Newsletter
November 2019 - December 2019

"Interoperability as a Service" – Connecting IoT infrastructures and smart objects

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Editorial

Dear Partners & Friends,

Yet another newsletter.

Christmas time is there.

It should be cold. But it isn't.

Actually it is getting hot in our offices. Not due to some climate issues, but because the whole VICINITY team has LOTS to do.

We are now short of time before submission of the final reports.

Nevertheless we have some time to report the latest news in this newsletter.

Prof. Dr. Christoph Grimm

Coordinator of VICINITY project

Technische Universität Kaiserslautern

The latest news include much use cases of VICINITY:

the Niko-Hack hackathon in Kaiserslautern, the Urban Marathon in Greece, the finished 2nd Open Calls.

And an interview with a stakeholder from India: Prof. Gomathi Nandagopal.

And many, many updates from our own VICINITY
use cases!

Enjoy this newsletter.

Best wishes *Christoph*

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Latest news

- **VICINITY as IoT backbone for Ústi Region in Czech republic**: The VICINITY IoT platform was selected to participate in Proof-of-Concept activity for the IoT backbone for PORTABO as a common data platform for the [Usti Region](#). VICINITY is proving its concept in collaboration with public agencies, citizens and regional government. This is currently in the domains of smart-parking, building-management and renewables in the energy community. These domains have already been piloted over the duration of the VICINITY project.
- Tinymesh participated in the [European Utility Week](#), 12nd - 14th November 2019, Paris, France, to disseminate and find new partners for collaboration or direct sales using the VICINITY and Tinymesh platform,
- VICINITY contributed to the ["ISO/IEC JTC 1/SC41 Internet-of-Things and related technologies"](#) meeting and this has been reported to AIOTI which is heavily supported by EC. The VICINITY Smart Parking use case which is located in Tromsø, Norway was registered with ISO/IEC SC29 for the first time in April 2016, 21st November 2019, in St Petersburg, Russia.

- VICINITY partners held their last General Assembly Meeting, 28th - 29th November 2019, Faro, Portugal where we were also delighted to visit the VICINITY installations at the Solar Lab and Smart School in Martim-Longo.

- ENERC organised a stakeholder workshop with VICINITY partners on 29th November 2019, Faro, Portugal.

- UNIKL organised a VICINITY Hackathon - Niko Hack 2019 to showcase and demonstrated the use of VICINITY to interested students and SMEs, 6th - 7th November 2019, Kaiserslautern, Germany.

- Through the VICINITY project, the Municipality of Pilea-Hortiatis succeeded in promoting a healthier lifestyle to the middle-aged citizens through the really successful fitness competition URBAN MARATHON.

VICINITY Stakeholder Workshop

Upcoming events

- The book - The Internet of Things: Platforms, Use Cases, Privacy, Business models. *With comprehensive code examples based on the VICINITY platform* is going to be submitted for review.

- The VICINITY project will have its final EC review meeting on 21st - 22nd February 2019, Faro, Portugal.

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"Niko Hack" - VICINITY Hackathon

UNIKL organised a hackathon to showcase and demonstrate the use of VICINITY to interested students and SMEs. The event started off with an introduction and hands-on 4h tutorial and workshop, followed by around 20h of straight hacking and utilizing VICINITY to its full potential.

"Niko Hack" - VICINITY Hackathon

As the event took place on the 6th December, "Nikolaustag" (Saint Nicholas Day) in Germany, the hackathon was fittingly called "Niko Hack".

Overall, 42 people signed up for the event. Students mostly participated in the hacking session, whilst the introductory session was also attended by four different SMEs from inside and around Kaiserslautern.

After the tutorial, the participants were given ideas on how VICINITY could be utilized. Yet they were free to choose their own topics and came up with creative, useful and some quite business-oriented ideas. The hackathon ended with a session of 3-minute pitches, during which each participating group was to present their ideas, demonstrate how VICINITY is being utilized and show, what they had managed to pull off in 24 hours in front of a 4-person jury: Prof. Dr. Christoph Grimm, along with 3 other representatives of local SMEs. The three top teams were awarded prizes. The first was a starter kit of our beloved IoT lightbulbs, which have been part of VICINITY since the very beginning.

The Hands-on Tutorial and Hackathon

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Digital Innovation Hub Event

On 17 October 2019 the IoT Digital Innovation Hub (DIH) held an event in Salamanca Spain.

The main objective was "To help companies (specially SMEs) to become more competitive throughout the adoption of Internet of Things technologies in their business/production processes, products and services." The Digital Innovation Hub promotes projects developing with cutting-edge technologies.

It is coordinated by the Air Institute and supports organizations (mainly SMEs) to be more competitive by exploiting the training and adoption IoT technologies.

VICINITY participated actively in two sessions at the event:

• **First Session VICINITY Presentation**

PROYECTO VICINITY

■ **11:30 – 12:05** Architecture Introduction and Semantic Interope-rability, Andrea Cimmino (UPM)

■ **12:05-12:30** Use Cases and Git Hub, Carmen Perea (ATOS Spain)

■ **12:30-13:00** Energy use Case, Natalie Samovich (Enercoutim)

Figure 1. Agenda VICINITY Presentation DIH

Public interest in the VICINITY Platform was high and interesting conclusions were formulated by the attendees. One of the attendees concluded that "VICINITY is a platform of platforms".
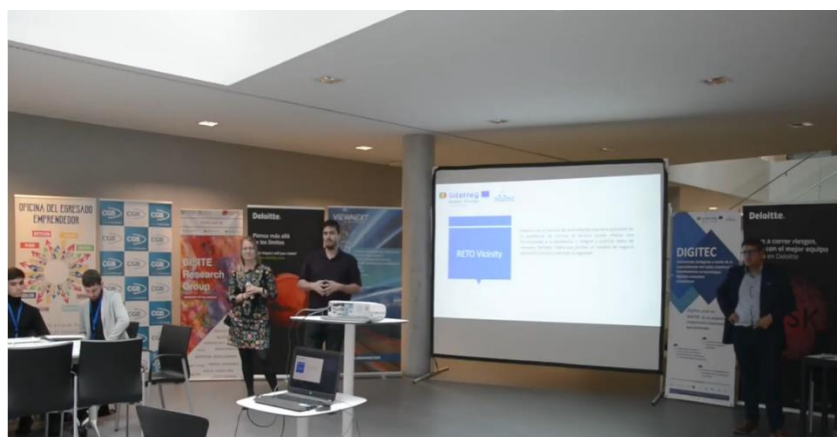
Furthermore, a video was recorded by the VICINITY Team explaining the relevance of the IoT Innovation Hub for projects such as VICINITY. See the video in the following link.

The IoT Digital Innovation Hub organized a multi-discipline (ICT, Legal and business teams) hackathon around blockchain. Several organizations/projects were invited to pose a technological challenge to the hackers.

The VICINITY team seized the opportunity to present the following challenge:

"Develop and deploy a Value-Added Service for the VICINITY cloud that offers some practical and useful service to third-party users; which must be related to the blockchain technologies. In this challenge three main features will be evaluated: technical complexity, potential business models, and feasibility from a legal aspect."

VICINITY Partners in the IoT Digital Innovation Hub Hackathon

One team took up the challenge and an application was built, based upon VICINITY.

They developed a solution that provided a value-added service for the VICINITY cloud that would keep track of the provenance of the ingredients within a food market product and offer such data to third-party users. The idea of this challenge was to rely on

blockchain technologies to support the trustworthiness of the stored data, and promote transparency in the food-chain supply-industry.

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The Winner of the URBAN MARATHON and Upcoming Award

Through the VICINITY project, the Municipality of Pilea-Hortiatis succeeded in promoting a healthier lifestyle to the middle-aged citizens through the really successful fitness competition URBAN MARATHON. Many citizens who didn't regularly participate in work-outs in the past and have changed their everyday habits, in order to obtain a better quality of life. The motivation was the fitness tracker and the dietician that kept track of their progress and consulted them. The application, produced by VICINITY, gave them even more encouragement to try harder and climb in rankings via the application. The mobile application was also able to identify a winner of the competition, who will be given as an Award *a one year free subscription fee for the municipal sport centers*.

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VICINITY Second Open Call

Second Open call projects have successfully finished their deliveries.

It has been a pleasure to work with these amazing teams for this reason the VICINITY consortium wants to say

"Thanks to"

VIZLORE Labs in Serbia for providing blockchains capabilities to VICINITY and tested it in two use-cases SmartGarage and SmartHotel;

Nissatech in Serbia for providing citizens with more information about our state of fitness through their value-added service which provides 'Actionable-Analytics' utilizing data from various information silos for continuous improvement of the trainee performance in the 'Fitness' of the Future campaign;

Ubiwhere in Portugal because they created a decentralised EV charging solution whose settlement and billing layer have been built on top of an open and public blockchain. We will be able to charge our EV everywhere;

Sensinov in France for fault detection in a smart building environment. We will know when our sensors are not providing accurate information.

And thanks to all the organizations that participated in the open call and were not awarded because they also enriched VICINITY with their brilliant ideas.

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VICINITY Unique Selling Point - Stakeholders' Opinion

This year we have had the opportunity to check the understanding of the VICINITY Unique Selling Point with our stakeholders.

We want to share with you some opinions.

"VICINITY is a platform of platforms" (one attendee in the IOT Innovation Hub Workshop)

Open Call partner answers to the question "What is the highest value that they found in using VICINITY?" - their response, "We could not have implemented the system without VICINITY – a main advantage is that it allowed us to swap sensors and even sensor types without having to restart the project" - so interoperability was key for them.

From the VICINITY team, "The development of Proof-of-Concept is faster with VICINITY than with other solutions. We can demonstrate to our customers our competitive advantage in less time than competitors".

From an Open Call participant "The project has overall been very visible and Active, for instance through contributions to AIOTI (Keith Dickerson) which resulted in the publication of one AIOTI deliverable on 'cross domain use cases'; that is highly visible and appreciated."

Another Open call participant said, "The overall concept of IoT interoperability-as-a-service is definitely something the market needs and is looking for. Given our experience in the IoT, which is characterised by a high degree of fragmentation and where each

vendor is basically providing their own interfaces (with their own data model), an approach like the VICINITY one would have the potential to enormously speed up the development and integration process, as well as lowering the barrier for high-tech startups and innovative SMEs to enter the market".

The VICINITY consortium would like to say "Thank to you too, for these remarks, they were very flattering!!!"

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Results and Ambitions of Tromsø Pilot Site

The pilot project in Tromsø has led to insight into the demands of healthcare personnel and transporters of goods and services. Building upon on the strength offered by VICINITY to offer interoperability as a service, Hafenstrom is now focusing on establishing a platform for providing services within the healthcare and mobility sectors to municipalities and other public entities.

Four main categories have been identified which will be extended on: shared parking and Parking as a Service (PaaS), Healthcare Visit by First Responder, and a mobility platform that offers P2P connectivity for all services that are integrated with VICINITY. Hafenstrom is currently looking for partners and investors that can contribute to the exploition of the results and develop new solutions for a market that is growing impatient for user-friendly and viable solutions within area management and service planning in urban environments.

In particular, the potential to integrate and present data from both existing and future smart devices in apps for citizens, have caught the attention of several stakeholders. VICINITY allows for many new types of Value-Added Service (VAS), and several municipalities have already discovered the benefits of these.

A marketplace for VICINITY2020 services is planned to make its first public appearance on the 1st of January 2020. VICINITY2020.com will be a commercial site that will live side-by-side with the project website VICINITY2020.eu. The goal is to establish a foundation for developers and consultants to present expertise, solutions and network. More information will be provided on VICINITY2020.com in January when we will talk about VICINITY-ready devices, upcoming VICINITY products and services, and upcoming opportunities.

Hafenstrom can now also boast of having Asbjørn Hovstø being elected chair of the IoT committee (NK JTC 1 / SC 41) in the Norwegian Electrotechnical Committee (NEK). NEK is also the Norwegian member body within IECs conformity assessment systems IECEE/CB scheme (for electrical equipment) and IECEx (for hazardous areas). There was immediately great interest in the work, and the number of participants has increased at a record pace. Now Asbjørn Hovstø is bringing in his experience of VICINITY and vast network of European partners into the committee, and its ongoing efforts, to influence the standardisation work of the Internet of Things.

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Interview with Prof. Gomathi Nandagopal - Vel Tech University

An online interview with Dr. Gomathi Nandagopal, Professor, Vel Tech University, by VICINITY – Dr. Yajuan Guan, Assistant Professor, Aalborg University.

Prof. Gomathi Nandagopal (PhD)

Professor

Vel Tech University, Chennai, India

We would like to know a little more about the concept "Platform as a Service", could you explain it to us?

In the Platform-as-a-Service (PaaS) model, designers basically lease all that they need to construct an application, depending on a cloud supplier for development tools, foundation, and operating systems. This is one of the three assistance models of distributed computing. PaaS boundlessly improves web application advancement; from the designer's point of view, all backend management happens behind the scenes. In spite of the fact that PaaS has a few resemblances with serverless computing, there are numerous basic contrasts between them.

PaaS is accessed through internet connection, facilitating the construction of an entire application in a web browser. The development environment is not facilitated locally, so the designers work on the application from any place in the world. This empowers groups that are spread out worldwide to collaborate.

How can VICINITY greatly contribute to the "Platform as a Service"?

The VICINITY platform is an open virtual neighbourhood network to connect IoT infrastructures and smart objects. It is a decentralized platform, which resembles a "social network" (known as "virtual neighbourhood" in VICINITY) and provides "interoperability as a service" for infrastructures in the Internet of Things. Through the VICINITY platform, different IoT ecosystems can be interconnected. That means, it allows interaction with smart devices from other ecosystems as if they were their own. The user is able to control his shared smart devices and data by setting access rights via the neighbourhood manager. The VICINITY platform can be used in various areas.

Finally, what is your area of interest in VICINITY and how do you think you can contribute to the project?

My area of interest in VICINITY is privacy of individuals' data which can be achieved through homomorphic encryption.

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VICINITY Core Components Continuous Updates

In the final phase of the VICINITY project, the last release of the VICINITY server core components has been deployed which includes updates arising during the evaluation period and through exploitation activities. Besides the routine bug-fixing of the VICINITY core components, the VICINITY Landing Page was rebuilt to include documentation directly from the platform and VICINITY price estimates. The VICINITY core components and VICINITY Gateway API provides features for measuring usage of the platform from device point and value-added service provider points of view. These features will support VICINITY users' understanding of how they use the platform and what the estimated costs will be.

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VICINITY Client Operation and Continuous Upgrades

The VICINITY Client Infrastructure Components consist of VICINITY Gateway Adapters, VICINITY Agent and Auto-Discovery platform and VICINITY Security Services.

The VICINITY Gateway API has seen two new minor releases during the last reporting period, recently introducing Client-side authentication as well as validation in the Neighbourhood Manager, apart from on-the-fly bug fixes, which were implemented as direct responses to reported issues.

The VICINITY Agent and Auto-Discovery platform and the VICINITY adapters ontology both received updates in the form of bug-fixes and implemented new feature requests, again in direct response to issues raised by external and internal consortium partners.
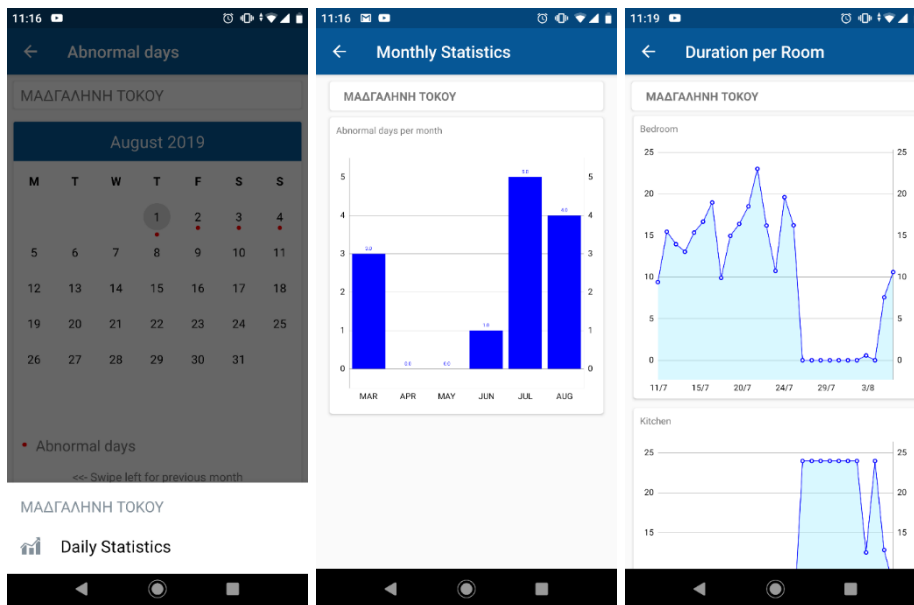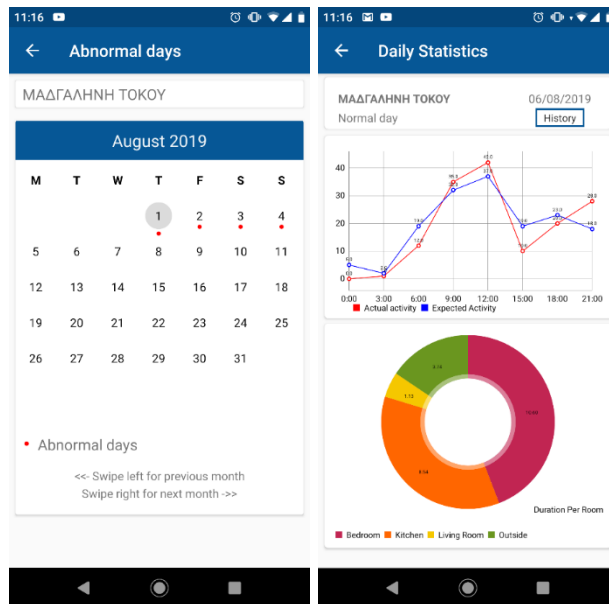
D4.5 is explanatory document to all 'living' documentation regarding VICINITY client operation and continuous upgrades which are held in their corresponding GitHub repositories. This and related accompanying deliverables can be found in the VICINITY homepage.

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Continuous Operation and Upgrades of VAS

This period many changes and updates have been conducted on the functionalities of the value-added services (VAS) and the user interfaces for the two use cases of the eHealth pilot site in the Municipality of Pilea-Hortiatis. Feedback received under real-life operational conditions, both regarding technical aspects and user experience, was valuable and has contributed both to the improvement of the offered services and the user satisfaction.

Corrective maintenance included bug-fixing and errors which occurred while monitoring and auditing of data transactions and data requests. Moreover, many functionalities have been added to the first use-case of assisted living for elderly people. These functionalities included blood pressure, panic button and weight statistics and algorithms to improve accuracy and so reduce false alarms. Also, regarding the user interfaces which help health professionals to interpret the results, the algorithm's decision is now displayed as 'expected activity'. Screenshots of the doctor's user interface are presented below:

Screenshots of the doctor's user interface

User support actions include regular visits of health professionals to the elderly persons' homes and questionnaires for doctors' and relatives' feedback regarding the usability of the application in order to make improvements.

For the second use case, health improvement for middle aged people, updates were made to the internal rules of the gamification system, depending on the dietician's guidance. Active feedback was collected from end-users through face-to-face meetings in order to improve the performance of the application. In addition, a questionnaire was distributed for the dietician's feedback regarding the usability of the application in order to make improvements. Meetings with users to support them with the usage of the application during their biweekly visits to the dietician were conducted. Finally in this period, maintenance activities have taken place on the pilot site's installations.

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Security and Privacy Valuation of VICINITY Components

The task *VICINITY security and privacy evaluation* demonstrates the capability of the VICINITY ecosystem to provide a high level of security and data protection. The pilots demonstrated the ease by which this technology can be applied to different use cases, by employing the platform provided by VICINITY. Nevertheless, we should keep in mind that since a variety of objects become part of an interconnected environment, we have to consider that these devices may have lost physical security, as they are going to be located in uncontrolled environments. Regarding privacy, the VICINITY platform provides privacy to the IoT data transactions between devices and services. VICINITY 2.0 has been

proposed as possible way to further improve privacy and is based on a decentralized Semantic Repository.

Overall Evaluation of User Experience and Performance of VICINITY Framework and Tools

Regarding Technology Readiness Levels (TRLs), the overall evaluation of the VICINITY trials has confirmed that the project has taken the VICINITY concept from TRL 2 (Technology concept formulated) to TRL 7 (system prototype demonstrated in operational environment). This is sufficient to give confidence that the approach works and that higher TRLs, TRL 8 and 9 can be achieved, subject to the completion of necessary additional development work. The concept has been proved to work and to facilitate new service integration. The next steps will need the VICINITY interface to be built into sensors. They will then be VICINITY-ready, rather than rely upon the use of adaptors with the inevitable additional cost. (The development of integrated sensors was outside the scope of the current project). The other important step will be the move to provision of a commercially supported service.

The evaluation is based upon the findings of the four pilot sites that were created and operated by project partners and delivered the intended functionality. These pilots overcame difficulties such as radio propagation limitations as well as identifying and resolving a small number of technical issues with the early implementation of the VICINITY Framework. The design and documentation were improved following feedback from key stakeholders. At the end of these pilot trials the opportunity to build an operational system

based on the trials is being discussed, to exploit the value that was perceived during their operation.

There were also two rounds of open call projects, four projects in each round were financially supported by VICINITY. These provided an important independent evaluation by the developers of the trial systems as none of these developers had been involved in the development of the VICINITY framework and architecture. All of these projects successfully implemented their service using VICINITY. Each project concluded that there would be commercial benefits for them in adopting VICINITY because of: the ease of integration, the market proposition, and that they were using an open architecture which allows integration with existing sensors and competitive procurement of new sensors. The organisations that developed these trials are keen for VICINITY to move to a commercially supported service so that they can migrate their businesses and rely upon VICINITY in the future.

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Final Milestones

- VICINITY platform standardization and conformance assessment are completed and available.
- Pilot demonstration and overall system evaluation are completed.
- Final exploitation strategy, business plan and market analysis documentation is available.

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