# IMMUNeT

COST Innovators Grant IG15104

Industrial Machine Monitoring Unplugged Network (IMMUNet)

## MINUTES

Third CIG Team and Scientific Meeting

Microsoft Teams (*online*)

1-2 February 2021

The meeting was attended by the following people:

## CIG Chair / Co-Chair

- Chiara Bologna (in Bologna)
- Roberto Verdone, CNIT (in Bologna)

## CIG Team Members

- Carles Anton-Haro, CTTC (remote access)
- Laurent Clavier (in Bologna)
- Guillaume Villemaud, INSA (remote access)
- Konstantin Mikhaylov, UoOulu (remote access)

## Other participants

- Florin Hutu, INSA (remote access)
- Giampaolo Cuozzo, UniBO (in Bologna)
- Lala Rajaoarisoa, UoLille (remote access)
- Régis Rousseau, INSA
- Dheeraj Raja Kumar, CTTC

## Invited External experts

- Dr. Ognjen Dobrijevic, ABB AB, Corporate Research, Sweden- February 2nd

Day 1: February 1st, 2021

### 9.15 – 9.30: Welcome and approval of the agenda
Chiara Buratti presented the agenda that was approved without modifications.

### 9.30 – 10.30: INSA: Status of the work on the IMMUNet FW/SW and relative discussion
Guillaume Villemaud reported the status of the measurements at INSA. Three main problems have been encountered: 1. Due to the lack of the RTC, devices were not able to communicate and only the Default status of the machine has been tested; 2. It was measured an RSSI very low even in the presence of high transmit power and very low distance. As far as point 1 the RTC will be mounted in the next weeks, to fix the problem; while for point 2 more accurate measurements will be performed in order to understand if there are problems in the way LoRa devices are measuring the RSSI.

### 10.30 – 11.00: UoLille: Status of the work on the IMMUNet FW/SW and relative discussion
Laurent Clavier presented the status of activities in Lille. Due to some delays in the production, the GW was developed only few days before the meeting, therefore no specific advance has been done. It was discussed the need to mount the RTC on the boards, in order to let the devices working with the current code. In case of problems in mounting the RTC , UniBO will revise the code to let devices communicating even without the RTC.

### 11.00 – 11.30: Break

### 11.30 – 12.00: CTTC: Possible improvement of the ImmuNet system
Carles Anton presented some results related to "Improving the link reliability of LoRa protocol used in Immunet". ImmuNet currently uses a Hamming code (n=5, k=4) which does not provide any error correction capability. The work presented proposes to: i) decrease the coding rate of existing encoder/decoder by switching to Hamming code (7,4), to correct one wrong bit, and ii) to add an outer coding layer, offering FEC, possibly using Reed Solomon code. Simulation results shown the improvements in terms of BER and code word error rate (WER) w.r.t. to the current code used. The impact on the latency and energy consumption have been suggested as possible joint work with other partners for the next months. In addition, the possibility to implement the proposed outer code will be evaluated in the next months by CTTC.

### 12.00 – 13.00: Business Plan: Chapter 4 on "Business Model" – Status of the work – CTTC
Carles Anton presented the status of the editing of Chapter 4. The Business Risks and mitigation factors (section 4.4) have been discussed the related table has been edited. The Chapter is almost complete.

### 13.00 – 14.00: Lunch

### 14.00 – 16.00: Business Plan: Chapter 5 on "Financial Projection" – ToC proposal and discussion – UoOulu
Konstantin Mikhaylov presented the ToC of the chapter and the different sections content have been discussed. Relationship with the hardware partner has been discussed, together with the type of product / service the ImmuNet will come out with.

## Day 2: February 2<sup>nd</sup>, 2021

### 10.30 – 12.30: IMMUNet what's next? Startup Yes or Not

A discussion about the possibility to create a startup at the end of the project was chaired by Roberto Verdone. The discussion touched the following points:

1. Who would be on board among the ImmuNet partners.
   All partners are possibly interested to the setup of the startup. However, some of them still have to check if the can / want to participate personally, or as representative of the Institution they belong to.

2. Whether Embit or someone else should be on board
   The solution we will propose includes hardware and firmware / software. Depending on the requirements of the customer the system will be customized according to requirements. The customization will be in terms of size and shape of the devices mainly, but it could involve also firmware / software adaptation, in terms of functionalities requested. The re-design of the HW could require important investments and for sure calls for having some experts of HW design on board. None is against the inclusion of Embit as partner of the startup, for the development of the HW platforms. Currently there are not concrete alternatives (no further contacts took place after the invitation of some potential partners at the ImmuNet meetings).
   Since the cost of the HW in terms of certifications and engineering, could be very high, partners are wondering about who/how we could anticipate such amount of money. This key point will be discussed with Embit.
   Conclusion: a proposal to Embit to join the startup will be done soon.

3. Resources needed to setup the startup.
   At the beginning it will be necessary to hire two people in full-time:
   - One engineer, involved in the FW/SW development
   - One person (could be an engineer or not) in charge of management issues, managing the staff and the projects, together with the relationship / contact with the customers. This person should be the CEO.

   Therefore, assuming the cost of the personnel will be about 80 Keuros in total, there is the need to have 100 Keuros, that should be provided by partners to enter the startup.
   - CNIT does not have problems in providing 15 K euros
   - Embit should not have problems in providing at least 15 K euros
   - INSA: still need to understand the feasibility to participate as Institution
   - CTTC: potential interest to participate as Institution, but not clear if they can participate with funds
   - UNIBO: weather UNIBO might participate to such initiative, depends on UNIBO KTO / accelerator. It is not very common that UNIBO shares with the company, but this is something that will be checked.
   - Konstantin Mikhaylov will most probably participate personally.

   Conclusion: Unlikely if there are 7 partners each one will put the same amount of money – some partners have to check with their institutions, etc.

4. Shares will be defined according to:
   - Amount of money provided by each partner
   - Competences: FW development, protocol design, transmission techniques design, etc.
   - Networking: ability to connect to potential customers
   - Time spent by people in working on the startup

   These are the comments:
   - Konstantin Mikhaylov can dedicate time, working to technical development aspects. He could be / is available to take the role of CTC.
   - Chiara Buratti, can participate as UniBO, dedicating some time to the protocol design aspects and providing contacts/links with automation machine companies.
   - INSA, CTTC: still need to check with institutions
   - Laurent Clavier: still has to check if he can participate with IMT, in any case can provide some money to get some share.

5. Where to locate the Company

The startup will be Italian-driven, but the possibility to open it in another country will be    also considered.

The following comments were raised:
- Konstantin Mikhaylov: No Finland, because of too much taxes and too high cost of the workers. In addition, local funding opportunities in Finland are quite limited.
- Guillaume Villemaud / Laurent Clavier: in France there could be some sources of funding, but they do not see any specific advantage to select France rather than Italy.
- Carles Anton underlined the need to select a country where there is availability of regional funds, together with work force.

6. Roles and Governance:

The startup will be managed by an Exececutive Board composed by all partners plus Embit plus the CEO.

The CEO should be identified, he/she will work 100% for the startup and should have a management profile (in addition to possible technical skills).

The CTO will be Konstantin Mikhaylov who will manage the work of the engineer hired for developing FW/SW.

## 12.30 –14.00: Lunch

## 14.00 – 16.00: Business Plan: Chapter 6 on "Roadmap and impact of money and time" – ToC proposal and discussion – INSA

Guillaume Villemaud, presented the ToC of Chapter 6. Each section has been discussed and analysed.

## 16.00 – 16.30: Break

## 16.30 – 17.30: Invited Speaker: Ognjen Dobrijevic, ABB

Chiara Buratti presented the ImmuNet project, while the invited speaker presented the project ABB is involved in, that is 5GSmart. Interesting scenarios and application requirements related to Industrial IoT have been presented. The speaker provided the following link where public deliverable of the project can be found:

https://5gsmart.eu/deliverables/

## 17.30 – 18.30: Wrap up: Next steps and AOB –UNIBO

The following next steps have been identified:
- Lille → check RTC issue, start implementation phase
- INSA → check RTC issue, RSSI issue, start measurement campaign
- CTTC → Investigate existing implementations of RS coding in C language
- Contact possible companies / send the questionnaire
- UNIBO: feedback after the CRIT webinar – Feb 16
- CNIT: feedback about contact with Embit - possible meeting in one month
- All: propose invited speakers for the next meeting in "Oulu"

## 18.30 – Close of the meeting