RAINBOW NEWSLETTER

ISSUE 3, FEBRUARY 2021

RAINBOW is a Research and Innovation Action funder under the EU Horizon 2020 framework programme, focusing on producing an open, trusted **fog computing platform** facilitating the deployment, orchestration and management of scalable, heterogeneous and secure IoT services and cross-cloud apps.

RAINBOW USE CASES

To evaluate its wide scope, the **RAINBOW** framework will be demonstrated in various **real-world and demanding scenarios**. These include automated manufacturing within IoT-based smart factory infrastructure, industrial surveillance applications performed by unmanned aerial vehicles, and advanced notification systems for connected vehicles in urban areas.

Through these scenarios **RAINBOW** will **stress-test and validate** the applicability, usability, effectiveness and value of its developed components and services. At the same time these cases will demonstrate how **RAINBOW** can improve the **competitive positioning** of the Next Generation Internet initiative (NGI) and IoT in general.

Horizon 2020
European Union Funding
for Research & Innovation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 871403

PROJECT INFORMATION

TITLE: RAINBOW - *A fog platform for secured IoT services*
GRANT AGREEMENT NO: 871403
CALL ID: ICT-15-2019-2020
CALL TOPIC: Cloud Computing
START DATE: January 1st, 2020
END DATE: December 31st, 2022
COORDINATOR: UBITECH Ubiquitous Solutions

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Look for our hashtags!

#RAINBOW_H2020
#FogComputing
#EdgeComputing
#Industry4
#secureIoT

https://rainbow-h2020.eu

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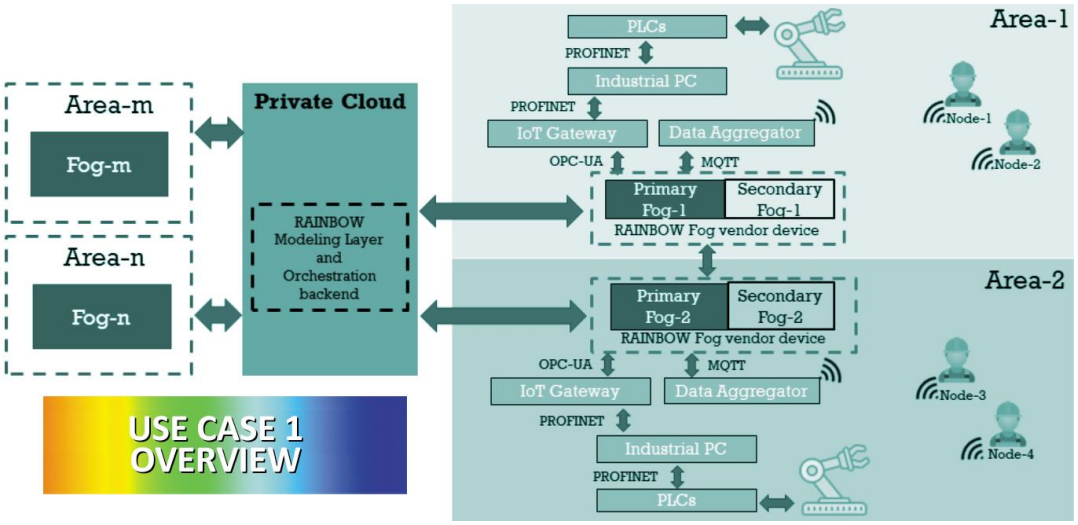
HUMAN-ROBOT COLLABORATION IN INDUSTRIAL ECOSYSTEMS

USE CASE 1

Reliable and accurate indoor positioning allows for real-time interaction between humans and cyber-physical systems. For safety-critical industrial IoT, real-time localization services that monitor the movement of objects and detect human workers' position with respect to moving machinery, are essential to prevent collisions and accidents. In addition to strict latency requirements, other considerations such as scalability, mobility, reliability, resource-sharing, secure-deployment of applications, application monitoring, distributed data management and analytics, security and data privacy are important as well.

By exploiting RAINBOW's fog platform, we aim to achieve:

- Scalability of cloud-native services and effective utilization of resources on Fog devices.
- Reduction of system latency and jitter.
- Run-time application monitoring, constraint evaluation and dynamic resource provisioning.
- Reliable service-and-data migration between Fog devices.
- Efficient data management and high-performance queries across distributed databases for data analytics on the edge.



USE CASE 1 OVERVIEW

USE CASE 1 - LEADER

The **Bremen Institute for Production and Logistics** is one of the largest engineering research institutions in the state of Bremen. Its main research areas include *Intelligent Production and Logistics Systems* and *ICT Applications in Production*. BIBA possess extensive expertise in application-oriented and industrial contract research in the fields of production and logistics, in important sectors such as transportation, automotive, aviation and wind energy.

BIBA
https://www.biba.uni-bremen.de

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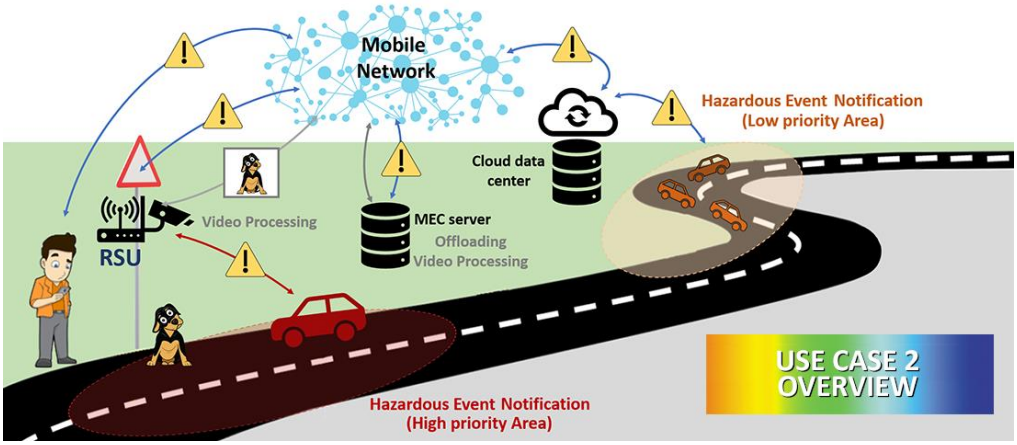
DIGITAL TRANSFORMATION OF URBAN MOBILITY

This use case hinges upon a real-time geo-referenced notification system for vehicles in urban areas that warns about hazardous situations in the city's mobility network, due to any possible cause (e.g., accidents, road infrastructure failure, animals on the road, etc.) Explicit notifications refer to those that are triggered directly by vulnerable users (citizens), who may want to report a hazardous situation. Automatic notifications may be triggered by on-board sensors, by Road Side Units or as a result of sensor fusion processes that may involve cars and Road Side Units all sending log data to Fog, MEC (Multi-access Edge Computing) and Cloud nodes, where AI/ML algorithms can infer alert conditions. Each alert signal will be delivered with the available geo-localization information, allowing reports to be localized in the areas where the hazardous situation was detected.

With the aid of RAINBOW's fog platform, we aim at:

- Offering an Automatic Hazardous Event Detection (AHED) service that can be run in different platforms towards optimizing the work performance
- Migration of the AHED algorithm between Road Side Unit and MEC nodes according to specified metrics (e.g., network conditions, RSU load, application-level metrics, etc.) utilizing RAINBOW's smart orchestration services.
- Vehicle to Cloud secure V2X connection using the Rainbow Trust Enablers.



USE CASE 2 - LEADER

Centro Ricerche Fiat, headquartered in Orbassano, Turin, was established in 1978 as a focal point for research activities of Fiat Chrysler Automobiles (FCA). Its mission includes the research and development of state-of-the-art power units, vehicle systems and features, materials, processes and methodologies together with innovation expertise in order to improve the competitiveness of FCA products.

CRF CENTRO RICERCHE FIAT

https://www.crf.it

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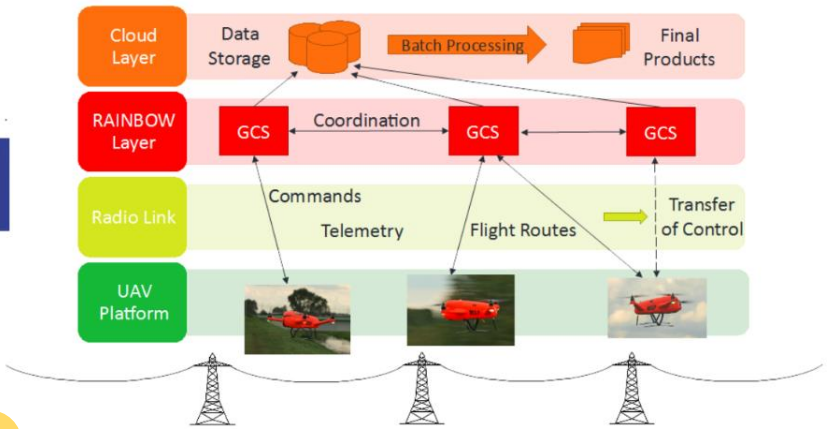
POWER LINE SURVEILLANCE VIA A SWARM OF DRONES

Due to the high cost of power line inspection, power grid operators are pursuing possibilities for using drones instead, as a more cost-effective solution. Multirotors, equipped with RGB and IR cameras meet many limitations in an effective power lines inspection: short flight time, necessity to maintain a visual line of sight, constant relocations of a ground control station (GCS). Long segments of power lines must be handled by several teams and the whole data acquisition process lasts for several days. To overcome these challenges there is a need for a system that will allow changing a group of independent drones into a swarm, where every drone works towards the realization of a common goal and its actions are automatically coordinated to minimize the time and effort needed to acquire data for the given power line section.

Key challenges to overcome with the aid of RAINBOW:

- Ability to fly for longer distances than the range of the radio link
- Smart route planning for individual drones in the swarm to raise the overall mission efficiency
- Increasing the autonomy of the drone by minimizing human assistance
- Elimination of the execution of the fail-safe procedures due to interference or interruptions in the radio link caused by obstacles and terrain configurations
- Minimizing the GCS deployment time and the need for frequent relocations

USE CASE 3 OVERVIEW



USE CASE 3 - LEADER

MSP has launched its activity in 2001 and is one of the leading entities in the unmanned flying system industry in Poland. MSP has conducted extensive R&D in the field of unmanned systems, particularly of composite structure design and execution, on integration with autonomous control systems and optimizing flight test performance.

https://uav.com.pl

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ADVISORY BOARD

We are very proud to announce the following external experts, all of them world leaders in their domains, who have joined our Advisory Board! The board's main role is to monitor and provide consultation for the research and technological development activities performed within RAINBOW.

Dr. Rajkumar Buyya is a Redmond Barry Distinguished Professor and Director of the Cloud Computing and Distributed Systems Laboratory at the University of Melbourne, Australia. He is also the founding CEO of Manjrasoft, a spin-off company of the University, commercializing its innovations in Cloud Computing. He has served as a Future Fellow of the Australian Research Council during 2012-2016. He is serving/has served as Honorary/Visiting Professor for several elite Universities, including Imperial College London (UK), University of Birmingham (UK), University of Hyderabad (India) and Tsinghua University (China).

Dr. Weisong Shi is the Associate Dean for Research and Graduate Studies at College of Engineering, Wayne State University. He is a Charles H. Gershenson Distinguished Faculty Fellow and a Professor of Computer Science, and leads the Wayne Mobility Initiative (WMI) and directs the Mobile and Internet Systems Laboratory and Connected and Autonomous Driving Laboratory, investigating performance, reliability, power- and energy-efficiency, trust and privacy issues of networked computer systems and applications. Dr. Shi founded the IEEE International Conference on Connected and Autonomous Driving.

Dr. Liqun Chen joined the Department of Computer Science at the University of Surrey as Professor in Secure Systems in 2016. Prior to this appointment, she was a Principal Research Scientist at Hewlett Packard Laboratories in Bristol, UK, which she joined in 1997. Before that, she worked at Royal Holloway, University of London, the University of Oxford, and Southeast University in P.R. China. Liqun is a visiting professor at Southeast University. During her 19 years working for Hewlett Packard, Dr. Liqun had a number of patents granted and more out for review.

Mr. **Anthony Chelidonis** is a commercial lawyer with five years' experience in the legal industry. He holds a BSc in Political Science and Public Administration from the National and Kapodistrian University of Athens, a Bachelor's degree in Law from Kingston University (LLB) and a Master's degree in Law from University College London (UCL) in International Commercial Law. He is also a member of the Athens Bar Association and he speaks fluently Greek, English as well as Russian at an elementary level.

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RAINBOW SYNERGIES & COLLABORATIONS

Future Cloud Cluster

The aim of Future Cloud Cluster is to provide a forum for discussion and collaboration for research and innovation initiatives that address next generation Cloud Computing challenges and issues, including diverse forms of distributed computing (Cloud, Multi-Cloud, Edge, Fog, Ad-hoc and Mobile computing). The goal of the cluster is to create a critical mass of projects so as to share experiences, collaborate on approaches, discuss challenges for adoption and future research and elaborate a broad EU perspective for cloud technology roadmapping.

Learn more at: https://eucloudclusters.wordpress.com/future-cloud

MORPHEMIC

MORPHEMIC is a unique way of adapting and optimizing Cloud computing applications. The project is an extension of MELODIC which is a multi-cloud platform developed in the H2020 project. MELODIC is the simplest and easiest way to use Cross-Cloud. Now this open-source platform is extended to MORPHEMIC with 2 main innovative pillars:

- Polymorphing architecture: when a component can run in different technical forms, i.e., in a Virtual Machine, in a container, as a big data job, or as serverless components.
- Proactive adaptation: aims to forecast future resource needs and possible deployment configurations -adaptation can be done effectively and seamlessly for the users of the application.

Find more at: https://www.morphemic.cloud

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https://rainbow-h2020.eu/contact-us/

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