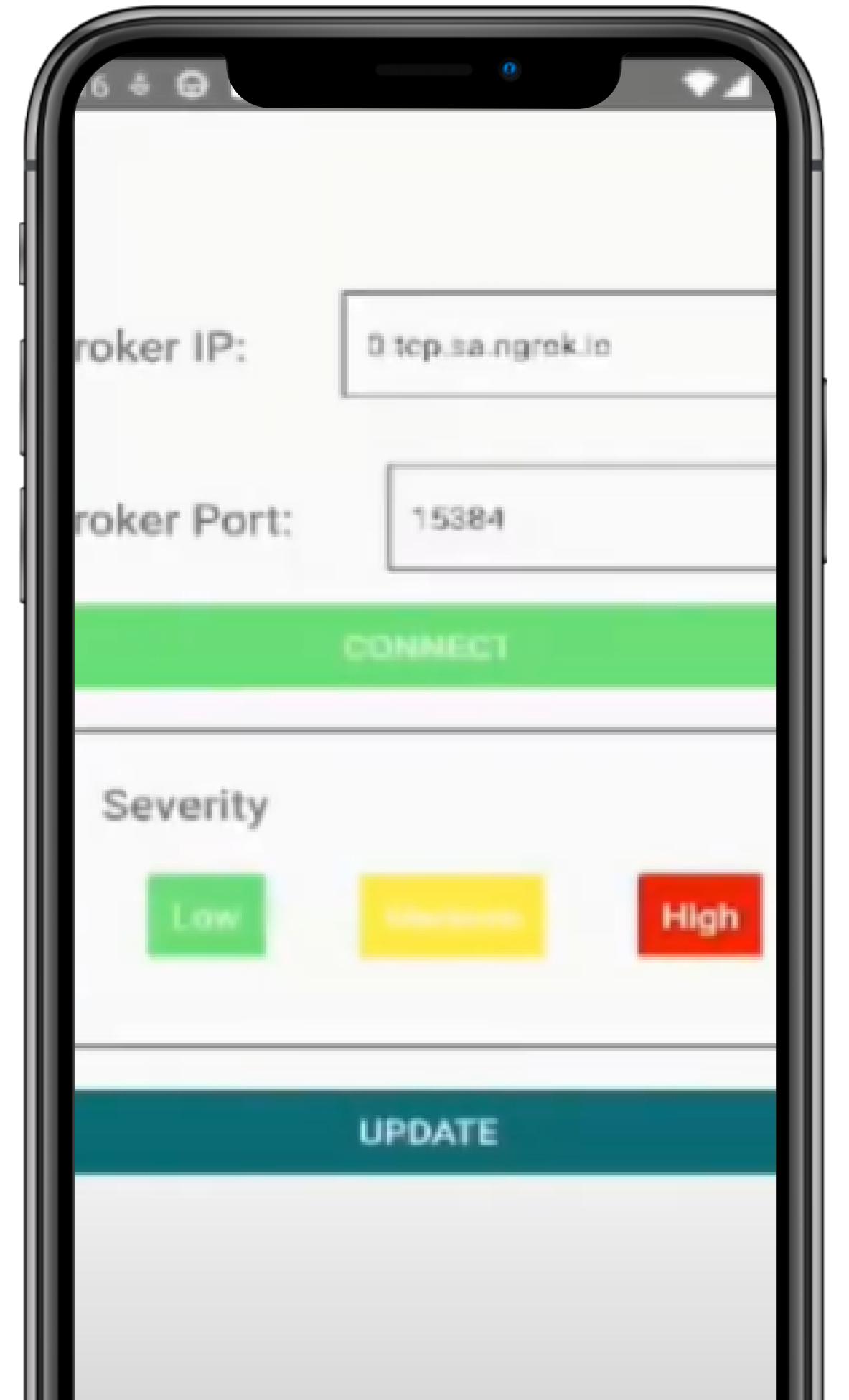
Then in other terminal inside the folder too:

npm run android ----> to start the app



android
studio





Android Client

It should be added that at the code level it is necessary to specify the IP to which the messages of the app will be directed. What would be the IP of the virtual machine where we have the entire structure



Demo of System

Let's see it working :D