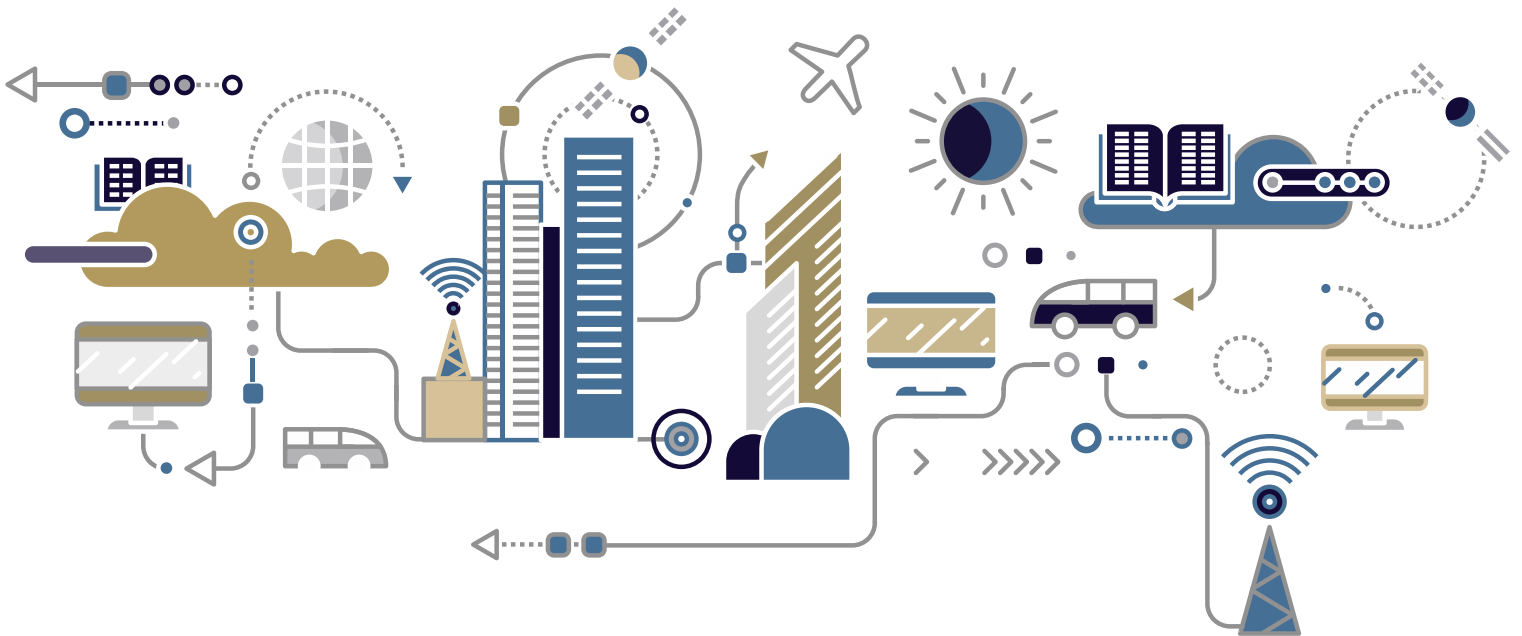


# European SME Expertise in 5G and Beyond



# USEFUL LINKS

Find the SME you need

[www.networld2020.eu/find-the-sme-you-need/](http://www.networld2020.eu/find-the-sme-you-need/)

NetWorld2020 SME support

[www.networld2020.eu/sme-support](http://www.networld2020.eu/sme-support)

NetWorld2020 European Technology Platform

[www.networld2020.eu](http://www.networld2020.eu)

5G Public-Private Partnership

[www.5g-ppp.eu](http://www.5g-ppp.eu)



## JACQUES MAGEN

interinnov  
Chair of the  
SME Working Group

I can hardly believe that this June 2020 edition of the “SME brochure” is already the 4th annual edition. The number of members in the SME Working Group, whose main objective is to promote the skills and expertise of SMEs, has been regularly increasing since its inception in 2013 under the auspices of the NetWorld2020 European Technology Platform. By May 2020, I am proud to announce that there are 183 members in the Group, including 153 SMEs.

The interest of the SME community in the 5G Public-Private Partnership (5G PPP) has never been higher. In addition to a record number of SMEs presented in this edition, more and more SMEs also appear on the “Find your SME” web page<sup>1</sup>, that displays both the expertise and skills of SMEs in 5G-related technology, and their involvement in vertical sectors. To cope with this increasing demand, both the web page and the brochure have been subject to an additional update in December 2019. We are now planning a bi-annual update.

Considering that we are in the core of Phase 3 of the 5G PPP, five years into the programme, we are now starting to see some concrete results in terms of exploiting achievements from the projects. Consequently, a new “SME success story” section has been added to this edition.

The participation of SMEs in the 5G PPP has reached 19.13% representing a total of 91.38 M€ in EU funding, a little under the objective of 20% defined as a KPI of the programme<sup>2</sup>. 226 SME participations are currently accounted for, i.e. 20.96% of the 1,078 participations. A dedicated SME call is scheduled in 2020, hopefully allowing the 20% participation to be reached by the end of the initiative. SMEs have also demonstrated their interest in the 5G long-term evolution, with a participation in the call on this topic reaching 19.8% in terms of participants and 18.5% in EU funding.



## NICOLA CIULLI

Nextworks  
Vice-chair of the  
SME Working Group

I am very happy to join our SME WG Chair, Jacques Magen, in introducing this new edition of the “SME brochure”. SMEs have already demonstrated their strong interest and commitment to the research and innovation projects within the 5G Public-Private Partnership (5G PPP) in its various phases: in the early steps in fundamental research, and even more in the later steps in 5G pilots and experimentation in several vertical industry sectors. This very moment in the 5G PPP roadmap is even more focused on SMEs than ever, with an upcoming call topic on “5G innovations for verticals with third party services” where both the scope and expected impacts are promoting the strong involvement of SME-driven applications and services over 5G.

We must acknowledge that this exciting time for SMEs in the 5G PPP programme coincides with a very difficult and challenging period, due to the COVID-19 emergency, and due to the upcoming economic consequences of that. Several nodal points along a wide range of value chains are being hit by the crisis, with reverberations that are still hard to predict. In this moment of uncertainty, the technology weight and value of SMEs will prove to be of outmost importance, especially for those in business related to ICT and to many 5G vertical sectors. We really hope that the 5G PPP programme has contributed to build this value in the past years, with the help of the SME Working Group in NetWorld2020. With our most felt wishes, to all of us, to travel safely through these stormy waters!

The SME Working Group (WG) is gathering about 180+ members including 150+ SMEs. More than 350 SMEs are members of NetWorld2020, the European Technology Platform for telecommunications and related services and applications. The SME WG is jointly supported by NetWorld2020 and the 5G IA. The current SME representatives in the 5G IA Board are Nicola Ciulli from Nextworks and Jacques Magen from interinnov. There are five SME representatives in the NetWorld2020 Steering Board: Integrasys, interinnov, Montimage, Nextworks, and Quobis Networks. The SME WG is supported by the Full5G Coordination and Support Action. The Chair of the SME WG is Jacques Magen from interinnov. The Vice-Chair of the SME WG is Nicola Ciulli from Nextworks. If you wish to join the SME Working Group, please send a request to [sme-wg-contact@networld2020.eu](mailto:sme-wg-contact@networld2020.eu).

<sup>1</sup> <https://www.networld2020.eu/find-the-sme-you-need-new-page/>

<sup>2</sup> According to the H2020 dashboard, <https://webgate.ec.europa.eu/dashboard/>. These figures include the following calls: Phase 1: H2020-ICT-2014-2 / ICT-14-2014; Phase 2: H2020-ICT-2016-2 / ICT-7-2016; Phase 3 (1): H2020-ICT-2017 / ICT-17-2017; Phase 3 (2) H2020-ICT-2018 / ICT-18-2018; Phase 3 (3) H2020-ICT-2019 / ICT-19-2019; Phase 3 (4) H2020-ICT-2019 / ICT-20-2019.



**RUI L. AGUIAR**  
Network2020 Steering  
Board Chair

The last time we engaged in the production of this brochure we were living in a very different world. During this last year, a new workprogramme went into planning, discussions on future European budgets started and we moved into the covid19 shadow. But in these changing times, SMEs are increasingly relevant for the European society. The flexibility, eagerness and drive for innovation, that so many European SMEs possess, are essential for the development of our lives – we have seen many SMEs in the forefront of new technologies for addressing the challenges of our current situation, providing fast responses to the needs of our changed environment.

Network2020, the European Technology Platform that collects the efforts of all entities interested in telecommunications and associated technologies, is proud to count 350+ SMEs inside its constituency. SMEs have been an essential part on, and a key contributor to, the work we performed. The SME working group has been key in intertwining the realities of innovation in European context and the constraints of SMEs, actively working to facilitate this two-way street, improving the interest of SMEs for European research, and promoting the advantages of collaborating with SMEs inside the research and innovation communities. With the upcoming Horizon Europe, novel opportunities will exist for SMEs, most specially because our relations with other industries (the so called vertical markets) are going to increase. At a time when we will be discussing funding priorities for the next years, a renewed engagement of multiple SMEs may smooth the path for future joint successes!

It would be extremely rewarding for all of us if we continue to see an increase of the collaboration of SMEs inside European-funded research, and we see SMEs providing a guiding line for the future diversity of our communications ecosystem .

Best of luck to all SMEs, and hope you remain ambitious in your objectives!



**COLIN WILLCOCK**  
Chairman of  
the Board, 5G IA

On behalf of the 5G Infrastructure Association (5G-IA), I welcome the opportunity to write an introduction for this new version of the SME brochure. At this difficult time, with the world suffering from Covid-19 it is important to retain hope for the future. In our industry, SMEs play a key role here. They offer the promise to contribute to future growth and opportunities as we try and recover from the terrible effects of the virus. SMEs have the ability to bring new ideas to the market and the flexibility to experiment and eventually create valuable products.

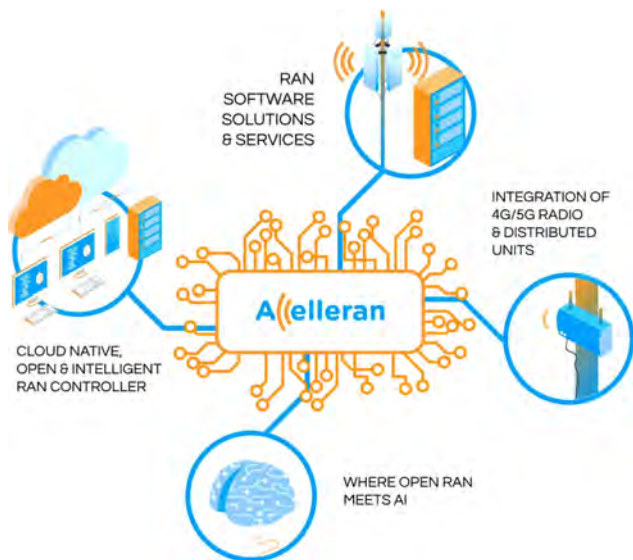
The 5G-IA is committed to the advancement of 5G in Europe. The 5G-IA represents the “private” side in the 5G Public Private Partnership (5G PPP), a 700 Million Euro joint initiative between the European Commission and the European ICT industry. In the context of the 5G PPP, the 5G-IA has been active to ensure a high SME participation. This is because, SMEs are recognized as the catalyst for innovation. Their ability for “out of the box” thinking and their agility to rapidly develop and test ideas in multiple sectors, have been important assets in the industrial digitization of the so-called vertical industries. Joining forces between SMEs and the key ICT companies has been one of the key factors driving the overall success of the 5G PPP programme.

Moving forward, the 5G-IA together with other key industry associations, are driving the formation a new partnership called Smart Networks and Services. The partnership will ensure European leadership in the creation of the next generation network technologies and services. The above-mentioned abilities that SMEs will bring in this new Partnership will be of central importance to create novel services and technological breakthroughs. These will be eventually transformed into valuable solutions for vertical industries thus, creating new jobs and improving the everyday life of European citizens.



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# Accelleran

- YEAR ESTABLISHED  
2013
- NUMBER OF EMPLOYEES  
25
- MORE INFORMATION  
[www.accelleran.com](http://www.accelleran.com)
- CONTACT  
[info@accelleran.com](mailto:info@accelleran.com)

EXPERTISE IN 5G IOT NGI SATELLITE COMMUNICATIONS MEDIA & CONTENT TRANSPORT & LOGISTICS MFG. ENERGY SMART CITIES PUBLIC SAFETY

## BACKGROUND, EXPERTISE & SKILLS

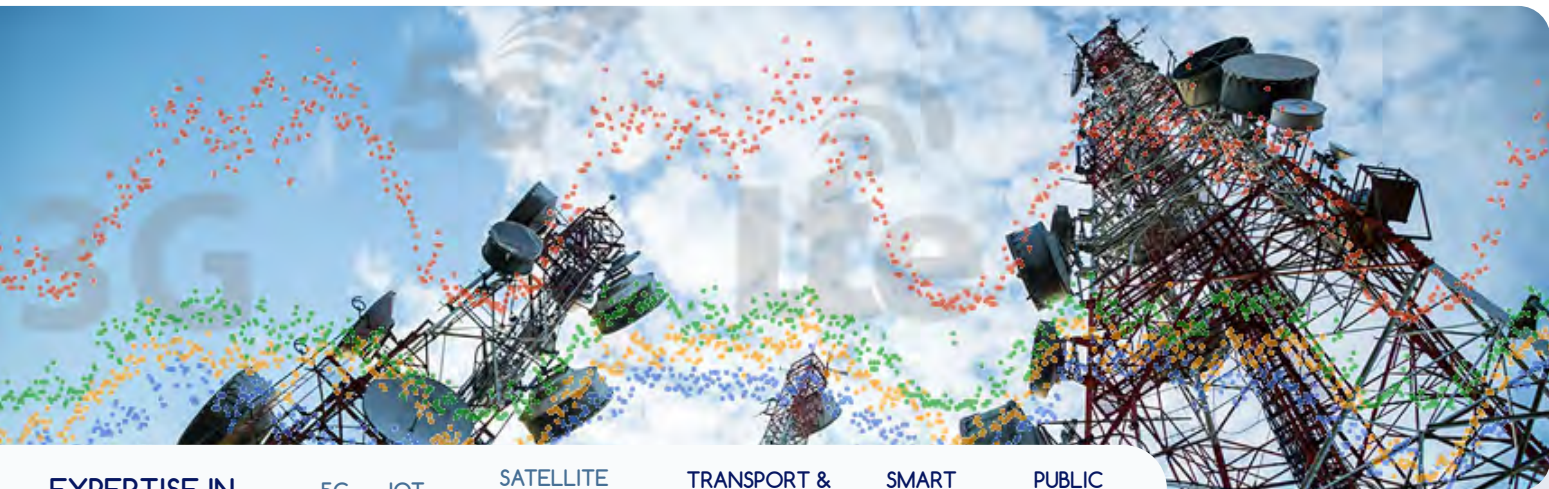
Accelleran provides Mobile RAN/vRAN software and 4G/5G Small Cell product solutions addressing the real-world challenges of increasing data volumes and 5G applications, calling for hyperdense networks. Accelleran's unique software architecture is genuinely independent from any hardware platform. Operators can leverage one software solution for integrated small cells and for disaggregated and virtualised RAN networks with slicing and edge capabilities. With a global Cellular Industry's leading design team, Accelleran is the technology choice for carrier grade, reliable, performant Small Cells and Radio Access Network software solutions for Fixed Wireless Access, Public Mobile, Private Network, Neutral Host or IoT/Vertical solution providers. Accelleran four core service activities are Consulting & Design, SW Engineering, Test & Integration and Research (7 H2020 5G related projects).

## ACHIEVEMENTS & SUCCESS STORIES

Accelleran delivers across the globe carrier grade RAN/vRAN Software and Small Cell products in different architectures. From the versatile, robust, small, lightweight and outdoor integrated E1000 Series Small Cell in different band variants including CBRS, to the ORAN-aligned Cloud Native Virtualised dRAX Open Interface RAN Intelligence enabling AI/ML xApps in an open, scalable and interoperable RAN platform. Accelleran won the 2017 TechTour TOP EVC Final, the 2018 Small Cell Forum Award in the category Outstanding Innovation in Small Cell Technology/Architecture and the 2018 TEAC (TIP Ecosystem Acceleration Centre) UK Wave 2 program. Accelleran has successfully participated in Belgian 5GUARDS and UK 5GRuralFirst projects and currently participates in 5GCity, 5G-Enhance, UNICORE, 5G-CLARITY and 5G-COMPLETE European and joint EU/ Japan projects.

## INTEREST FOR FUTURE R&D&I COOPERATION

Accelleran seeks European and International RIA, IA, FTI, MSCA... actions and in general any Research, Development and Innovation cooperation projects to underpin the future of mobile RAN/vRAN solutions enabling hyperconnected, ubiquitous, efficient and dense networks. 5G, IoT, Satellite Communications and Next Generation Internet are some of the areas we focus on to enable different vertical sectors such as Transport & Logistics, Manufacturing, Energy, Smart Cities and Public Safety with the networks of the future.



## EXPERTISE IN

5G

IOT

SATELLITE  
COMMUNICATIONS

TRANSPORT &  
LOGISTICS

SMART  
CITIES

PUBLIC  
SAFETY

## BACKGROUND, EXPERTISE & SKILLS

ACTA Ltd is an SME founded in October 2002 in Athens, Greece. Our expertise and experience is as a provider and integrator of long-term performance analysis monitoring solutions as well as ad-hoc network measurements. Main focus is on Telecoms, IT, Electronics and EMF & EMC technologies, utilizing state-of-the-art instruments and solutions from leading manufacturers. ACTA is present in South East Europe.

Typical customers, of ACTA, are Telecom Operators, Integrators, Manufacturers, Utility companies, Universities, Research Laboratories, Enterprises. Solutions provided cover a wide range of technologies with focus on optical, mobile, radio and access networks. ACTA participates in two Horizon2020 EU funded projects, 5G-TOURS and 5G-HEART in partnership with SMEs, Universities and Telecom providers from France, Norway, Italy, UK, Netherlands and Greece.

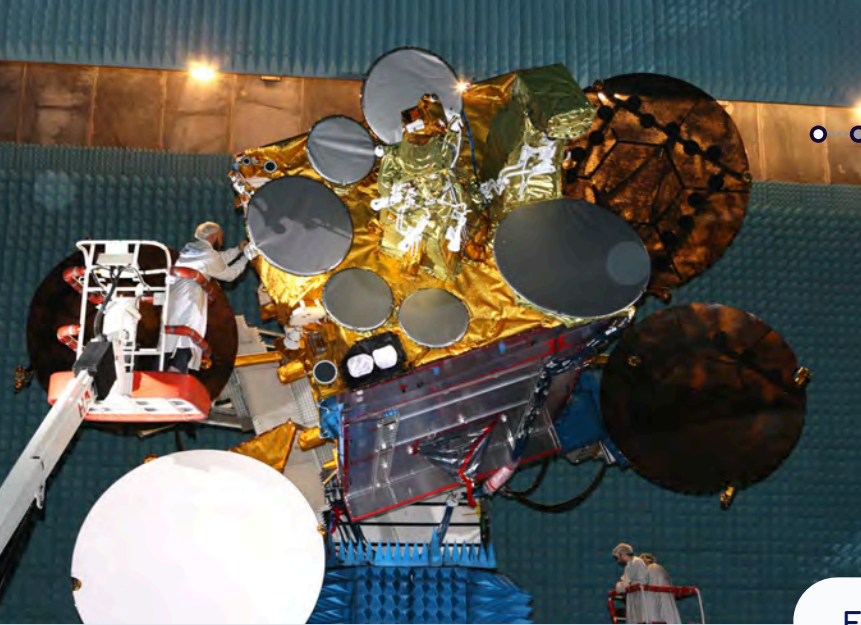
## ACHIEVEMENTS & SUCCESS STORIES

ACTA has provided to Telecom Operators in Greece, transmission performance monitoring solutions. Based on ACTA's KPI Validation Platform and HW probes. Collected data help in Operations and Capacity Planning. Raw data, aggregated according to physical network medium, manufacturer, demographics. 5G network KPIs are collected in 5G-HEART and 5G-TOURS projects.

ACTA's EMF Observatory Application collects measurements from several types of ElectroMagnetic Field monitoring stations. It also manages the EMF monitoring network (alarms, configuration, integrity check). Solution currently deployed at the EMF Authority of Greece (<https://paratiritirioemf.eeae.gr>), the Romanian (ANCOM) and Paraguayan (CONATEL). EMF Observatory is further developed to support 5G frequencies. ACTA has deployed the TR-069 "0-touch provisioning" xDSL management platform, in three Greek Telecom Operators. Platforms are further developed.

## INTEREST FOR FUTURE R&D&I COOPERATION

ACTA Ltd is interested in cooperating with other parties that focus on optical, mobile, radio and access networks. Special focus is on the technology areas of 5G - IoT, hardware design, machine learning software, edge computing, monitoring sensors, blockchain and in electromagnetic fields monitoring.



AETHERIC ENGINEERING



YEAR ESTABLISHED

1989



NUMBER OF EMPLOYEES

2



MORE INFORMATION

[www.aetheric.co.uk](http://www.aetheric.co.uk)



CONTACT

[enquiries@aetheric.co.uk](mailto:enquiries@aetheric.co.uk)

## EXPERTISE IN

SATELLITE  
COMMUNICATIONS

### BACKGROUND, EXPERTISE & SKILLS

As an independent consultancy, specialising in Satellite Communications, we support R&D, design, procurement and implementation of space segment and ground segment systems. We have an in-depth understanding of satellite communications networks and their relevance to commercial applications. Our expertise includes design; procurement; project management; and supervision of manufacture, test, installation and commissioning. Our experience includes working for clients on a world-wide basis.

### ACHIEVEMENTS & SUCCESS STORIES

We have performed feasibility studies for satellite communication systems, for example the provision of telecommunication service throughout Africa, and the augmentation of a terrestrial banking network. We have supported the design and the procurement of telecommunications satellites, including GNSS augmentation, broadband connectivity, television distribution and delivery, and data networks as supported applications. We designed and built a prototype transportable VSAT terminal. We also managed studies into the design standards for the user terminals of a broadband satellite communications network.

### INTEREST FOR FUTURE R&D&I COOPERATION

We are interested in applying our expertise and experience in support of R&D&I in all aspects of satellite communications. In particular, we would welcome opportunities to support researchers with little expertise, themselves, in satellite communications but with technology or IP that they wish to introduce into the satcom sphere.



YEAR ESTABLISHED

2012



NUMBER OF EMPLOYEES

22



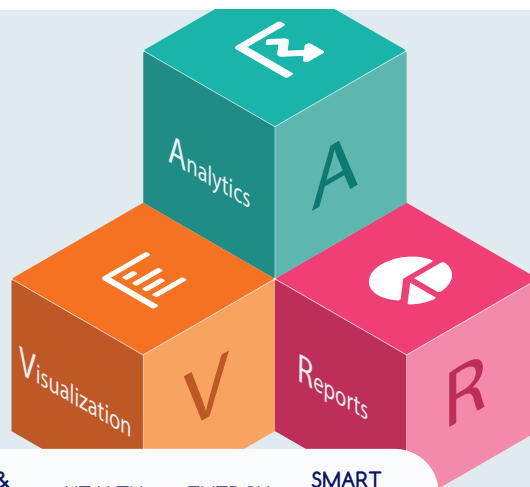
MORE INFORMATION

[www.app-art.gr](http://www.app-art.gr)



CONTACT

[info@app-art.gr](mailto:info@app-art.gr)



EXPERTISE IN

5G

IOT

MEDIA &  
CONTENT

HEALTH

ENERGY

SMART  
CITIES

## BACKGROUND, EXPERTISE & SKILLS

AppArt is a software development company, located in Athens, Greece, with activities focusing mainly in the design and development of Software Applications and Solutions targeted for Telecom Operators, Financial Organizations, Health and Energy Industry.

AppArt delivers both custom, as well as its own solutions. AppArt provides solutions in the areas of Big Data Analytics, implementing a plethora of Use Cases such as, Customer Experience Presentation, Network Performance Management, Digital Network Analytics, Customer Value Management, Enterprise Reporting etc. and in the areas of Mobile Applications creation and Web Development. AppArt provides its own platforms for Business Intelligence, Real Time Campaigns' Management and Next Generation Messaging business functions. AppArt team includes professionals with long market experience and technical expertise, providing the company with the advantage of being able to address business requirements in the most innovative ways.

## ACHIEVEMENTS & SUCCESS STORIES

In the area of 5G, AppArt is a member of the consortium of 5G-SOLUTIONS project (<https://www.5gsolutionsproject.eu/home>). With its participation in 5G-SOLUTIONS, AppArt is leveraging its capabilities even further as it is applying its skills and experience in Analytics area for the design and implementation of the real-time KPI visualization system. More specifically, AppArt is contributing in a) the detailed design of the KPI visualization system, b) the design and implementation of all the integration points of the KPI visualization system with the ICT-17-2018 E2E facilities and c) the development and deployment of all the necessary components comprising the KPI visualization system, in order to meet the required specifications.

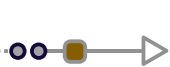
AppArt is also member of the consortium of a national funding program in the area of 5G, under the title "5G Traffic". 5G Traffic project is planned to be a development of a framework that will optimize the performance of 5G networks, with software that runs on the control plane and automates the management of forwarding rules at the data plane.

## INTEREST FOR FUTURE R&D&I COOPERATION

AppArt has already experience in participating in H2020 actions, , and is currently seeking for new, potential collaborations with other companies/enterprises and/or academic institutions within the frames of European projects, in order to expand further its activities in research and development within the 5G ecosystem.

AppArt is interested in activities related to requirements analysis, design of software solutions and solutions development , mainly in the Data Analytics area for data coming from various sources and to be utilized in different Use Cases of various industries. However AppArt is ready to welcome any other idea, or proposal within, but not limited only to, 5G area.





# ARCTOS LABS



YEAR ESTABLISHED  
2008



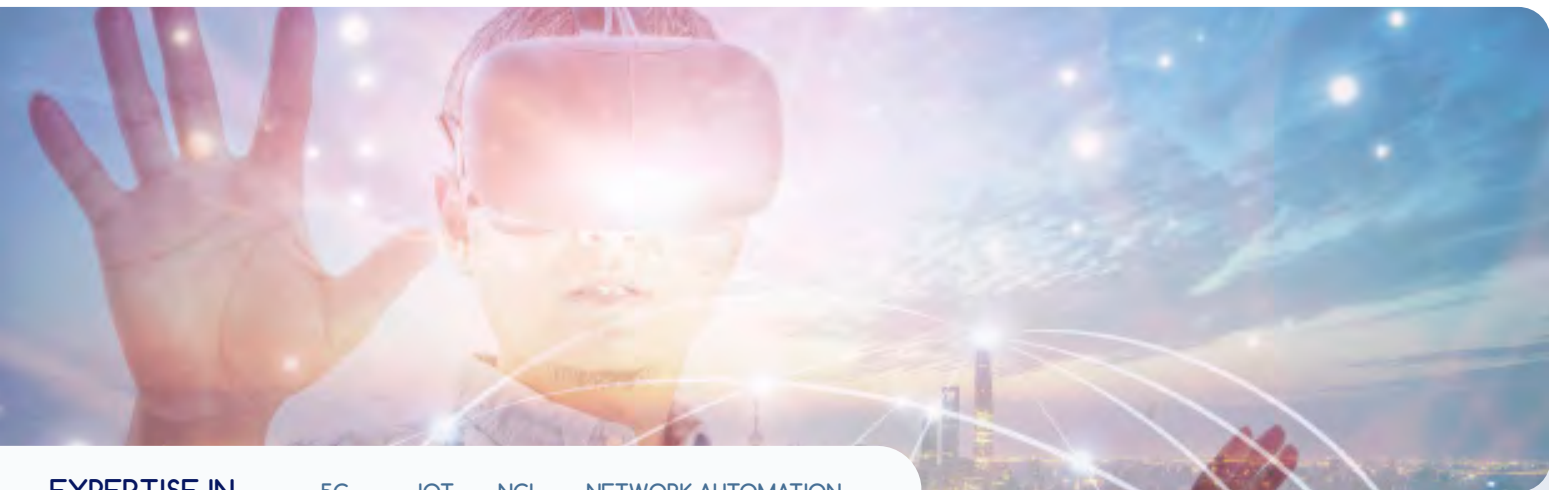
NUMBER OF EMPLOYEES  
10



MORE INFORMATION  
[www.arctoslabs.com](http://www.arctoslabs.com)



CONTACT  
[mats.eriksson@arctoslabs.com](mailto:mats.eriksson@arctoslabs.com)



EXPERTISE IN

5G

IOT

NGI

NETWORK AUTOMATION

## BACKGROUND, EXPERTISE & SKILLS

The team consists of very senior consultants with a wealth of experience from the leading global telecom companies. Our experience covers mobile and core systems, software technology, services development, as well as business management.

We are currently active in 5G R&D, edge optimization & automation etc.

## ACHIEVEMENTS & SUCCESS STORIES

We provide unique technology for edge workload optimization and similar scenarios that has been showcased in PoC's and in major international conferences (such as MWC)

## INTEREST FOR FUTURE R&D&I COOPERATION

Arctos Labs is interested in collaboration projects that moves industry further when it comes to enable emerging edge compute applications and technology



YEAR ESTABLISHED

1996



NUMBER OF EMPLOYEES

100



MORE INFORMATION

[www.azcomtech.com](http://www.azcomtech.com)



CONTACT

[info@azcomtech.com](mailto:info@azcomtech.com)

EXPERTISE IN

5G IOT

SATELLITE  
COMMUNICATIONS

HEALTH

SMART  
CITIES



## BACKGROUND, EXPERTISE & SKILLS

Azcom Technology is a leader in advanced wireless communication with two decades of experience. It provides a complete suite of software IPR and hardware platforms to build and deploy commercial and special purpose solutions for cellular communications, automotive, aerospace, home automation and mobile applications. Azcom provides highly specialized expertise in areas such as signal processing, algorithm design/simulation and DSP software development for multiple application types, including cellular networks, space and radar communication. The company has experience, competency, established processes and structure to execute complex projects and product development on a turn-key basis. Azcom offers a wide range of product engineering services across a wide range of development platforms and application domains. Azcom involvement in H2020 projects started in 2015.

## ACHIEVEMENTS & SUCCESS STORIES

Azcom Technology has successfully participated in funded 5GPPP projects such as 5G NORMA and 5G CORAL. From all these collaborations Azcom developed a strategic 5G knowledge. In the first participation Azcom small cell was controlled by the innovative orchestrator proposed by the 5G NORMA project. Then Azcom 5G focus also involved the automotive field, through PoC realization both hardware and software of an On Board Unit, within the 5G CORAL project. The 5G CORAL demo allowed the connection of vehicles by means of a distributed network, leading to a quicker and distributed manner information exchange. Direct consequences were the optimization of the network response, then improving driver safety.

## INTEREST FOR FUTURE R&D&I COOPERATION

Azcom Technology is interested in 5G services and gNB and RU developments, from the low PHY to the higher levels of the protocol stack. Azcom is interested in big tier client and also other small cell partner to help them in building a complete 5G solution. In addition our interest is in radar automotive, biomedical, vehicular communications solutions, home automation, space and satellite communications as well.





**YEAR ESTABLISHED**  
1991



**NUMBER OF EMPLOYEES**  
50



**MORE INFORMATION**  
[www.beia.eu](http://www.beia.eu)



**CONTACT**  
[george@beia.ro](mailto:george@beia.ro)

**EXPERTISE IN** 5G IOT NGI **SATELLITE COMMUNICATIONS** **TELECOMMUNICATIONS EQUIPMENT** **MEDIA & CONTENT** **TRANSPORT & LOGISTICS** **HEALTH** **ENERGY +**

## BACKGROUND, EXPERTISE & SKILLS

BEIA Consult International is a SME performing research, design, production, distribution, sales, installation and service.

BEIA is one of the leading providers of telecommunications equipment and solutions in Romania and offers consultancy services for carrier grade infrastructure, communication solutions for PABX, voice mail, IVR, call centre, VoIP services.

BEIA has R&D expertise in Cloud and embedded M2M telemonitoring applications, developing IoT based platforms such as agriculture monitoring platform for monitoring ecological parameters, and systems for irrigation management.

BEIA provides managed services & system integration, IP-Wireless-SCADA, GPRS/CDMA communications with TCP/IP embedded, GPS applications, µ-controller programming, software development.

BEIA is certified ISO 9001, 14001, 18001 and 27001 and is a member of various professional organizations such as ARIES, PMI, IEEE, AHK, IPMA.

## ACHIEVEMENTS & SUCCESS STORIES

The company's references include over 5,000 national and EU projects for IT and communications solutions, enterprise cloud communications and telemetry, energy, smart cities, public safety, radio networks, etc.

**CitiSim** - Smart City 3D Simulation and Monitoring Platform

**COSIBAS** - Cognitive services for IoT-based scenarios in the industrial domain

**ESTABLISH** - Environmental Sensing To Act for a Better quality of Life: Smart Health

**Mobiway** - Mobility Beyond Individualism: an Integrated Platform for Intelligent Transportation Systems of Tomorrow ProSe - Proximity Services Framework

**Power2SME** - Aims to create a cloud system that will change SMEs' way of consuming energy

**SWAM** - Smart WATER Management system for better environmental sustainability

Other projects (finished and ongoing H2020, ECSEL, MSCA, Eureka/Eurostars, ITEA, Celtic, Erasmus, ERA-Net, AAL, BBI, COST, etc.) can be found on BEIA sites.

## INTEREST FOR FUTURE R&D&I COOPERATION

BEIA is interested for future R&D&I cooperation in the following research areas (not exclusive): IoT, Cloud and embedded M2M applications, agriculture, environment, smart cities, smart mobility, health and well-being, energy, digital industry, digital life, etc.

To develop our projects or to cooperate within other projects, we need partners to build a comprehensive "ecosystem", interdependent on one another.

1. Horizontal partners: to provide the unified, standards-based network infrastructure and contribute with technologies and experiences to create a complete solution.
2. Vertical Partners: to solve market-specific business problems and address particular use cases, to have the knowledge of specific business operational.
3. Geographic, from Europe and other continents: to understand local environments, laws (such as data privacy regulations), and to facilitate project deployments.



YEAR ESTABLISHED  
2005



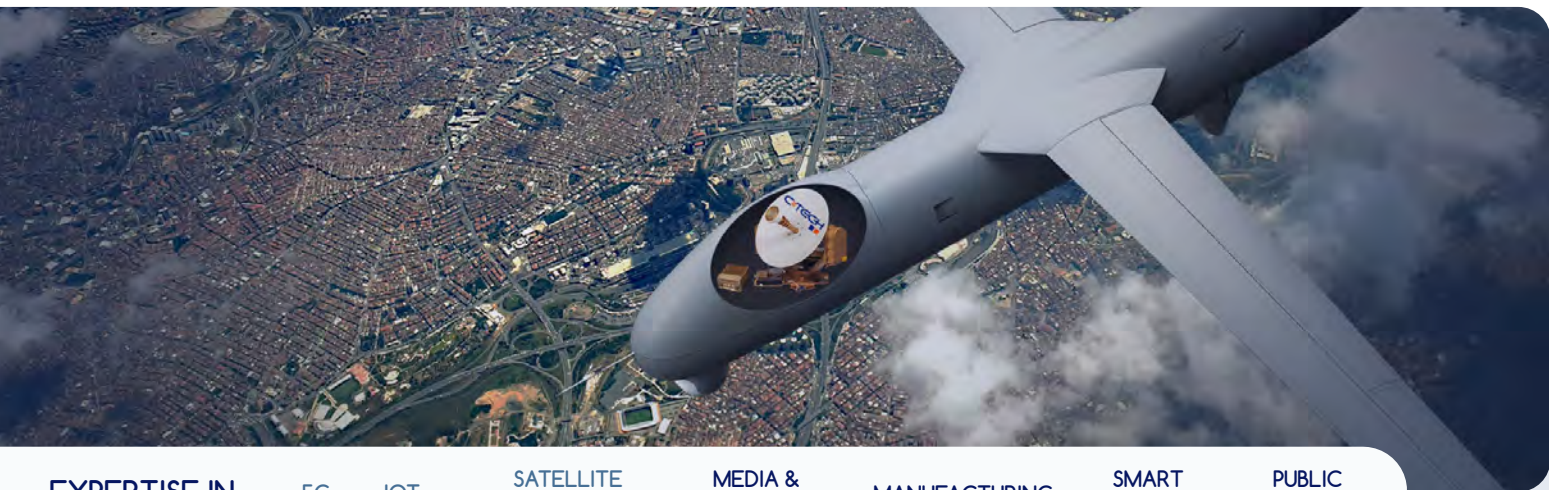
NUMBER OF EMPLOYEES  
172



MORE INFORMATION  
[www.ctech.com.tr](http://www.ctech.com.tr)



CONTACT  
[ahmet.akan@ctech.com.tr](mailto:ahmet.akan@ctech.com.tr)



EXPERTISE IN

5G

IOT

SATELLITE  
COMMUNICATIONS

MEDIA &  
CONTENT

MANUFACTURING

SMART  
CITIES

PUBLIC  
SAFETY

## BACKGROUND, EXPERTISE & SKILLS

C Tech Information Technologies Industry and Trade Inc. founded in 2005, operates in Defense, Aerospace and Satellite Technologies, Communication Systems, Cyber Security, Modeling and Simulation.

C Tech accomplishes its mission of developing innovative products and creating solutions for national and international markets with its knowledge and experience in information and communication technologies and with its experienced human resources.

C Tech has system engineering, electronic hardware design, digital design, communication system design, RF design, embedded and PC based software design and system development capabilities and integration and production capabilities comprised by these capabilities. C Tech offers products and solutions to various public, private and international stakeholders as the contractor of the projects.

## ACHIEVEMENTS & SUCCESS STORIES

C Tech, a subsidiary of TUSAŞ, is one of the few private sector company with infrastructure in electronic design, software development and production under the Defence, Aerospace standards of our country, together with the subcontracting ecosystem. Our company is one of four company in the domestic communication development consortium of TÜRKSAT-6A which is the biggest R&D program and vision project of our country up to today within the scope of the design and production works of military and civil satellite communication systems that it conducts.

C Tech has ISO-9001: 2008 and CMMI Level-3 quality certifications, Production Permission Certificate issued by the Ministry of National Defence, National and NATO Facilities Safety Certifications. It is based on internationally accepted standards and approaches such as IEEE-12207 and MIL-STD-973.

## INTEREST FOR FUTURE R&D&I COOPERATION

C Tech considers research and development as core business, actively taking part in European and international funded research projects since its incorporation.

C Tech is looking for international partners focused on R&D&I cooperation in the areas of emerging 5G technologies, Smart Technologies, AI and ML, telecommunications, satellite services, cyber security, V2X and IoT.



YEAR ESTABLISHED  
2015



NUMBER OF EMPLOYEES  
10



MORE INFORMATION  
[www.cumucore.com](http://www.cumucore.com)



CONTACT  
[info@cumucore.com](mailto:info@cumucore.com)

## EXPERTISE IN

5G

IOT

SDN, MEC,  
EMBMS

MEDIA &  
CONTENT

SMART  
CITIES

PUBLIC  
SAFETY

## BACKGROUND, EXPERTISE & SKILLS

Cumucore is a spin off from Aalto University which products include results of several research projects in cooperation with industry partners such as Nokia, Ericsson, Huawei and Coriant/Infinera.

Ultra-reliable 5G packet core enhanced with SDN mobile backhaul orchestrator to manage network slices and Multi Access Edge (MEC) edge computing. The 5GC includes NB-IOT and eMBMS running in dedicated servers or virtualized on the cloud.

Cumucore 5GC has been deployed in several trials and pilots in Italy, South Africa and middle east showing reliable and optimized packet core for private LTE, Industrial environments and small deployments.

## ACHIEVEMENTS & SUCCESS STORIES

Active participation in EU-KR project related to usage of UAV for firefighting including network slicing and MEC for URLLC required for emergency use cases.

Participation to 5G-SMART project for ultra-reliable 5G Core and network slicing for Industrial use cases.

Cumucore as part of Primo-5G project in cooperation with project partners have achieved an important milestone. The first deployment world wide of intercontinental 5G mobile network where Cumucore 5G Core is running in Korea at Yonsei University and Cumucore User Plane GW (UPF) is running in Helsinki at Aalto University (<https://twitter.com/PriMO5G/status/1202260945168486400>). This open new business models for mobile operators, private and industrial internet 5G networks.

## INTEREST FOR FUTURE R&D&I COOPERATION

Cumucore is interested to partner with other SMEs to participate in pilots on NB-IoT, eMBMS, Industrial Internet and private 5G networks. We are looking for partners complementing Cumucore portfolio on RAN including SDR and Cloud-RAN as well as OSS and BSS.





YEAR ESTABLISHED

2017



NUMBER OF EMPLOYEES

10



MORE INFORMATION

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CONTACT

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EXPERTISE IN

IOT

MEDIA &  
CONTENT

MFG.

HEALTH

ENERGY

SMART  
CITIES

## BACKGROUND, EXPERTISE & SKILLS

CyberEthics Lab. (CEL) is an Italian SME with a holistic vision of innovation, generated by efficiency, scientific curiosity, and respect for human beings. CEL promotes innovation, ethical awareness and ethical behaviour to build confidence and trust within the society. CEL leverages on the experience and knowledge of its multidisciplinary members (i.e. ICT, Law, Philosophy, Politics, Management, Economy), some of them teaching at University, and who are working in numerous R&D activities in the context of inter-disciplinary EC Research projects (i.e. 5G-SOLUTIONS, PHOENIX, PERSONA, ASSISTANCE, PERSIST). CEL has formulated its own methodology on ethical, societal and legal assessment. This is a relevant aspect and it is applied for the 5G technology solution assessment to ensure its future full acceptance and sustainability.

## ACHIEVEMENTS & SUCCESS STORIES

Here below two success stories from international cooperation and solutions for customers.

Societal acceptance analysis in security border solutions and eHealth ecosystems. Security and health are often seen antithetic topics, however CEL – with its own RRI approach (Responsible Research & Innovation) and Ethical Societal and Legal assessment methodology - has provided these two domains with qualitative and quantitative tools and methods to measure the social acceptance not in terms of technological usability, rather for enabling suitable alignments of human values and technological innovation. This experience is extended in 5G-SOLUTIONS.

Innovative engagement of stakeholder: in the context of 5G-PPP and security border solutions, CEL is fruitfully adopting best practices from PMBOK and OpenPM2 methodology for the engagement of community of stakeholders.

## INTEREST FOR FUTURE R&D&I COOPERATION

CEL's offering is mainly based on promoting innovation and new opportunities in the market as well as creating ethical awareness and promoting ethical behaviour to build confidence and trust. In particular CEL's actions are also directed to promote the inclusion of legal and ethical concerns in the design and implementation of new technologies, the identification of risks on individual fundamental rights and the issuance of recommendations aimed to make technologies compliant with ethical principles and the relevant legal framework. CEL aims to reach either European and international partners and one of its main strength is its capacity to adapt and target its assistance depending on the concrete needs and situations.



YEAR ESTABLISHED

2018



NUMBER OF EMPLOYEES

6



MORE INFORMATION

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CONTACT

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EXPERTISE IN

5G

IOT

VR/AR

MEDIA &  
CONTENT

TRANSPORT &  
LOGISTICS

SMART  
CITIES

## BACKGROUND, EXPERTISE & SKILLS

DigitalTwin Technology is software solution provider for construction and ICT industry. We create digital twins of construction site and urban cities for real-time monitoring and operations. We generate simulation behaviour of those 3D model to predict any possible accidents to mitigate in advance. 5G technology, with its promises of immersive virtual reality, will be a data hungry generation of wireless communications. Arrival of 5G will mean we can push these capabilities away from the PC and into something called the edge cloud, so we only require the headset. This is our cloud AR/VR technology. Cloud VR/AR technology is set to be a disruptive form of immersive multimedia in a number of different ways.

## ACHIEVEMENTS & SUCCESS STORIES

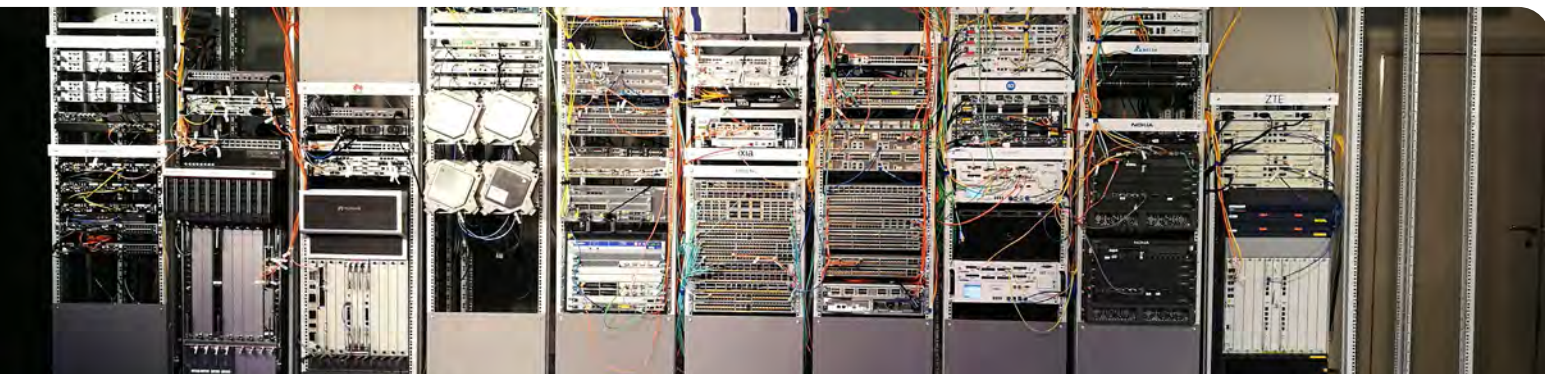
Tunnelware is a VaaS (Virtuality as a Service) for tunnel construction industry to manage the construction process while managing the data generated by various sensors and human interaction. With a focus on reducing cost and waste, and increasing productivity, the system will improve the construction process at every stage, delivering "faster builds to a higher quality with fewer defects and more sustainable tunnels.

Cityware is a digital twin of your city to monitor the infrastructure on real-time, simulate the real situation in the virtual world. Completely under GDPR regulation with no video streaming.

## INTEREST FOR FUTURE R&D&I COOPERATION

Engineers have been so preoccupied with designing and building the low-latency networks for these emerging applications that they've neglected the rest of our vast, tangled telecom networks. The result is that there is now a growing gap between the capabilities of the fixed and mobile sides of these networks. A big part of the problem is that the way data moves through our networks has been designed for efficiency on the mobile side. In the process our networks have become redundant and prone to clogging on the fixed side.

We are looking for partners in the area of networking who can help us taking this research to the next step. Partners can be from EU region or globally.



EXPERTISE IN

5G

IOT

NGI

MEDIA &  
CONTENT

TRANSPORT &  
LOGISTICS

MANUFACTURING

ENERGY

SMART  
CITIES

PUBLIC  
SAFETY

## BACKGROUND, EXPERTISE & SKILLS

EANTC (European Advanced Networking Test Center) is internationally recognized as one of the world's leading independent test centers for telecommunication technologies. Based in Berlin, Germany, the company offers vendor-neutral consultancy and realistic, reproducible high-quality testing services since 1991. Customers include leading network equipment manufacturers, tier-1 service providers, large enterprises and governments worldwide. EANTC's performance and scalability, interoperability, proof of concept, acceptance tests and network audits cover established, and next-generation fixed and mobile network technologies.

EANTC develops new test methodologies for 5G networks and applications. We especially focus on end-to-end interoperability, scalability, and performance tests. They cover network infrastructure (SDN transport, slicing, telco cloud/NFV, edge computing) as well as network applications for a range of industry sectors.

## ACHIEVEMENTS & SUCCESS STORIES

5G-VINNI: EANTC provides benchmarking methodology and state-of-the-art testing expertise in NFV, SDN, and Network Slicing. EANTC's particular focus on use case-centered, end-to-end testing will be applied in the project to develop realistic, representative, and reproducible tests.

Innovation cluster 5G BERLIN: is a joint network between research institutes and SMEs. EANTC develops new test methods for 5G networks and applications used in the 5G Berlin context. We focus on end-to-end interoperability, scalability, and performance tests covering both the network infrastructure (SDN transport, slicing, Telco Cloud/NFV, edge computing) and the applications for various industrial sectors.

IETF/NetSecOPEN: EANTC co-created an independent, multi-vendor, multi-labs, and multi-tool test program for NGFW, IDS, IPS, and UTM implementations. The methodology has been prepared as an IETF standard edited by EANTC. The test suite is used for evaluation and certification of network security products, and to provide guidelines for infrastructure testing.

ETSI: EANTC is involved with the TST WG in ETSI's NFV Industry Standardization Group. Capabilities include the management of descriptors and software images, life-cycle management of network services, and virtual network functions.

F-Interop: The European research project aimed to develop online test tools supporting IoT-related technologies.

## INTEREST FOR FUTURE R&D&I COOPERATION

EANTC has strong industry experience in interop and performance testing of SDN, NFV, 5G services and applications. Being an independent test lab, EANTC is interested in contributing testing, quality assurance, and lab setup/management expertise to research projects. We would like to contribute our extensive commercial telecoms experience and strong focus on realistic scenarios. We find projects exciting that help Europe to capture markets strongly (in TRL 7-8) or to create a technology leadership position (TRL 5-7).

We have worked in small, 50%-funded EU projects as well as in large consortia, fully funded. H2020 and follow-on projects are great, likewise smaller proposals e.g. in the Eurostars area. We are ok to provide Task and WP leaders if desired.





# eBOS

-  **YEAR ESTABLISHED**  
2003
-  **NUMBER OF EMPLOYEES**  
30
-  **MORE INFORMATION**  
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**EXPERTISE IN**

5G

NGI

AI/ML, GRAPH  
ANALYTICS

SMART  
CITIES

MEDIA &  
CONTENT

TRANSPORT &  
LOGISTICS

MANUFACTURING

## BACKGROUND, EXPERTISE & SKILLS

eBOS is an innovative software powerhouse SME providing technological advanced e-business software solutions to enterprise customers around the world. Headquartered in Nicosia, Cyprus, eBOS operates sales branches in Ireland and closely collaborates with strategic partners in Europe and in the USA. eBOS has a long history of engaging with international research and technology organisations, industrial leaders, universities, research organisations and SMEs to drive collaborative technological innovation and bring best-of-breed technologies to its enterprise customers and the wider community.

The development of our WiseBOS product portfolio has equipped us with core competencies which we deploy in R&D projects. The knowledge and innovation gained are then fused into our solutions and services. We seek to explore radically new solutions and technological breakthroughs.

## ACHIEVEMENTS & SUCCESS STORIES

eBOS is a partner in three 5G-PPP projects, 5G-SOLUTIONS (<https://www.5gsolutionsproject.eu/>), MonB5G (<https://www.monb5g.eu/>) and 5G-ROUTES (starting in 09/2020). Through these projects, eBOS will develop multi-tenant front-end dashboards for KPIs visualisation, friendly to use intent-based APIs and cybersecurity solutions for 5G networks, thus advancing our knowledge and reinforce our understanding in 5G enabling technologies. eBOS plans to apply the results in the company's product portfolio for developing new innovative applications and solutions. Also, we aim to expand our customer base, whilst identifying potential patents for IP protection in collaboration with other consortium partners. eBOS will contribute to the shaping of 5G enabling technologies, thus enabling Europe to maintain a leading and a decisive role in the field of 5G.

## INTEREST FOR FUTURE R&D&I COOPERATION

eBOS has a long history of fostering collaborations in R&D&I projects with EU partners and is inherently open to new opportunities for collaborations with interested partners. In particular, eBOS is interested in further developing and exploiting its Research & Development and Innovation activities through cooperation with industrial leaders, universities, research organisations and SMEs in 5G over a broad range of vertical sectors, including Next Generation Media, Transport & Logistics, Autonomous Vehicles, Manufacturing, Smart Cities, Next Generation IoT and Fintech.



# IOT



YEAR ESTABLISHED  
2010



NUMBER OF EMPLOYEES  
15



MORE INFORMATION  
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EXPERTISE IN

5G

IOT

SATELLITE  
COMMUNICATIONS

SMART  
CITIES

PUBLIC  
SAFETY

## BACKGROUND, EXPERTISE & SKILLS

Easy Global Market (EGM), first, specialises in validation, testing & interoperability today mainly in IoT and 5G areas. EGM stepped in the 5G area to provide NFV V&V methods for 5G within the H2020 5GTango project and IoT related 5G use cases (IoT slicing) in H2020 5GinFIRE project. Second, EGM provides scientific and engineering services for IoT market from sensors (HW) to data analytics using experience from about 24 international research projects. This applies to vertical fields, such as in Smart cities, Smart water Monitoring, Aquaculture and Agriculture where EGM is currently active within 10 running H2020 projects. In these fields EGM is exploring the use of 5G available technologies (e.g. NB-IOT) for developing devices or virtualized services (e.g. VNFs)

## ACHIEVEMENTS & SUCCESS STORIES

On testing matters, EGM is working to provide a 5G NFV V&V platform. EGM has developed key devices to the Bioceanor start-up ( [www.bioceanor.com](http://www.bioceanor.com)) that is supporting booming demand in Aquaculture digitalisation and where 5G is demanded. EGM deployed advanced autonomous sea buoys in Polynesia to help monitoring coral bleaching. EGM is now working more actively in agriculture digitalisation, on soil monitoring and is about to deliver a prototype in the beekeeping area to save bees depopulation. After a first successful product, EGM plans to deliver a low-cost water quality sensor. EGM is also working on virtualized services for smart cities thanks to the EU-Japan project fed4IoT

## INTEREST FOR FUTURE R&D&I COOPERATION

We are looking for stakeholders in verticals which need key 5G devices or services exploiting our advanced expertise in IoT and virtualisation. We can work with a broad range of verticals with can be smart cities, automotive, agriculture, aquaculture, water networks, environment, public safety.

We can also develop for 5G-enabled verticals, solution to check KPI and to validate solutions with our V&V platform.



YEAR ESTABLISHED

2014



NUMBER OF EMPLOYEES

20



MORE INFORMATION

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CONTACT

[dalam@epitomical.com](mailto:dalam@epitomical.com)

EXPERTISE IN

5G

IOT

SATELLITE  
COMMUNICATIONS

NGI

TRANSPORT &  
LOGISTICS

MANUFACTURING

SMART  
CITIES

## BACKGROUND, EXPERTISE & SKILLS

Epitomical is UK based design & engineering company targeting the Transport & Smart Infrastructure Sectors. The company has a headcount of 20 full-time and part-time employees based across Western Europe, India and Japan.

The company has experience in Electrical & Electronic Systems, Embedded & Cloud software, Industrial Design and the planning and creation of Services. Our focus is on building Connected & Autonomous Systems for Air, Marine and Surface Transport Vehicles and associated Infrastructure. Over the past six years, Epitomical has designed and manufactured more than twenty different products for our own brand in addition to product development work for other parties.

## ACHIEVEMENTS & SUCCESS STORIES

The company has been successful in the design and launch of numerous products as well as in collaborating with numerous companies including Google, Sony and Jacobs.

Epitomical recently led and delivered Project Alloyed (an Innovate UK funded project) together with sixteen consortium partners. The project delivered a number of positive outcomes in the area of Connected & Autonomous Vehicles including a flexible architecture for connecting Vehicles, Infrastructure & Cloud services. Project details can be found at <https://alloyed.epitomical.com/>.

In 2019, the company was awarded Horizon 2020 funding for the 5G-HEART project led by the Finnish technical research organisation, VTT. 5G-HEART will trial 5G use-cases across multiple vertical markets including Transport, Healthcare & Aquaculture. Project details can be found at <https://5gheart.org/>.

## INTEREST FOR FUTURE R&D&I COOPERATION

The company is interested in collaborating with technology providers, local & regional authorities as well as other players within the Transport & Logistics ecosystem. This would include end users of services such as those in Healthcare, Construction and Regional & City operations.

Epitomical is currently delivering trials and development projects in Europe, Japan & India and would be interested in exploring other international markets for Connected & Autonomous Systems. These would include markets for autonomous systems leveraging drones, mass-market transport vehicles, pods as well as submersible and semi-submersible marine vehicles. Other areas of interest include organisations with an interest in Satellite Communications, Cellular telecommunications, HD Mapping & Cloud based services.



-  YEAR ESTABLISHED  
2019
-  NUMBER OF EMPLOYEES  
3
-  MORE INFORMATION  
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EXPERTISE IN

5G

IOT

MEDIA &  
CONTENT

TRANSPORT &  
LOGISTICS

MANUFACTURING

HEALTH

## BACKGROUND, EXPERTISE & SKILLS

FIVECOMM is a technology-based company spin off from the iTEAM Research Institute of Universitat Politècnica de València (UPV), founded in 2019 and focused on the use and implementation of 5G mobile technology for industrial applications. Its aim is to do innovation, design, development, production, integration, operation, maintenance, repair and commercialization of systems, solutions and products that make use of 5G, either with public or private networks. Fivecomm works in different research lines: a) management of a small fleet of automated guided vehicles (AGV); b) Smart operations of AGVs based on human gestures; c) VR immersion and AGV control; d) Remote driving

## ACHIEVEMENTS & SUCCESS STORIES

During the Global 5G event and the European Conference on Networks and Communications (EuCNC) 2019 conference in Valencia, the founding team of Fivecomm was involved in several innovative demonstrations using a 5G Stand Alone (SA) network. In particular: a live holographic call, live television content production, remotely-controlled operation of an industrial robot and a remotely-controlled connected vehicle.

## INTEREST FOR FUTURE R&D&I COOPERATION

Fivecomm is interested in creating future collaborations in the field of industry verticals specially in robotics, automotive and industry 4.0, either from European or international companies. Of course, Fivecomm welcomes proposals and ideas for new areas of collaboration in research and development.



-  YEAR ESTABLISHED  
2016
-  NUMBER OF EMPLOYEES  
10
-  MORE INFORMATION  
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-  CONTACT  
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## EXPERTISE IN

5G

IOT

VR/AR

MEDIA &  
CONTENT

SMART  
CITIES

## BACKGROUND, EXPERTISE & SKILLS

Fogus is a thriving SME in Greece that aims at integrating state-of-the-art technological advancements and cutting-edge research achievements, towards an immersive communication and computing experience. Founded by a group of industrial and academic experts covering a wide range of disciplines in the area of Information and Communication Technologies (ICT), Fogus exhibits strong research record and vast experience in managing and implementing ICT Research & Innovation actions. Holding experience that ranges from the design of mobile communication protocols to the development of custom-made software, Fogus undertakes: i) end-to-end set-up of network simulation and emulation environments for IoT and user-centric services, ii) development of network functions end protocols for access and transport network domains, ii) analysis of big data with expertise on mapping network and service performance parameters to user-experience metrics, iv) MEC-empowered service provisioning and integration for 5G.

## ACHIEVEMENTS & SUCCESS STORIES

Fogus has active role in leading consortia and forums for 5G networks. Currently, the company participates in the 5GENESIS (<https://5genesis.eu/>) project. 5GENESIS is a large-scale 5G experimentation project that aims at validating 5G KPIs for various 5G use cases, in both controlled set-ups and large-scale events. This will be achieved by bringing together results from a considerable number of EU projects as well as the partners' internal R&D activities in order to realise an integrated End-to-end 5G Facility. Moreover, the company develops integrated services for user-centric digital content delivery in 5G mobile data networks that will be founded on the pillars of a) blockchain based wireless network resource sharing, b) QoE-enhanced video content delivery, c) software-defined networking and d) cache-enabled mobile data networks.

## INTEREST FOR FUTURE R&D&I COOPERATION

Fogus research and development team has vast experience in participation to many European R&D projects in the past, including FP7 and H2020 actions, ICT, MSCA ITN, IAPP and RISE actions. The company is mainly interested in 5G and beyond research projects. Strategically, the company is looking for academic and industrial partners for potential collaborations in the following directions: i) exploitation of the last advancements in ICT sector to provide complete end-to-end solutions to vertical industries, ii) scientific research on innovative ideas for wireless mobile networking and service provisioning, and ii) participation in training and knowledge sharing activities, as explained in the MSCA work programme.







YEAR ESTABLISHED  
2017



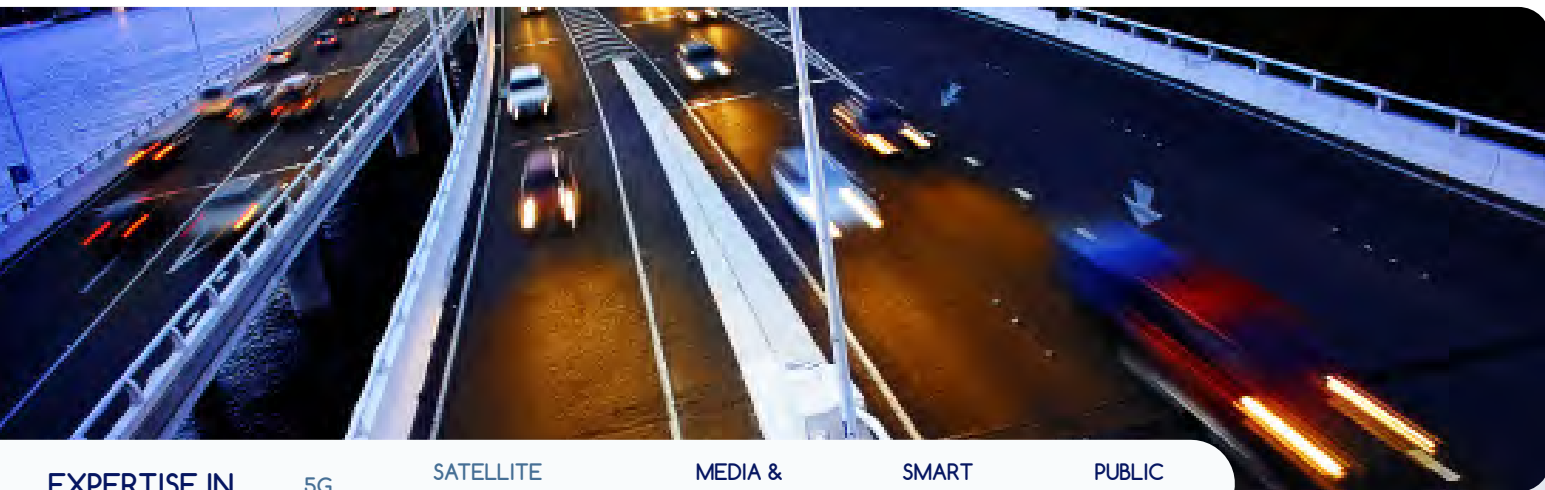
NUMBER OF EMPLOYEES  
2



MORE INFORMATION  
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EXPERTISE IN

5G

SATELLITE  
COMMUNICATIONS

MEDIA &  
CONTENT

SMART  
CITIES

PUBLIC  
SAFETY

## BACKGROUND, EXPERTISE & SKILLS

- Media. New mechanisms to broadcast content and provide personal TV. Assistant to ITU-D on supporting new advanced entertainment systems. Also, research analysis on new preferences of content viewers and comparison of efficiencies of different delivery platforms (satellite, cable, terrestrial over the air, OTT)
- Automotive. Designers and supporters of new solutions for Car2Car communications
- Public Safety. Involvement on the standardization processes for ICT solutions applicable to PPDR.

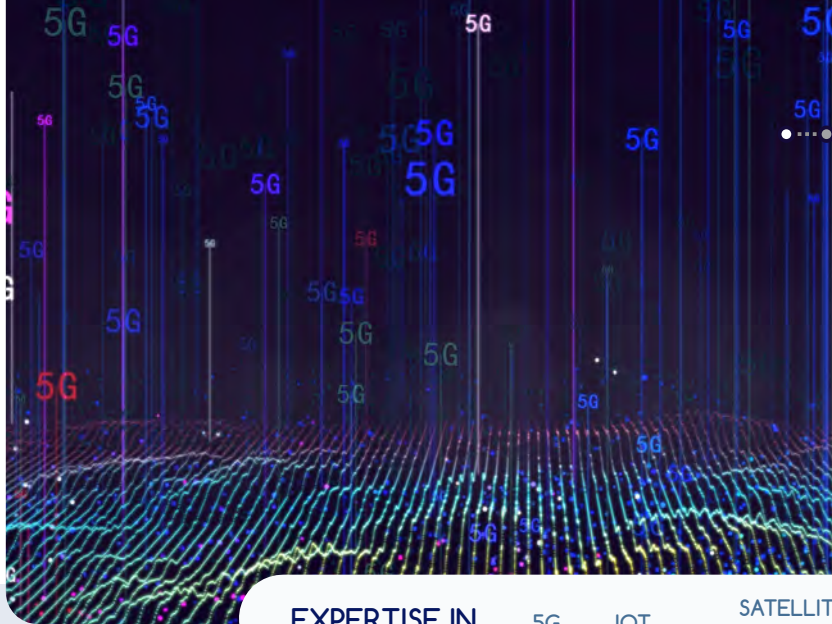
## ACHIEVEMENTS & SUCCESS STORIES

Main areas of work have been the assessment of suitable spectrum for 5G and integration of satellite and terrestrial networks. HI has conducted studies on the use of current available spectrum and future opportunities for 5G.

## INTEREST FOR FUTURE R&D&I COOPERATION

Widely involved in activities in Europe, Latin America and Africa. Assistance is regularly provided to Governments of Mexico, Colombia, Paraguay as well as ongoing activities in Africa.. HI interest in Morocco, Algeria, Tunisia, Egypt, Lebanon, Argentina, Chile, Brazil, Ecuador, Perú, Venezuela, Colombia, Panamá, Costa Rica, Honduras, Mexico.

Main technology areas are related to spectrum management and efficiency on the use of the spectrum through intelligent terminals capable to share the spectrum.



YEAR ESTABLISHED

2014



NUMBER OF EMPLOYEES

15



MORE INFORMATION

[www.incelligent.net](http://www.incelligent.net)



CONTACT

[info@incelligent.net](mailto:info@incelligent.net)

EXPERTISE IN

5G

IOT

SATELLITE  
COMMUNICATIONS

NGI

TRANSPORT &  
LOGISTICS

HEALTH

FINTECH, PUBLIC  
SECTOR

## BACKGROUND, EXPERTISE & SKILLS

Incelligent delivers Predictive and Prescriptive Analytics solutions, tailored for the sectors: (a) telecommunications; (b) fintech/banking; (c) public sector, focusing on social security, taxation and customs. In the area of telecommunications, the Incelligent product (working name: RAN.ai) targets: (a) Proactive capacity planning and network resource management, at the access and backhaul segments; (b) Proactive customer experience (CX) management; (c) Customer management applications with emphasis on risk minimization; (d) Telco data monetization through the generation of actionable insights, based on traffic concentration and mobility predictions; these empower service providers to optimize their offerings; benefitting sectors ranging from transport infrastructures, to retail / stadiums / malls, and to citizen security / health (including the assessment of pandemic situations as COVID-19).

The target of the vertical (banking, public) sector products is overall risk minimization, customer satisfaction, and optimization of the efficiency of the operations (of the banking or public sector entity).

The Incelligent products rely on: (a) standard and in-house built / patented methodologies,

based on Machine Learning (ML) and Artificial Intelligence (AI); (b) means for efficient Big Data management and for flexible functionality deployment.

Incelligent technologies have a footprint in Greece, in Europe and in Middle East. Announcements on successes in further areas are underway.

## ACHIEVEMENTS & SUCCESS STORIES

Incelligent is proud to work in the context of 5G PPP, to contribute in the shaping of technologies for 5G and for the generations to follow, Beyond 5G (B5G).

Through its participation to the 5G PPP projects, MATILDA and 5G-PHOS, Incelligent was enabled to mature its technology (in terms of functionality, positioning in standards, etc.), to conduct showcases, and to enhance its expertise with respect to the 5G ecosystem technologies. Advanced services were built by Incelligent, for areas like malls, venues, stadiums, of interest to vertical players and network operators.

Through project LOCUS, Incelligent is building analytics that leverage on advanced localization information, which can have various degrees of detail. Information can come from 3GPP and WiFi standards, operating at sub-6 GHz or at the mmWave

bands. Based on raw information and on the Incelligent analytics, the generation of more accurate insights is achieved, therefore, powering advanced network planning, as well as further location-aware applications.

## INTEREST FOR FUTURE R&D&I COOPERATION

Incelligent will continue to pursue research and development engagement towards B5G/6G, to maintain competitive advantages, and also for contributing to the maintenance of a prominent European role in the field.

Incelligent aims at developing algorithms for proactive resource and customer experience optimization in B5G / 6G contexts. Moreover, there is the ambition to continue enhancing the development of advanced services that monetize telecommunications data. In addition, there is interest in creating future collaborations in the areas of fintech, public sector applications, as well as smart venues.

Incelligent is an experienced partner, with an extrovert and cooperative mentality, in search for cooperation on research and products development, with an eye for applications with a worldwide potential.



YEAR ESTABLISHED  
2017



NUMBER OF EMPLOYEES  
7



MORE INFORMATION  
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EXPERTISE IN

5G

IOT

CHATBOT  
APPS

TRANSPORT &  
LOGISTICS

HEALTH

ENERGY

SMART  
CITIES

## BACKGROUND, EXPERTISE & SKILLS

INFOLYSIS P.C. is an innovative SME company, established in Athens, Greece, specialising on the design and development of chatbots, either as custom-made standalone applications or as subscribed-based services (Chatbot as a Service) via the privately owned chatbot platform. Chatbots are applications that simulate human conversation, based primarily on conversational flows, enriched with DL/ NLP technologies for more sophisticated solutions.

INFOLYSIS is committed to driving research results forward in order to expand chatbot applicability in novel ICT use-cases by experimenting with novel technologies, such as 5G, SDN/NFV at the network edge and container-based virtualization in IoT domains. An indicative example includes the INFOLYSIS IoT Virtual GW, which offers the provision of agile interoperability over heterogeneous IoT domains, along with a user friendly chatbot interface.

## ACHIEVEMENTS & SUCCESS STORIES

In 2017, INFOLYSIS achieved to commercialise the first chatbot business solution over Viber in Greece, enabling food ordering via chatting. This pioneering solution created strong business cooperation with Viber, granting to INFOLYSIS the title of Viber Preferred Enabling Partner.

Since then, INFOLYSIS demonstrated its solutions to many events organised by Viber. Two events are standing out, the "Viber for Business Innovation Day" at SNFCC and the "Viber Chatbot event" at INNOVATHENS, where both the CEO of Viber Mr. Djamel Agaoua and the VP of Global Partnerships Mrs. Cristina Constandache were present, together with key-players from the Greek market.

Concerning R&D, INFOLYSIS successfully participates in two 5G-PPP/H2020 projects, 5GENESIS ([www.5genesis.eu](http://www.5genesis.eu)) and 5G!Drones ([www.5gdrones.eu](http://www.5gdrones.eu)), which validate 5G applicability in real life use-cases.

## INTEREST FOR FUTURE R&D&I COOPERATION

INFOLYSIS plans to further enhance chatbot characteristics and functionalities with DL/ NLP technologies for providing AI-driven chatbots to the Greek market and therefore there is a strong interest for building a cooperation with AI specialised companies.

Moreover, INFOLYSIS is looking for expanding chatbot applicability to new use-cases, such as improving citizen engagement in smart cities and to smart agriculture use-cases for simplifying continuous monitoring process.

Finally, INFOLYSIS also aims to expand its target market for the privately owned chatbot platform beyond the boundaries of Greece, targeting at popular Viber international chatbot markets in Europe, Russia and Asia, but also extending chatbot development over additional messaging platforms that are popular in specific countries, targeting at niche markets.





# interinnov



YEAR ESTABLISHED

2009



NUMBER OF EMPLOYEES

5



MORE INFORMATION

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EXPERTISE IN

5G

IOT

NGI

MEDIA &  
CONTENT

SMART  
CITIES

AGRIFOOD

## BACKGROUND, EXPERTISE & SKILLS

In 2009 interinnov started with one specific challenge in mind: bridge the gap between innovation and the real world. We want to transform the breakthroughs achieved by brilliant minds in Science and Technology into actual benefits to target communities and the society. We believe in a positive and colourful vision for the future.

After 10 years, interinnov is a proficient partner in the European and international Research and Innovation context, with a prominent role in several ICT initiatives including the 5G PPP, NGI, FIWARE, and FIRE. Interinnov is a Steering Board member of the NetWorld2020 European Technology Platform and a Board member of the 5G IA. We are involved in several 5G PPP projects with a strong focus on vertical sectors such as media & content, smart cities, and agrifood.

## ACHIEVEMENTS & SUCCESS STORIES

In the framework of the 5G PPP, interinnov coordinates key activities on community building and marketing communication since the initiative started in 2013, including the management of the YouTube channel and design of official printed material. interinnov is leading the impact, promotion and exploitation activities of 5G-MEDIA, one of the first European projects addressing the impact of 5G over the vertical industry of media. In addition, we are chairing the cross-project SME Working Group, responsible for empowering Small-Medium Enterprises.

Besides 5G, interinnov has become a pivotal partner in the new NGI flagship initiative from the European Commission. We are responsible for leading the strategy and activities to create synergies between Europe and the USA, via the NGI Explorers Programme and the Think NEXUS project.

## INTEREST FOR FUTURE R&D&I COOPERATION

interinnov is constantly looking for new partners and projects to strengthen its knowledge of the world of innovation. Our worldwide network of partners will give you access to top-level institutions from the Academia, Industry and Public Administration. Europe is our core centre of operations, strengthened with partners in the Americas, Africa and Asia.

We facilitate a professional framework to create interest-based networks, rapidly identifying and bringing in the key organizations that will strengthen the success of your endeavour. We make your innovation attractive, by giving it an outstanding visibility and market position to deliver your value proposition to the right target audiences. We increase the competitiveness and capacity of your innovation to access the market.



YEAR ESTABLISHED  
2014



NUMBER OF EMPLOYEES  
4 + 8 associates



MORE INFORMATION  
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EXPERTISE IN

5G

IOT

NGI

CYBERSECURITY

SMART  
CITIES

PUBLIC  
SAFETY

CRITICAL  
COMMUNICATIONS

TELECOMS

## BACKGROUND, EXPERTISE & SKILLS

INTERNET INSTITUTE Ltd. (ININ) is an innovation intensive SME, specialized in 5G performance and quality metrics development and validation, 5G testing, benchmarking and end-to-end validation, and quality monitoring and SLA assurance for orchestrated 5G infrastructures and services. Also, we are experienced in design, deployment and operation of reliable and resilient 5G infrastructures for public safety and critical communications sectors.

We address telco, corporate and vertical industrial sectors with our quality MONitoring (gMON) portfolio for performance monitoring and SLA assurance, benchmarking and end-to-end validation of communication infrastructures and services. In addition, we specialise in on-site critical communications, smart sensing and intervention monitoring services with our intervention MONitoring (iMON) and remote MONitoring (rMON) portfolios, customised for public safety and critical infrastructures.

## ACHIEVEMENTS & SUCCESS STORIES

We are proud of our continuous cooperation with a number of notable telco players, utility owners and public safety organisations, who help us in creating a realistic hands-on ecosystem for both innovative R&D pilots and actual deployments in practice. We are currently part of the 5G PPP Phase 2 program as part of the MATILDA project ([www.matilda-5g.eu](http://www.matilda-5g.eu)) where our primary focus is on quality and performance monitoring capabilities for 5G-orchestrated domains, as well as real-world 5G vertical use cases for emergency response domain. In addition, we've recently launched PPDR One, a one-of-a-kind 5G and NFV ready experimentation facility that facilitates hands-on experimenting with stationary and portable 5G deployments for public safety and critical communications sectors (<https://5ginfire.eu/ppdr-one-facility/>).

## INTEREST FOR FUTURE R&D&I COOPERATION

Our interests for the upcoming R&D&I cooperation are geared towards further advancements in 5G performance and quality monitoring and verification systems and intelligent network orchestration. In particular: quality assurance of mobile, fixed and cloud systems, including 5G related quality metrics development and validation, 5G testing, benchmarking and end-to-end KPIs validation; cybersecurity monitoring, quality monitoring and SLA assurance for 5G infrastructures and services; R&I and piloting of resilient real-time 5G critical infrastructures, and specialised 5G deployments for public safety, automotive, intelligent transport, and utility verticals.



YEAR ESTABLISHED  
1997



NUMBER OF EMPLOYEES  
21



MORE INFORMATION  
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research-and-development](http://www.iquadrat.com/research-and-development)



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EXPERTISE IN

5G

IOT

NGI

MEDIA &  
CONTENT

SMART  
CITIES

ENERGY

## BACKGROUND, EXPERTISE & SKILLS

IQUADRAT has a focused business plan specifically intended on delivering a “new generation of research tools for system level evaluation of wireless integrated communication systems”. The company is involved in projects with large corporate clients, mobile operators and public authorities. Our R&D department is involved in many National and EU-funded research projects, and has extensive know-how in 5G Networks, IoT, simulation methodologies for Radio Access Networks (RAN), Software Defined Networking (SDN) and Demand Response algorithms for Smart Grids. Our key products include: i) an innovative end-to-end 5G platform that employs Network Function Virtualization in conjunction with Machine Learning algorithms that offer automated (zero-touch) network management and orchestration at the cloud/edge/RAN, ii) a suite of System Level Simulators (SLS) that 802.11, 802.15.4, and 4G LTE networks, iii) an SLS for Smart Grids that implements Demand Response algorithms, and iv) an IoT platform for Smart Building automation.

## ACHIEVEMENTS & SUCCESS STORIES

Iquadrat is participating in a number of 5G-network related projects, such as the 5GPPP projects 5G-PHOS, MonB5G and 5GROUTE, the H2020-IoT SEMIOTICS, and the MSCA-ITNs 5G STEPFWD, SEMANTIC, MOTOR5G, and SPOTLIGHT. Iquadrat has gained extensive know-how in radio access technologies, network platforms, SDN, IoT and energy management methodologies for smart-grids. Key outcomes are i) our IoT platform for Smart Building automation that supports sensing of comfort related parameters (CO<sub>2</sub>, humidity, lux, etc.) via our own custom battery operated IoT nodes and transmit data over BLE or 802.15.4, and multi- IoT gateway setups with cloud-based control via a centralized controller; ii) our 5G SDN/NFV platform that decouples the RAN Control & Data Plane, and consolidates the control plane into a single centralized controller, enabling easier coordination among base stations and offering real-time control.

## INTEREST FOR FUTURE R&D&I COOPERATION

Iquadrat is interested in international cooperation in H2020 projects in ICT-related research and innovation, such as networking research for 5G and beyond, smart anything everywhere initiatives, tools for smart content in creative industries, etc.





EXPERTISE IN

5G

IOT

NGI

ENERGY

SMART CITIES

PUBLIC  
SAFETY

## BACKGROUND, EXPERTISE & SKILLS

IS-Wireless develops algorithms, protocols, and tools for 4G and 5G mobile networks. We provide licensable software in the two following areas: i) Software-Defined RAN (SD-RAN) – a NFV-compatible, standard-compliant RAN protocols ready for 4G/5G, it allows mobile networks to support more users with better performance at lower cost ii) the 5GToolset - experimentation solutions for mobile networks supporting research and education on 4G and 5G (5G NR). Our ambition is to bring 4G and 5G innovation for every university and research lab worldwide at affordable prices.

## ACHIEVEMENTS & SUCCESS STORIES

IS-Wireless has designed and develops innovative solutions for RAN virtualization like: the software-defined RAN (SD-RAN) – funded by the Public Authority in Poland; we have also developed the 5G Toolset – experimentation software for 4G/5G link and system level testing, and the unique solution called VNF Composition Framework (VCF) to support virtual RAN operation. Our radio resource management (RRM) solutions include among all 4G scheduler that has been integrated with the Eurecom OpenAirInterface to support carrier aggregation under the umbrella of FP7 Solder. It has been upgraded to also support 5G and multi-RAT scheduling (based on LWA, LWIP coexistence protocols). IS-Wireless is proud member of the two industry fora: O-RAN Alliance (O-RAN) and the Telecom Infra Project (TIP).

## INTEREST FOR FUTURE R&D&I COOPERATION

We are looking for partners willing to collaborate in: (i) development of 5G small cell protocols and radio resource management solutions for 4G/5G and cloud-RAN (ii) delivering cyber security solutions for 4G/5G small cells. We look forward to cooperate with different verticals (IoT/automotive, public safety, media) as we have our proprietary solutions for virtualized RAN that can be tailored and further adjusted per use-case (e.g. to complement existing products or solutions).



YEAR ESTABLISHED  
1996



NUMBER OF EMPLOYEES  
70



MORE INFORMATION  
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EXPERTISE IN

5G

IOT

NGI

SATELLITE  
COMMUNICATIONS

MANUFACTURING

HEALTH

SMART  
CITIES

PUBLIC  
SAFETY

## BACKGROUND, EXPERTISE & SKILLS

The main competences of ITTI related to 5G are in PHY layer (channel coding, modulation, signal processing, synchronisation) and MAC layer (admission control, congestion control optimization), cognitive resource control and service adaptation (cross-layer, context driven, machine learning based, QoE/QoS), network and cybersecurity, test campaigns (e.g. video systems, mobile data services) and validation by means of system/link level simulators (LTE, WiMAX).

Our expertise covers eHealth, energy, and public safety vertical sectors. We developed Medstar.co solution that offers telecare support for remote patients. In the energy sector, we worked on optimal control for smart cities (e.g. light control, energy management). We also have extensive expertise in economic evaluation of PPDR networks and social media usage in crisis management within the public safety sector.

## ACHIEVEMENTS & SUCCESS STORIES

ITTI has contributed to over 50 international R&D projects in the EC Framework Programmes (5FP, 6FP, 7FP, H2020), EDA programmes and ESA programmes.

In recent H2020 CAVICO (Context-Aware Video Controller for autonomous transport and security monitoring) project ITTI successfully tested in the 5GinFire testbed the developed system that is able to control the video streaming on the basis of measured QoS and QoE parameters. In another H2020 project – QoEST4CM (QoE Support for improved Crisis Management) we provided video streaming system, integrated with UAV in the RAWFIE testbed, enabling for adaptive change of video parameters depending on network conditions, and user requirements.

## INTEREST FOR FUTURE R&D&I COOPERATION

Having a competent and experienced team of telecommunication engineers and software developers, ITTI is interested in collaboration with partners on development of innovative solutions for vertical sectors in the 5G ecosystem. In particular, we are interested in integrating novel technologies to our eHealth Medstar.co solution to enhance its functionality leveraging 5G capabilities. We are also seeking partners for collaboration on security solutions for 5G networks.



EXPERTISE IN

5G

IOT

SATELLITE  
COMMUNICATIONS

MEDIA &  
CONTENT

TRANSPORT &  
LOGISTICS

## BACKGROUND, EXPERTISE & SKILLS

JCP-Connect is a French SME with expertise in caching and edge computing for verticals as events, transport and smart cities. We provide portfolio of HW and SW edge computing solutions as well as caching as NFV for content delivery in virtualised environments.

## ACHIEVEMENTS & SUCCESS STORIES

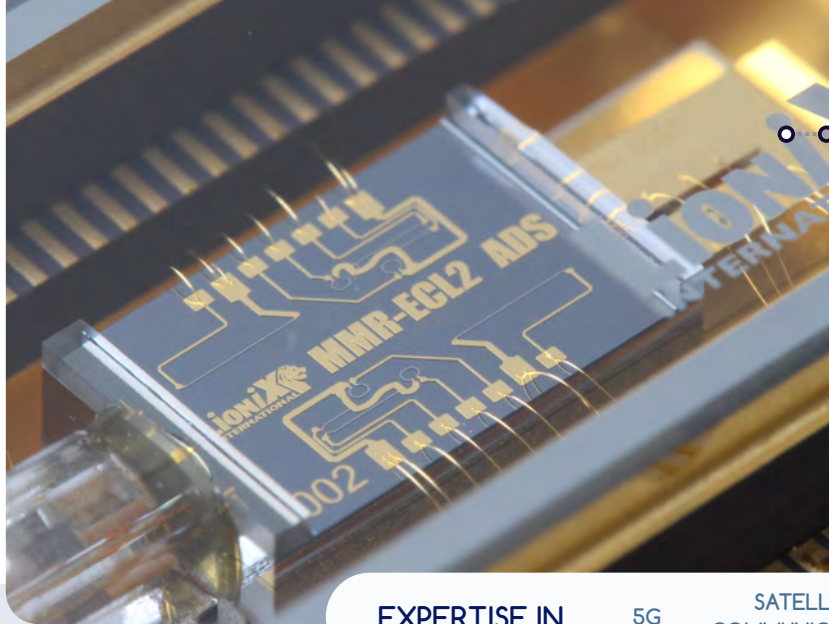
Our involvement in numerous H2020 projects (including Beyond 5G and FTI calls) has helped us develop our edge computing and content delivery portfolio. Our gateway MoBCache, mounted on vehicles such as bus, trains, or drones, can collect and process sensor data from the surrounding environment in a secure manner. Our content delivery is currently implementing enhanced security features.

## INTEREST FOR FUTURE R&D&I COOPERATION

We are interested to collaborate with telecoms, satellite operators, content and media providers, companies developing AI, etc. We are naturally open to European partners, but we would be happy to collaborate with partners from Africa, Latin America and Oceania as well.

We are interest in R&D collaborations in the following domains: Edge computing, MEC, caching, content security, intrusion detection, mobile IoT.





YEAR ESTABLISHED

2016



NUMBER OF EMPLOYEES

50



MORE INFORMATION

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EXPERTISE IN

5G

SATELLITE  
COMMUNICATIONS

OCT

MANUFACTURING

HEALTH

## BACKGROUND, EXPERTISE & SKILLS

LioniX International is a leading global provider of customized microsystem solutions, in particular integrated photonics-based, in scalable production volumes. We provide customized solutions for OEM's and System Integrators, from design to device, by vertical integration in scalable production volumes and maintaining technology leadership secured by strong IP position. As LioniX International we focus on Photonic Integrated Circuits (PIC) enabled modules based on our proprietary waveguide technology (TriPleX™), in addition to our other core competences micro-fluidics, opto-fluidics and MEMS. As vertically integrated company we deliver a complete solution to our OEM customers: from initial design through volume manufacturing of products.

LioniX is manufacturing partner for integrated microwave photonics optical beamforming networks in 5G-PHOS and blueSPACE. Our chips drive your business.

## ACHIEVEMENTS & SUCCESS STORIES

LioniX International secured a seven-figure contract for the development and fabrication of integrated photonic modules that enable ultra-high capacity broadband satellite communications from flatpanel aeronautical antennas. This contract with ViaSat Antenna Systems S.A. is part of the ESA project AIDAN and follows the years of intensive research and development of broadband solutions using microwave

photonics (MWP) beamformers on the proprietary TriPleX™ platform.

LioniX International obtained the prestigious PIC Award 2018 for "Advanced in PIC manufacturing" at the PIC International Conference in Brussels.

Magic Micro, a Kosdaq-listed South Korean electronic component company, acquired a majority share of 75% in LioniX International. This acquisition strengthens the position of both and clearly shows the Photonic Integrated Circuit (PIC) ecosystem is further maturing.

## INTEREST FOR FUTURE R&D&I COOPERATION

LioniX International has a strong R&D focus where more than 50 % of the employees have a PhD degree. The focus on integrated photonics, utilizing the benefits of the low-loss high contrast TriPleX™ microprocessors provide numerous solutions for a suite of applications in telecommunication/data communication, sat com, sensing health tech and health care.

The hybrid integration of InP and TriPleX PICs enables small and compact integrated modules with improved stability and performance.

Main topics of interest are: [1] implementation of microwave photonics (MWP) processing and analog photonic links (APL) and its application in mmWave beamforming for terrestrial and satcom networks, [2] hybrid tunable lasers for telecom and sensor applications [3] low-power actuation of complex processors through stress-optic tuning.





YEAR ESTABLISHED  
2006



NUMBER OF EMPLOYEES  
250



MORE INFORMATION  
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EXPERTISE IN

5G

IOT

SATELLITE  
COMMUNICATIONS

MEDIA & CONTENT

TRANSPORT &  
LOGISTICS

PUBLIC  
SAFETY

## BACKGROUND, EXPERTISE & SKILLS

LiveU is driving the live video revolution, providing live video streaming for TV, mobile, online and social media. Since the company invented cellular bonding, LiveU's portable live video transmission solutions have replaced traditional SNG trucks, offering far greater mobility and cost-effectiveness for global newsgathering, sports and events coverage. From backpacks to smartphones, and satellite/cellular hybrid to external antenna solutions, LiveU offers a complete range of devices for high-quality live video coverage, together with cloud-based management and video distribution. All LiveU products are 5G ready, designed to transmit effectively from the field over 5G networks. With 3,000+ customers in 130+ countries, LiveU's technology is used by global broadcasters, online media, sports organizations, public safety and autonomous vehicle manufacturers with teleoperation/remote-assisted driving.

## ACHIEVEMENTS & SUCCESS STORIES

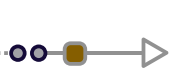
LiveU offers creative HEVC live video streaming solutions for global newsgathering and every type of sporting event, including the FIFA World Cup™, Winter and Summer Olympic Games, Super Bowl, US Collegiate Championships, IRONMAN and Absa Cape Epic mountain bike race (South Africa).

LiveU has been involved in a series of 5G tests worldwide, for example, teaming up with AT&T to trial 5G with its portable HEVC units for live news and sports broadcasts, and taking part in Vodafone's 5G Experience Day, delivering 4K feeds from the 4K camera and over the 5G network to test 5G potential.

LiveU is an active partner in successful EU collaboration projects, including: the 5GPPP research project, 5G-Xcast; 5G-Solutions (2019); 5G-Tour (2019); PrEstoCloud and others.

## INTEREST FOR FUTURE R&D&I COOPERATION

LiveU is looking for EU Horizon 2020 and international collaboration projects in: autonomous vehicles and connected cars, media and broadcasting, 5G, trials, public safety, telemedicine, video compression and video delivery over low cost public internet and any other area that requires reliable high-quality real-time video from the field for monitoring and/or control. LiveU contributes real-time video and data delivery over multiple cellular networks, high quality video over the public internet, remote teleoperation of SAE L3, L4, L5 vehicles and more.



YEAR ESTABLISHED  
2005



NUMBER OF EMPLOYEES  
28



MORE INFORMATION  
[www.magister.fi](http://www.magister.fi)



CONTACT  
[info@magister.fi](mailto:info@magister.fi)



EXPERTISE IN

5G

IOT

SATELLITE  
COMMUNICATIONS

TRANSPORT &  
LOGISTICS

MANUFACTURING

ENERGY

SMART  
CITIES

## BACKGROUND, EXPERTISE & SKILLS

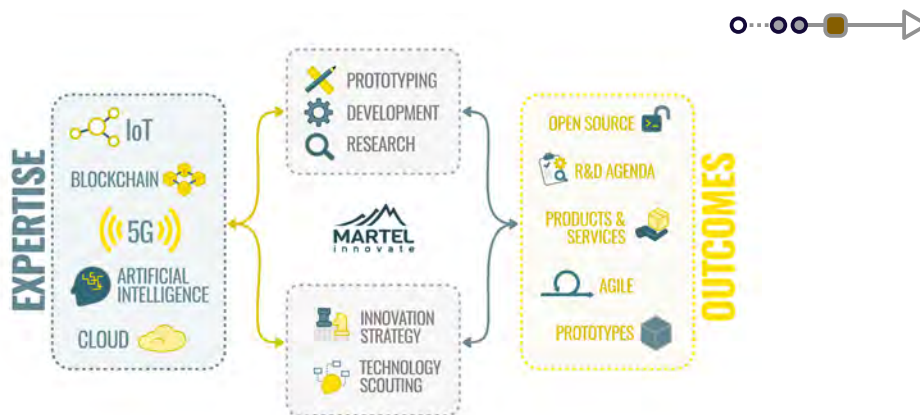
Magister Solutions is specialist in communication network simulation and emulation tools and services for modelling real world telecom (satellite and terrestrial) in detail. Services for telecommunication include network simulation environments, concept, algorithm and software development, machine learning expertise, testing and PoC development.

## ACHIEVEMENTS & SUCCESS STORIES

Magister Solutions has developed several simulators modelling terrestrial and satellite networks in details. One of the latest developments is a novel simulation framework called Self-Organizing Simulator 3 (SonS3) that makes use of real network data to enable an accurate performance analysis of mobility related SON use cases. In addition to simulator development, we also developed an MRO algorithm which adapts dynamically the Cell Individual Offset (CIO), and a performance analysis within a realistic urban scenario. The proposed MRO algorithm leads to an overall reduction of more than 30% in mobility problems without causing a significant increase in the number of HOs.

## INTEREST FOR FUTURE R&D&I COOPERATION

We are working as a R&D&I partner with companies that are developing wireless systems, providing telecom services or looking for expertise in telecommunications. These companies include Satcom vendors and operators, Telecom vendors and operators and companies in defence and aerospace sector.



-  **YEAR ESTABLISHED**  
1996
-  **NUMBER OF EMPLOYEES**  
16
-  **MORE INFORMATION**  
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-  **CONTACT**  
[info@martel-innovate.com](mailto:info@martel-innovate.com)

## EXPERTISE IN

5G

IOT

NGI

SATELLITE  
COMMUNICATIONS

MEDIA &  
CONTENT

TRANSPORT  
& LOGISTICS

SMART  
CITIES

PUBLIC  
SAFETY

## BACKGROUND, EXPERTISE & SKILLS

Martel is a dynamic Swiss-based company with more than 20 years' experience managing digital research and innovation projects across Europe and worldwide. After more than 100 projects, Martel has grown from its origins as a small consulting agency into a thriving organisation with employees located in offices in Zurich, Lugano and Lausanne. In the past five years, Martel's business has diversified to include research and development activities in the area of next generation internet technologies, such as 5G, IoT and Cloud. Our R&D department is specialised in virtualisation and orchestration of virtual resources, including IoT functions and Virtual Network Functions. Martel is an active member of key organisations including 5GIA, Network2020, FIWARE Foundation, BDV, AIOTI, IoT Forum, and NEM.

## ACHIEVEMENTS & SUCCESS STORIES

The proliferation of IoT and the rise of 5G are unleashing the potential to transform public services, transportation, safety, sustainability and infrastructures across many smart city scenarios. Orchestra Cities ([orchestracities.com](http://orchestracities.com)) is a data and IoT-driven solution allowing cities to collaboratively develop and share smart services using Open Source software, APIs and Data Models. It offers easy plug-and-play on top of 5G. Orchestra Cities was developed with the European cities of Antwerp and Helsinki and is now being trialled in Wolfsburg, Germany. It is modular and scalable, satisfying the needs of cities of different sizes. It allows cities to manage data access in a flexible way and in compliance with GDPR. Orchestra Cities supports different data formats and enables the creation of visual dashboards, which present a realtime view of city services.

## INTEREST FOR FUTURE R&D&I COOPERATION

Martel is interested in further developing Orchestra Cities and in trialling it in a variety of scenarios. These trials will complement and extend the platform's current smart cities focus and explore its development and deployment in other verticals, such as smart mobility, automotive, smart energy, sustainability and multi-media content scenarios. We are also looking to explore the behaviour of the Orchestra Cities platform combined with 5G technologies. In turn, this will allow the incorporation of 5G infrastructures and solutions in combination with advanced IoT, Cloud and AI. Our interest is in the convergence between IoT management solutions and 5G, including the usage of micro-services architectures. We are also looking to bring usage scenarios in the context of Electric Vehicle Charging Station Management, Parking Management, Air Quality Management and Waste Management.





YEAR ESTABLISHED  
2001



NUMBER OF EMPLOYEES  
38



MORE INFORMATION  
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EXPERTISE IN

5G

IOT

SATELLITE  
COMMUNICATIONS

MEDIA &  
CONTENT

TRANSPORT  
& LOGISTICS

ENERGY

SMART  
CITIES

PUBLIC  
SAFETY

## BACKGROUND, EXPERTISE & SKILLS

MBI has experience and interests in Business Analytics and Optimization, where MBI provides customized solutions for Risk Management, Business Intelligence and Optimization to mainly the Telco, Energy, Gas, Water companies and Satellite Communications and applications, where MBI closely collaborates with the satellite operators and SatCom ecosystem in a wide variety of innovative solutions in the area of hybrid satellite/terrestrial networks, entertainment, applications for mobile or automotive devices.

MBI Research and Development activities are mainly focused on advanced networking, optimization, signal processing, network planning and software defined radio technologies.

MBI has acquired a deep know-how on Software-Defined Radio and GPU technologies and more generally on software-based approach for the development of ground telecom components, both at hub and terminal side.

## ACHIEVEMENTS & SUCCESS STORIES

MBI solution for seamless vertical handover has been adopted by some leading European enterprises.

MBI provides solutions for IoT networks via satellite used in multiple domains (agriculture, energy, public safety, etc).

MBI works with the main European satellite operators and the European Space Agency in the standardization, development and testing of highly efficient, energy saving and green communications protocols.

MBI realized the first software implementation of a complete testbed for the ETSI S-MIM protocol.

MBI is patenting its solution to measure rain fields using satellite receivers.

MBI is founding member of the 5G-MAG (Media Action Group) in which needs of the broadcast and media domains are analysed in order to provide 5G standardization bodies with requirements and specifications.

## INTEREST FOR FUTURE R&D&I COOPERATION

MBI is willing to explore collaborations with partners whose intent is to integrate satellite communications in the 5G world, by applying virtualization and orchestration concepts to hybrid networks to be used for fixed and mobility applications.

MBI is also interested in bringing its large expertise on IoT via satellite in 5G networks.

Collaborations with satellite terminals manufacturers should be welcome.







YEAR ESTABLISHED

2004



NUMBER OF EMPLOYEES

10



MORE INFORMATION

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CONTACT

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EXPERTISE IN

5G

IOT

NGI

CYBERSECURITY

ALL VERTICALS

(MONITORING AND SECURITY MANAGEMENT  
SOLUTION APPLICABLE IN ALL VERTICAL SECTORS)

## BACKGROUND, EXPERTISE & SKILLS

Montimage specialises in the development of techniques and tools for security and performance analysis and management of 4G/5G/IoT networks using real-time monitoring and cyberprotection techniques. It provides flexible Security and Monitoring as a Service adapted for SDN/NFV-based dynamic environments. Montimage's expertise covers the detection, prevention and mitigation of cyber-security incidents in both the data and control planes. Its security management solution allows deploying and configuring monitoring agents to analyse network behaviour using DPI and AI techniques.

Montimage has deep knowledge of network and application protocols and behaviour; and, its products are completely build in-house. In consequence, they are trustworthy, adaptable, reliable, robust and can deal with high throughputs and complex systems. Montimage can rapidly provide proofs-of-concepts adapted to specific needs.

## ACHIEVEMENTS & SUCCESS STORIES

Montimage's solutions have been applied to improve the resiliency and trustworthiness of complex systems and adapted to different domains, including: automotive/transport, manufacturing/industry, health, telecommunications, critical infrastructures. The solutions can be extended to deal with proprietary protocols and analyse the behaviour and business activities of the different sectors.

Montimage has successfully deployed its solution in the SoftFire platform (Software Defined Networks and Network Function Virtualization Testbed within FIRE+, [www.softfire.eu](http://www.softfire.eu)) to improve the security-awareness of the operators; and its IoT solution in Fed4Fire platforms.

Montimage commercialises advanced solutions for creating instant 4G/5G mobile networks for emergency situations, events requiring extra bandwidth, and improving coverage in white/gray zones. It has an ongoing collaboration with Cumucore to commercialise 4G/5G mobile solutions in a box.

## INTEREST FOR FUTURE R&D&I COOPERATION

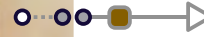
Montimage participates in many collaborative research projects that allow introducing innovative techniques into its products. For instance:

SISSDEN H2020 project where it analyses darknet and honeypot network traffic to detect low-intensity attacks and evasion techniques.

SENDATE CelticPlus project where it defines and implements new techniques for managing the security of SDN/NFV-based 5G networks.

ANASTACIA H2020 project where it implements new solutions for IoT network security.

Montimage is actively searching for new partnerships and collaborations. It can bring its technical knowhow and tools, its fast exploitation strategy, as well as its experience in the participation and management of projects in different research programs.



YEAR ESTABLISHED  
2017



NUMBER OF EMPLOYEES  
22



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EXPERTISE IN

5G

IOT

MISSION CRITICAL  
COMMUNICATIONS

TRANSPORT &  
LOGISTICS

ENERGY

SMART  
CITIES

PUBLIC  
SAFETY

MFG.

HEALTH

## BACKGROUND, EXPERTISE & SKILLS

Pioneers in the industry, Nemergent leads the way towards more open Mission Critical Communications. Nemergent Solutions SL has significant expertise in designing and prototyping novel PPDR (e.g. Blue lights) and Public Transport (e.g. FRMCS communications) solutions over mobile broadband technologies, supporting mission critical communications between end users. Nemergent's portfolio includes a complete and fully 3GPP standard MCPTT/MCS ecosystem made up of early implementations concerning MCPTT/MCS Application Servers (AS), MCPTT/MCS management servers and the Nemergent MCX Client for Android and Linux operating systems. The server-side components are designed as NFV components, fostering agile and flexible deployments in 5G-alike setups. The innovation-driven nature of the company promotes the establishment of commercial links with different UE, IMS and EPC leading companies.

## ACHIEVEMENTS & SUCCESS STORIES

Nemergent Solutions is involved in international R&D projects oriented to PPDR where it takes advantage of its best-of-breed products. The company is engaged in 5GPPP 5GENESIS project bringing the first real-world mission critical integration and use-cases over 5G and US NIST/PSCR MCS TaaSting to fulfil the needs of mission critical community for compliance testing (RAN5) based on TTCN-3 code specs. It has also finalized a OC2 project in Fed4FIRE+ and OC1 in INTER-IoT and it has also been involved in US NIST/PSCR PSIAP achieving end-to-end mission critical communications according to 3GPP specifications together with Sonim and their XP8 ruggedized devices. Nemergent Solutions is a regular company showcasing its technology in different events and counts with a network of well-established partners.

## INTEREST FOR FUTURE R&D&I COOPERATION

The R&D background shows the clear advocacy of the Nemergent Solutions to improve and adapt future MCS communications and the importance of first responders and public protection together with verticals such as railways, ports, fleets management, airports and mining among others. The firm is devoted to adapt and adjust the current mission critical products towards 5G technology and operations and therefore, aims at collaborating with partners providing orchestrators, MEC solutions, 5G Cores, gNodeBs, 5G UEs, deployables, drones, PPDR-related IoT products, and finally other 3GPP MCS compliant vendors and companies for interoperability purposes. These international collaborations are intended not only to serve as an early adoption of 5G operations, but also to assess the service-level KPIs of standardized mission critical products.



EXPERTISE IN

5G

IOT

NGI

SMART  
FACTORIES

MEDIA &  
CONTENT

MANUFACTURING

ENERGY

SMART  
CITIES

PUBLIC  
SAFETY

## BACKGROUND, EXPERTISE & SKILLS

Nextworks has long-term experience in 5G control and orchestration technologies, built on top of solid know-how of ETSI NFV and MEC specifications and architectures. We have deep hands-on expertise with various NFV MANO software tools (ETSI OSM, OpenBaton, Cloudify), SDN controllers (OpenDaylight, ONOS), VIMs (OpenStack), cloud native orchestration (Kubernetes). We developed various solutions for control and orchestration of Network Slices, Network Services and Service Chains made of Virtual network Functions in 5G environments, both proprietary and open-source. We also have strong involvement in SDOs, particularly at ETSI NFV and MEC, where we have been working in various specialist task forces and NFV Plugtests.

Our R&D and products target domains closely related to Media, Smart Cities, Smart Homes and Smart Factories.

## ACHIEVEMENTS & SUCCESS STORIES

Our mission is to provide cutting-edge solutions and consultancy services tailored to customers' needs.

Through the participation in 5G PPP projects, Nextworks is developing a strong asset of software prototypes for 5G, NFV, SDN and MEC; this includes: 5G Apps & Service Catalogue, TIMEO (Transport Infrastructure and MEC Enabled Orchestrator), SEBASTIAN (Service Based Slice Translation, Integration and Automation), Plug & Play control of 5G VNFs, 5GCity Service Development Kit.

Our prototypes are demonstrated at various international events, such as ECOC, EuCNC, ICT, OFC, MWC.

Our background translates into consultancy services: i) Specialized Training on NFV/ MEC technologies and software tools; ii) Technical Project Management for 5G trial experimentation; iii) Standards Development Support in ETSI Specialist Task Forces and NFV Interoperability and API conformance Plugtests.

## INTEREST FOR FUTURE R&D&I COOPERATION

Despite the solid R&D in Software Networks of these years, work is still needed to realize the vision of Smart Networks for any Vertical service on top. Key challenges to address include aspects of control over multiple distributed network control operating systems; use of powerful abstractions for resources and services; new naming schemes for virtualised resources for automated discovery; intent-based APIs and highly configurable policies to control resource and service lifecycles; high degree of automation to enable cognitive (at first) and intuitive (then) network behaviours.

To properly address these challenges, we seek for teaming with international experts on virtualization and control technologies (Networking Industry), service operation (Telcos), vertical business service offering (above all [Industrial-]IoT domain top players for our target products), and top-tier research centers and universities.





YEAR ESTABLISHED  
2014



NUMBER OF EMPLOYEES  
5-10



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EXPERTISE IN

5G

IOT

AI

WEBSITE DEVELOPMENT

CLOUD

TRANSPORT  
& LOGISTICS

SMART  
CITIES

PUBLIC  
SAFETY

## BACKGROUND, EXPERTISE & SKILLS

We develop customized Data communication solutions helping customers to realize potential of existing Network, while providing innovative solutions in the field of unprecedented business and technological changes.

We Provide

- Innovations and products in wireless, IP and cloud networking, IoT, NFV and SDN
- R&D Consultancy and Test Services
- Customized solutions for Tactical Communication, public safety and other vertical markets

## ACHIEVEMENTS & SUCCESS STORIES

1. Design and Development of Remote Environ Monitoring System
2. IoT Gateway with GPRS connectivity to cloud with optional Wi-Fi and 4G interface to cloud for remote solar power monitoring application
3. Prototype Trial in a small vineyard in Houston USA for LoRA based system for Smart Agriculture
4. Setup Website Design and Hosting Business

## INTEREST FOR FUTURE R&D&I COOPERATION

We are looking for projects in Wireless 5G, IoT, Test Beds, R&D Services including Architecture, Software and Hardware Design and Testing. We are also looking for Business Development partners.





YEAR ESTABLISHED  
2007



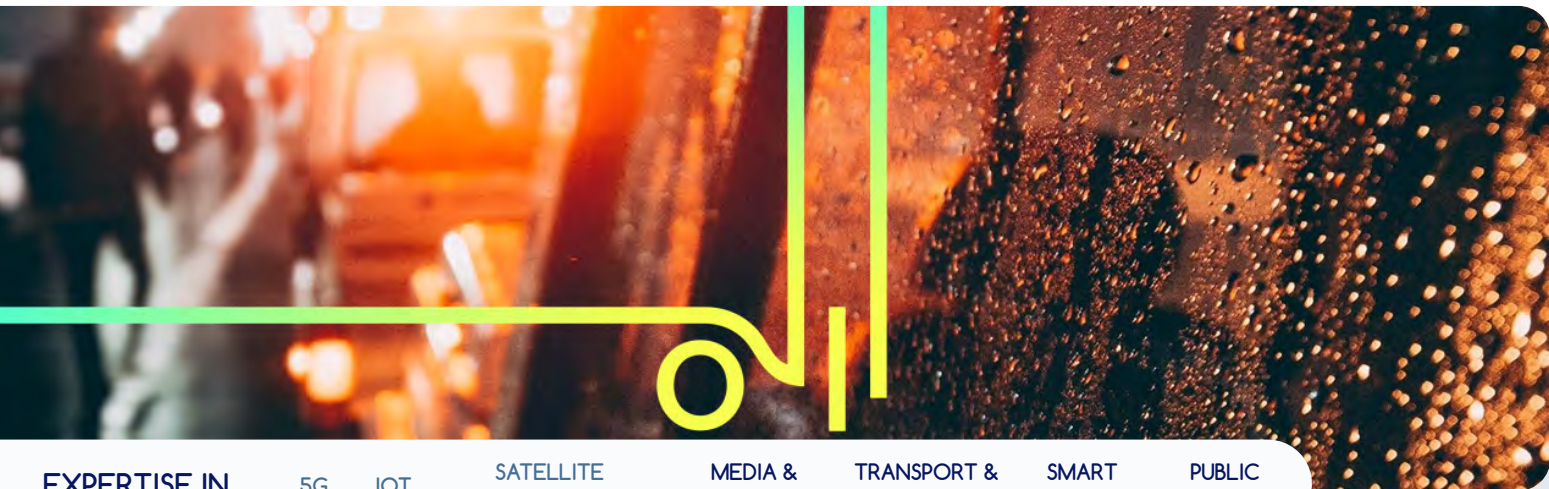
NUMBER OF EMPLOYEES  
30



MORE INFORMATION  
[www.one2many.eu](http://www.one2many.eu)



CONTACT  
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EXPERTISE IN

5G

IOT

SATELLITE  
COMMUNICATIONS

MEDIA &  
CONTENT

TRANSPORT &  
LOGISTICS

SMART  
CITIES

PUBLIC  
SAFETY

## BACKGROUND, EXPERTISE & SKILLS

One2many is the leading global vendor of broadcast and public warning solutions for the broadcasting, governmental and the telecom industry.

Established in 2007, one2many is headquartered in the Netherlands, with support offices on 4 continents.

One2many enjoys many of world first deployments and has experience in high profile projects with 85 installations, at 55 customers in 32 countries.

One2many's geo-targeting and geo-fencing broadcasting and dissemination channel product portfolio is the most extensive in the market and includes amongst others: Cell Broadcast System, evolved Multimedia Broadcast Multicast Service Centre, Public Warning Portal with CAP (Common Alerting Protocol), SMS, Voice, Social Media and Mobile App gateways.

One2many is an award-winning member of standardization bodies significantly contributing to 5G standardization of broadcast and public warning worldwide.

## ACHIEVEMENTS & SUCCESS STORIES

One2many is the only company in the world that has been capable to deliver full end-to-end nationwide public safety system in The United States, The Netherlands, Taiwan, Philippines, Chile, UAE, Oman, Saudi-Arabia, Greece, Mauritius and New Zealand by providing the necessary infrastructure towards Government and Telecom and enabling one2many's own state-of-the-art software products.

One2many is recognized as the global innovator in the 4G/5G Broadcast solutions and actively involved with PoCs in the Netherlands, Canada and USA.

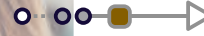
One2many provides solutions to the US NIST/PSCR programme achieving 4G and 5G end-to-end mission critical communications. One2many is a successful member of the 5G-Xcast Horizon-2020 project. One2many has the most innovative eMBMS, BM-SC and MooD server in the world and the most proven and mature public safety products in the world.

One2many is a main contributor to the latest 3GPP TS 23.041 specifications containing the CBCF 5G specification including the latest 4G and 5G Device Based Geo Fencing feature.

## INTEREST FOR FUTURE R&D&I COOPERATION

One2many has strong industry experience in public safety and broadcast industry consequently all innovative projects in this domain have our highest attention.

We are interested in national and international partnerships to enlarge one2many multi-channel approach for public safety early warning system. Consequently, we are looking for partners to enhance our capabilities in IOT and sensor networks, connected-cars and C-V2X communication, Satellite communication, Next generation Television (ATSC 3.0) and Radio (DAB).



YEAR ESTABLISHED

2006



NUMBER OF EMPLOYEES

51



MORE INFORMATION

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EXPERTISE IN

5G

IOT

NGI

MEDIA &  
CONTENT

TRANSPORT &  
LOGISTICS

HEALTH

SMART  
CITIES

## BACKGROUND, EXPERTISE & SKILLS

Quobis is an European leading company in voice interconnection expert services and well-known as one of the pioneers in the deployment of WebRTC technology after being involved in the release of the industry's first WebRTC Application Controller. Today, this element is part of the core network of different telcos worldwide. In addition, Quobis Communication Platform is helping enterprises from different industries such as telecommunications, BFSI or retail to quickly adopt the most advanced ways of communications such as video calling, instant messaging, VoIP, etc. for improving collaboration between office and deskless workers and creating a richer customer experience."

## ACHIEVEMENTS & SUCCESS STORIES

Quobis is one of the partners involved in 5GTANGO project, a 5GPPP Phase2 Innovation Action that enables the flexible programmability of 5G networks with:

- a) an NFV-enabled Service Development Kit (SDK);
- b) a Store platform with advanced validation and verification mechanisms for VNFs/ Network Services qualification (including 3rd party contributions);
- c) a modular Service Platform with an innovative orchestrator in order to bridge the gap between business needs and network operational management systems.

The main role of Quobis in this project consists of the development and implementation of the communication suit pilot, that enables real-time videoconferences using media VNFs, application VNFs and platform VNFs for the 5GTANGO platform.

## INTEREST FOR FUTURE R&D&I COOPERATION

Quobis has broad experience working on international projects not funded by public agencies as is a key partner for some of the larger network integrators and service providers that see Quobis as the reference partner for projects with special needs in UC.

Quobis is already cooperating in R&D&I projects with partners in Europe and Brasil. We are looking at strengthening those partnerships as well as opening up to new countries and new projects.



YEAR ESTABLISHED  
2002



NUMBER OF EMPLOYEES  
1-5



MORE INFORMATION  
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EXPERTISE IN 5G IOT NGI SATELLITE COMMUNICATIONS MEDIA & CONTENT TRANSPORT & LOGISTICS SMART CITIES MFG. HEALTH PUBLIC SAFETY

## BACKGROUND, EXPERTISE & SKILLS

Quotient is an international strategy, technology, security and economics consultancy to the communications industry. The company specialises in all aspects of fixed and wireless communications, broadcasting, security, and spectrum regulation and management.

## ACHIEVEMENTS & SUCCESS STORIES

We are used to both leading and participating in multidisciplinary projects. Our skills lie in 5G new technologies in both core and RAN, 5G network security and project management. We are currently serving as part of the technical design authority for UK Government (DCMS) testbeds and trials, which include the vertical sectors of Industrial Internet of Things, Smart Tourism, Connected and Autonomous Vehicles, Healthcare and Agriculture Technology. We also have an overarching security role across all projects, which are now all up and working.

## INTEREST FOR FUTURE R&D&I COOPERATION

We are looking to be involved in any of the above in a technology; strategy; testbeds and trials; network or application security; and / or project management role.





YEAR ESTABLISHED

2007



NUMBER OF EMPLOYEES

7



MORE INFORMATION

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EXPERTISE IN 5G IOT

SATELLITE  
COMMUNICATIONS

MEDIA &  
CONTENT

TRANSPORT &  
LOGISTICS

SMART  
CITIES

ENERGY

HEALTH

PUBLIC  
SAFETY

## BACKGROUND, EXPERTISE & SKILLS

Redmill Marketing Associates (RMA) is a UK-based full-service B2B marketing agency, founded in 2007, that is dedicated to providing telecoms and technology companies with the support and strategic input they need to meet their growth objectives.

We have deep experience and expertise of mobile communications and networks and, in particular, 5G evolution and market development. Our expertise spans infrastructure, applications and services, backed by a clear understanding of market context and trends.

Our customer portfolio covers: smart technology, IoT, SaaS, mobile networks, 5G evolution, network planning / analysis, AI and ML, as well as OSS and BSS. We provide our customers with a focused and responsive service that acts as a seamless extension of their own marketing resources.

## ACHIEVEMENTS & SUCCESS STORIES

We work with leaders and innovators from our industry, including Tambora Systems, Telecom26, CROSS Network Intelligence, InfoVista, Polystar, Digitalk, Spirent / Mobilethink, Gintel, 5G Briefing, and others.

We are proud of our continuous support for customers over more than a decade, providing strategic input and marketing services to reach growth targets, M&A goals, market penetration and expansion targets, and to plan new sales and lead generation channels.

Tambora Systems: transforming an innovative startup into a fast-growing and relevant entrant offering orchestration of dynamic network slicing to control latency and QoS for LTE / 5G applications.

Polystar: supporting an established provider of Service Assurance, CEM, Data Monetisation, and 5G Network Load Testing tools with strategic marketing input and content creation.

## INTEREST FOR FUTURE R&D&I COOPERATION

RMA is dedicated to fostering new partnerships with SMEs in order to help them reach new markets, define successful market strategies, and to provide market analysis to identify growth opportunities.

In particular, we are interested in delivering marketing projects in the following areas: 5G, IoT, Smart Technologies, AI and ML, B2B and VAS solutions for operators, NGN OSS / BSS, Core Network functions, EPC, IMS and more.





**YEAR ESTABLISHED**

2011 (UK) and 2018 (Ireland)



**NUMBER OF EMPLOYEES**

10



**MORE INFORMATION**

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**EXPERTISE IN** 5G IOT NGI

**SATELLITE  
COMMUNICATIONS**

**MEDIA &  
CONTENT**

**TRANSPORT &  
LOGISTICS**

**SMART  
CITIES**

**MFG. HEALTH**

**PUBLIC  
SAFETY**

## BACKGROUND, EXPERTISE & SKILLS

RFSAT has been in the forefront of mobile communications technology development since over 20 years, starting with the first 3G basestation built in FP5 project back in 1999. Since then it has contributed to developing successor technologies constituting current 4G (LTE and LTE+) and has been involved in developing core technologies as well as value-added services for the future 5G communications. Its employees have been supporting launch of various PPP projects including 5G-PPP or Cyber-PPP. Its main relevant technical competencies relate to hardware efficient transceiver design and implementation, network virtualisation, low-latency networking, network/client-assisted positioning/localisation and security-sensitive services, as well as applying future 5G mobile communication in diverse vertical sectors, including, Health, Security, Environment, Cultural Heritage, Transport, Smart Grids and Precision Agriculture.

## ACHIEVEMENTS & SUCCESS STORIES

Since over 8 years RFSAT has been focussing its research and technological developments on such vertical sectors as communication, e-Health, environment, transportation, smart cities, smart energy and utility grids and public safety including crisis management. Services are generally focussed on distributed sensing and control (involving sparse Big Data management and IoT technologies) over variety of communication and networking transports for providing added value to mobile users and geographically dispersed enterprises. With its real-time technologies RFSAT has targeted also media virtualisation, such as Mixed-Reality Immersion, demonstrated for real-life e Health and crisis management applications. It has applied new mobile services in both recent and ongoing funded EU projects in areas such as large-scale Crisis Management, Environmental Monitoring and Climate Change, and Cultural Heritage protection. They are expected to be deployed and evaluated in the near future on an operational 5G test infrastructures.

## INTEREST FOR FUTURE R&D&I COOPERATION

RFSAT considers research consultancy and development as core business, actively taking part in European and international funded research projects since its incorporation. It has participated in over six (6) projects as core partner and over ten (10) as associated and/or as SME group member. Funding programs include FP6, FP7, Horizon 2020 and COST Actions. It has been operating several industrial consultancy contracts for both academia and industries in UK and across Europe. Its developed technologies are diverse and seamlessly applicable across multiple sectors. Examples include sensing & control as well as Mixed-Reality technologies used successfully in e-Health, Smart Grids and Security applications, certainly with certain adaptations.



**SEVEN**  
Solutions



YEAR ESTABLISHED

2006



NUMBER OF EMPLOYEES

41



MORE INFORMATION

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[carlos.valenzuela@sevensols.com](mailto:carlos.valenzuela@sevensols.com)

EXPERTISE IN

IOT

ENERGY

SMART CITIES

FINANCIAL

## BACKGROUND, EXPERTISE & SKILLS

Seven Solutions, worldwide leaders in the White Rabbit (IEEE 1588 high-accuracy profile) timing technology. It is a private held leading company in accurate sub-nanosecond time transfer and frequency distribution for reliable industrial and scientific applications. Our timing solutions have been validated during the last 9 years and we offer currently the best interoperable, dependable and ultra-accurate time transfer and synchronization approach in the market (nanosecond accuracy, deterministic, dependable and scalable).

Seven Solutions provides solutions capable of distributing time and frequency over metro and long-haul 5G links in both back-haul and front-haul:

- Ultra-accurate Time and Frequency Transfer (phase transfer using IEEE 1588 High-Accuracy Profile)
- Reliable GNSS Timing Solution with integrated accurate Time Transfer capability over optical fiber (backup system)
- High bandwidth & latency bounded Ethernet communications
- Deterministic data delivery based for Time-Aware Applications

## ACHIEVEMENTS & SUCCESS STORIES

Currently collaborating with Tier 1 technology partners towards the standard eCPRI. Validating our solution with Deutsche Telekom for the visibility network.

## INTEREST FOR FUTURE R&D&I COOPERATION

We are interested in collaborating in ICT-related H2020 calls related to telecom, satellite services, 5G, IoT, smart cities and energy. Cooperation with international partners from different sectors to setup pilots and PoCs.



EXPERTISE IN

5G

IOT

NGI

MANUFACTURING

SMART  
CITIES

PUBLIC  
SAFETY

## BACKGROUND, EXPERTISE & SKILLS

Siklu is a provider of wireless connectivity solutions based on mmWave technology. Siklu's products include both point-to-point solutions with data rates as high as 10Gbps for backhaul/fronthaul applications and point-to-multi-point solutions that may be used for broadband fixed access applications or small-cell backhaul applications. Siklu has intellectual property in the RFIC and mmWave beamsteering antenna. This allows Siklu to design mmWave remote radio heads compatible with 5G standards. In addition to our hardware portfolio Siklu leads the mmWave industry with a suite of SaaS applications including automated complex network design tools, ROI calculators and management systems

## ACHIEVEMENTS & SUCCESS STORIES

Siklu focuses on Gigabit Wireless Access (GWA) and Smart Cities as well as cellular front haul and backhaul. By the end of 2018 we had networks deployed in over 150 Smart Cities around the world. Currently the largest mmWave market is the US, where Siklu has roughly 60% market share for 60, 70/80GHz systems. From a product perspective in 2018 we launched our 10Gbps product with the longest range in the market, a new small size Terminal Unit for outdoor deployment that is just slightly bigger than a typical smart phone, and our automated network design tool WiNDE.

## INTEREST FOR FUTURE R&D&I COOPERATION

Siklu has been intensively involved in R&D and innovation cooperation projects. It has participated in FP-7 projects BunGee and IPHOBAC-NG, as well as in H2020 projects RAPID, and currently participates in the projects 5G-PHOS and THoR. Siklu is also involved with other research consortia and collaborates on research with partners from both industry and academy. Siklu cooperation interests include mmWave radio and antenna technology, high-speed modem technology, mmWave beamsteering antennas, 5G RRH, mmWave/fiber integration and other ideas that may be exploited in our target markets.





## SDN/5G next security challenges (partial)

- I. TRUSTABLE IA/ML-based supervisi
- II. Disruptive workflow to deploy VULNE  
TELCOS.
- III. VM Introspection Easy Remediation



YEAR ESTABLISHED  
2003



NUMBER OF EMPLOYEES  
3



MORE INFORMATION  
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### EXPERTISE IN

5G

IOT

MEDIA &  
CONTENT

DEFENSE  
SECTOR

## BACKGROUND, EXPERTISE & SKILLS

We protect software against confidentiality (reverse engineering) and integrity (tampering) attacks. We are active in the field of entertainment (DRM), the defence sector and more recently with the telecom industry. Our core expertise is transverse to the whole ICT but we bring tailored turnkey solutions to each sector. We operate with both Java and compiled languages (C, C++, Go, ...).

In the telecom industry, our solution can be automatically applied, without any programming required and does not drop the performance of the protected network function. We have our own software-based security solution and we are also capable of leveraging and coupling with hardware-based trusted execution environment (e.g., Intel SGX).

Our automated workflow is a key value. It is linked to our ability to process binary-level ready-to-deploy software, with no changes from the software vendor. Henceforth, our solution can be applied on 3rd party code.

We have been selected in two SDN collaborative projects (Sendate Tandem and Inspire 5G).

## ACHIEVEMENTS & SUCCESS STORIES

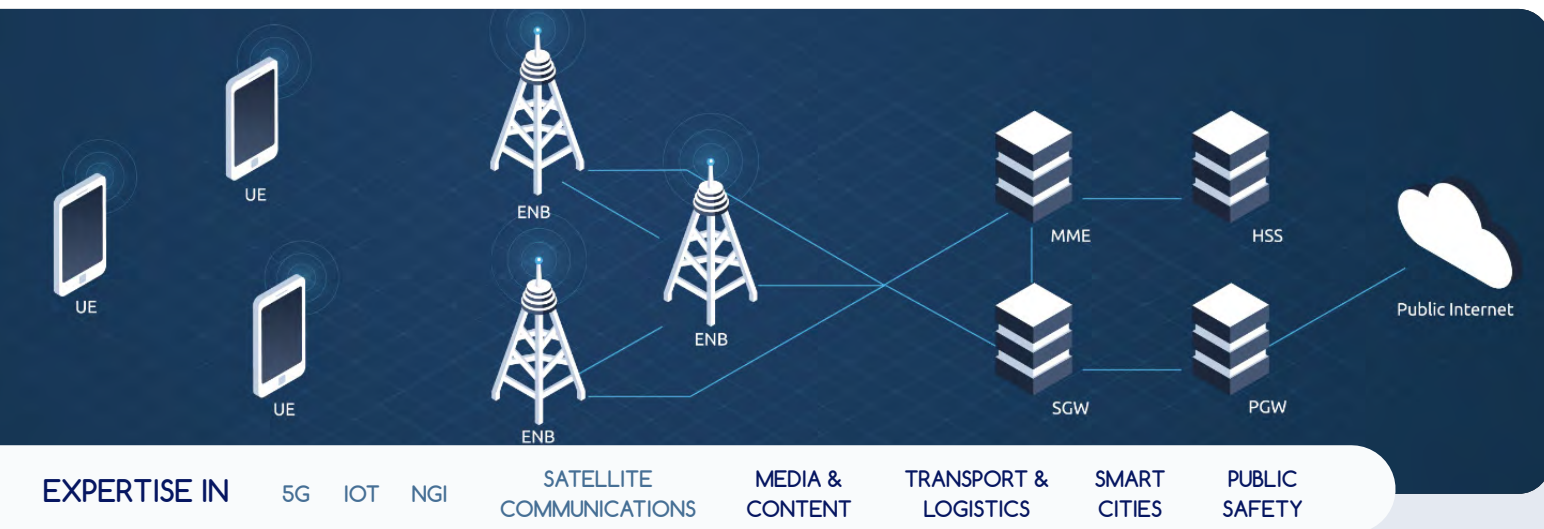
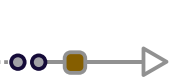
In one collaborative project (Sendate Tandem), we had demonstrated how a Security NF (malware probe) can be itself secured in order to prevent an Introspection attack. Without protection the malware probe detection can be "inversed" by the attacker. Reversely, with our protection, the operation is far more complex. The demonstration also covered the setup workflow, done in one click.

## INTEREST FOR FUTURE R&D&I COOPERATION

We see these CHALLENGES for the Telecom Industry, for which we are looking forward to participating to a consortium:

- A. Bringing trust to AI/ML that will be managing un-supervised autonomic SDNs?
- B. Bringing to TELCOs self-efficiency to check the safety of VNFs (known vulnerability-free) before their deployment as well as enforcing their integrity when they are operated of-premises.
- C. Designing a fully secured network function integrity chain made of detection, transfer of alarm and reaction.
- D. Bringing TEE (namely Intel SGX) to VNFs, by designing a fluid and simpler workflow to leverage this low use technology.





EXPERTISE IN

5G IOT NGI

SATELLITE  
COMMUNICATIONS

MEDIA &  
CONTENT

TRANSPORT &  
LOGISTICS

SMART  
CITIES

PUBLIC  
SAFETY

## BACKGROUND, EXPERTISE & SKILLS

Software Radio Systems (SRS) is the team behind the popular srsLTE project ([www.srslte.com](http://www.srslte.com)). Providing a complete open-source end-to-end mobile network implementation, srsLTE is used by leading mobile wireless researchers around the world and is the enabling SDR platform behind 5 of the 6 most recent coordinated vulnerability disclosures listed on the GMSA mobile security hall of fame.

Commercially, SRS builds upon the proven srsLTE platform to provide customized, high-performance 4G and 5G mobile network solutions including IoT and V2X. Customer successes include operational air-to-ground broadband networks, launched and active LEO satellite systems, advanced 5G field-test solutions and deployed mobile wireless sensor and analytic networks.

## ACHIEVEMENTS & SUCCESS STORIES

SRS is involved in international R&D projects which focus on novel applications of mobile wireless technology. The company is engaged in the 5GPPP 5GVINNI project where it contributes SDR components for 5G, building upon its proven srsLTE platform. In the US, the company has successfully completed a 2-year project with NIST/PSCR under the Department of Commerce. The OpenFirst project provides an end-to-end reference network implementation for research, prototyping, test and validation of LTE technologies for public safety communication. SRS works with the European Space Agency on projects related to multimedia delivery over hybrid satellite/terrestrial networks and efficient satellite backhaul of IoT traffic. The company is a regular MWC exhibitor and works globally with Tier 1 mobile operators and OEMs.

## INTEREST FOR FUTURE R&D&I COOPERATION

SRS is looking for international partners focused on RDI cooperation in the areas of emerging 5G technologies, cyber-security, V2X and IoT. We have extensive experience in working directly with RDI partners to accelerate proof-of-concept and shrink time-to-market and we regularly engage in projects under NIST, ESA, H2020 and others.



-  YEAR ESTABLISHED  
2017
-  NUMBER OF EMPLOYEES  
20
-  MORE INFORMATION  
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EXPERTISE IN

5G

IOT

DATA ANALYTICS

MEDIA &  
CONTENT

MFG.

ENERGY

SMART  
CITIES

PUBLIC  
SAFETY

## BACKGROUND, EXPERTISE & SKILLS

Suite5 Data Intelligence Solutions is a data analytics and software house with a strong focus on R&D and Innovation projects. Suite5 participates in such activities as an analytics and intelligence provider, working on topics such as big data, data management and insights generation, in various verticals. In more detail, the company works on analytics solutions that are able to provide descriptive and prescriptive analytics, which are based both on structured and unstructured data and are coming out of hardware and software sensors. The company participates in such attempts in the 5G sector (MATILDA project), as well as in other sectors such as Aviation (ICARUS project), Manufacturing (EOSC-hub project, UPTIME project), Cybersecurity (FutureTPM project) and Energy (FLEXCoop project).

## ACHIEVEMENTS & SUCCESS STORIES

In MATILDA Suite5 worked on the development of policy models for applications that run on top of SDNs, and in the area of Analytics that are able to the behaviour of systems in 5G ecosystems. Those two combined are in a position assist decision making towards network placement, deployment and reconfiguration and could help to generate new insights about 5G applications and new policies for optimum utilisation of resources.

## INTEREST FOR FUTURE R&D&I COOPERATION

Suite5 is highly interested in joint ventures which have R&D and Innovation interest in any vertical that either is in need of advanced data insights and analytics, or expects to benefit from the application of data technologies to traditional functions towards using data intelligence and softwarisation to explore value that is not exploited yet.



EXPERTISE IN

5G

NGI

TRANSPORT &  
LOGISTICS

MANUFACTURING

## BACKGROUND, EXPERTISE & SKILLS

Telcaria is an SME providing advanced services to network operators and equipment manufacturers worldwide. We partner with network operators to redesign their products towards NFV/SDN based network infrastructure and cloud-computing applications.

Telcaria is headquartered in Madrid, Spain, and has collaborations with the IMDEA Networks and top Universities in the area: UC3M, UPM and UAH. This critical mass of networking expertise located in very close proximity creates many synergies, having the members of these institutions a history of fruitful collaboration between them. The company is currently working in three H2020 EU (5GEVE, 5GROWTH and 5G-DIVE), collaborates as an expert in the Master of SDN&NFV technologies offered by UC3M and is currently actively developing and commercially distributing Alviu, its SD-WAN solution.

## ACHIEVEMENTS & SUCCESS STORIES

Telcaria has participated in EU/FP7 NetIDE and two 5G-network-related projects: EU/H2020 SUPERFLUIDITY and 5G-CORAL (shortlisted in the Glotel Award for 'Best 5G innovation' and CSI Award for 'Best 5G project and innovation' in collaboration with Taiwanese partners), and is an active partner in 5GEVE, 5GROWTH and 5G-DIVE.

As an advanced network service virtualization SME, Telcaria has benefited from the technology advances generated from the previously mentioned projects acquiring the know-how for applying technologic achievements for rapid prototyping, design, validation, and direct deployment of Edge and Fog distributed computing platforms, advanced multi-domain monitoring platforms, innovations in orchestration mechanisms to assist offloading and roaming scenarios among others. Additionally, Telcaria has disseminated its results in mayor events and public demonstrations such as EuCNC.

## INTEREST FOR FUTURE R&D&I COOPERATION

Telcaria research and development team has experience in participation in multiple European R&D project such as, FP7 and H2020. Telcaria is looking in partnering with vendors, academic and industrial partners, interested in future R&D&I cooperation in beyond 5G, SDN, NFV, edge and fog computing, distributed datacentre platforms, SLA assurance, network slicing, Zero-touch network and service management (and network intelligence platforms). We are actively searching for new partnerships and collaborations which can further enhance Telcaria product line or in the design of third-party enhanced systems, providing solutions for operators and enterprises.



EXPERTISE IN

IOT

NGI

TRANSPORT &  
LOGISTICS

SMART  
CITIES

MANUFACTURING

HEALTH

PUBLIC  
SAFETY

## BACKGROUND, EXPERTISE & SKILLS

Tree Technology is an R&D-performing company providing information and communication technology solutions based on Big Data and Artificial Intelligence. Tree helps optimizing processes and business operations in several sectors using advanced ICT, integrating emerging technologies as part of the Smart Data ecosystem. In particular in 5G, Tree Technology is active in accompanying industrial partners such as telecommunication operators in their digital transformation, contributing with our knowledge in advanced AI and Big Data technologies. In addition to that, Artificial Intelligence-based solutions for cybersecurity in the 5G telco infrastructure are also offered by the company.

## ACHIEVEMENTS & SUCCESS STORIES

Tree Technology operates in several vertical sectors, such as Telecommunications, Health, Transport, Finance, Insurance, Industry, Public Safety, or Security. Tree Technology accompanies industrial partners in their digital transformation and business optimisation, contributing with expert knowledge in advanced smart data technologies such as Big Data, Data Science and Computer Vision. In particular, Tree Technology helps to exploit data to add value to business, with the aid of real time data processing, data mining and automated and deep learning strategies (artificial intelligence).

## INTEREST FOR FUTURE R&D&I COOPERATION

Our R&D activity provides us with knowledge and differential capabilities, based on advanced technologies aligned with worldwide innovation priorities, allowing us to develop competitive advantages. Tree Technology is very active in cooperative R&D initiatives, both publicly and privately funded. In example, Tree Technology actively participates in international R&D projects, strongly performing in the European R&D programme Horizon 2020 in different areas, both as a partner and as a leader. We are open and interested in collaboration in R&D wherever our expertise can add value. Our core activity is in the area of Artificial Intelligence and Big Data, so we are interested to collaborate with partners and initiatives demanding these competencies.





YEAR ESTABLISHED  
2007



NUMBER OF EMPLOYEES  
17



MORE INFORMATION  
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EXPERTISE IN

5G

IOT

TRANSPORT &  
LOGISTICS

ENERGY

SMART  
CITIES

PUBLIC  
SAFETY

## BACKGROUND, EXPERTISE & SKILLS

TST participated in the Flex5Gware project (<http://www.flex5gware.eu/>), focused on flexible and efficient HW and SW platforms for 5G network elements and devices, addressing increased capacity, reduced energy footprint, as well as scalability, modularity and reconfigurability. Research was demonstrated on proof-of-concept implementations. TST participated on a PoC for testing the reconfiguration of the radio behaviour according to different optimization criteria, allowing for instance multi-cell dynamic resource allocations and switching across different radio access technologies according to the link quality. Furthermore, TST's participation in the FLEXNET project makes the company contribute to the development of flexible networks, focusing in IoT use cases. IoT is a growing market, and also an essential part of the future evolution of 5G networks.

## ACHIEVEMENTS & SUCCESS STORIES

TST provides IoT custom solutions on the smart cities, industry (IIoT and Industry 4.0) and precision farming domains. TST support companies to transform their ideas into innovative, profitable and feasible market solutions, with main focus on Smart City, Agri-food and Energy Efficiency business areas: some examples are environmental sensing, level sensors for urban waste management, water control for precision farming and real time location systems.

TST has a broad experience in R&D projects, being involved in 20+ EU funded research projects related to IoT, smart services and future networks (from diverse programmes such as ICTFP7, ICT-CIP, ICT-H2020, EUJ-H2020, ECSEL, CELTIC, EUROSTARS or PENTA). TST's research activity has been recognized by the Spanish Ministry of Economy and Competitiveness, which awarded the company the official "Innovative SME" seal.

## INTEREST FOR FUTURE R&D&I COOPERATION

TST relies on a highly experienced team of telecommunication and electronics engineers with more than 15 years of research in wireless communications, sensor networks and IoT platforms. The company's goal is to create cutting-edge and competitive products and services, helping the clients to reduce operating costs.

Thus, TST looks forward to continue working with other potential partners coming from both industry and academia, in R&D and innovation activities, offering it's experience in IoT hardware design and development, smart sensing and system integration. The way forward for TST includes the involvement in initiatives related to 5G, Software Defined Networks and edge and fog computing, retorting to its expertise and know-how in the IoT and networks fields.



EXPERTISE IN

5G

IOT

AI

SECURITY

MEDIA &  
CONTENT

MANUFACTURING

SMART  
CITIES

ENERGY

HEALTH

PUBLIC  
SAFETY

## BACKGROUND, EXPERTISE & SKILLS

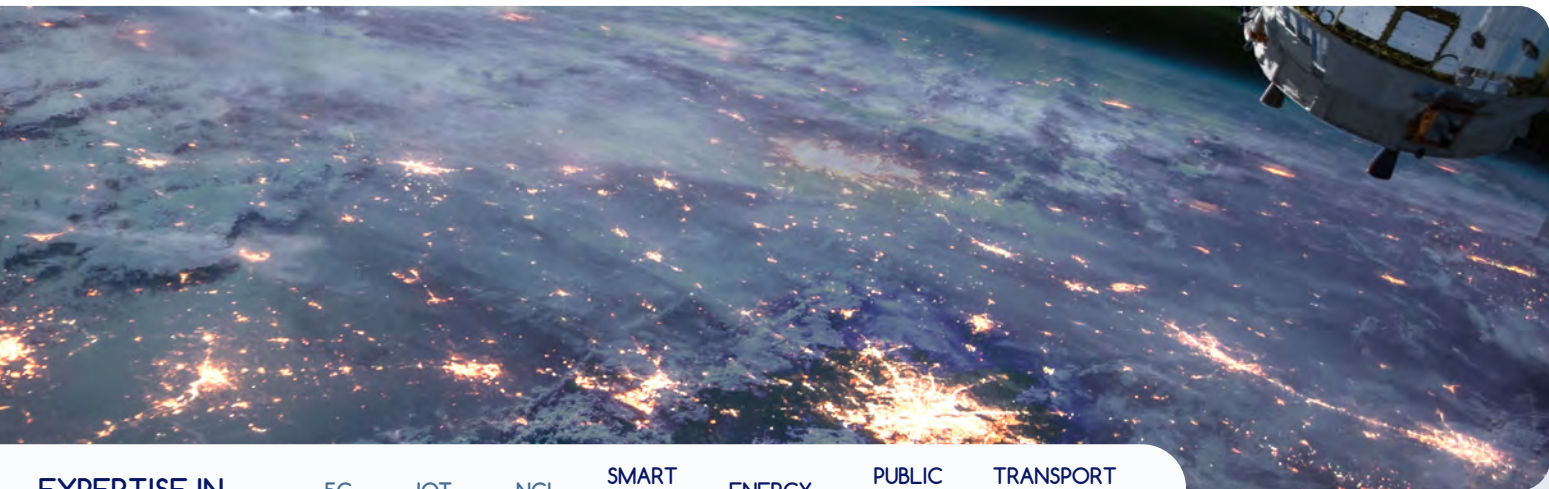
UBITECH is active in a series of 5G PPP projects, focusing mainly on the design and development of software development kits and intelligent orchestration mechanisms for network applications. UBITECH is the technical coordinator of the MATILDA H2020 5G PPP project targeting at the provision of a novel holistic framework for enabling vertical industries to take advantage of a 5G ecosystem. UBITECH has developed various application and network services orchestration mechanisms, taking into account the separation of concerns among vertical application and NFV orchestrators, as well as end to end slice management mechanisms. UBITECH has also invested on the design and development of a 5G analytics engine exploiting novel AI technologies, providing resource and elasticity efficiency profiling of 5G services.

## ACHIEVEMENTS & SUCCESS STORIES

UBITECH has developed a set of intelligent orchestration mechanisms (e.g. rules-based policy management framework for NFVOs as well as vertical application orchestrators, big data analytics techniques for network services and applications profiling) and introduced them in existing orchestrators, such as the SONATA NFVO as well as the inhouse developed orchestrator, known as Maestro (<https://themaestro.ubitech.eu/>). UBITECH has also significantly contributed towards the design and implementation of OSS northbound APIs, targeting at interconnection of vertical application orchestrators with telecom operators' network management systems.

## INTEREST FOR FUTURE R&D&I COOPERATION

UBITECH is highly interested in establishing R&D and Innovation cooperation in the framework of research and development projects regarding the evolution of intelligent orchestration and slice management mechanisms, as well as collaborations with telecom operators and vendors towards the design of OSS-oriented functions and APIs, as well as the development of targeted AI mechanisms for resource and elasticity efficiency profiling of network services and applications.



## EXPERTISE IN

5G

IOT

NGI

SMART  
CITIES

ENERGY

PUBLIC  
SAFETY

TRANSPORT  
& LOGISTICS

## BACKGROUND, EXPERTISE & SKILLS

Ubiwhere is a Portuguese high-tech SME, focused on research and development of innovative, user-centred software solutions to address the challenges of Smart Cities and Telecommunications.

We've participated in numerous national and European RDI projects, which have extended our expertise on IoT systems architecture, blockchain, cyber-security, AI, ETSI MEC Compliant and 5G services and orchestration, among other telecom-related topics and leveraged our contribution to leading standardization entities such as ETSI. Such experience aligned with a highly strategic vision and a fully motivated team has driven the creation and successful implementation of a wide portfolio of solutions priming on interoperability, network security and data protection to meet the needs of the Telecom ecosystem and support the evolution of next-generation networks and services.

## ACHIEVEMENTS & SUCCESS STORIES

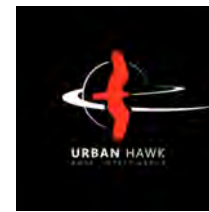
Since the beginning, Ubiwhere stood out for its know-how in scalable software architectures that prompt the creation of innovative solutions handling multimodal data collection, analysis and visualisation, driving our involvement in remarkable European alliances such as 5G-PPP. Our participation in the 5G-PPP programme and Network Management WG leveraged our knowledge in 5G technology and convergence networks and paved the way for the creation of novel solutions with great business potential. Smartlamppost product considerably benefited from 5G-PPP Phase 1, 2 and 3 projects (SELFNET, SONATA, 5GCITY, 5GZORRO), which uses urban furniture to provide 5G networks, EV-charging stations and edge computing capabilities, among other plug-and-play functionalities, allowing the combination of innovative services and supporting our vision of a rich ecosystem of partnerships between different verticals.

Moreover, we will contribute to Affordable5G, deploying Smartlamppost to validate a project's use case, holding the opportunity to confirm the impact of our product within an additional scenario and enhance its functionalities.

## INTEREST FOR FUTURE R&D&I COOPERATION

Ubiwhere is always actively searching for both R&I partnerships and commercial joint ventures. The company's team includes different Telecommunications Engineers and highly-qualified Software Developers. Ubiwhere positions itself both as a 5G enabler and 5G vertical service provider (by providing services benefitting from the 5G KPIs and infrastructure).

Most recently, and aligned with Smartlamppost's web marketplace roadmap, the company has been focused on DLTs (Distributed Ledger Technologies) and Smart Contracts, designing innovative solutions which brings value to the new multi-stakeholder environment brought forth by 5G networks. Companies whose expertise is on virtualized RAN and other 3GPP-standard technologies are of great interest, as Ubiwhere intends to bridge these 5G networks with public or private blockchains, in the scope of its Smartlamppost product.



YEAR ESTABLISHED  
2017



NUMBER OF EMPLOYEES  
5



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EXPERTISE IN

5G IOT

SATELLITE  
COMMUNICATIONS

MEDIA &  
CONTENT

TRANSPORT  
& LOGISTICS

SMART  
CITIES

## BACKGROUND, EXPERTISE & SKILLS

We are a Bristol based startup into smart city relevant data driven solutions. We excel in commercialising early concepts. Currently, as partner in the 5G-Victori consortium, we are trialling our Future Mobility solutions with multiple rail operators across cities of Europe. Our technical skills are focused on real-time large data processing in HPC, AI, 3D mapping and visualisation. We develop our own data platform that we deploy throughout commercial use cases.

## ACHIEVEMENTS & SUCCESS STORIES

From zero to post revenue in 18 months with clients in insurance, logistics, and marine. Finalised the Sea Traffic Management European project in 2019.

## INTEREST FOR FUTURE R&D&I COOPERATION

We are interested to join Smart City and IoT related projects, that are trialled through telecom like in 5G, or in operation management like in rail, marine ports, or other transport operations. Wherever we can marry state of the art data technology of current and next generations with commercial applications.





EXPERTISE IN

5G

IOT

SMART  
CITIES

ENERGY

PUBLIC  
SAFETY

TRANSPORT  
& LOGISTICS

MANUFACTURING

HEALTH

## BACKGROUND, EXPERTISE & SKILLS

Vertical M2M has a strong expertise in telecom software and PaaS architectures, and advanced skills in telecommunications, supporting many different telecom protocols through an agnostic approach.

With a 12+ year - experience in IoT, we also bring a complete framework and sets of tools for secured IoT applications over 5G networks, all based on a containerized Kubernetes architecture.

## ACHIEVEMENTS & SUCCESS STORIES

As a telecom software vendor dedicated to IoT, we invest a wide part of our resources in R&D. and were involved in several R&D 5G projects, among which the NGPaaS project (H2020 5G-PPP – ngpaas.eu), led by NOKIA, rated “exceptional achievements” by the EC, or the SCORPION project, providing IoT infrastructure to support these projects through our solution, CommonSense IoT Platform®.

Over the past 12 years, we also deployed many IoT projects, with a particular focus on the following markets through mostly white-label solutions:

- energy: smartwater and renewable energy monitoring solutions for Utilities
- smartcities: smartmetering solutions, streetlighting services, building management,...
- manufacturing/industry: predictive maintenance, process monitoring and smartfactory, putting together combinations of heterogeneous secured IoT systems.

## INTEREST FOR FUTURE R&D&I COOPERATION

We are particularly interested in any collaborative research related to IoT over 5G networks (massive IoT, mission critical IoT, vertical IoT or Edge Cloud IoT) and bring contributions either at the IaaS or the PaaS levels.

We also have a strong interest in 5G applications for the energy, smartcity, public safety or industry/smartfactory areas and are eager to be part of PoCs or large-scale experiments applied to these markets.



YEAR ESTABLISHED  
2006



NUMBER OF EMPLOYEES  
7



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EXPERTISE IN

5G IOT

NGI

AI

MEDIA &  
CONTENT

HEALTH

ENERGY

SMART  
CITIES

PUBLIC  
SAFETY

## BACKGROUND, EXPERTISE & SKILLS

VISIONA is a cutting-edge Information Technology SME that has actively participated in several open calls from the research and innovation EU programmes, like the H2020 5G-PPP Phase-1 5G-Crosshaul and Phase-2 NRG5 projects. VISIONA team counts on with expertise in designing big systems and managing projects of big magnitude, in designing network elements and network services for NFV and SDN, planning and operation of networks based on these technologies. Strong background in virtualization of functions that lead to 5G-ready innovative and smart environments.

VISIONA is specialized in groundbreaking media and artificial intelligence technologies as machine vision and deep learning. This makes of VISIONA a suitable partner for any vertical demanding such expertise (from media to smart cities and energy related contexts, among others).

## ACHIEVEMENTS & SUCCESS STORIES

Artificial intelligence for machine vision is the core of all the solutions developed by VISIONA which aim to address the needs of different verticals.

For instance, VISIONA's approach to the preventive maintenance of critical energy infrastructures is able to detect, from an autopilot drone, different changes in the target zones in order to predict possible dangerous conditions on the environment or in the structures. Image processing and deep learning techniques are exploited by VISIONA for: (1) people and vehicle detection system in critical locations, (2) change recognition system on UAV imagery and (3) abnormal hot points through thermal image.

VISIONA also counts on with a portfolio of innovative solutions for parking monitoring and management, advanced surveillance of public and crowded spaces, and QoE/ QoS tools for video quality assessment among other.

## INTEREST FOR FUTURE R&D&I COOPERATION

VISIONA is seeking EU partners interested in collaborating with our SME to identify synergies so that we could work together on the creation of innovative solutions and the design strategies for exploitation of cooperation results in order to achieve maximum impact of 5G-related technologies after experimentation. VISIONA is open to start any kind of project related to artificial intelligence in any vertical as the technology has a wide range of applications.



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SMART  
CITIES



YEAR ESTABLISHED  
2012



NUMBER OF EMPLOYEES  
95



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EXPERTISE IN

5G

IOT

NGI

MEDIA &  
CONTENT

TRANSPORT  
& LOGISTICS

SMART  
CITIES

HEALTH

ENERGY

PUBLIC  
SAFETY



## BACKGROUND, EXPERTISE & SKILLS

WINGS ICT Solutions develops solutions (hardware and software) for verticals. Vertical areas covered are utilities (water, gas, energy), smart city applications (e.g., air quality, parking, assisted living, safety), food security/safety (aquaculture, agriculture, farm to fork systems), applications for logistics/industry. The solutions rely on Artificial Intelligence (AI), cloud/edge and big data platforms, IoT and advanced wireless connectivity (namely, 5G, NB-IoT and other). In the light of the above, WINGS has developed and constantly updates its "Artificial intelligence & Internet of Things powered solution for verticals" (working name ATHENA) platform, as well as the "WINGS system level simulation" platform (working name NESTOR). WINGS is proud to have already collaborated with top companies in Greece and internationally. Furthermore, collaborations are built in the EU and beyond, on 5G/6G and verticals.

## ACHIEVEMENTS & SUCCESS STORIES

Through the Phase 2 project One5G, WINGS enhanced its simulation platform with 5G features, therefore, powering a wave of studies of commercial value. Through the Phase 2 Clear5G project, WINGS developed in the development of industry-oriented robotic solutions, motivated by requirements from Taiwanese factories; the applications are powered by heterogeneous wireless technologies, including 5G. 5G-Carmen and 5G-Mobix enabled the development of 5G and CAM systems for logistics and for environment protection through green driving. In phase 3 a wealth of applications, powered by 5G, are developed, deployed and trialled. Through 5G-EVE, WINGS enhances its utility (water, energy) and smart city solutions (air quality and health areas). In 5G-Tours, WINGS is working on the deployment of a smart parking solution in cooperation with the Athens International Airport; moreover, 5G powered AR/VR based applications on education and culture/tourism will be trialled in cooperation with vertical partners. Finally, through 5G-Heart WINGS is developing on the development and deployment of systems for optimizing aquaculture farms near Athens.

Moreover, WINGS constantly upgrades its infrastructure oriented technologies (intent networking, orchestration, diagnostics),

therefore, contributing to the shaping of 5G/ 5G/6G, for assisting Europe to maintain a leading role in the respective developments.

## INTEREST FOR FUTURE R&D&I COOPERATION

WINGS aims at further developing its development and innovation activities through cooperation with industrial and academic partners in 5G/6G and in vertical sectors, such as utilities (energy, water, gas), smart city areas (air quality, mobility, parking, health and assisted living, security, tourism, education), aquaculture/agriculture, food safety, factories/logistics, media. WINGS also develops novel systems and components on intent-based networking, application/network performance diagnostics, intelligent orchestration (from cloud to edge to devices), system level simulation. Teams specialized in software, hardware, optimization techniques, machine learning, networks and applications. Extensive skills for project and technical management, workpackage leadership, and systems design, development and validation.



EXPERTISE IN

5G

IOT

NGI

MEDIA &  
CONTENT

PUBLIC  
SAFETY

SMART  
CITIES

MANUFACTURING

## BACKGROUND, EXPERTISE & SKILLS

Zeetta Networks simplifies network operations and improves the efficiency of a 5G network with intelligence and automation. Zeetta offers a multi-domain orchestration technology based on 5G network splicing™ and slicing. Network slicing is the ability to define and provide prioritised, partitioned and protected subnetworks to ensure that business and time-critical systems can run over shared infrastructure without interference. Network splicing™ is a unique concept developed by Zeetta that allows network slices to be joined in sequence to extend reach for the provision of a seamless, continuous service. These technologies will play an important role in manufacturing applications, particularly where assets must be tracked across multiple sites, geographic locations and indoor and outdoor environments. The company has received a number of industry awards including GSMA's GLOMO Award, TMF's Excellence Award and 5G World Award. In 2019 Zeetta Networks was recognised as a "Gartner Cool Vendor".

## ACHIEVEMENTS & SUCCESS STORIES

Zeetta Networks currently participates to three 5GPPP projects: MetroHaul, 5G-PICTURE and 5G-VICTORI.

Earlier in the year, Zeetta Networks announced as the lead partner for the €10m 5G-ENCODE project that will deliver a private 5G network at the National Composites Centre (NCC) in the Southwest of England. This is the UK Government's biggest investment in 5G for manufacturing to date and part of their Industrial 5G Testbeds and Trials Programme. The project consortium consists of 11 partners including Telefonica, Toshiba, Siemens and Solvay. The 5G-ENCODE project will explore new business models and value propositions for enterprise private 5G networks in an industrial environment and test new 5G technologies such as network splicing and slicing in a real operating setting.

## INTEREST FOR FUTURE R&D&I COOPERATION

Zeetta will be interested in working together with other European and international partners organisations in a wide variety of collaborative project focusing on private 5G networks, industrial 5G networks and applications and network orchestration and automation where the company's patent-protected network splicing and slicing technology can be used to optimise the performance of the network.

# SME SUCCESS STORIES



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Accelleran participation in several national and European RIA and IA H2020 5G-focused projects enabled the different consortia involved to leverage on Accelleran's RAN/vRAN Software Solutions and Small Cell products to enable new 5G architectural paradigms (virtualisation, slicing, edge computing,...) and advances required in future networks. The participation of Accelleran in some of these projects also distilled into the launch of Accelleran ORAN-aligned Cloud Native Virtualised dRAX Open Interface RAN Intelligence enabling AI/ML xApps in an open, scalable and interoperable RAN platform. Beside the pilot deployments where operators are currently evaluating the use of Accelleran dRAX Open Interface RAN Intelligence to enable the new 5G paradigms, one of the most important reference deployment cases for dRAX, focused on the Smart Cities vertical, is the Distributed Cloud and Radio Platform for 5G Neutral Hosts envisaged by the H2020 5GCity project, with deployments in Barcelona, Bristol and Lucca. 5GCity has designed, developed, deployed and is demonstrating, in operational conditions, a distributed cloud and radio platform for municipalities and infrastructure owners acting as 5G neutral hosts.

The following are some of the projects where Accelleran has participated and is participating with its RAN/vRAN Software Solutions and Small Cell products:

- 5GUARDS: Flanders (Belgium) based imec.ICON collaborative project involving the major Flemish universities

and industry partners (SMEs, big infrastructure provider and big mobile operator). The goal of the 5GUARDS project was to investigate, evaluate and demonstrate how various services with diverse requirements could be simultaneously supported by the future 5G network based on the concept of network slicing. 5GUARDS envisioned three building blocks will contribute to the realization of services with diverse requirements: core slicing, RAN slicing and dynamic software reconfiguration.

- 5GRuralFirst: 5G RuralFirst is a co-innovation project led by Cisco and a consortium of other partners from across business, government and academia. Its first goal is to create rural test-beds and trials for 5G wireless and mobile connectivity across three main sites in the Orkney Islands, Shropshire and Somerset.
- 5GCity: 5G-PPP Phase 2 project (call H2020-ICT-2016-2) in which Accelleran is participating with the goal of enabling a distributed cloud radio platform for neutral hosts. To do so, 5GCity's main aim is to build and deploy a common, multi-tenant, open platform that extends the (centralized) cloud model to the extreme edge of the network, with a demonstration in three different cities (Barcelona, Bristol and Lucca), and thus advance the state of the art to solve the main open research challenges in the 5G-based edge virtualization domain, including the neutral host perspective

in dense deployment environments such as cities. Accelleran's dRAX Open Interface RAN Intelligence with Neutral Host and Network slicing functionality is used in 5GCity virtualized platform together with with Accelleran Small Cells in different bands.

- 5G-Enhance: joint EU H.2020 (call H2020-EUJ-2018) and Japanese research project looking at testbed development for advanced 5G topics like eMBB in dense urban areas with high mobility. Establishing long-term research collaboration between EU/Japan research institutes, Accelleran's small cell technologies are being leveraged for infrastructure deployments.
- UNICORE: (call H2020-ICT-2018-2) with the ICT focus on lightweight Unikernel VMs. These software technologies will be vital for VNF IaaS deployments allowing quick deployment and high scalability in the future VNF IaaS networks. Accelleran participates with the migration of dRAX Open Interface RAN Intelligence from Kubernetes Docker containers or Openstack VMs frameworks towards lightweight Unikernel VMs.
- 5GClarity: (H2020-ICT-2018-2020 call): 5G multi WAT system with 4G, 5G-NR, WiFi and LiFi technology.
- 5GComplete: (H2020-ICT-2018-2020 call): 5G framework for secure computing nodes.



ACTA Ltd is an SME founded in October 2002 in Athens, Greece. Our expertise and experience is as a provider and integrator of long-term performance analysis monitoring solutions as well as ad-hoc network measurements. ACTA is a member in two Horizon2020 European Union funded projects, 5G TOURS and 5G HEART.

- ACTA's experience and expertise, from its KPI validation platform (KVAP) application and use of hardware probes in Telecom networks, will be utilized during the 5G-TOURS and 5G-HEART, Horizon2020 projects. Currently we have supported the efforts to convert the user/Vertical defined business KPIs into network KPI's, and specify the relevant, measurable, network KPI values. When

the 5G-TOURS and 5G-HEART pilot 5G networks are installed, by Ericsson and Nokia respectively, ACTA will utilize probes and the KVAP application to measure the performance of the network. The network KPI values will be compared to the required per Vertical Use Case, to verify that the pilot 5G networks are providing, what is promised. One telecom network should be able to provide a solution for all the Vertical requirements. Any major differences will be identified and discussed with the technology partners in the Projects, to either point out that the required values are not achievable, or make adjustments to the 5G pilot network installations in order to achieve the desired KPI values.

 MORE INFORMATION  
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ACTA Ltd is interested in cooperating with other parties that focus on optical, mobile, radio and access networks. Special focus is on the technology areas of 5G - IoT, machine learning software, edge computing, monitoring sensors, blockchain and in electromagnetic fields monitoring.



Azcom Technology is a leader company in advanced wireless communication, with two decades of experience in the wireless Telecom market. We developed a complete suite of software IPRs and hardware platforms to build and deploy commercial and special purpose solutions for cellular communications, automotive, aerospace, home automation and mobile applications. Our business includes both products and services. The most recent product of our wireless portfolio is a LTE/NB-IoT small cell, customizable for different solution, such as providing private LTE/NB-IoT deployments, and available also in NIB configuration along with our Core Network EPC. Azcom Technology offers also services, from turnkey solutions to the optimization of third party software for a wide range of clients and in different areas from industrial 4.0 to automotive to home automation. This year Azcom is engaged in development for its first Open RAN compliant product.

Azcom involvements in H2020 framework started in 2015, when Azcom joined the 5GPPP Phase 1 5G Novel Radio Multiservice adaptive network Architecture (NORMA) project (<http://www.it.uc3m.es/wml/5gnorma/>). 5G NORMA aimed to develop a novel mobile network architecture that provides the necessary adaptability in a resource efficient way able to handle fluctuations in traffic demand resulting from heterogeneous and dynamically changing service portfolios and to changing local contexts. In the contest of 5G NORMA

Azcom have developed the Native Multi-Service Architecture Proof of Concept (PoC), showing the support of service flexibility using the decomposition of mobile network functions and their allocation to the edge cloud or central cloud, based on the service requirements. In this demo Azcom small cell functionality has been extended to support the control commands received from an external orchestrator. This work opened Azcom small cell product to the new frontier introduced in the 3GPP Release 15 standard including the implementation of Distributed Unit (DU) and Radio Unit (RU), also enabling software defined mobile network control.

Azcom focus is not limited only to the 5G mobile infrastructure, and in the 5GPPP Phase 2 Azcom joined the 5G Convergent Virtualised Radio Access Network Living at the Edge (CORAL) project (<http://5g-coral.eu/>). 5G CORAL aims to deliver a convergent 5G multi-RAT access through an integrated virtualized edge and fog solution that is flexible and scalable, where Edge Data Centre (DC) are smaller data centres than clouds, located typically closer to the connectivity nodes and Fog Computing Devices (CD) provide computing, storage and/or networking capabilities on terminals or a near-terminal infrastructure nodes and access point. Consequently, new delay sensitive services can be provided. Azcom contributed to the Connected Car PoC, where 5G CORAL technologies, functions application and services, can be run on the vehicles, in the On Board Unit (OBU) and

 **MORE INFORMATION**  
[www.azcomtech.com](http://www.azcomtech.com)

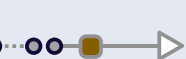
 **CONTACT**  
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on the Road Side Unit (RSU). Compared to a legacy architecture where all the application and services are placed beyond the core network, this configuration leads to a quicker and distributed manner information exchange, resulting in an optimization of the network response, improving driver safety.

Azcom designed and developed the OBU and integrated the RSU with all the required 5G CORAL vehicular applications, services and network functions, exploiting also an innovative multi-RAT approach. The importance of the OBU has been grown since it is also used as the basic block of the implementation carried on by Azcom in the European C-ROADS project (<https://www.c-roads.eu/platform.html>) which aims to implement and test, in real traffic conditions, cooperative systems based on V2X technologies and involve technology partners.

Azcom next steps are focusing in the direction of an implementation of ORAN interface, and renewed interest in H2020 and Horizon Europe projects to adjust the Azcom future vision and direction.

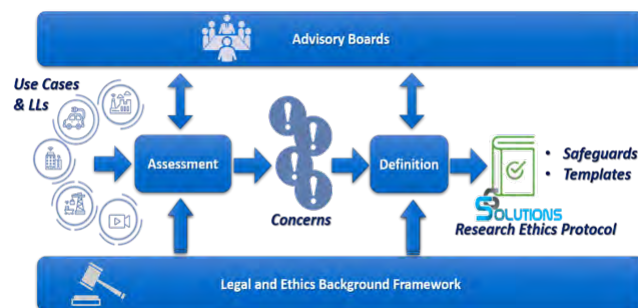




 MORE INFORMATION  
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CyberEthics Lab. (CEL) is an Italian SME with a holistic vision of innovation, generated by efficiency, scientific curiosity, and respect for human beings. CEL promotes innovation, ethical awareness and ethical behaviour to build confidence and trust within the society. CEL has formulated its own methodology on ethical, societal and legal assessment. This is a relevant aspect and it is applied for the 5G technology solution assessment to ensure its future full acceptance and sustainability. CEL – with its own RRI approach (Responsible Research & Innovation) and Ethical Societal and Legal assessment methodology - has provided in many other R&D projects and customers with qualitative and quantitative tools and methods to measure the social acceptance not in terms of technological usability, rather for enabling suitable alignments of human values and technological innovation. This experience is extended in the context of 5G-SOLUTIONS project and it is applied to different market segments, i.e. Factories of the Future, Smart Energy, Smart Cities and Ports, Media & Entertainment.

CEL is DPO and chairs the Ethics Panel of 5G-SOLUTIONS, and together with other two SMEs (i.e. Inlecom Group and Applied research to technologies) the Ethics Panel assures compliance with ethics principles during the whole lifecycle of the project. Since the beginning of the project, CEL methodology aims to create awareness about ethics and legal issues inside the consortium and to create a mindset shared among partners to prevent potential risks by applying a set of common methods and procedures for the project research process.



*The 5G-SOLUTIONS Legal and Ethics Assessment Framework*



EANTC, as a German SME, is one of the world's leading independent test centers for telecommunication technologies providing vendor-neutral consultancy and realistic, reproducible high-quality testing services.

EANTC participates in several European H2020 calls and projects focused on 5G networks and applications. As work package leader, EANTC provides benchmarking methodology and state-of-the-art testing expertise.

The innovation cluster 5G BERLIN is an open, evolutionary experimental network in Berlin. With 5G BERLIN we established a cluster in the capital Berlin investigating new 5G technologies and applications for the Smart City, PPDR, and the Industry 4.0 sector.

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In Q1 2020, we conducted a hybrid remote and on-site multi-vendor interoperability event with more than 100 participants; two-thirds joined remotely. We successfully completed more than 500 test combinations, probing the maturity of innovative transport network solutions to support 5G networks, data center networking evolution, and multi-vendor domain orchestration. Specifically, we covered Ethernet VPN, Segment Routing, Software Defined Networking, and packet network clock synchronization.



#### MORE INFORMATION

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eBOS Technologies Ltd is an innovative software powerhouse SME providing technological advanced e-business software solutions to enterprise customers around the world. Headquartered in Cyprus, eBOS has a long history of engaging with international research and technology organisations, industrial leaders, universities, research organisations and SMEs to drive collaborative technological innovation and bring best-of-breed technologies to its enterprise customers and the wider community.

With an increasingly comprehensive portfolio of software solutions, investments in Research and Development are crucial to eBOS. The development of eBOS product portfolio as a specialist software powerhouse has equipped us with core competencies which we deploy in R&D projects. The knowledge and innovation gained from our participation to such projects are then fused into our solutions and services. Our activities not only seek to improve existing systems to keep them competitive, but also explore radically new solutions and technological breakthroughs. Our aim is to identify new and emerging technologies and leverage them to deliver cutting-edge, robust and cost-effective engineering solutions.

Our core areas of expertise include intelligent front-end dashboards and APIs development, advanced big-data analytics, Artificial Intelligence/Machine

Learning, cybersecurity, quality assurance and data management, risk assessment and compliance, covering a wide range of application domains, including 5G, NFV/SDN, digital security, security of industrial IoT and others. Our expertise has been extended in the context of 5G-SOLUTIONS (<https://www.5gsolutionsproject.eu/>) and MonB5G (<https://www.monb5g.eu/>) 5G-PPP projects, including a recently funded ICT-53 project on 5G for connected and automated mobility (5G-ROUTES). We apply our expertise to different vertical domains, including Factories of the Future, Smart Energy, Smart Cities and Ports, Media & Entertainment, Transport & Logistics, Autonomous Mobility, etc.

eBOS is the Quality Assurance & Risk Manager in 5G-SOLUTIONS with the responsibility of organising and supervising quality review/peer reviews for all deliverables including the implementation of the quality management plan. eBOS is also engaged in the design and development of the technological enablers, and in particular of the front-end dashboard of the innovative smart KPI visualisation system for facilitating the near real-time analysis, presentation, benchmarking and performance validation of reference 5G network KPIs against predefined target values. eBOS also leads the design and the development of intent-based APIs for stimulating innovation and fostering the development, portability and provisioning of

new innovative applications by SMEs.

eBOS has the role of the Dissemination and Communications Manager in MonB5G and is also currently working on the design of the MonB5G security framework, the development of AI-driven security algorithms to provide novel mechanisms for mitigation of network slicing threats, the integration and testing of all components and the proof-of-concept experimentation.

In 5G-ROUTES, eBOS will undertake the role of the Innovation Manager leading the relevant innovation, data management and IPR activities, and will leverage its expertise in front-end dashboards to design and develop the tenant web portal for facilitating access to the platform including the presentation of the results from the field trials.

eBOS is also actively participating in a number of 5G-PP Working Groups, including Test, Measurement and KPIs validation WG, the Trials WG, Software Networks WG, Vision & Societal Challenges WG and NetWorld2020 SME WG.



Incelligent is a company based in Athens, Greece, founded in 2014 by highly experienced telecom business professionals and R&D engineers. Currently, its workforce consists of highly competent software engineers/ developers, machine learning engineers and big data scientists.

By following best practices in data-driven development (DataOps), Incelligent has managed to systematically incorporate the latest advances in Big Data, Analytics and Artificial Intelligence (AI)/ Machine Learning (ML) technologies in its product research and development processes, resulting into a diverse product portfolio that includes out-of-the box and production-ready, AI/ ML solutions, tailor-made for the Telecommunications, Banking and Public sectors.

With respect to the telecommunications sector, Incelligent has launched RAN.ai, a suite of solutions built on top of advanced big-data analytics and ML/ AI for improving telecom RAN operations, currently deployed in Greece for a major operator. RAN.ai aims to support the strategic decision processes with respect to RAN evolution by capitalizing on its predictive and "What-If" scenario building capabilities. More specifically, it delivers accurate predictions for traffic demands and subsequent critical insights regarding future spectrum requirements, network rollout and capacity needs. It further allows for the setup of scenarios to evaluate the impact of strategic decisions

and thus enabling optimized network planning, targeted investments and smart expenditures and eventually in enhanced customer experience (CX) and maximized ROI. With regards to credit risk operations in the Telco sector, Incelligent has deployed a credit risk minimization and risk-based marketing solution for a major operator in the Middle East catering to the minimization of losses, the increase of sales opportunities and therefore revenues, as well as boosting customer engagement.

The aforementioned capabilities are similarly exploited in Incelligent's solution involving credit risk management and analytics-based marketing for the Banking sector.

Additionally, Incelligent is currently involved in three 5G-PPP projects, namely MATILDA, 5G-PHOS and LOCUS, offering its personnel the opportunity to enhance their competencies with respect to the 5G ecosystem. Through its current involvement in phase-3 5G-PPP project LOCUS (<http://www.locus-project.eu/>), Incelligent aims to enhance its engagements in the Telecommunications sector and expand its portfolio of solutions, adding new enhanced software modules/ functionalities. By combining fine-grained localization information and Incelligent's advanced traffic and mobility prediction mechanisms, the new functionalities and insights yielded will be exploitable by current products and could potentially be used in fine-tuning network resource allocation, as well as for



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enabling other vertical/ 3rd party services.

The role of the phase-2 5G-PPP projects, MATILDA (<http://www.matilda-5g.eu/>) and 5G-PHOS (<http://www.5g-phos.eu/>) should also be acknowledged, as through these projects Incelligent was able to mature its technology and diversify, as well as enhance its product portfolio. In particular, the following has been achieved: (a) Enrichment of the set of use cases addressed and of the supported functionalities/ solutions in its portfolio, leveraging on the capabilities brought by 5G and its ecosystem; (b) Positioning of the advanced functionalities in forward-looking (pre-)standardization groups, especially in ETSI and others; (c) Performing validation activities and showcases, relevant to verticals entities (e.g., stadiums, malls, etc.) and in collaboration with large vendors and operators; (d) Improvement of the company's position in the research field and global market through the participation in various events, i.e. conferences, exhibitions and so on, as well as publications.

On the whole, Incelligent is proud to have delivered contributions, which assist in the overall shaping of the 5G world and lead to a prominent European role in the field.





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The Company InnoRoute (Munich, Germany) has achieved business success with a new routing concept and their router platform TrustNode. A feasibility study conducted within a SMEINST Phase 1 project allowed us to verify the concept and to become partner in two 5G PPP projects:

1. CHARISMA: optimization of TrustNode platform for ultralow latency.
2. SELFNET: optimization of TrustNode platform for modularity and extension to SDN (Software Defined Networking).

Thanks to ultralow latency and SDN support, we were able to enter the Industry 4.0 business. Today, major players from Automotive and Industrial segment use the TrustNode as evaluation and prototyping platform for TSN (Time Sensitive Networking, IEEE Ethernet). We got contracts to develop further TSN functionality for the TrustNode. Modularity of our platform allowed us to do this fast and at low cost.

At the research side, the combination of TSN and SDN became a technology trend. Being the only supplier for both in one device made the company a welcomed partner in German research projects for Industry 4.0. We were partner in TreuFunk and are associated partner in FlexSi-Pro and TACNET4.0.

Next step planned by InnoRoute is to offer a low latency networking service.



*InnoRoute's TrustNode*



IQUADRAT R&D has a focused business plan specifically intended on delivering a “new generation of research tools for system level evaluation of wireless integrated communication systems”. The company is involved in projects with large corporate clients, mobile operators and public authorities and is currently active in three different domains: Software development, consultancy primarily in wireless network planning, and R&D for developing new and innovative products. Our R&D department is involved in many National and EU-funded research projects, and has extensive know-how in Network Function Virtualization (NFV) technologies, Zero-touch automation at the network layer using state-of-the-art machine learning algorithms for network status prediction, IoT Networking, simulation methodologies for Radio Access Networks, Software Defined Networking (SDN) and Demand Response algorithms for the Smart Grid.

## IQUADRAT'S SOLUTIONS

### IoT Platform for Smart Home

#### Key features

- Interactive Mobile and Web applications
- Widgets for sensor value display and actuator control
- Bindings for commercial IoT devices
- Customizable Sensor Nodes in wall-mounted and portable layouts
- Automation & Energy management functionalities

### Industrial IoT (IIoT) platform for Industrial Applications

#### Key features

- Openstack-based private cloud
- Use of SDN and NFV for network & infrastructure virtualization
- Virtualized IIoT gateway
- Management and Orchestration through ETSI-compliant OSM
- Machine learning algorithms for rapid and reliable anomaly detection

### IoT Platform for Smart Energy Management

#### Key features

- Peak demand calculation and daily consumption pattern
- Scheduling for peak demand reduction
- Management of excess energy from photovoltaic cells
- Electric Vehicle Charging Management

### 5G communications platform

#### Key features

- 5G access (New Radio) and Core modules
- Use of SDN and NFV for network & infrastructure virtualization
- Flexible orchestration for network slicing and on-demand resource allocation
- Mobile edge cloud (MEC) capabilities and live migration
- Machine learning for Key Performance Indicators (KPI) prediction



MORE INFORMATION

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IS-Wireless (SME, Poland) has successfully contributed to the 5G Essence project where the company is working on a centralized radio resource management for the cloud-RAN solutions in the two-tier cloud networks (especially multi-RAT scheduling for 4G and 5G networks). Moreover IS-Wireless is currently together with the Thales (France), ORION (Greece) and other partners working on planning the public safety showcase for demonstrating the benefits of 5G mission critical applications in coexistence with centralized RAN. The final demonstration of the 5G Essence as regards “mission critical” will be presented during the B-APCO

conference (in UK) on 13-14 November 2019, shortly before the project finalizes. IS-Wireless is working on the delivery of a complete software defined (SD) RAN solution to be showcased next year.



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Q1 2019 marks the end of the first integration cycle for the H2020 ICT-17 5GENESIS project and its five platforms in Athens, Malaga, Limassol, Surrey and Berlin, together with its Portable 5G Demonstrator. The 5GENESIS SMEs already had and will continue to have a significant impact on the project advances and achievements through the continuous provision of essential components and valuable expertise. With their work Nemergent, Fon, Athonet, RunEL, INFOLYSIS, Avanti, FOGUS and OneAccess bring to 5GENESIS standardized mission critical services, integration of WiFi and cellular access, a 4G/5G Core, a gNodeB, an

interoperable IoT vGW and also support the virtualization process of core elements of the 5GENESIS infrastructure among other core pieces and the KPI monitoring and analysis procedures.



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In the context of its activities across several 5G PPP projects, Nextworks has developed a strong asset of software prototypes for an advanced NFV MANO framework targeting 5G infrastructures and integrating innovative features for 5G telcos, service providers and vertical industries. The core of Nextworks service management and orchestration framework is built around the 5G Apps & Service Catalogue, TIMEO (Transport Infrastructure and MEC Enabled Orchestrator), SEBASTIAN (Service Based Slice Translation, Integration and Automation), the Plug & Play control of virtualized functions for 5G, and the 5GCity Software Development Kit. On top of these service management and orchestration framework, Nextworks has developed, in the context of the 5G-MEDIA project, a 5G media use case for UHD media content distribution over virtualized Content Delivery Networks (CDNs), which integrates and enhances open source CDN solutions with Nextworks' SmartHome Symphony product.

- The 5G Apps & Service Catalogue, started as part of the SELFNET project (5G PPP Phase 1) and further advanced in 5G-MEDIA (5G PPP Phase 2), is a generalized catalogue of descriptors that allows service customers to bring their own VNFs and services into the 5G management and orchestration layer, with unified ETSI NFV standard format where applicable (aligned to the latest best of breed ETSI SOL specifications) and MANO specific translation towards ETSI OSM and other NFV-MANO stacks. It started as part as research activity and prototype in the SELFNET project and further advanced to a consolidated catalogue solution in 5G-MEDIA project. Further extensions are planned in 5G EVE project (5G PPP Phase 3) to support onboarding and exchange of slice, service and function descriptors from multiple domains.
- TIMEO is an enhanced NFV Orchestrator originally developed in the context of 5G-Crosshaul project (5G PPP Phase 1) and further extended in blueSPACE project (5G PPP Phase 2). It is an ETSI NFV compliant NFVO which implements the ETSI IFA interfaces and information models for service and VNF/MEC apps package lifecycle management. It extends the NFV MANO models with mechanisms to support advanced resource allocation strategies for transport network (SDN based) and network+IT, can interface to packet and optical network controllers via Transport API, can manage power states for network and computing devices and is able to handle management and monitoring of both VNFs and PNFs.
- SEBASTIAN is a tool for service-driven slice management and orchestration, implemented as part of Nextworks activities in 5G-TRANSFORMER (5G PPP Phase 2) and extended in SliceNet (5G PPP Phase 2) and 5G EVE (5G PPP Phase 3). It allows modelling and instantiation of vertical-driven services in 5G network slices, with multi-slice arbitration mechanisms. Key features of SEBASTIAN are the automated translation

from business/service to network slice requirements; the slice arbitration for efficient service sharing, re-usability and composition; multi-tenancy with service isolation and SLAs management.

- The Plug & Play control framework, developed in the SliceNet project (5G PPP Phase 2), allows to deploy customized slice control instances for verticals in the form of isolated control environments where customized control logic can be plugged to build a truly tailored slice control at runtime. These functions have been designed from the beginning around the principles of modularity, flexibility and open interfaces, in order to simplify and fasten the introduction of novel features, algorithms and even platform components. In this sense, Nextworks assets are designed and prototyped to provide an extensible and integrated framework to foster and stimulate the research in the network slicing and NFV area, providing an agile platform to quickly and efficiently develop, integrate and experimentally validate innovative features in an ETSI NFV compliant environment.
- The 5GCity Software Development Kit is a toolkit that allows wiring, in an arbitrary sequence, a pre-defined set of abstract functions defining the logical service chain of the Vertical service, generating the corresponding network service and virtual network function templates with all the complexity required by the NFV-MANO layer. The 5GCity SDK abstracts infrastructure's low-level details and automatically translates functional components and business requirements into descriptors of virtual computing and networking resources for the operational service. In the 5GCity project, the SDK module is planned to be used in the three city-wide pilots of Barcelona (ES), Bristol (UK) and Lucca (IT) to design the various network service and experimentation scenarios of the Neutral Host, Media industry use cases (immersive media and collaborative media), and waste management through video analytics.

The open and modular nature of the 5G Apps & Service Catalogue, TIMEO, SEBASTIAN, Plug & Play control and 5GCity SDK is key facilitator of an intense collaboration of Nextworks team with other researchers in 5G PPP, who can easily contribute to the evolution of the frameworks in their specific area of expertise. For example, the collaboration with academic partners allows to introduce new resource allocation algorithms, while the possibility to easily integrate new drivers for NFV domains opens opportunities to interact with multi-technology infrastructure providers. These collaborations create multi-faceted value chains that continuously encourage to investigate new research directions.

This set of assets allows Nextworks researchers to early introduce innovative functionalities for the management of 5G infrastructures and the orchestration of 5G services, often anticipating the major themes and trends of the

research. Starting from 5G PPP Phase 1, Nextworks has already developed solutions for the joint orchestration of cloud and network resources, as part of a wider strategy for energy efficient service deployments, with a demonstration at the 5G Global Event 2nd in November 2016. In this particular case, TIMEO orchestrated the automated configuration of the fronthaul/backhaul network in the service lifecycle management (as further demonstrated at EuCNC conference in June 2017); the capability was further extended in the blueSPACE project to cover also optical-based transport networks (public demonstration at ECOC 2018 conference), a topic which is still attracting strong interest of network vendors and potential customer. Similarly, Nextworks started very early to design solutions for sharing and composition of network services in NFV frameworks, which constitutes the baseline enabler for the efficient management of network slices in shared and multi-tenancy environments. Relying on these concepts, SEBASTIAN already integrates basic mechanisms for service-driven management, composition and sharing of network slices (as demonstrated in EuCNC 2018, ECOC 2018, ICT 2018 and OFC 2019 conferences), with the objective of efficiently arbitrating the execution of multi-tenant and concurrent vertical services requesting network slices. This topic is expected to draw much attention during 5G PPP phase 3, when several 5G services will run in live trials. Here, Nextworks has already demonstrated a realistic 5G media use case that enables Media Service Providers to build flexible and adaptable media distribution service chains, made up of virtualized functions, and deliver UHD media contents while users are moving in a geographically distributed 5G networks, as successfully demonstrated at the Mobile World Congress 2019.

Deeply involved in the development of the main research areas in network slicing and orchestration for 5G, Nextworks is in a strong position to successfully propose highly innovative solutions to its customers, above all in the consultancy market. In this area, the development and demonstration activities performed over the 5G Apps & Service Catalogue, TIMEO, SEBASTIAN and the Plug & Play control platforms, already integrated with a 5G media vertical use case for UHD media content distribution over vCDNs, are key references and success stories to present the company expertise to potential customers, thus increasing competitiveness and differentiation from competitors. If that's true that today many companies are offering integration services around several of the orchestration platforms developed in mainstream open source projects, it is a fact that not so many are able to go beyond what is available there in terms of features and functionalities. Moreover, most of the potential customers in this area are developing their own proprietary MANO solutions, requesting specialized skills to enhance them and introduce innovative concepts. Nextworks' PoCs in public exhibitions are excellent opportunities to present new ideas developed by the company, demonstrating their technical feasibility and potential benefits.



Telcaria is an SME providing advanced services to network operators and equipment manufacturers worldwide. We partner with network operators to redesign their products towards NFV/SDN based network infrastructure and cloud-computing applications. We collaborate with the IMDEA Networks and top Universities in the area: UC3M, UPM, and UAH. This critical mass of networking expertise located in very close proximity creates many synergies, having the members of these institutions a history of fruitful collaboration between them. The company is currently working in three H2020 EU (5GEVE, 5GROWTH, and 5G-DIVE), collaborates as an expert in the Master of SDN&NFV technologies offered by UC3M and is currently actively developing and commercially distributing Alviu, its SD-WAN solution.

Telcaria has participated in EU/FP7 NetIDE and two other 5G network-related projects: EU/H2020 SUPERFLUIDITY and 5G-CORAL (shortlisted in the Glotel Award for 'Best 5G innovation' and CSI Award for 'Best 5G project and innovation' in collaboration with Taiwanese partners), and is an active partner in 5G-EVE, 5GROWTH and 5G-DIVE. As an advanced network service virtualization SME, Telcaria has benefited from the technology advances generated from the previously mentioned projects acquiring the know-how for applying technologic achievements for rapid prototyping, design, validation, and direct deployment of Edge and Fog distributed computing platforms, advanced

multi-domain monitoring platforms, innovations in orchestration mechanisms to assist offloading and roaming scenarios among others. Additionally, Telcaria has disseminated its results in major events and public demonstrations such as EuCNC.

Recently Telcaria successfully concluded EU/H2020 5G-CORAL, leading the SD-WAN PoC which demonstrates how the SD-WAN enables the federation of resources across different administrative domains while maintaining the service uninterrupted and guaranteeing a certain level of QoE at the Edge/Fog, enabling seamless migration between radio access technologies across domains by leveraging in roaming and offloading capabilities. This PoC has had a positive impact by improving latency, bandwidth and jitter by moving applications closer to the end-users, allowing service providers to serve more users in the same area due to the increased capacity and reduced latency of the Edge and Fog, contributing to reduce the bottlenecks caused when application traffic moves from user's terminal to the cloud.

In the wake of 5G PPP projects, Telcaria has motivated current employees to develop their professional careers to pursue a Ph.D. and has been able to hire new employees.

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Founded in 2007, in Aveiro, Portugal, Ubiwhere is a high-tech SME that builds innovative, user centred software solutions with two core areas of application: Smart Cities and Telecommunications.

Our background on 5G deployments and our expertise on the development of 5G network service orchestration platforms, MEC orchestration services and 5g services based on NFV and SDN technologies, have allowed us to take part and lead diverse RDI projects addressing the 5th generation network. More recently, and leveraged by the need of both our Telecommunication and Smart City deployments and RDI projects, Ubiwhere has been focusing on Artificial Intelligence, Cyber Security and Blockchain. Such know-how drove our involvement in remarkable joint initiatives carried out by the EU, tackling challenges of the Europe of the future, namely 5G-PPP, 5G-IA, BDVA, AIOTI, ERTICO and EIP-SCC IMET and boosted our contribution to prominent standardization entities such as ETSI.

Ubiwhere has been participating in the 5G-PPP program through Phase 1, Phase 2 and Phase 3. This participation has fostered Ubiwhere's position as an active part of the 5G ecosystem while opening doors to the creation of innovative solutions with great business potential. Listed below, are the products which were created or affected by Ubiwhere's participation in the 5G-PPP program.

- **Smartlampost** (<https://smartlampost.com/>) is a clean solution that leverages on urban furniture to elegantly provide 5G network deployment, EV-charging stations and edge computing capabilities, among other plug-and-play functionalities, targeting municipalities but also other vertical businesses (such as MNOs). Its modularity, offers a flexible and cost-effective way of tackling current e-mobility and 5G communication barriers.
- **The Urban Platform** (<https://urbanplatform.ubiwhere.com/>) was created from Ubiwhere's vision of a holistic perspective of the smart urban environment for cities actively looking to contribute back to those who manage it and their inhabitants, providing a global and integrated view. Supporting centralised collection and processing of data from heterogeneous sources and city systems, while providing the seamless integration and standardisation of different kinds of communication protocols and standards, the Urban Platform helps the city with correlation of information for knowledge extraction, forecasting, reporting and impact assessment, as well as to meet the Sustainable Development Goals (SDGs) by taking into account the Sustainable Cities and Communities Indicators from ISO 37120 and 37122, among other indicators.
- **Unicle** (<https://unicle.io>) has been created out of Ubiwhere's approach to V2X and its convergence with 5G technologies. Knowing the ever-growing relevance of 5G in this domain, Ubiwhere has been capitalising its knowledge on ETSI MEC and the C-ITS stack to create an Edge Computing framework focused on the deployment and management of V2X-oriented

leveraging Edge Computing and 5G radio technology (such as C-V2X). The goal is to position such product as a complementary feature of Smartlampost: besides being able to equip such urban furniture with dedicated V2X radio components and Edge Computing elements, Unicle provides now Service Providers from the Mobility space, Mobile Network Operators and the Automotive Industry with a platform which effectively allows them to deploy VNFs and or Linux Containers which will run co-located with the radio elements, providing access to the user plane via the local breakout and, thus, providing much reduced latency which are key for CCAM (Cooperative and Connected Automated Mobility) services and applications.

- **NFVal tool** is a software tool able to allow Network Service programmer to validate both VNF and NS packages (supporting different Orchestrators) and in case an incompatibility is detected, allow its fast identification by identifying its root cause. The tool performs three kinds of validation:
  - **Syntax validation:** The service descriptor and corresponding function descriptors are syntactically validated against the scheme templates specified by data model of the targeted Orchestrator
  - **Integrity validation:** The validation of integrity verifies the overall structure of descriptors through the inspection of references and identifiers both within and outside the individual descriptors
  - **Topology validation:** This tool provides a set of mechanisms to validate and aid the development of the network connectivity logic identifying potential loops/cycles, unlinked nodes and potential network bottlenecks

Below a list of the 5G-PPP projects as well as its main contribution for the previously mentioned products:

- **SELFNET** (<https://selfnet-5g.eu/>): SELFNET project enabled Ubiwhere to define and understand the lifecycle of a Service Orchestration framework with Self-Healing, Self-Optimization and Self-Protection capabilities. Smartlampost product vision was born at the end of SELFNET project leveraging on its architecture as well as on its monitoring and self action capabilities for the edge computing and orchestration framework.
- **SONATA** (<https://www.sonata-nfv.eu/>): In the context of SONATA, Ubiwhere's contribution was mainly focused on the SDK for Service development component. NFVal tool first version was created in the context of SONATA (supporting only SONATA MANO) and later evolved by Ubiwhere's R&I department to support other NFV MANO orchestrators (latest version of NFVal presented to ETSI for integration in OSM). Additionally, Smartlampost's platform targeting Service Providers (a relevant stakeholder in the broader 5G multi-stakeholder ecosystem) shares SONATA's vision of an SDK for the development

and deployment of Network Services in a MANO Orchestration framework.

- **5GCity** (<https://www.5gcity.eu/>): This phase 2 project shares the vision of Smartlampost product in the fact that both projects envision the usage of urban furniture across a city to provide network and computational resources to third parties. Smartlampost edge orchestration framework was considerably boosted by Ubiwhere's participation in the project and critical to Smartlampost's path to market. Additionally, this project allowed Ubiwhere to establish important partnerships and co-creation activities with other partners of the project - namely, Accelleran, a Small Cell vendor, with whom Ubiwhere has already performed commercial activities in the scope of Smartlampost through 4G media trials in Portugal, following also the Neutral Hosting approach. Having in mind the Edge Computing capabilities of our Smartlampost and alignment with the project's goal of having different Service Providers from different verticals deploying numerous applications leveraging 5G, Ubiwhere has contributed with a V2X use case which led to a new product called Unicle (<https://unicle.io>) (currently in BETA). Having contributed also with the front-facing multi-tenant web platform of the project, the technologies applied in the scope of this platform greatly influenced the development of our Urban Platform, which has already been also deployed in the city of Barcelona (one of 5GCity's targeted cities for trials).
- **5GZorro** (<https://5gzorro.eu/>): With this Phase 3 5G-PPP project started in November 2019, Ubiwhere intends to continue its commitment to create a multi-stakeholder 5G marketplace, aligned with Smartlampost's dedicated Marketplace app (<https://smartlampost.com>). Through blockchain and Smart contracts technology, Ubiwhere hopes to design the new set of shared business logic and SLAs as Smart Contracts and benchmark 5GZorro's findings when applying such set of rules in the telecom space: Mobile Network Operators, Site Owners, Spectrum Regulators and, finally, Service Providers. With this convergence of 5G technology and DLTs (Distributed Ledger Technologies), Ubiwhere hopes to enhance the existing Smartlampost Marketplace with a new trustless layer, effectively providing all of these entities with built-in protection mechanisms - as example, guarantying a certain SLA based on different monitored parameters which, if verified, may reflect positively or negatively in the billing process (automated P2P payments, through blockchain technology).

As a final remark, Ubiwhere is always seeking for strategic partners that can provide strategic value to both its research activities but also to its commercial endeavours. Ubiwhere is already paving the 5G market with the outcomes of the research it performed in the 5G-PPP program and expects to follow this row in the immediate future.



5G capabilities allow us to implement VNFs to deliver computer vision services through the network by deploying them around the network. More precisely, for our use case, the deployment should be done in the edge as we need to lower the delay to the minimum to increase drone autopilot reaction. The drone is piloted by a VNF, having a manual, automatic and remote flight control. The computer vision results, done from another VNF, may change the drone path depending on the detection and drone flight mode.

Visiona's approach to the preventive maintenance aims to detect, from an autopilot drone, different changes in the target zones in order to predict possible dangerous conditions on the environment or in the structures.

Regarding the artificial intelligence applied to vision, Visiona developed three systems:

- People and vehicle detection system in critical locations.
- Change recognition system on UAV imagery.
- Abnormal hot points through thermal image.

Our target with the first implementation is to analyse infrastructures and detect elements that could imply a risk, such a person or a vehicle in a forbidden and hazardous zone.

The second one is focused on finding environmental changes in areas close to key

infrastructures. To do so, the system needs to have a record of the initial status of the area to have a reference to compare with.

The third one, based on thermal image, implements an alert system for the hot points of the, in our case, dehydration chimneys of the gas plant. This can be applied to any other case.

All implementations are based on images obtained from Unmanned Aerial Vehicles (UAV). As a result, image processing techniques are a crucial part of the developments. More precisely, Deep Learning techniques applied to this field such as Convolutional Neural Networks. This technique is the base of most of the cutting-edge implementations of deep learning based on images.

Different challenges are going to be addressed with our approach. First, the use of drone imagery is a demanding task for the detection system, due to the reduced size of the relevant objects related to the complete image. Subsequently, the development of an implementation robust to lighting variations, environmental conditions and other factors produced by the different scenarios is one of our main goals.

Related to the change detection system, the capability of adaptation is a crucial factor for the viability of the algorithm. The main variation between this approach and



#### MORE INFORMATION

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the deepest learning methods for image processing is that we need to have a previous reference to compare with. As a result, the development process has a different perspective from the standard designing of deep learning models for computer vision.

To complement the explained above, Visiona's quality probe may be deployed in the different nodes of the network to analyse the QoS and QoE of the video that the operator is receiving remotely. The quality probe can detect no video (video is cut), freezing, packet loss, colour errors or audio defects. It has also the feature of demanding a new network path in case one of those failures are detected in the video, if in the edge the video is correct, of course.





#### MORE INFORMATION

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The WINGS success stories are related to the engagement in international cooperations, including H2020 and 5G-PPP projects. Through these activities, and especially, 5G-PPP, vertical solutions that leverage on advanced wireless technologies have been conceived, while contributions have been made for the development and validation of various technology components.

WINGS has success stories in all the main vertical areas that it addresses: utilities, food security, smart city applications, and industry / logistics.



*WINGS Nb-IoT based device for enabling smart water management, consumption monitoring/ predictions and fault management*

In the area of utilities, WINGS has collaborated with OTE and is deploying smart water management solutions in the South of Greece (e.g., Argos/Peloponnese, and elsewhere). First emphasis is on industrial areas, while residential deployments are also underway. The solutions provide the means for monitoring and predicting consumptions,

as well as faults that may occur in the utility networks. The technology foundation comprises IoT (Internet of Things) devices encompassing local intelligence, cloud-based AI (Artificial Intelligence) algorithms for predicting/reasoning, and advanced wireless networks. Communications rely, firstly, on Nb-IoT; more advanced 5G-based versions are being prepared/trialled (esp. in testbeds, as those provided by 5G-EVE), so as to prepare for augmented experience and fast actuation, in the presence of a massive volume of diverse devices.



*Camera to be installed underwater, for monitoring the production, and to transmit through cabling and 4G/5G and fault management*

In the area 5G-powered food security, WINGS started the work from aquaculture installations, based on its AQUAWINGS platform and the 5G-Heart project. Use cases addressed are water quality monitoring, the assessment of the health of the production, and the optimization of the feeding. Monitoring relies on multiple sensors,

video cameras and underwater drones. The higher the video quality, the faster and more robust the identification of diseases and the designation of mitigation actions. Moreover, underwater drones are essential for checking the quality of the farm cages. Video streaming and drone manipulation rely on 5G (and on underwater cables).

Instrumental for WINGS, for developing further competences and solutions for the industry/logistics case, is the Clear-5G project. Based on use cases from Taiwanese partners, specific robotic and advanced-wireless solutions have been developed, for automating factory floor tasks. The solution is validated based on proof of concept activities (a final phase, in Taiwan, will be pursued with some delay, caused by the COVID-19-induced bans) and based on simulation (for considering larger production lines). Finally, through 5G-Tours WINGS will enhance the smart city applications portfolio. WINGS will deploy a smart-parking and passenger security (evacuation) solution for the Athens International Airport. Moreover, there will be AR/VR applications targeted to high-school students, for the culture, tourism and safety fields, in cooperation with the partner institution EA (link, private institution providing primary, high-school and lyceum level education).

WINGS is honoured to be part of the journey of shaping emerging and future networking / cloud / application technologies, in cooperation with its partners, including world renowned multi-nationals, for the benefit of the European industry and citizen, while also having an eye to the world.

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