

IOTWeek

Dublin — June 20-23, 2022

Experimenting Next Generation Internet Technologies: LOG-a-TEC testbed

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GLOBAL VISION:

IoT TODAY AND BEYOND

IOTForum

Department of Communication Systems

Research, development and innovation in:

- Next-generation telecommunication networks, technologies and services for different application areas
- Wireless communication and experimental infrastructures
- Embedded and different sensor systems
- Parallel and distributed computing with the emphasis on modelling and simulating complex systems
- Sensor data gathering and analytics



Partners in current projects:

H2020 BD4OPEM – Big Data for Open Innovation Energy Marketplace

H2020 RESILOC – Resilient Europe and Societies by Innovating Local Communities

COST ACTION – Enabling Radio Communication for Seamless Inclusive Interactions

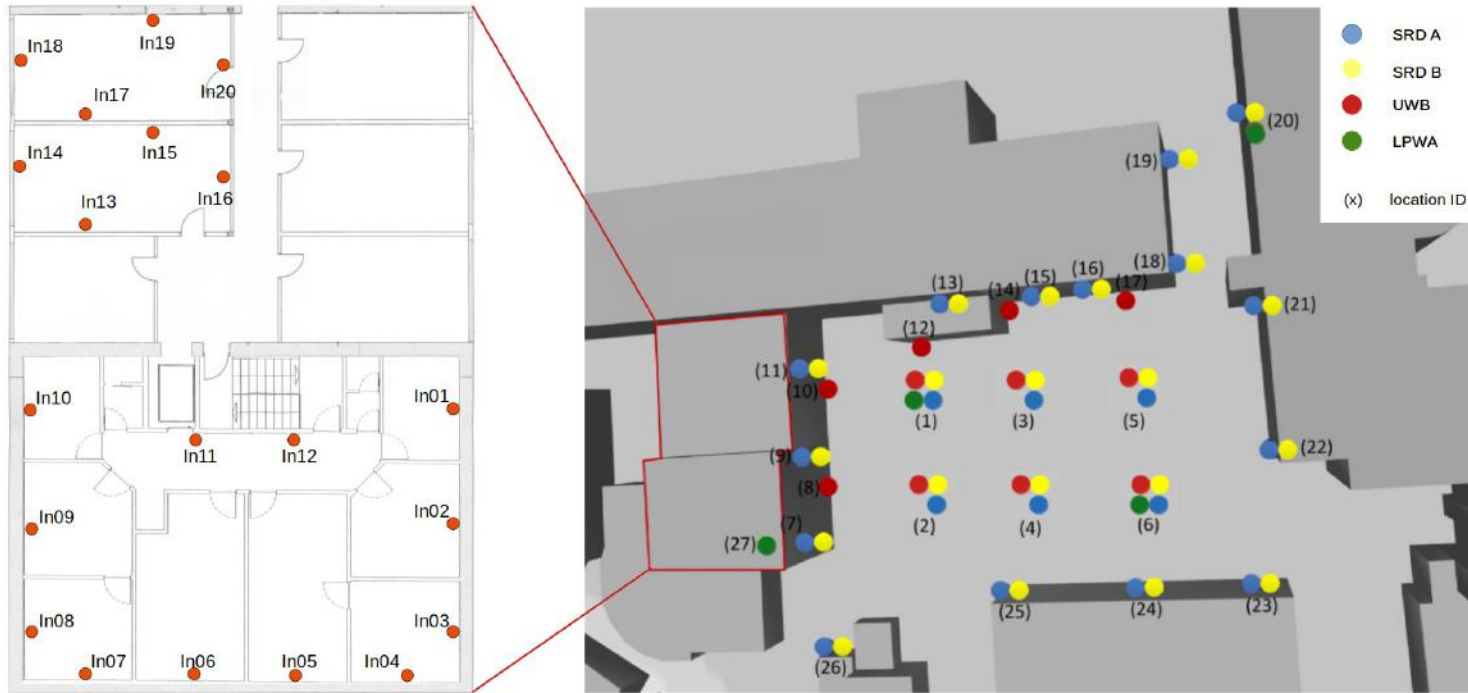
TimeSmart – Timeliness of Information in Smart Grids Networks

H2020 Fed4FIRE+ – Federation for Future Internet Research and Experimentation

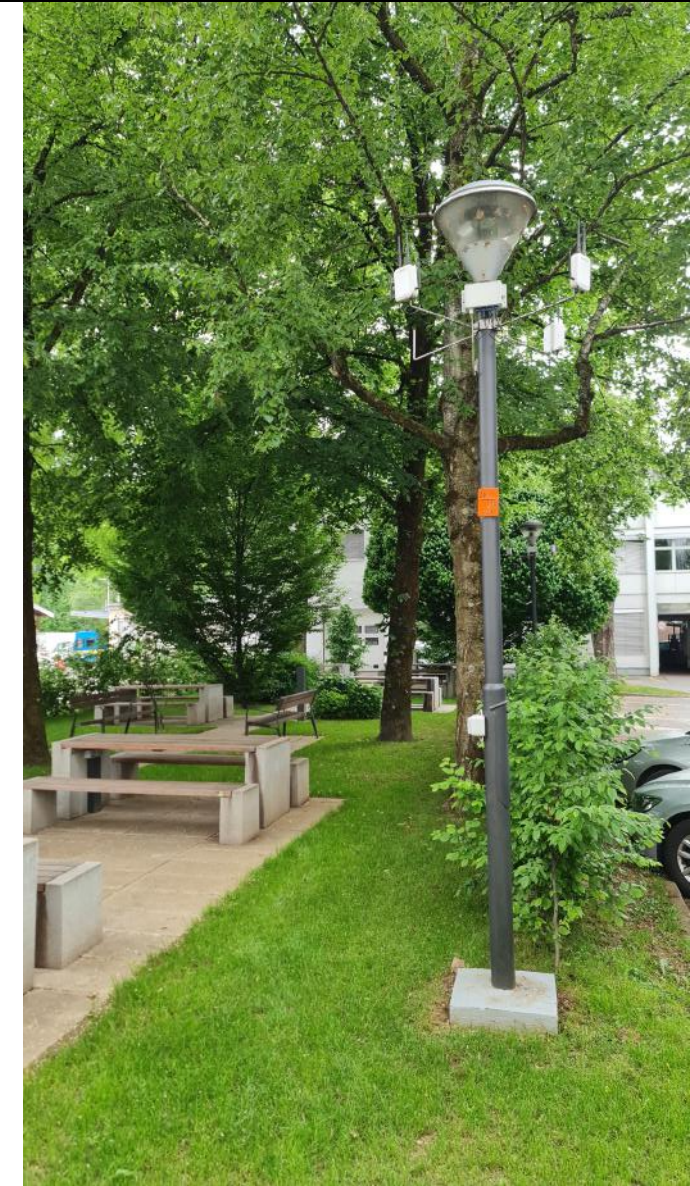
FACTS & NUMBERS:

- 30-35 researchers
- > 140 journal & > 170 conference papers since 2015
- 7 books and 9 book chapters since 2015
- on average running 3-4 basic research projects
- 25 years of tradition in international collaborative projects: FP7 (ProSense, CREW, CITI-SENSE, Fed4Fire, ABSOLUTE, PlanetData) H2020 (SAAM, eWine, DEFENDER, EuConNeCts3, NRG-5).

LOG-a-TEC testbed



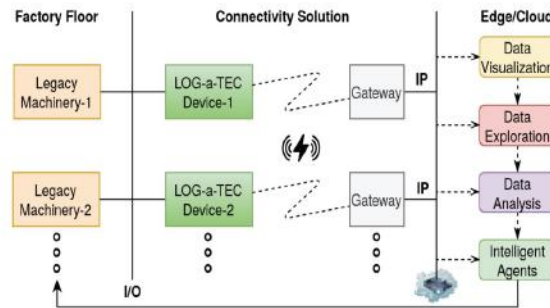
Technology	No. of nodes Outdoor/Indoor	Frequency	Chip
IEEE 802.15.4	21/0	868 MHz	AT86RF212 TI C1101
IEEE 802.15.4	21/0	2.4 GHz	AT86RF233 TI CC2500
LoRaWAN	3/1	860 MHz	LoRa SX-1272
UWB	11/20	3.5 ~6.5 GHz	DWM 1000
BLE	56/21	2.4 GHz	TI WL1837
WiFi	56/21	2.4 GHz, 5 GHz	TI WL1837



Continuous upgrades

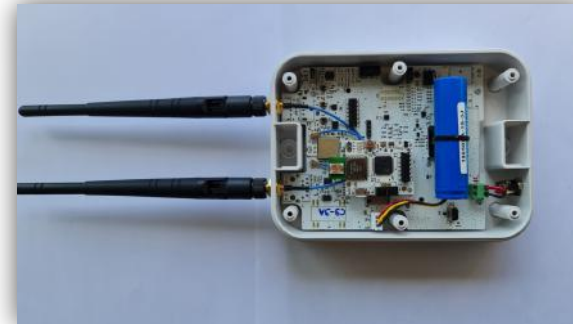
Open Call – WiBro (ComSensus d.o.o.):

- Battery powered mobile nodes
- Zero Touch deployment
- Ad-hoc network
- Remote management

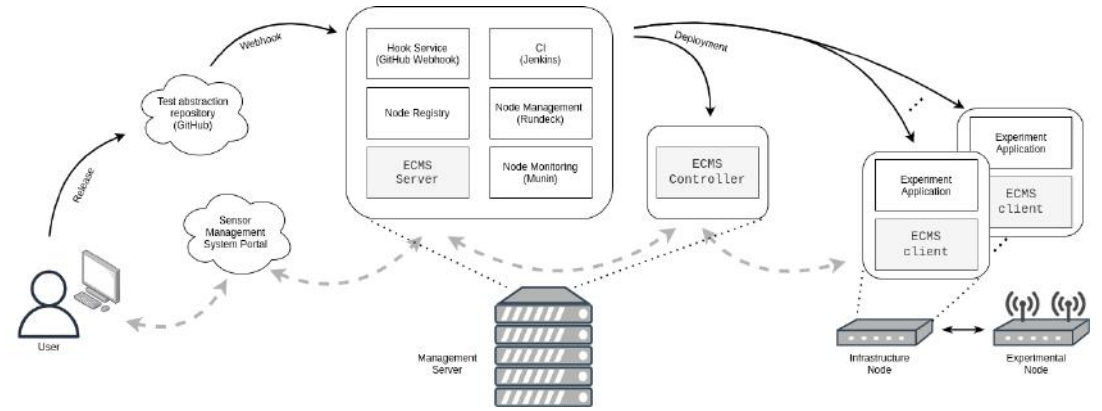
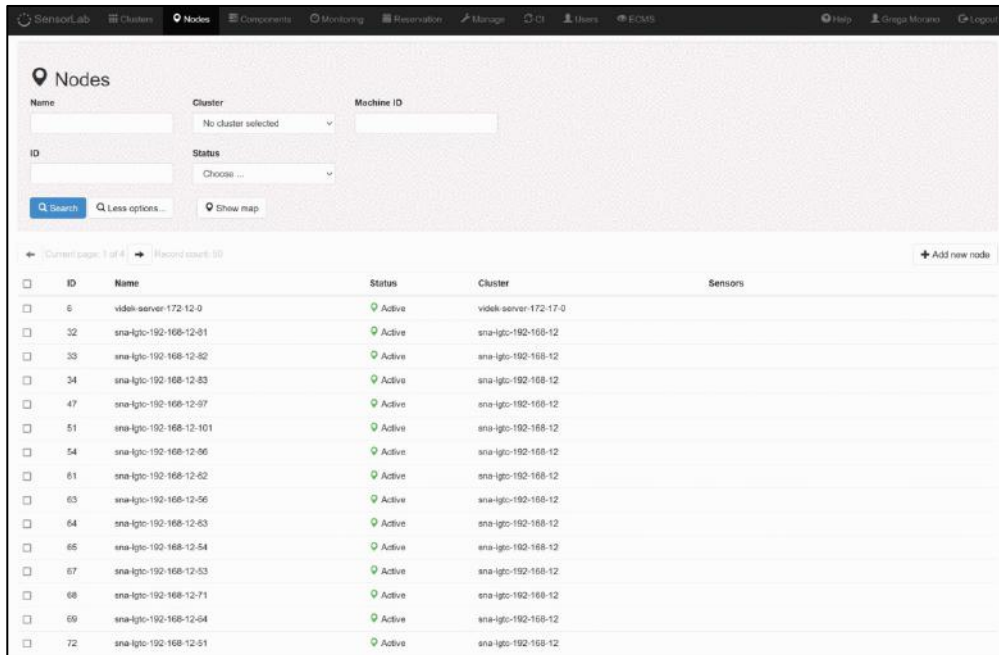


Ultra-Wideband upgrade:

- Costume designed extension board
- Based on DWM1000
- 20 indoor (3 office scenarios)
- 11 outdoor located at IJS campus
- Ranging, localization and sensing applications (H202 SAAM)



Software updates

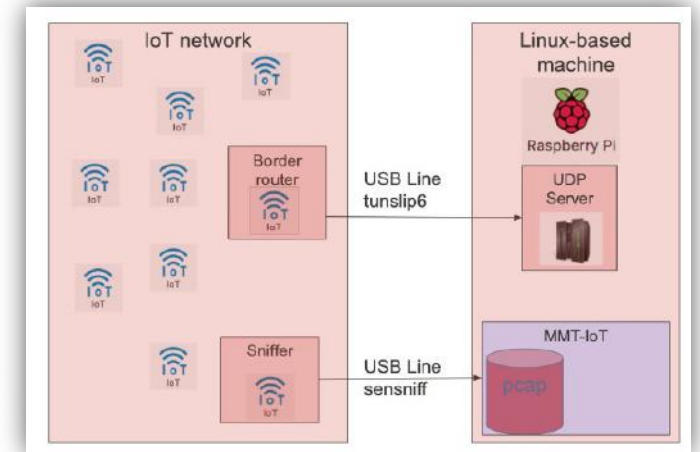


- Integrated social coding platforms
- Simplified management and updates with Continuous Integration and Continuous Deployment practices
- Radio technology reservation and resource scheduler
- Experiment control and monitoring system providing full control over the experimental network
- Real-time data accumulation and visualization
- Node health and resource monitoring

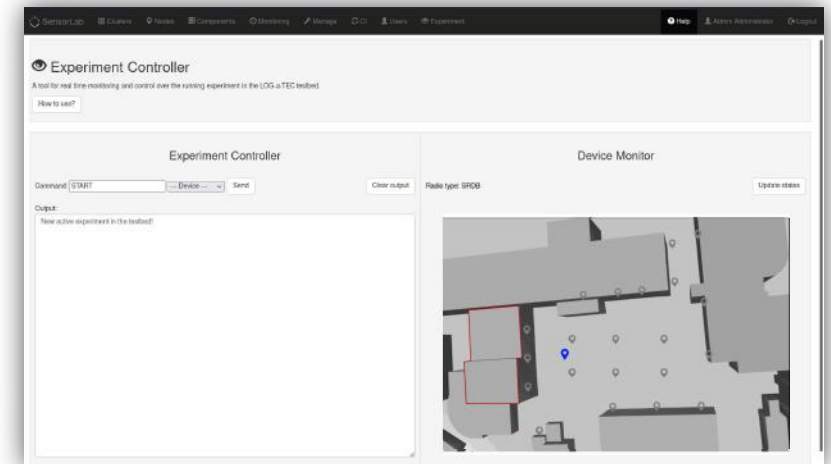
Components and modules

- Packet based experimentation,
- Custom protocol stacks,
- Spectrum sensing by energy detection and covariance
- Signal generation including wireless mic profiles
- Game theoretic power allocation
- LoS/nLoS classification
- Link quality estimation and prediction
- Sensing, ranging and localization

Datasets generated with the testbed openly available at: <http://log-a-tec.eu>



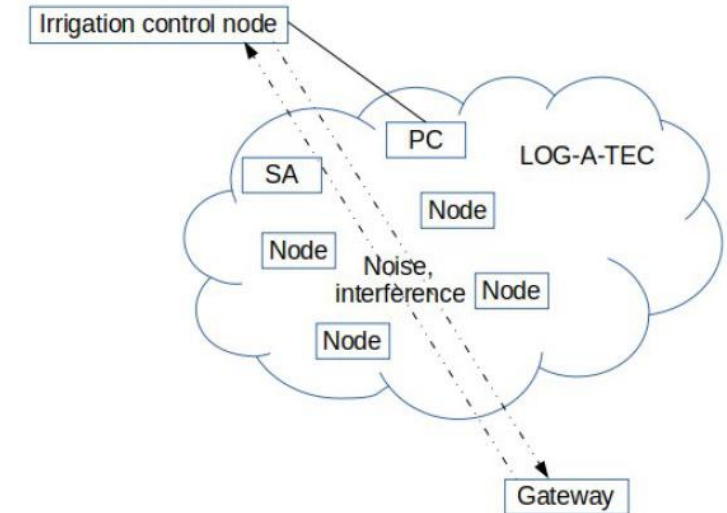
Open Call: MMT_IoT (Montimage)



Localization using BLE

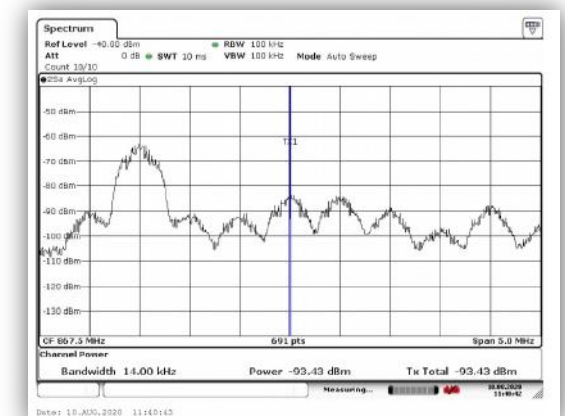
Testbed functionality

- Ultra narrow band and ultra wide band packet based experimentation
- Custom and advanced spectrum sensing and signal generating functions
- Real-world use case scenarios
- Tests and experiments on actual hardware
- Publicly open access



Open Call: eVineyard (Elmbit d.o.o.)

Interference Provided	Uplink Loss (msg)	Downlink Loss (msg)	Uplink Success	Downlink Success	System Success	Coorrected Downlink Succ.	Corrected System Succ.	Remarks
-5 dBm	0	17	100%	85%	85%	99.36%	99.36%	
-3 dBm	1	17	99%	64%	63%	98.20%	97.38%	
-1 dBm	0	17	100%	65%	65%	99.36%	99.36%	
1 dBm	0	18	100%	63%	63%	96.15%	96.15%	
3 dBm	0	19	100%	60%	60%	92.95%	92.95%	Trend of marginal reduction of success rate starts here
5 dBm	0	20	100%	58%	58%	89.74%	89.74%	
7 dBm	0	20	100%	58%	58%	89.74%	89.74%	
9 dBm	3	22	98%	53%	52%	81.83%	79.79%	
11 dBm	13	18	89%	57%	51%	87.91%	78.39%	Less transmitted downlinks than at 9 dBm, but with higher success



- Broader international visibility of the testbed brought by Fed4FIRE+ Open Calls
- H2020 projects: SAAM, RESILOC, etc.
- Strengthened cooperation with research organizations (University of Montenegro, University of Banja Luka, etc.)
- Additional research projects by the Slovenian National Research Agency
- Integrated in the education process at the Jožef Stefan International Postgraduate School, University of Ljubljana
- Research results published in leading international journals and conferences





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Thank you!

Find more: <https://e6.ijs.si/>
<http://log-a-tec.eu>

iotweek.org