

### **Integrated System for Support and Command of Crisis Response Actions- stage 3**

This document deals with the integrated communication subsystem, including a deployable private LTE network for a mobile command centre and VoIP networks in that centre and also in the main command. It also includes the elements for a subsystem meant to collect, transmit and store essential biometric and positioning data for the 1<sup>st</sup> responders working in the relevant crisis zone.

The above mentioned subsystems block diagram is depicted in Figure 1.

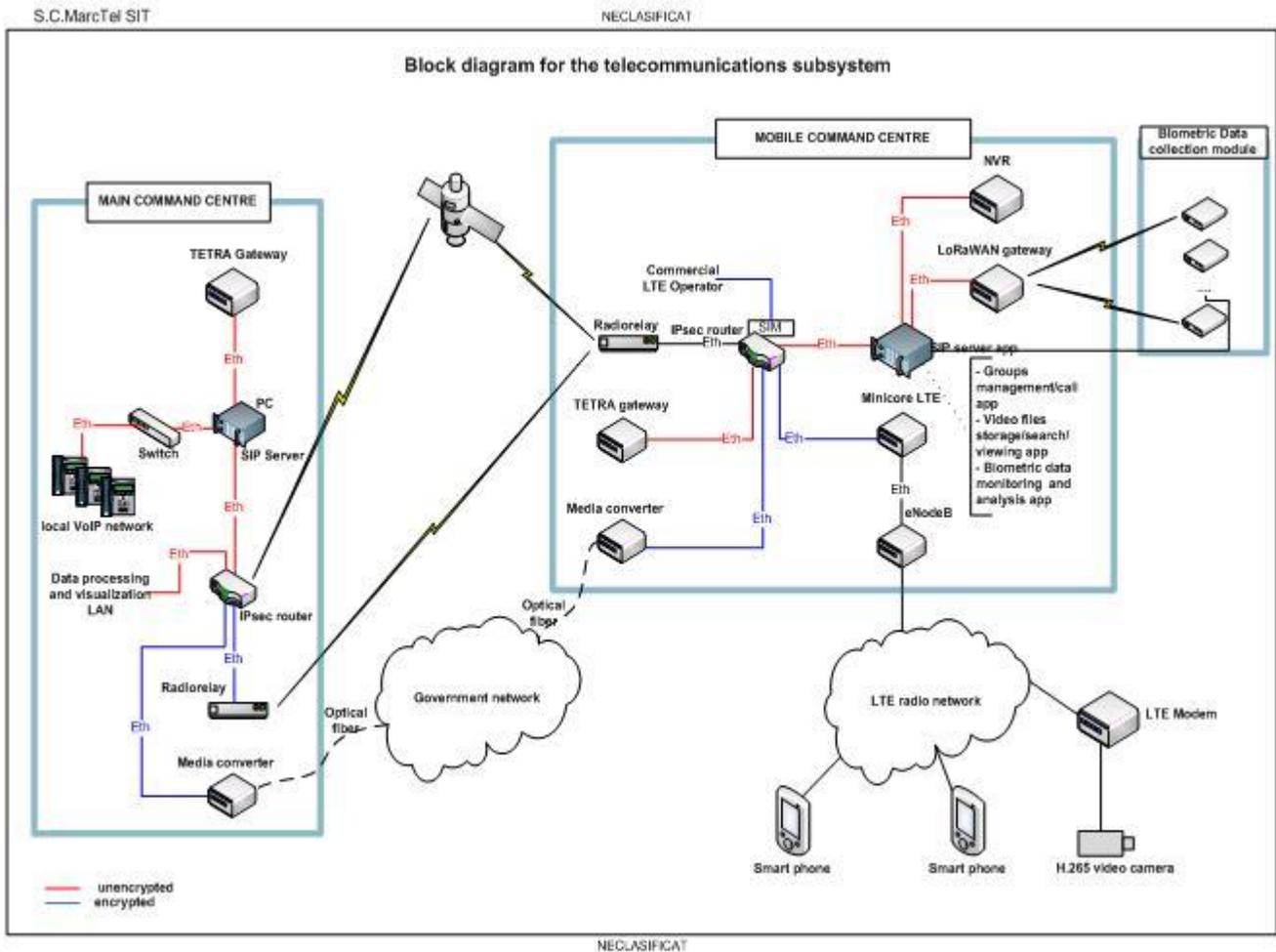


Figure 1 Block diagram for the telecommunications and biometric data collection subsystems

Update on further developments in 2019

On October 29, 2019, our consortium organized a demo session on the MTA premises. Each of the 3 involved companies presented the status of its subsystems.

With reference to the Figure above, MarcTel showed:

1. A laboratory sized LTE network, working in band 28, with 4 smartphones, with conference room and video upload/storage capabilities and a 4G router, for integration of autonomous IP cameras
2. A demonstrator for the biometric parameters acquisition and LoRaWAN based communication platform, consisting of an endpoint, a LoRaWAN gateway and a dedicated application server (software)

3. Data collection and storage demo platform, for the mobile command centre, hosted by the server that extends the LTE network with other VoIP phones, placed in the two command centres

4. Radio link for implementing the backhaul to the main command centre.

The 2 command centres were simulated on server machines, with original and free software applications.

In the Figures 2 to 5 are a few pictures taken at this event, illustrating the above mentioned platforms.



Figure 2: The two SIP servers, for the two command centres, implemented on computers pre existing in MarcTel (not the ones to be used for the prototype phase)



Figure 3: Smartphones for the private LTE network



Figure 4: The 4G router, near the display; the latter is used for the LTE network management app



Figure 5: The 2 main equipments for the laboratory LTE network: the eNB (center left) and the core network (center right). Also, on the right side, the demo platform for biometric data collection (the chest pulse measuring belt not visible)

## 2020 update

During year 2020, we are to:

- purchase the equipment and COTS software needed to complete the system prototype
- assemble the prototype, first on subsystems level and then as a whole
- document the tests for the prototype subsystems and for the whole system as well, with criteria to assess the results
- validate the prototype platform
- disseminate the results.

Looking back to our plans, the COVID19 pandemic has changed the whole frame within which we are working, at consortium companies, country and global levels. There is a state of emergency declared in Romania (not to mention what happens elsewhere in the world) and this has brought forward and challenged the previous SWOT analyses that we made, for each consortium member, and led to their broadening and revision.

For MarcTel, we can summarize this as follows:

**STRENGTHS.** At all levels in our company, measures were taken in order to protect the personnel:

- for those that have to be physically present on the premises: personal masks, rubber gloves, also germicide bottles throughout the company buildings, enhanced floor and other common space cleaning. We all know that these otherwise common hygienic materials are now hard to get by and at totally different prices than before, but they were made widely available.
- for all personnel, actual presence was reduced to only the unavoidable occasions, while activity continued remotely, from our homes.
- hardship showed again (and still does) that we are a solid team, just as we learned until now from many challenging projects, but also from our friendly relations between employees at all levels and with our employer. We are a small enterprise and this helps – we all know each other, we meet informally not only at the traditional team building occasions, but also in smaller groups, as friends

## WEAKNESSES

- we can't solve all technical problems with our internal resources, external assistance is needed from our providers, mainly on the private LTE network. This is harder to achieve in the state of emergency conditions that exist today
- we have team members that are needed on the premises, but they have previous health conditions that put them at significantly higher risks than the average, so we will not call them to be present in person, they are giving assistance from their homes. This means there are delays on some segments of our project.

## OPPORTUNITIES

- the pandemic brought attention to biological threats, and the unpreparedness of the relevant authorities. This might render scenarios for other types of crises more interesting and plausible. A big scale crisis may manifest itself in localized pockets with scarce telecom utilities, while keeping the 1<sup>st</sup> responders well connected is

essential. Integrated command, private LTE network, also live monitoring of personnel position and status are assets that make the system proposed by our project more interesting for the potential clients

- the fact that we are now working, when possible, remotely, might be used more in the future, when necessary.

## THREATS

- The equipment supply chains are working much slower, some items are not available and it's hard to know when things will return to normal
- Although we took timely precautionary measures, there is still a risk to see some team members incapacitated for a period of time. Mitigation: good quality documentation regarding the actions taken to be updated at least weekly, spare persons to be kept informed about the work status for each key team member.

Subsystems status, as of April, 2020

### 1. Private LTE

We have developed the software for:

- capturing the video streams uploaded by various cameras (phones and autonomous ones) on LTE support
- storage for the said video streams

### 2. Coordination and analysis functions at the mobile command centre

- Along with the capabilities for handling the video streams uploaded on the LTE network, the operator can remotely control the video cameras and redirect in real time the above mentioned live video streams to recipients selected by him, or download, towards selected (by him) recipients, other previously stored video streams
- Regarding the biometric collected data, these can be examined in real time. Another software application has access to a data base with the said data, for further analysis.

### 3. Biometric data collection

We have developed and are currently performing in-house tests for a small size, light device that picks up data from a cardiac chest belt (our device is placed on the belt, together with the pulse sensor). It also has a small, embedded GPS receiver, a 3D accelerometer and a LoRaWAN modem, all coordinated by a picopower microcontroller.