

CIG 15104 IMMUNet

FIRST CIG TEAM AND SCIENTIFIC MEETING

September 7th – 9th 2020

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 Cuzzo, UniBO (in Bologna)
- Lala Rajaoarisoa, UoLille (remote access)
- Mohammadmahdi Azari, CTTC (remote access)
- Régis Rousseau, INSA (remote access)

Invited External experts

- Dr.ssa Alessandra Baccigotti, Responsible of ARTEC, KTO, University of Bologna September 8th
- Ing. Fabio Bonizzi, CEO of Embit s.r.l – September 9th

Day 1: September 7th

On September 7th 2020 at 9.00 am, the Meeting took place at the University of Bologna and remotely via Microsoft TEAMS.

Firstly, the Chair presented the Agenda, which was accepted without modifications.

She then moved on and she gave the floor to Giampaolo Cuzzo who started the presentation of the IMMUNet protocols stack. Details on the different functionalities of the system, together with the related protocols developed for the access to the channel, have been presented.

After a short break, Giampaolo Cuzzo concluded the description of the IMMUNet protocols stack. A discussion about the channels used in the different phases of the communications took place.

After the lunch break, Chiara Buratti, presented the status of the work in terms of the Business Plan editing. A TOC (table of content) for the Business Plan was presented, starting from input received from the instructor of the CIG training provided by COST in June/July 2020. In addition, the status of the work on the Business Canvas took place. It was agreed that the value proposition was composed of firmware and

software running at the tags and at the gateway, together with the hardware that should be developed by a key partner, to be identified. As for the cloud application, we decided to contact some possible customers and to submit a questionnaire asking them if they would prefer a solution to be still integrated into their cloud / service application, or if they would be more interested into a complete solution, including also the service/application part.

After a short break, Carles Anton presented the status of the work related to the PESTLE Analysis. It was discussed to check regulation aspects related to the ISM bandwidth at 2.4 GHz, but also at 868 MHz (in case we would extend the IMMUNet system to Lora at 868 MHz). It was also decided to add Germany among the countries to be considered, together with the countries of the CIG Teams. The importance of the use of the energy harvesting (EH) technique was discussed: the Team agreed that the use of EH is fundamental, therefore it has been decided that the key partner to be identified for the HW development, should be able to produce EH-equipped tags (being WPT, light or vibration the source of energy). Finally, the Team discussed about some legal factors to be accounted for, especially in relation to the fact that the system is going to allow monitoring of machines but not controlling, a fact that should be clarified (legal-wise) to potential customers.

Copy of the above presentations were uploaded on the "Files" section of the TEAMS' group and on the IMMUNet Members Area of the Iracon/Immunet website (www.iracon.org).

The first day meeting ended at 5.30 pm.

Day 1: September 8th

On September 8th 2020 at 9.30 am, the Meeting took place at the University of Bologna and remotely via Microsoft TEAMS.

The meeting started with presentations from partners about the status of their contribution to the IMMUNet system.

Mohammad Mahdi Azari presented proposal of modifications of the IMMUNet tree-based topology. However, due to the complexity of the proposed modifications it has been decided to possibly introduce these modifications into future release of the system.

The presentation from Laurent Clavier followed. It has been decided that the first task to be implemented by UniLille will be the development of some compression techniques at the tags, to reduce the amount of data to be transmitted on the wireless channel. In addition, the possibility to improve the frequency channel selection strategy has been discussed. This task will be implemented as a second step.

Finally, Guillaume Villemaud, presented the task INSA is going to work on, that are related to energy consumption measurements and WPT tests.

After the break an hands-on session led by Giampaolo Cuozzo took place. During the session it was should the structure and main features of the IMMUNet firmware(FW).

After lunch Alessandra Baccigotti, Responsible of ARTEC, KTO, University of Bologna, gave a talk on IPR and patents.

After the talk from Alessandra Baccigotti, some discussion took place. It was decided to not apply for a patent of the entire system, and to go for the copyright solution. However, copyright and license agreement should be investigated in more details. The possibility to patent some specific feature(s) of the system/protocol will be also considered in the next future.

After the break Laurent Clavier led the discussion on the editing of the Market Analysis section of the Business Plan.

The following has been decided:

- The first section will include the market analysis and relative figures – it will be a general overview of Industry 4.0 and automation machine/tool market.
- The second section will include some more specific example of possible customers. Each partner will identify by September 26th 2 possible customers to be possibly contacted after the meeting in Lille.
- The third section will include the PESTLE analysis, that will be finalized by CTTC by the next meeting, the competitor analysis that will be edited by UoLille and UniBO and the SWOT analysis, that will be investigated during the meeting in Lille.
- The content of the last section, dedicated to market penetration strategy will be discussed during the meeting in Lille.

Copy of the above presentations were uploaded on the "Files" section of the TEAMS' group and on the Immunet Members Area of the Iracon/Immunet website (www.iracon.org).

The meeting closed at 5.30 p.m.

At 8 p.m. the dinner took place at Ristorante Da Cesari, Bologna.

Day 3: September 9th

The meeting started at 9.30 with the welcome to our second external experts, Ing. Fabio Bonizzi, CEO of Embit s.r.l. At first, Chiara Buratti summarized to the expert the main features of the system and then an extensive discussion about the functionalities and technical details of the system took place.

Ing. Fabio Bonizzi suggested as possible roadmap, the possibility to offer our IMMUNet solution to an Alliance (e.g., the LoRaWAN Alliance), in the form of a: i) upper layers solution for industrial applications, for networks using LoRa at 2.4 GHz at the physical layer; or ii) upper layers solution for industrial applications for whatever is the PHY layer used.

The invited expert identified as the most important feature of our system the following: the use of the 2.4 GHz band, and the use of a TDMA/FDMA approach to eliminate interference. As an example, Semtech is using LoRaWAN on top of LoRa at 2.4 GHz, where Aloha is implemented resulting in many collisions and not applicable to industrial applications. Even 802.15.4g uses frequency agility, but still there are

interference issues due to the use of CSMA/CA MAC protocol. Finally, LoRaEmb uses CSMA/CA similar to 802.15.4 and again interference are present.

It was also suggested to try to create a solution that is easy-to-be-installed.

Finally, some input related to possible requirements were given: typical industrial WSNs are composed of 100 / 150 devices, sending packets of 50 bytes and lasting at least one year, possibly 3 / 5 years.

After the talk, a discussion to comment the suggestions received from the expert took place among the CIG Team members.

All partners agreed that the suggestion to go for an Alliance could be a good option, possibly offering the code for an upper layer protocols stack for LoRa at 2.4 GHz, due to the complexity of porting the code to other possible platforms / physical layers (the FW should be re-written from the scratch).

Finally, there has been a discussion about the identification of the key partner for the development of the HW platforms. It was decided to consider Embit as possible candidate and to invite to the next meeting in Lille other possible candidates that will be identified by UoOulu, CTTC, UoLille and INSA. After having considered all the proposed companies, the final decision will be taken by the CIG Team members.

After the break Giampaolo Cuozzo presented the IIC, Industrial Internet Consortium (IIC), that is the world's leading organization accelerating the networked future of industrial systems. Since UniBO is inside this association and UniBO's researchers are going to participate to the next meeting, it was decided to dedicate a slot in the meeting in Lille to report about activities related to Industry 4.0 within the IICV.

The meeting ended with the identification of the following steps:

- Value Proposition:
 - Test of the HW platform and porting of a simplified code (UniBO, Oulu) → End of September
 - Green light to go for the HW production → End of September
 - Lille, INSA → Platform ready → Mid October
 - UniBO: porting of the entire code for UoLille development → End of October
- Business Plan:
 - Send possible customers to Laurent (2 per partner) → End of September
 - Laurent: editing of Section 3.1, 3.2 → End of October
 - Carles: editing Section 3.3.1 (PESTLE) → End of October
 - Carles: proposal of a different Business Plan ToC → End of September
- Key Partners:
 - Start thinking about possible key partners to be considered – to be discussed during the next meeting

Copy of the above presentations were uploaded on the "Files" section of the TEAMS' group and on the Immunet Members Area of the Iracon/Immunet website (www.iracon.org).

The meeting closed at 1.00 p.m.