Telecommunications in Emergency and Crisis Situations

Ioannis Askoxylakis
Foundation for Research and Technology - Hellas
Institute of Computer Science
asko@ics.forth.gr

Outline

- Introduction
- Communication services for disaster mitigation
- Communication scenarios in emergency and crisis situations
- Rapid Emergency Deployment Communication System
- Conclusions
- Future Directions

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Introduction

- A primary challenge in responding to Emergency and Crisis Situations (ECS) is communication operation.
- In the 9/11 terrorist attack at the World Trade Center some of the police warnings were not heard by firefighters resulting in several casualties.
- In ECS communication infrastructure might be inoperative or have poor Quality of Service.
- The primary technological challenge after a disaster is the adequate operation of the communication infrastructures.

Introduction

- In ECS, different Emergency Response Authorities (ERA)s are involved (civil protection, police, rescuers e.t.c.).
- For ECS communication infrastructures there is the challenge of:
  - Serviceability (to serve the increased traffic load):
    - Restoration of failed communication infrastructures.
    - Rapid deployment of Emergency Communication Infrastructures.
  - Interoperability of ECS communication infrastructures.

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ECS Communication Services

- Push to talk:
  - Analog Voice service in a point to multi-point architecture.
  - Half duplex communication service.
  - PTT is a widely used service to ERAs.
- Audio/Voice service:
  - Full-duplex audio communication.
  - Full duplex voice is required for public safety communication.

ECS Communication Services

- Real Time Video transmission:
  - Transmission of real time video to an ERA control center and vice versa could be a very powerful tool for disaster mitigation.
- Real Time Text Messaging:
  - Text messaging service is an effective and quick solution for sending alerts in case of emergencies:
    - Individuals reporting suspicious actions.
    - Victim affected by a disaster.
    - Authorities warnings to the public.

ECS Communication Services

- Broadcasting-Multicasting
  - Both functionalities can enhance public safety and rescue operations.
- Localization
  - Victim Location.
  - Rescuers Location.
- Status information.
  - Environmental parameters that can trigger ECS response.

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Emergency communications usage scenarios

- Mobile emergency responder.
  - Access to services and applications by emergency responders.
  - Mobile or Nomadic usage.
  - Requirements:
    - Interoperability between ERAs
    - QoS Support (for example prioritization)
    - Security – Privacy (for example in case of a terrorist attack)
    - Reliability – Availability, services should be available at all locations of the disaster area.
    - Scalability. ECS responder number increases
    - Mobility. Especially in the case of a large disaster Area
    - Location report. To efficient coordinate of the mitigation plan.

Emergency communications usage scenarios

- Fixed command/coordination center.
  - The case of an emergency response command center in the premises of a civil protection authority.
  - VoIP, multimedia content sharing, file sharing, tele-medicine services, and intergovernmental communications
  - Requirements:
    - Interoperability between ERAs
    - QoS Support. Prioritization of transmission especially in the case where the network capacity is reached
    - Security - Privacy. (ERA communications, Telemedicine data etc.)
    - Reliability – Availability (Restoration of infrastructures, Backup infrastructures)

Emergency communications usage scenarios

- Nomadic command/coordination center.
  - The case of an emergency response command center on a vehicle located close or within the disaster scene and coordinates the emergency responders locally.
  - Requirements:
    - Interoperability.
    - QoS Support. Classification to various responder teams.
    - Security – Privacy Secure Hand-offs, re-authentication.
    - Reliability – Availability, services should be available at all locations of the disaster area.
    - Scalability in order to support load and area coverage growth as ECS mitigation is carried out.

Emergency communications usage scenarios

- Victim Communications
  - Communications between Victims and Rescuers
  - Victim communication has to rely in consumer devices (mobile phones, Wifi enabled devices).
  - Requirements
    - Ubiquitous Access. The network should be easily accessible from everybody (112)
    - Interoperability. Between ERAs and Civlilans
    - QoS Support, prioritization to give priority to incidents requiring immediate response.
    - Security – Privacy. protecting victims privacy and should provide resilience to operational anomalies and security attacks
    - Location Services to assist responders.

Emergency Response Aspects

- In the ECS, emergency response does not take place all at once.
- At the early stages, first responders operate independently.
- Later the responder teams become part of a coordinated action plan.
- Traditionally ECS responder communication is based on VHF/UHF PTT service.
- ERAs communication infrastructure lack interoperability.

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Rapid Emergency Deployment Mobile Communication Infrastructure

REDComm

European Commission

Innovative Infrastructure:

- Cognitive mesh network backbone
- Use of unused UHF frequencies
- Auto-configurable

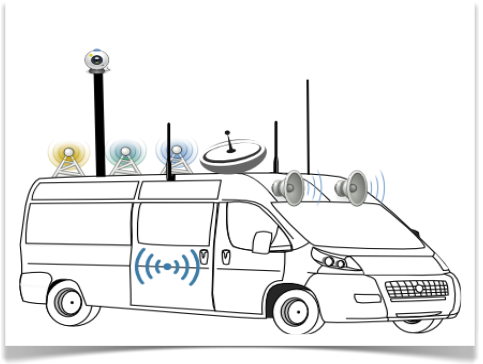
Nodes:

- 8 Mobile Units (trailers)
- 2 Suitcases

Communication Equipment:

- VHF radios
- GSM Base Stations
- WiFi Access Points
- Satellite Transceivers
- Ethernet
- ISDN
- FM Radio broadcast

Action Grant under the Programme for "Prevention, Preparedness and Consequence Management of Terrorism and other Security-related risks": 617k €

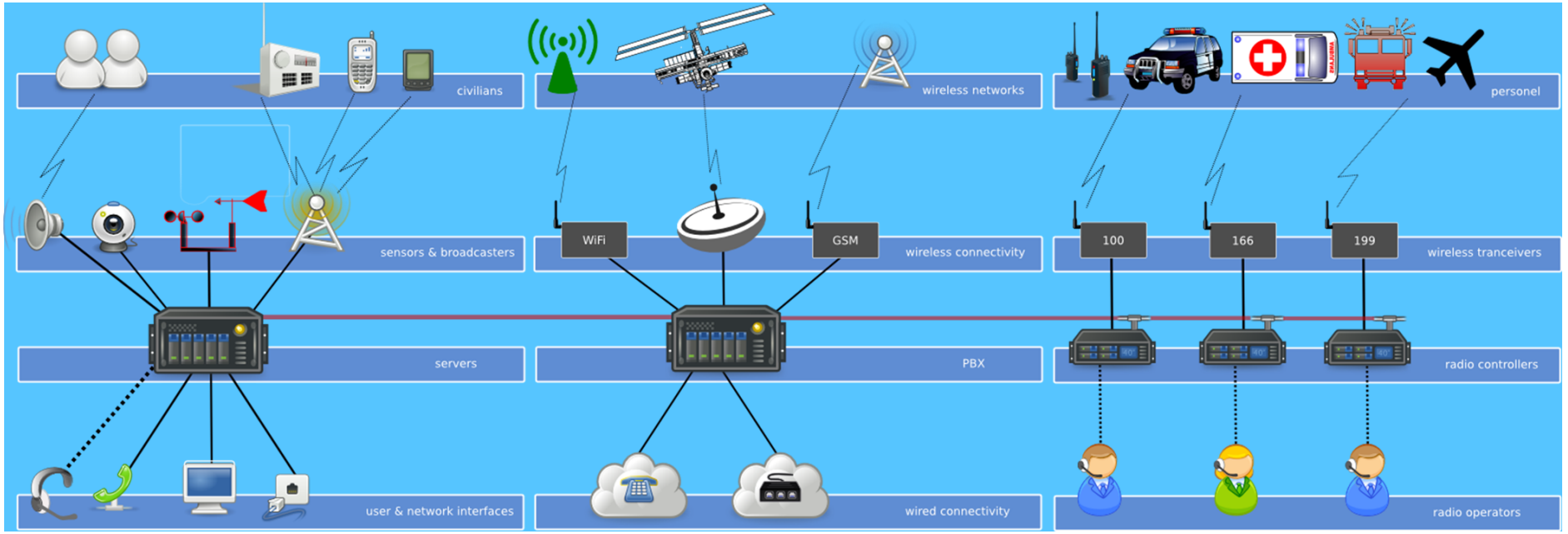


Coordinator: FORTH-ICS

Associate Partners:

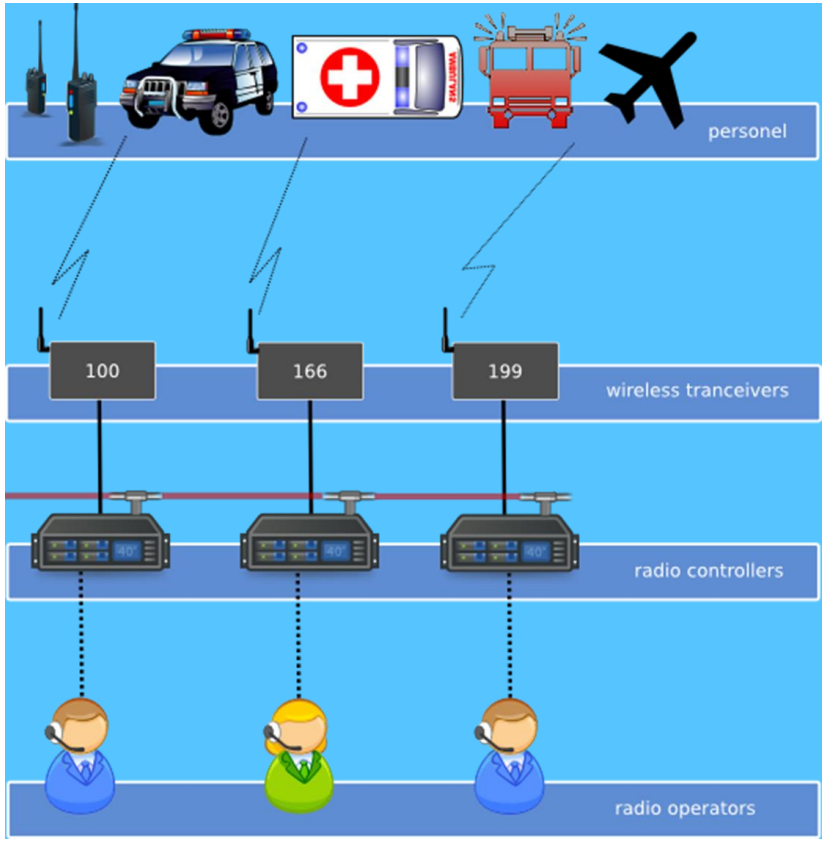
- Region of Crete
- Hellenic Republic – Hellenic Police
- Hellenic Republic Fire Service
- EKAB – National Center of Prehospital Emergency Medicine

System diagram



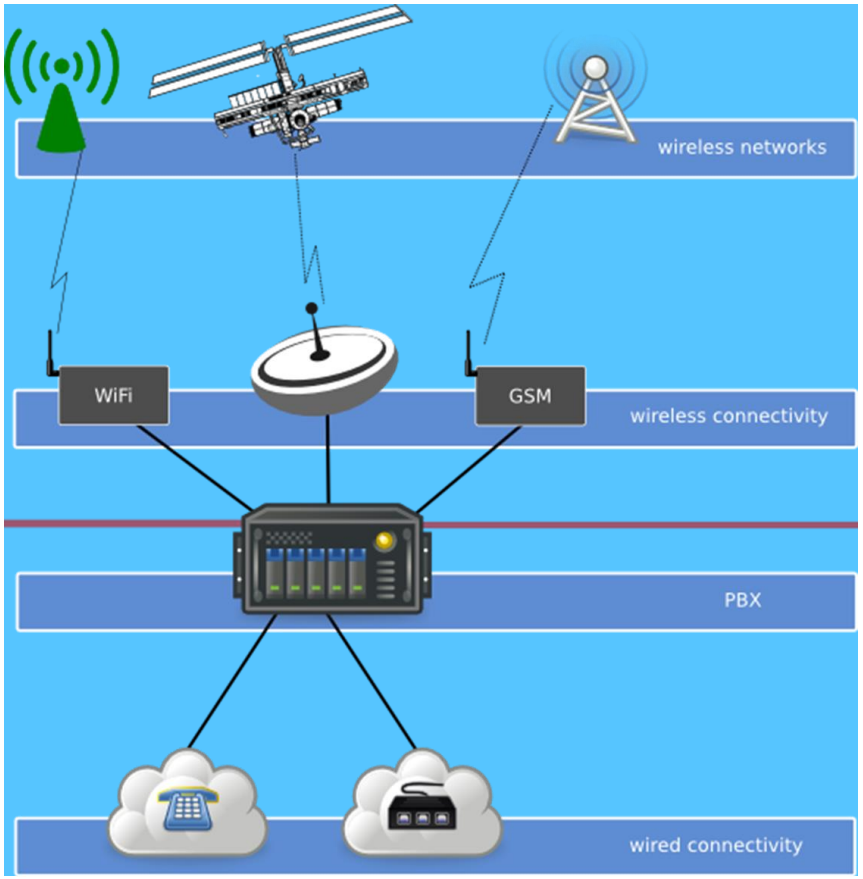
Basic components

- Independent VHF/UHF transceivers
- Independent operators
- Capability for interconnection
- Capability for parallel operations



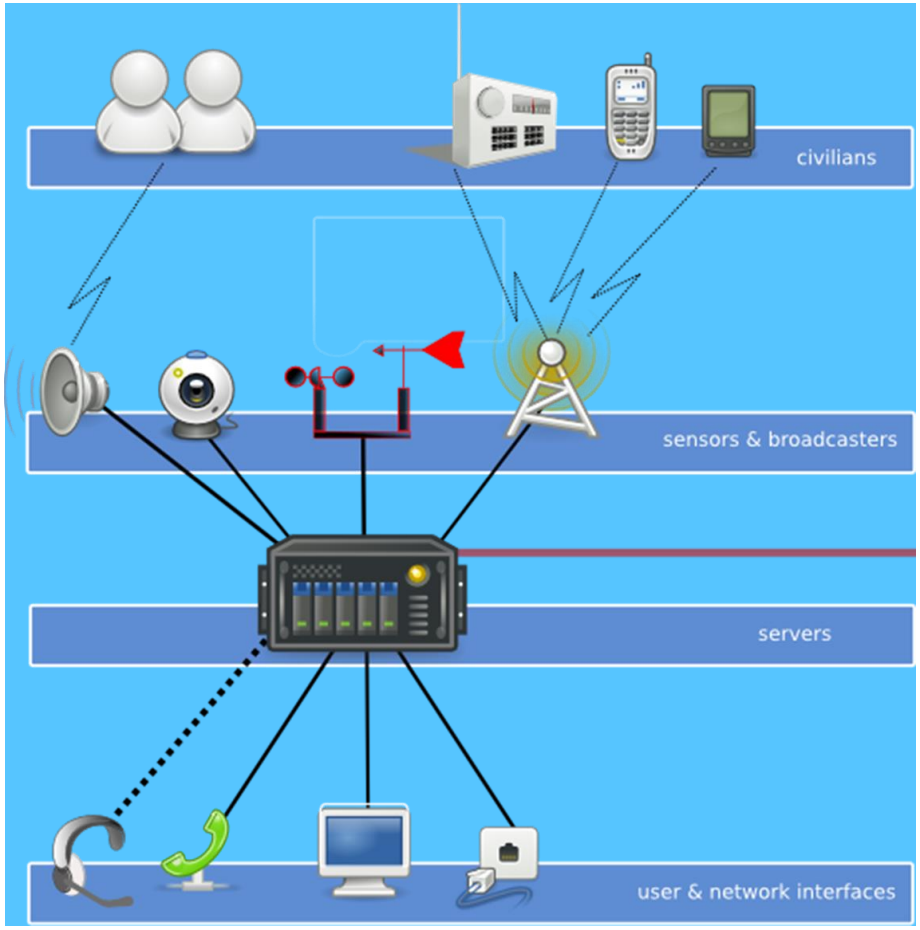
Connectivity

- Satellite transceiver
- Mobile networks-GSM base station
- Wireless networks – 802.11n Access Points
- Backbone Network interfaces – SDR PCIe cards
- ISDN Primary Rate interface (voice and data)
- Sector antennas covering 120 degrees (9 antennas)

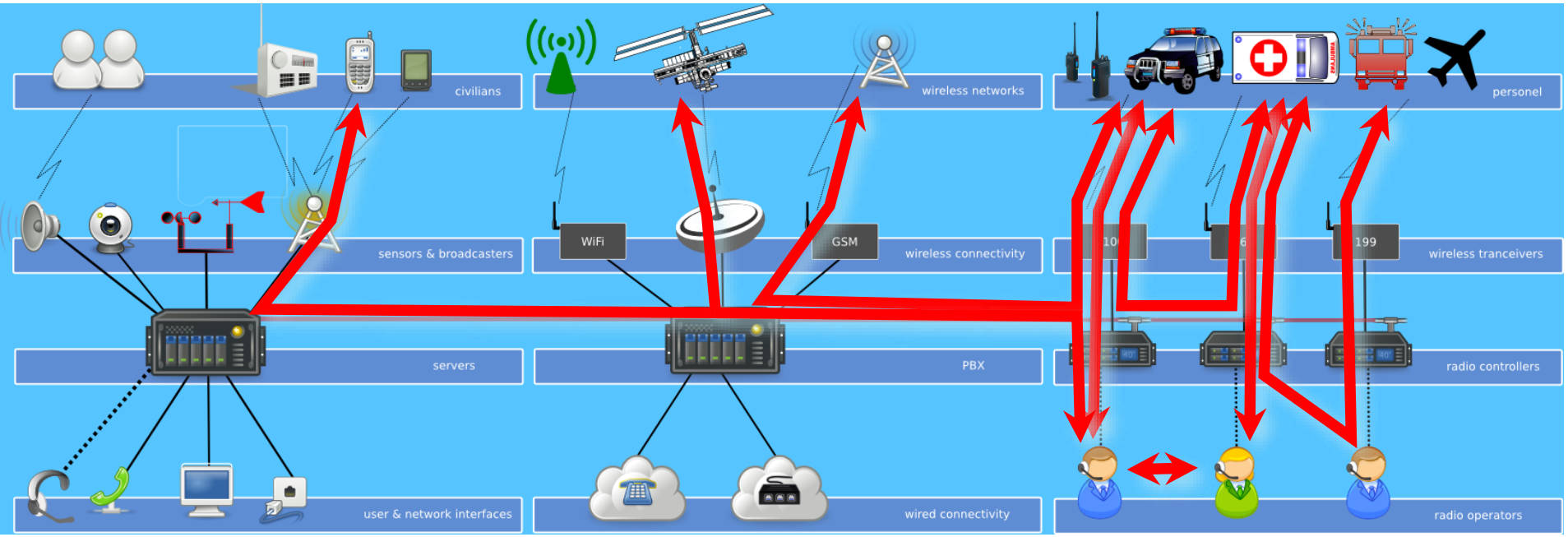


Supportive elements

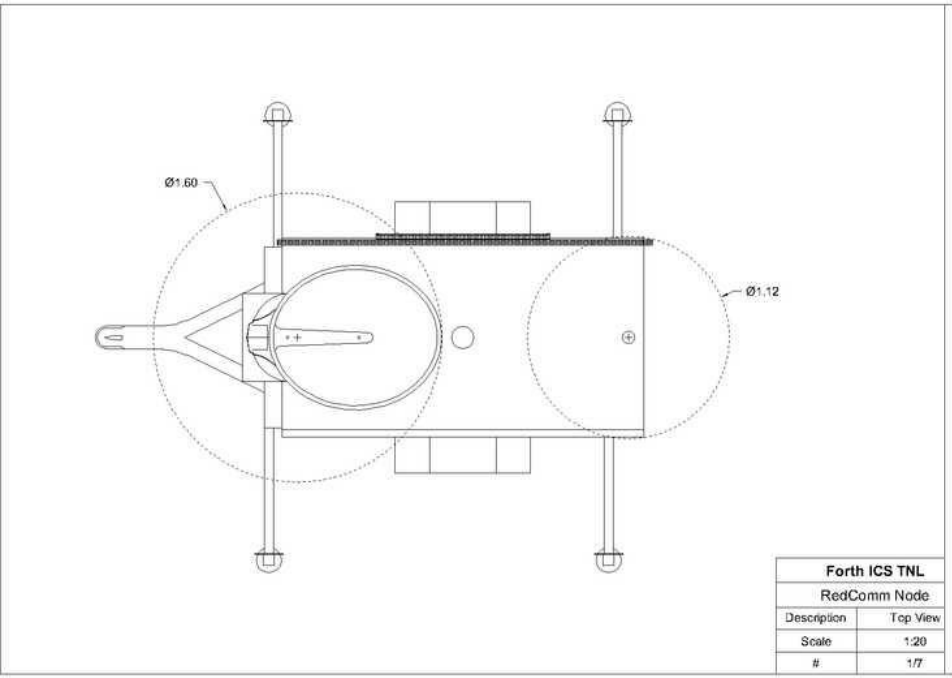
- FM Transmitter
- IP Video Camera
- Loudspeakers
- Anemometer
- Video screens
- Ethernet
- Telescopic mast
- 4 steel guy cables for mast resistance to wind

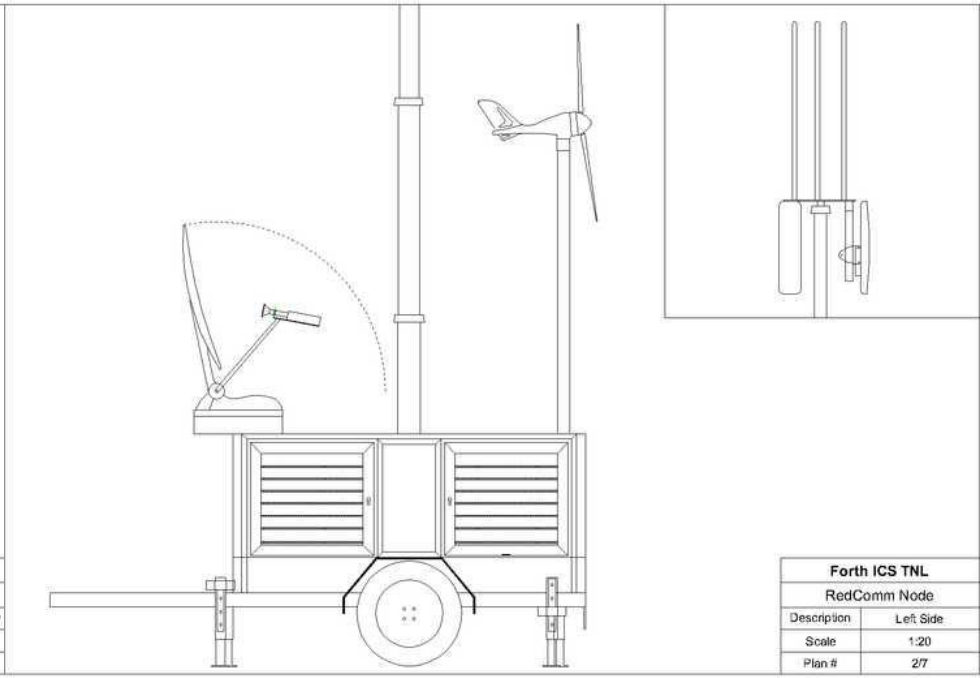


REDComm System Diagram

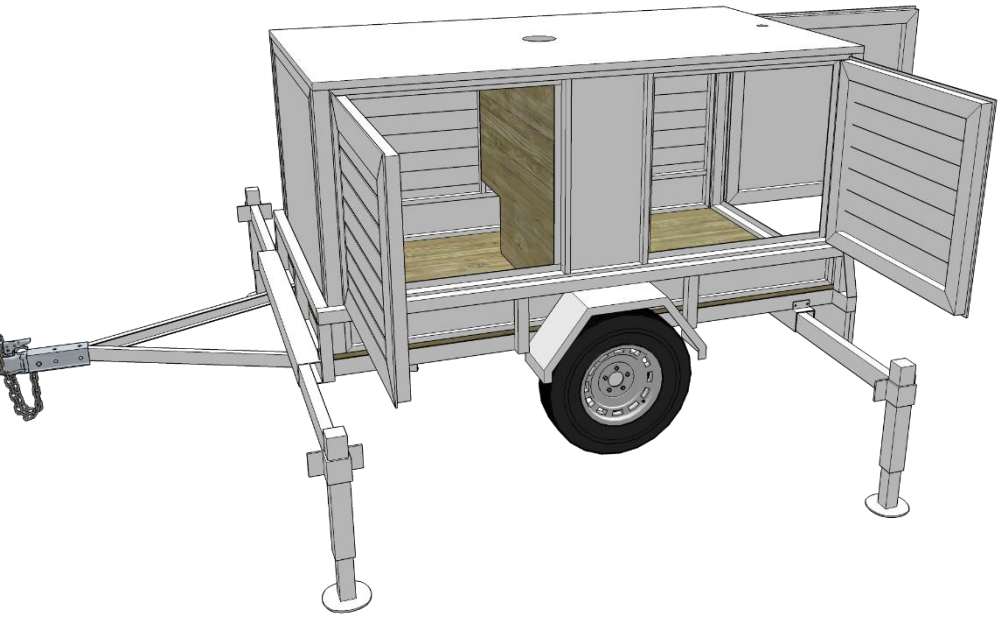


REDComm prototype development





REDComm prototype development



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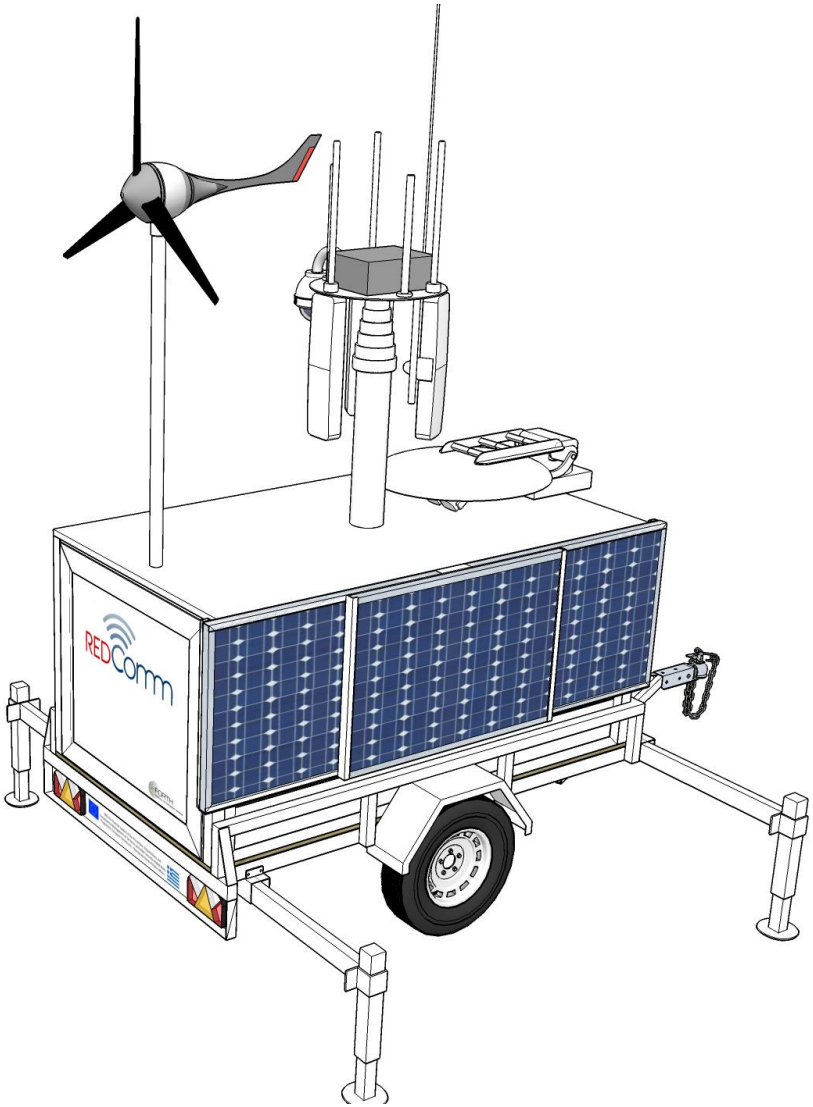

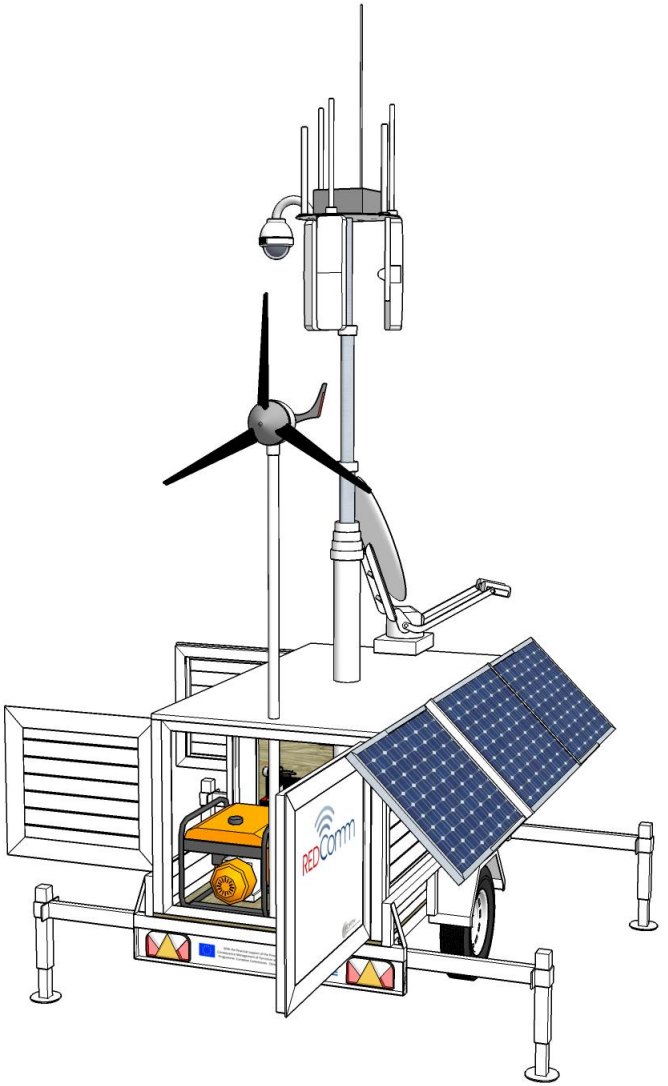

REDComm prototype development

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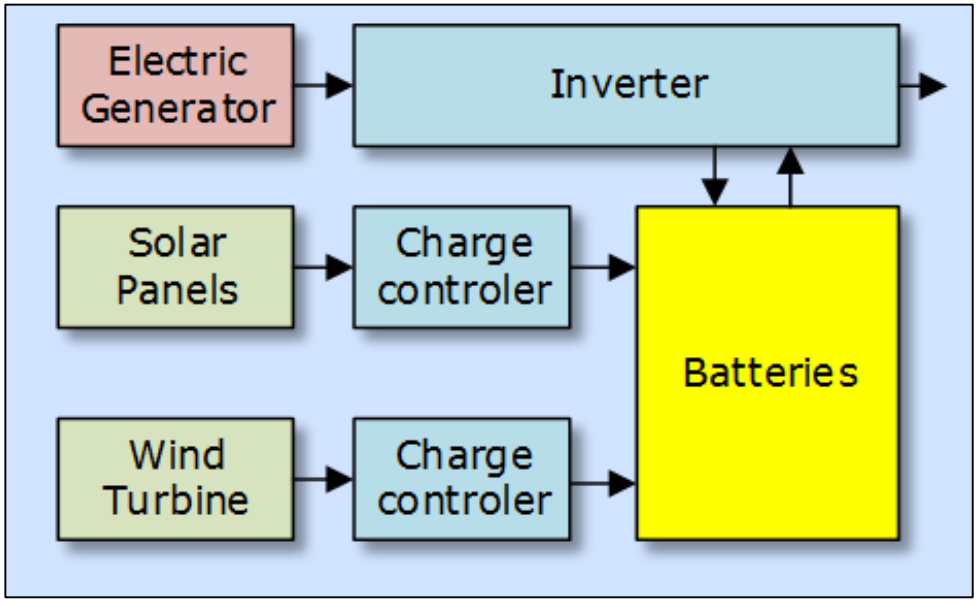
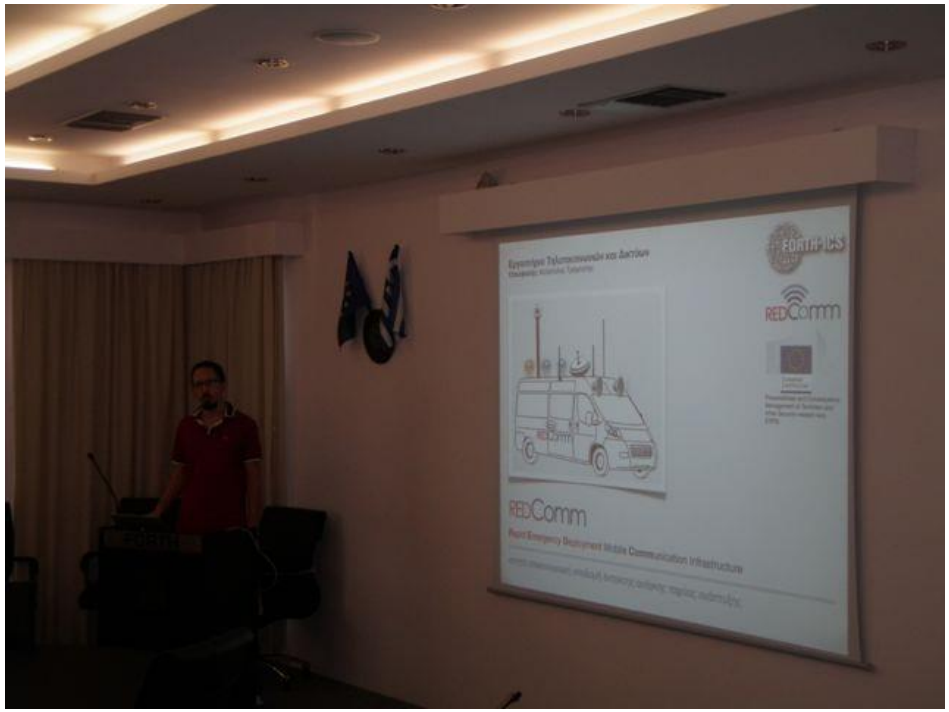
REDComm suitcases

REDComm energy aspects



Engagement of the authorities



Demonstrations

REDComm

Hellenic Parliament, December 2014

Researcher's Night, 2014, 2015, 2016

MARIE CURIE ACTIONS

- Introduction
- Communication services for disaster mitigation
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Conclusion from the EC

TRL 5 – technology validated in relevant environment
TRL 6 – technology demonstrated in relevant environment
TRL 7 – system prototype demonstration in operational environment
TRL 8 – system complete and qualified
TRL 9 – actual system proven in operational environment

EUROPEAN COMMISSION
DIRECTORATE-GENERAL MIGRATION AND HOME AFFAIRS

Directorate E: Migration and Security Funds
Unit E.3: Internal Security Fund

Brussels, Ares (2015) 3872740
HOME-E3/ds D(2015) 18 SEP. 2015

Foundation For Research&Technology
Mr Ioannis Askoxylakis
Research Scientist
Nikolaou Plastira 100
70013 Hereklion
GR-Greece

REGISTERED MAIL WITH ACKNOWLEDGMENT OF RECEIPT

Subject: Final calculation of Grant Agreement HOME/2011/CIPS/AG/40000002107

Dear Mr Askoxylakis,

Further to the submission of the final reports for the above-mentioned grant agreement, I am pleased to inform you that our services have completed the evaluation of your project and have rated it as **GOOD** with the following remarks:

CONCLUSION:

REDComm has produced a working system that is assessed as being of TRL 8; the project outputs are therefore in a position to be exploited by emergency services operators and/or serve as the basis for further development. REDComm can thus potentially make an important contribution to improving the response to emergency situations in the EU.

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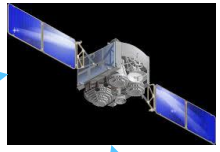
Secure, Interoperable, UAV-assisted, Rapid Emergency Deployment Communication and sensing Infrastructure - SIREN

Future directions

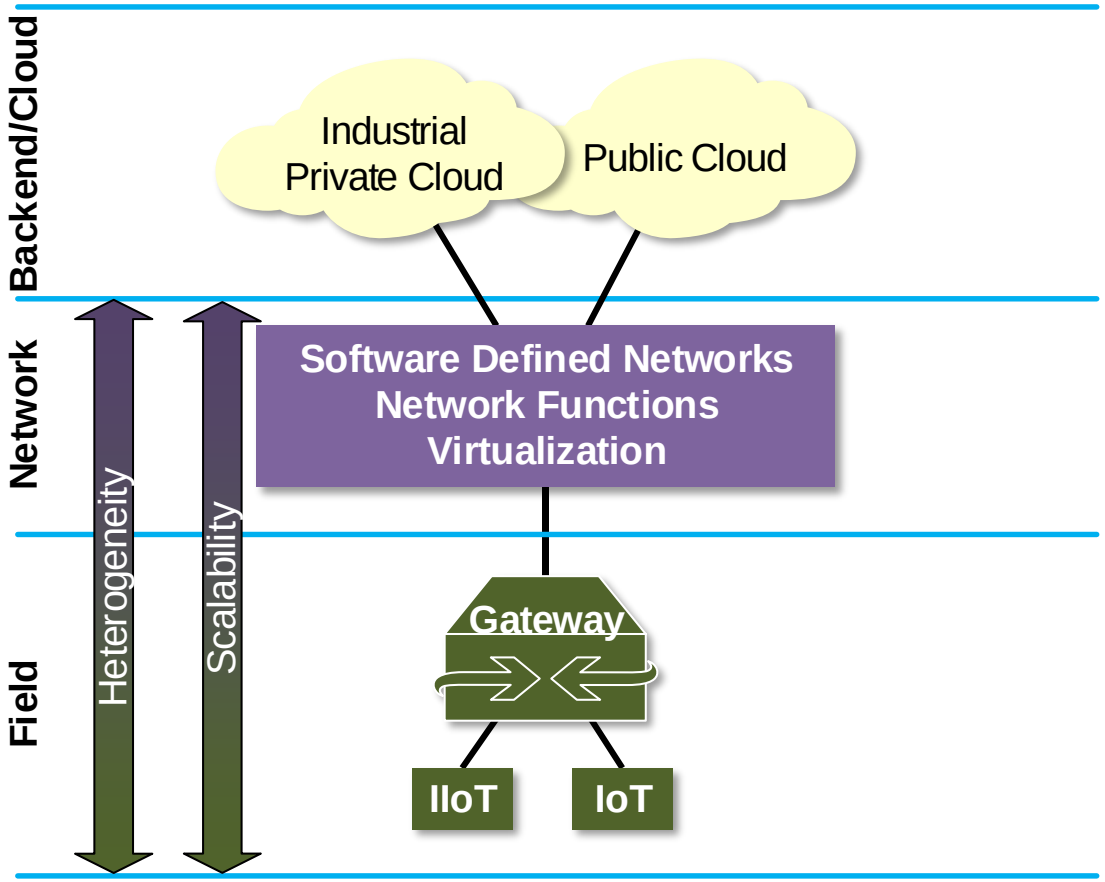


UAVs carrying cameras and sensors:

Secure device

REDComm Platform

Internet of Things



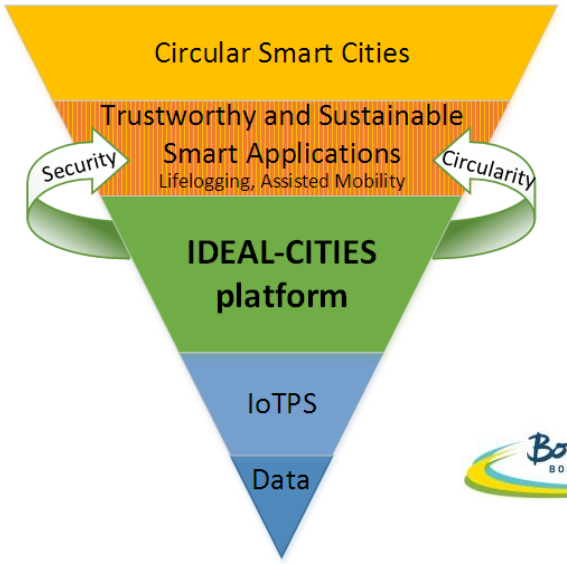
Intelligence-Driven Urban Internet-of-Things Ecosystems for Circular, SAfe and IncLusive Smart CITIES

Call: H2020-MSCA-RISE-2017

GA number: 778229

Budget: 1,611,000€

Duration: 4 years



Partners

FORTH INSTITUTE OF COMPUTER SCIENCE

BLUESOFT

École des Ponts business school

cablenet

Bournemouth University

Nodalpoint

Supported By

Bournemouth BOROUGH COUNCIL

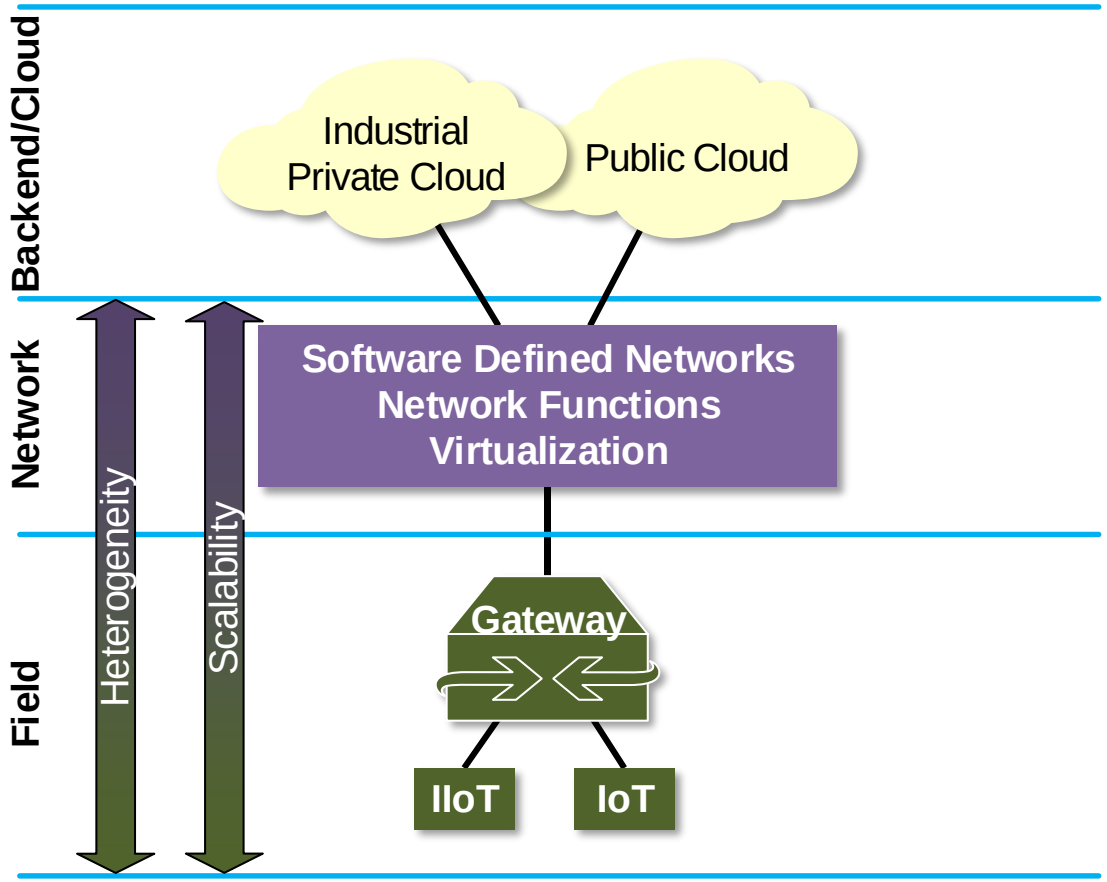
MUNICIPALITY OF HERAKLION

GUIDE DOGS

ENGOMI MUNICIPALITY

CRÉPY en VALOIS MODERNITÉ & TRADITION

Internet of Things



A Framework for Pairing Circular Economy and IoT: IoT as an enabler of the Circular Economy & circularity-by-design as an enabler for IoT

Call: H2020-MSCA-RISE-2017

GA number: 777855

Budget: 1,692,000€

Duration: 4 years

Partners

École des Ponts business school

University of Cambridge Judge Business School

FORTH Institute of Computer Science

cablenet

BLUESOFT

Deloitte.

Supported by

Ellen MacArthur Foundation

Philips

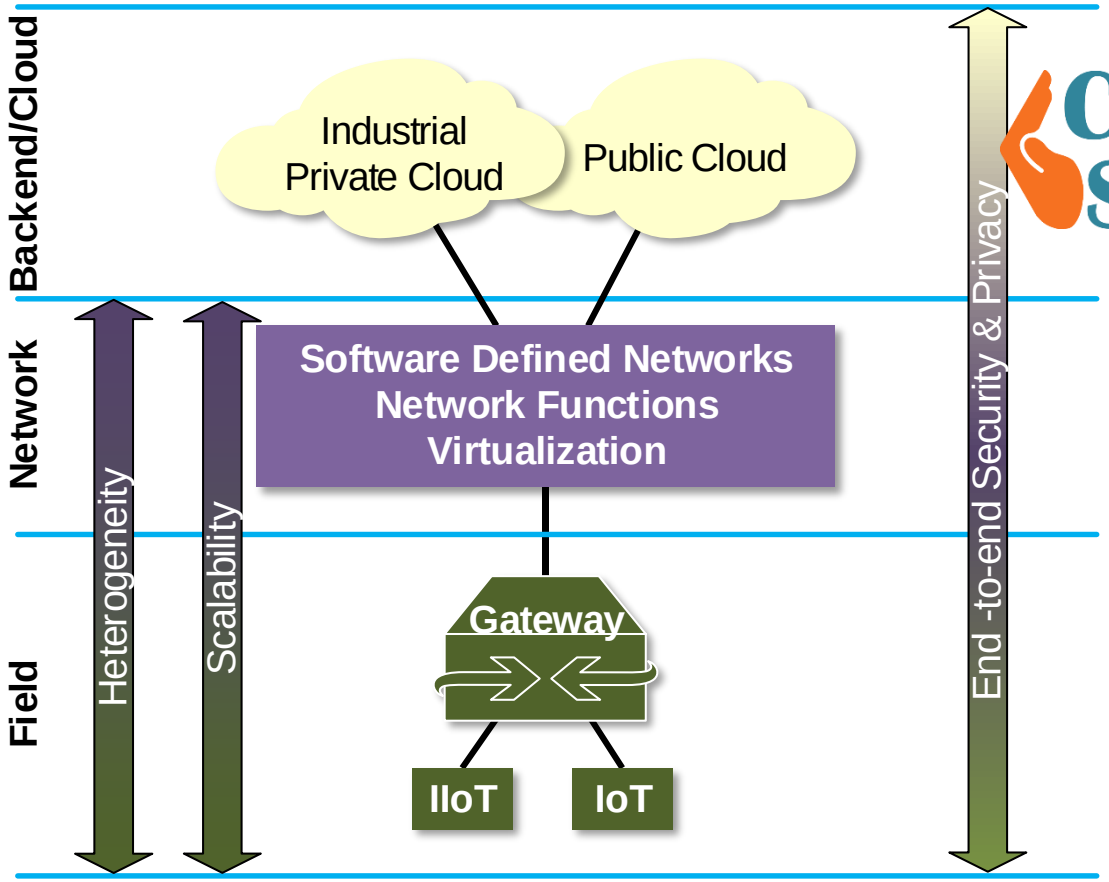
BearingPoint

Ministry of Digital Affairs Republic of Poland

SES

Integral Vision

Internet of Things



CYBER Security InSURancE — A Framework for Liability Based Trust

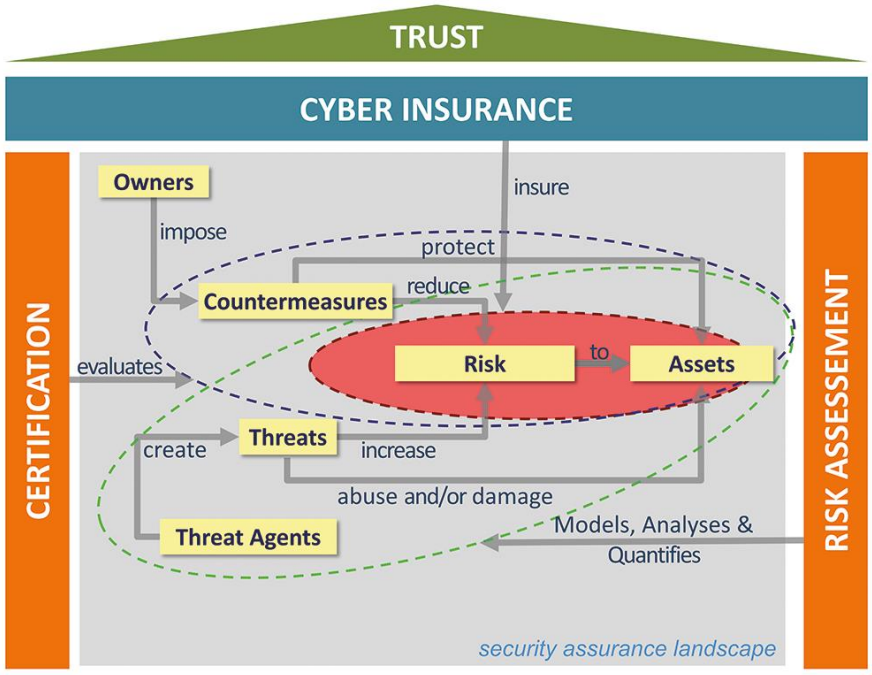
http://www.cybersure.eu

Call: H2020-MSCA-RISE-2016

GA number: 734815

Budget: 1,647,000€

Duration: 4 years



FORTH INSTITUTE OF COMPUTER SCIENCE

CITY UNIVERSITY LONDON

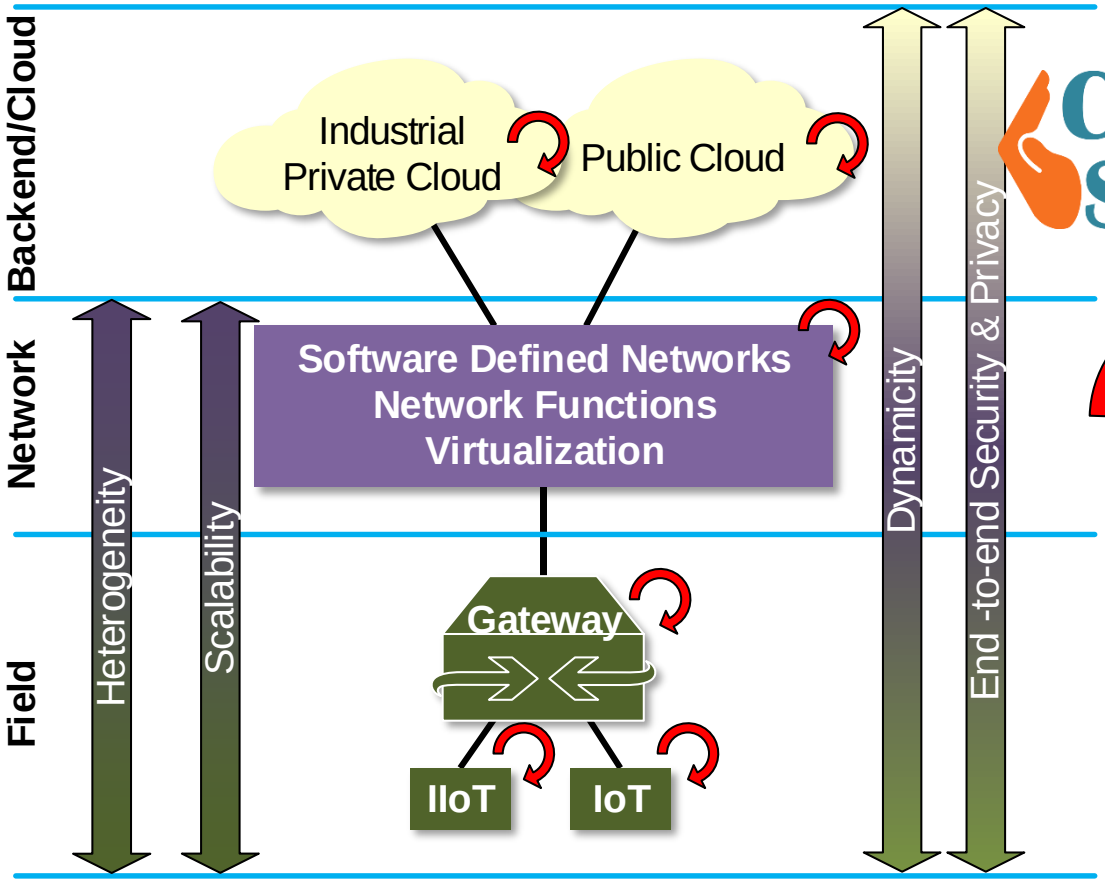
Consiglio Nazionale delle Ricerche

cablenet

HELLAS DIRECT RETHINK INSURANCE

NIS network integration & solutions

Internet of Things



SEMIoTICS

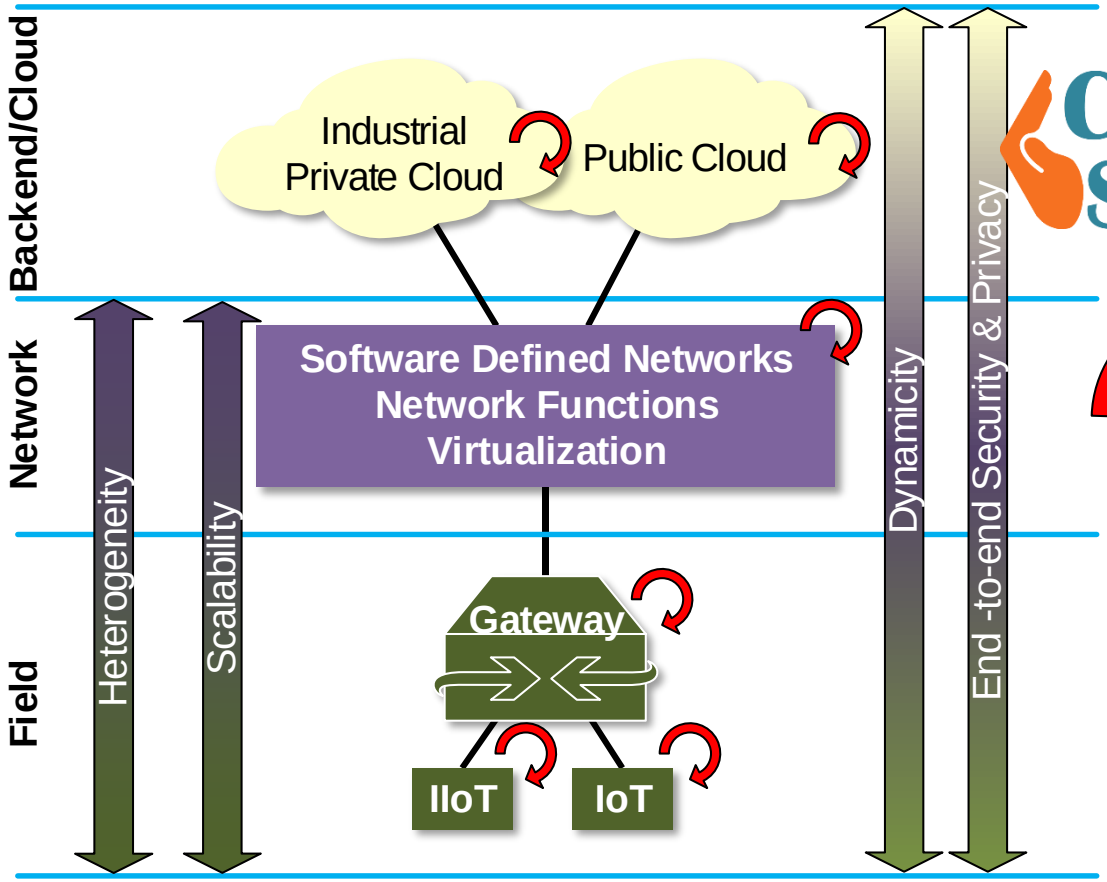
Smart End-to-end Massive IoT Interoperability, Connectivity and Security.

- TYPE OF FUNDING SCHEME: RESEARCH AND INNOVATION ACTION (RIA)
- WORK PROGRAMME TOPIC ADDRESSED: H2020-IOT-03-2017 - R&I ON IOT INTEGRATION AND PLATFORMS
- BUDGET: 4,995,915€
- CONSORTIUM: 9 PARTNERS
- DURATION: 36 MONTHS
- TOTAL SCORE:14/15
- PROJECT NUMBER: 780315

SIEMENS FORTH INSTITUTE OF COMPUTER SCIENCE CTTC Sphynx Technology Solutions

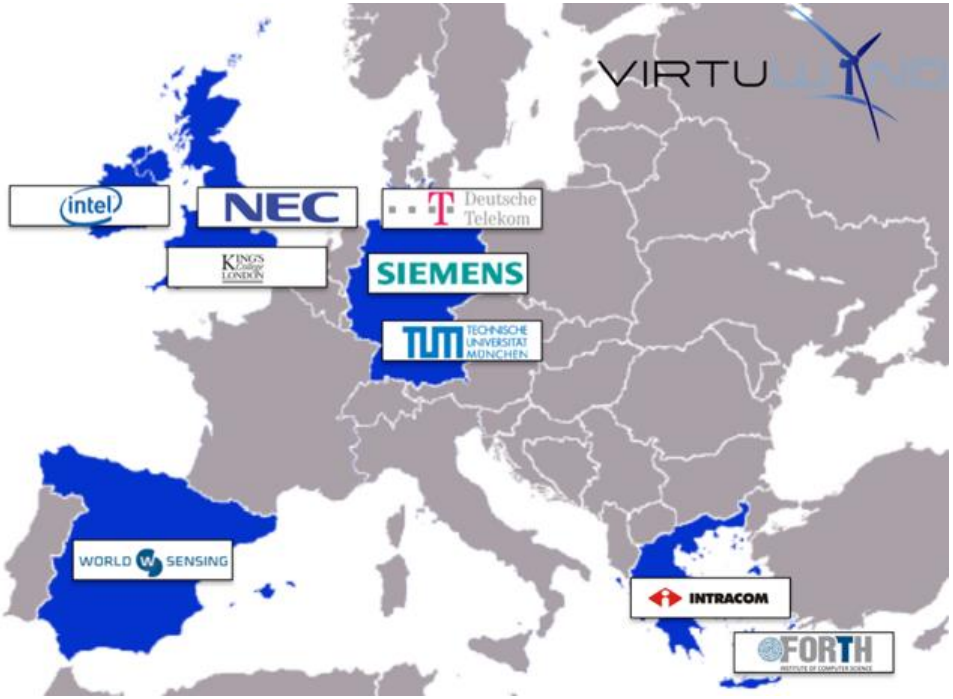
ENGINEERING life.augmented BLUESOFT EFFICIENT SOLUTIONS UNIVERSITÄT PASSAU iq

Internet of Things

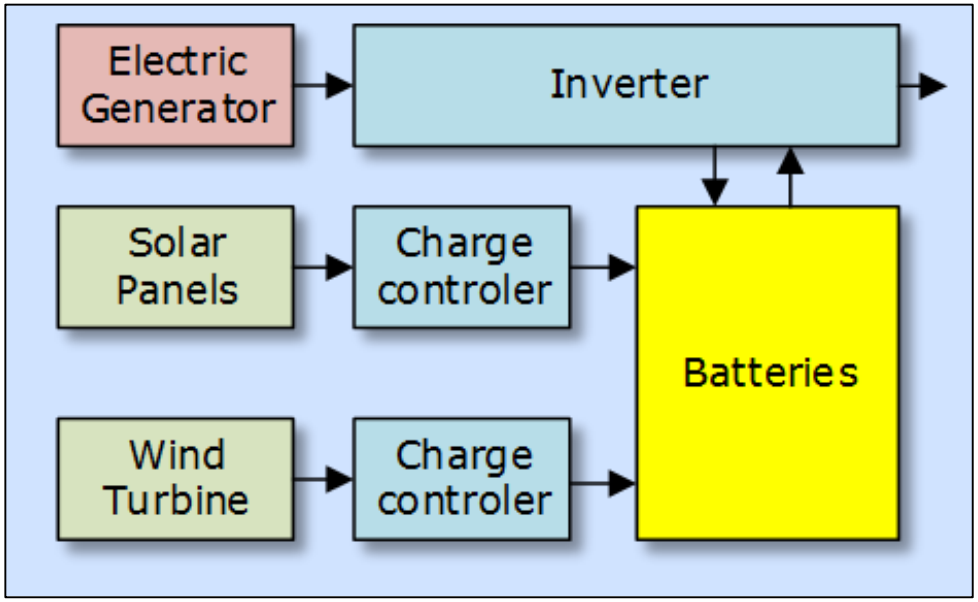


Project

- Call: H2020-ICT-2014-2
- Topic: ICT-14-2014
- Type of action: IA
- Proposal number: 671648
- Consortium
  - 9 members from 5 countries
  - 5 large industry partners
  - 3 research institutions
  - 1 SME
- Budget
  - 4,874,902€
- Duration
  - 3 years
  - Project Kicked off on July 2015



REDComm energy aspects

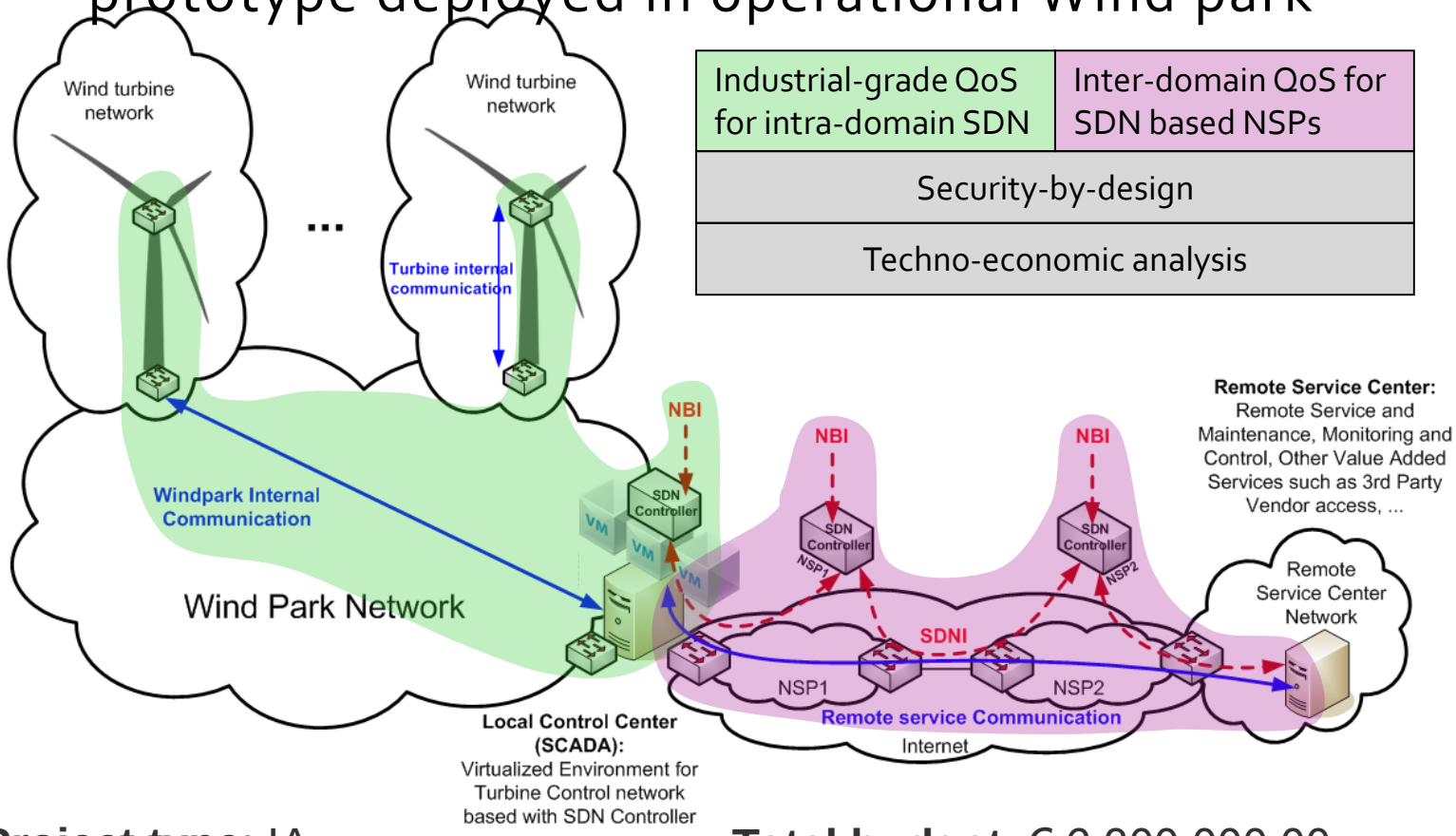


The 5G Infrastructure Public Private Partnership

VIRTUWIND

www.virtuwind.eu

Virtual and programmable industrial network prototype deployed in operational Wind park



Industrial-grade QoS for intra-domain SDN	Inter-domain QoS for SDN based NSPs
Security-by-design	
Techno-economic analysis	

Project type: IA
Start Date:1st July 2015
Duration: 36 months

Total budget: € 6,300,000.00
EU funding: € 4,900,000.00
Consortium:9 partners from 5 countries


5G PPP
VIRTUWIND

Thank you!


VirtuWind @VirtuWind · 19/12/2016
Photos of VirtuWind team and demonstration of VirtuWind project to European Commissioner for Digital Economy, Günther H. Oettinger.


VirtuWind @VirtuWind · 19/12/2016
Photos of VirtuWind team and demonstration of VirtuWind project to European Commissioner for Digital Economy, Günther H. Oettinger.