You need to set up wireless instrumentations?

Join the Taskforce of industrials who chose

ConnexSensors

Why wireless instrumentation?

… Where wiring is expensive

- Temporary installation (qualification, diagnostic, maintenance site…)
- Unavailable premises/place during the time of installation/construction
- On large site (surveillance of contaminated dust, fire detection…)
- Hazardous or dangerous areas (e.g. contaminated)

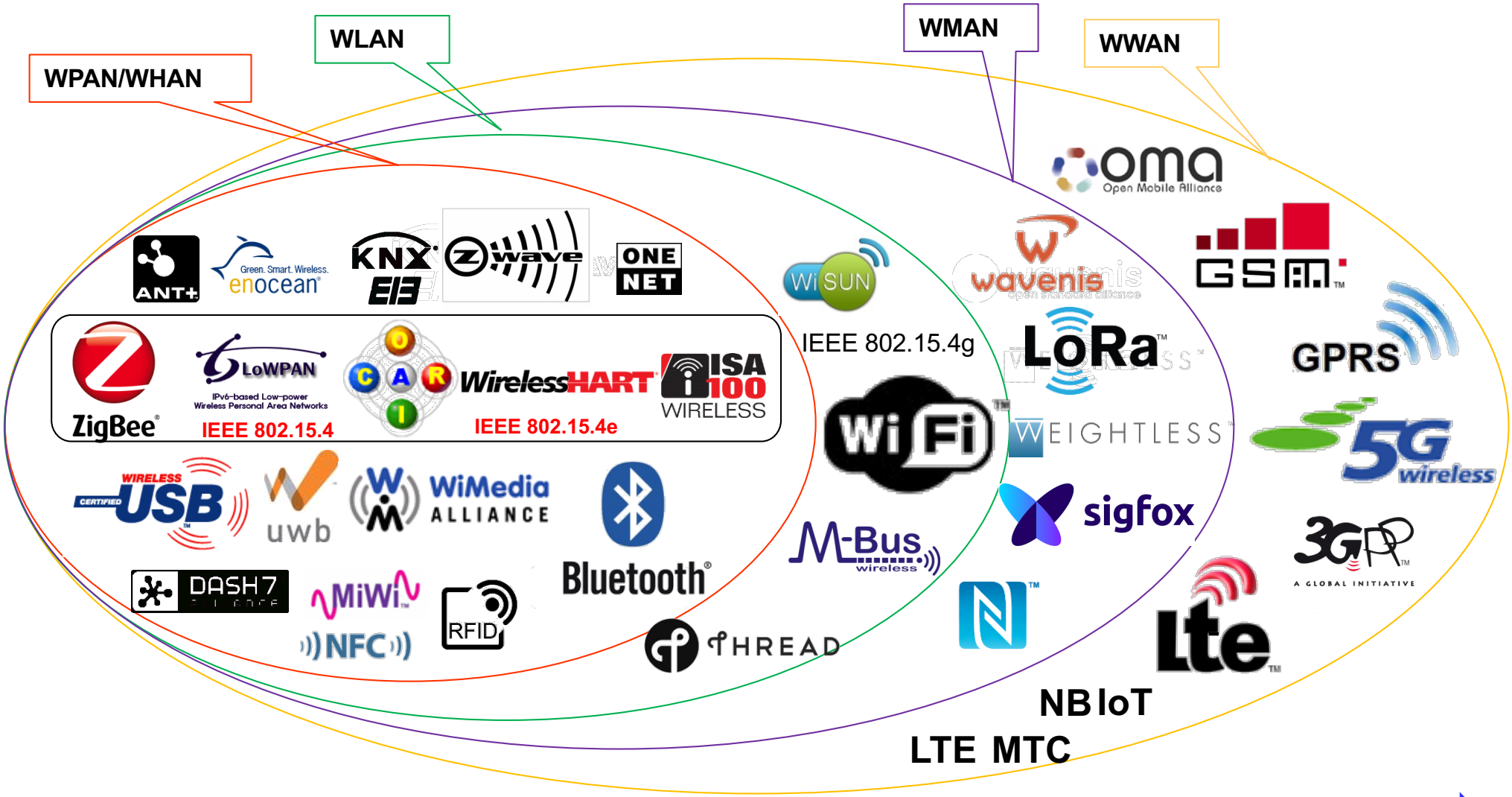
… Where wiring is not desirable

- Confined environments: aircraft cockpit, military vessel, submarine, nuclear power plant, space launcher, etc.
- Dust sensitive environments: surgical operating room, clean room

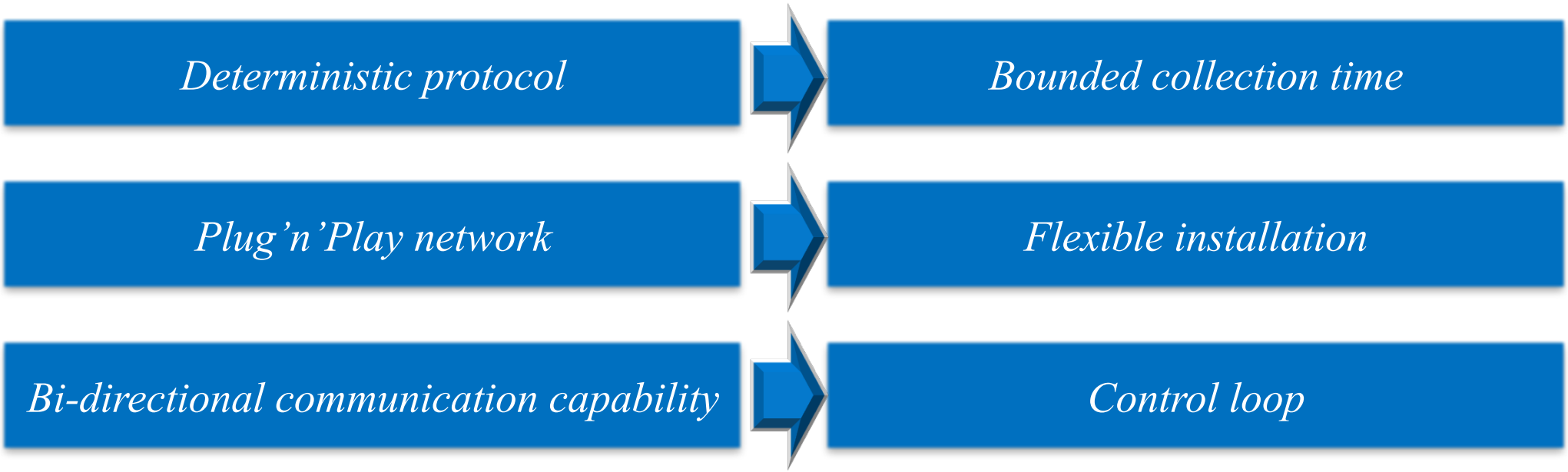
… Where wiring is banned or impossible

- Mobile systems (rotating axis, wheel, etc.)
- Nature (optimized watering, forest fire, wildlife study…)
- Intrusion detection & fire alarms in a sensitive place

A plethora of wireless instrumentation solutions: standard or proprietary



Addressing the industrial challenges

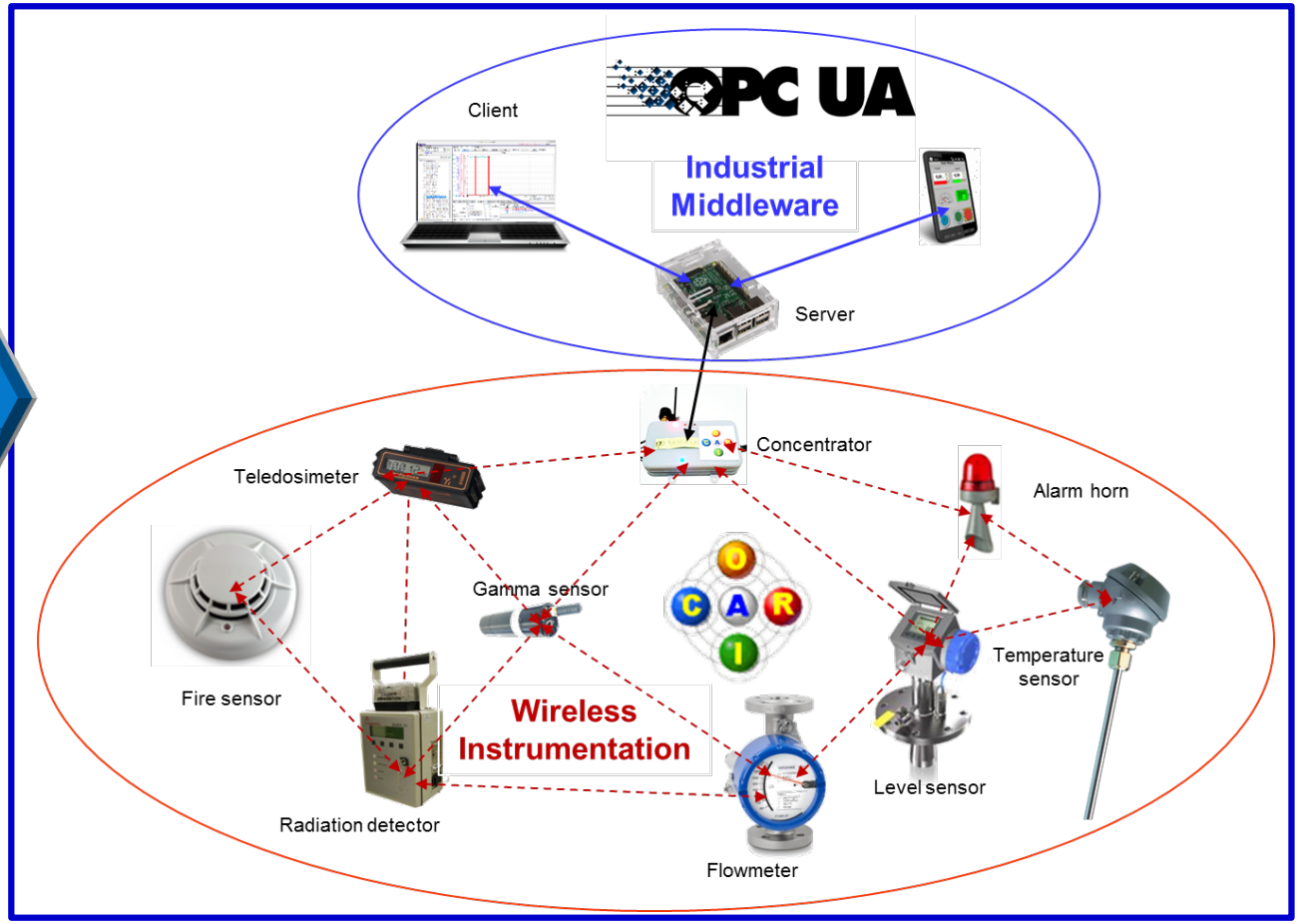


The big challenge is to address all of them at the same time

5 groups, 7 labs, 4 SMEs developed a wireless instrumentation demonstrator: the Connected Mobile Worksite

Connexion
Contrôle-commande numérique pour le nucléaire

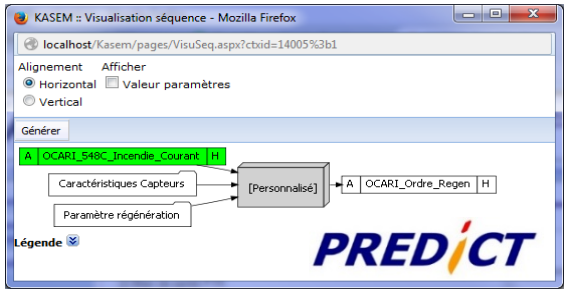
Rolls-Royce
ALSTOM
ESTEREL Technologies
Atos Worldgrid
Grenoble INP
cea
CNS CACHAN
EDF
CRAN
PREDICT
CORYS Training & Engineering Support Systems
Inria
AREVA
TELECOM ParisTech
ALL4TEC
UNIVERSITÉ DE LORRAINE

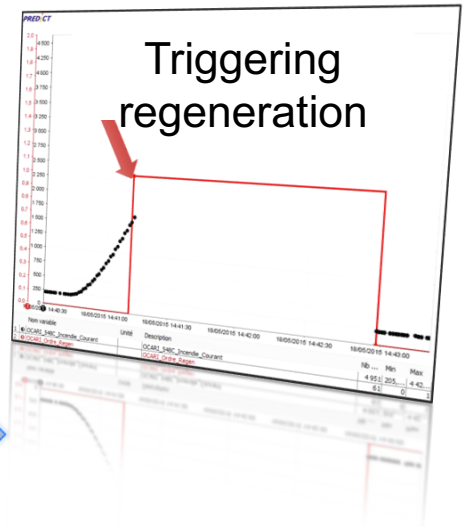


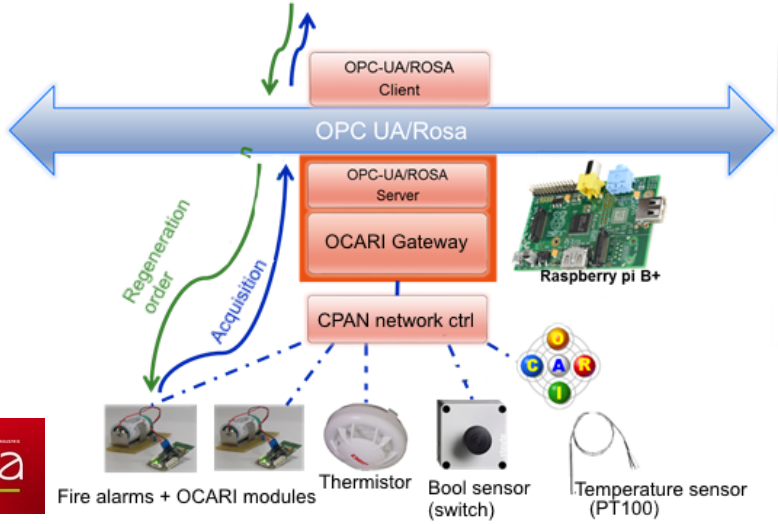
The Connexion research program: 5 years, 43 man-year, 6.6 millions €

Use Case: fire detector in radiative environment

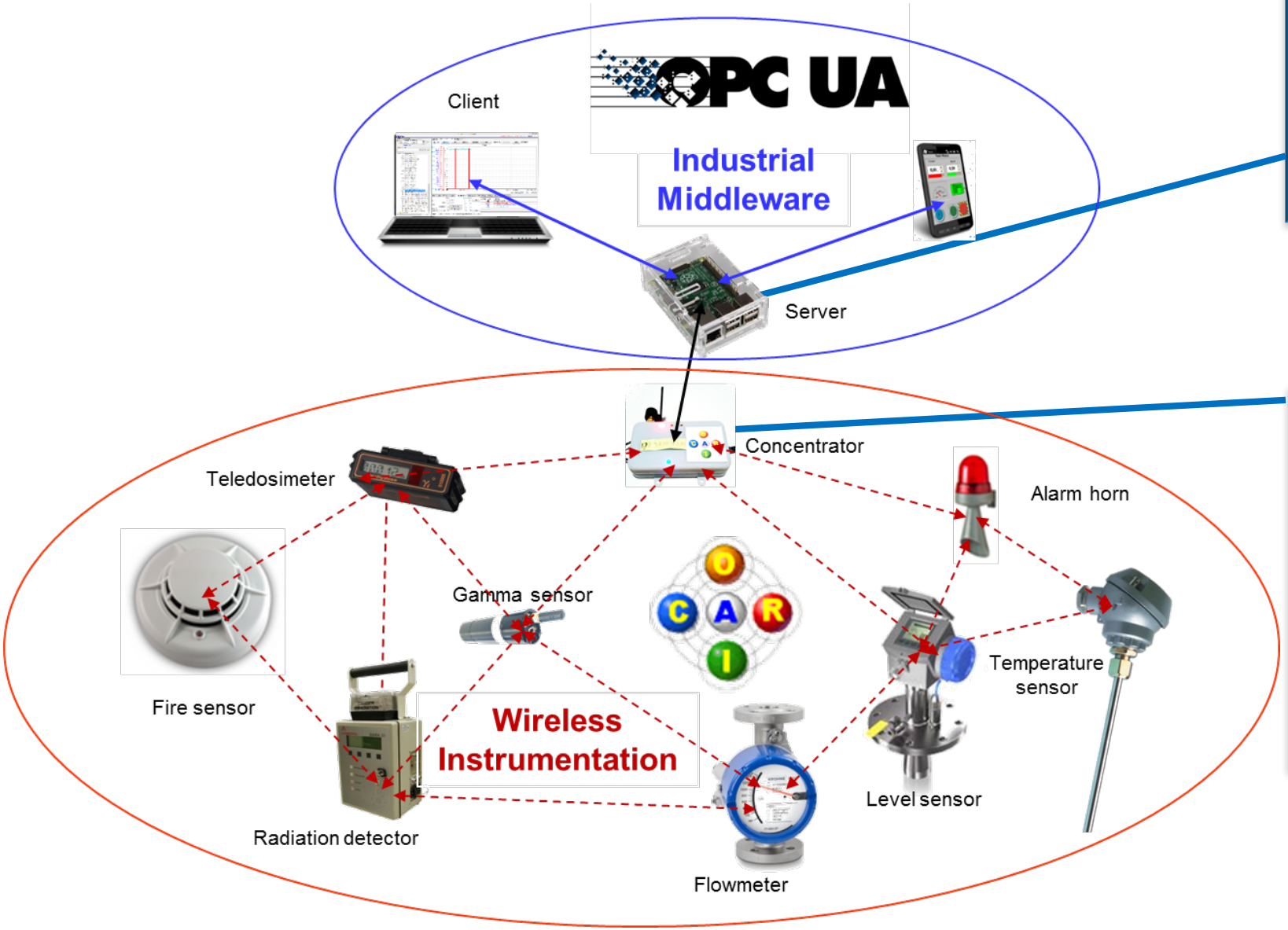
- Fire alarm transmission ➔ Deterministic protocol
- Flexibility of wireless fire detector deployment ➔ Plug'n'Play network
- Monitoring of electronics health in radiative environment and self-healing by regeneration ➔ Control loop







Plug'n'Play architecture based on two technologies OPC-UA/ROSA and OCARI



OPC-UA/ROSA:
« Robust Overlay network with Self-Adaptative topology »

TELECOM ParisTech

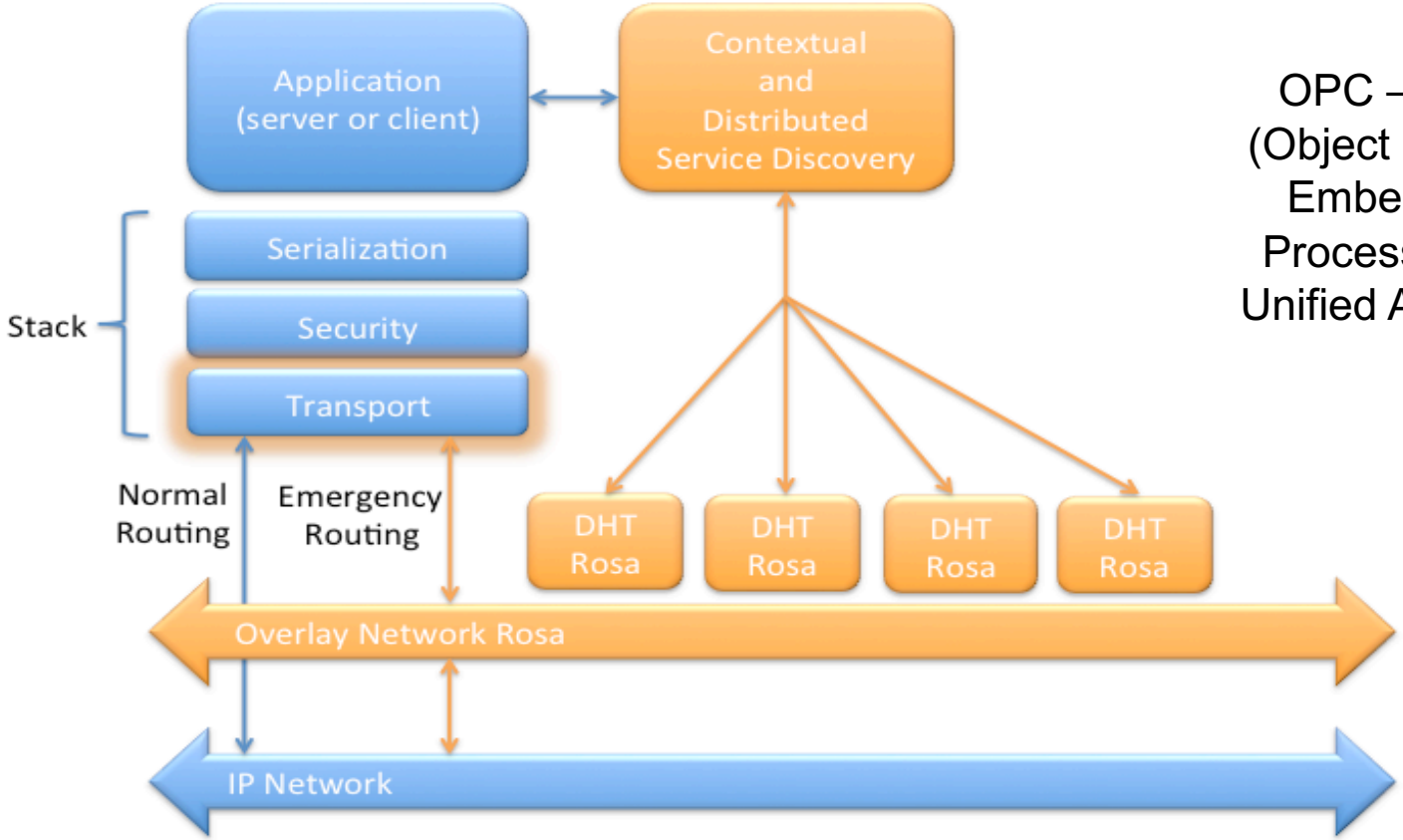
OCARI:
« Open Communication protocol for Ad hoc Reliable industrial Instrumentation » based on the PHY layer of the IEEE 802.15.4 standard

EDF Inria

The OPC-UA/ROSA innovation

OPC-UA/ROSA is an Open Source implementation of the OPC-UA standard (IEC 62541) with ROSA giving:

- **Contextual service discovery:** Services are stored in a resilient distributed hash table
- **Resilient routing with the Overlay Network structure:** An OPC-UA message re-routing service in the event of a node failure



OPC – UA: OLE (Object Linking and Embedding) for Process Control – Unified Architecture.

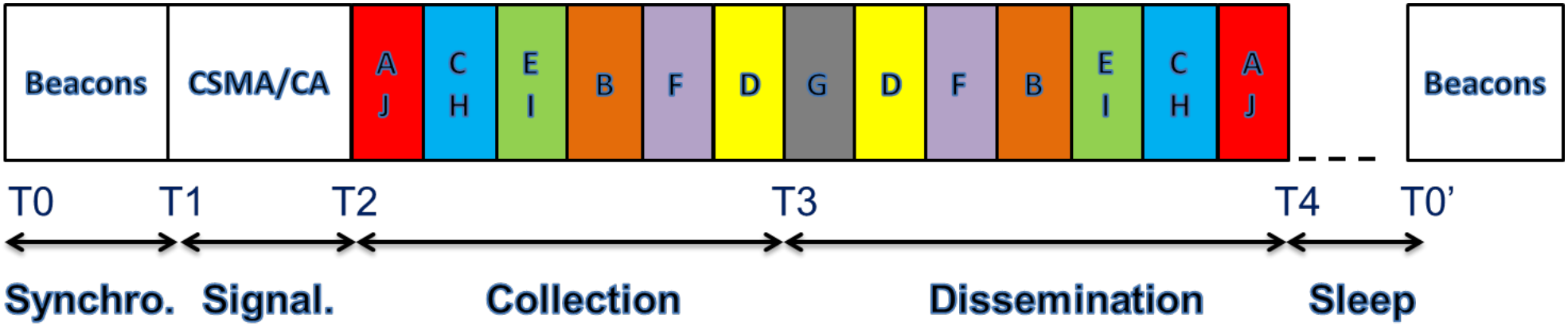
OCARI innovations

OCARI integrates advanced algorithms of ad-hoc networking for wireless sensors in an embedded RF system with limited resources

- **Energy saving:** Distributed synchronization enabling sleeping period of all network nodes
- **Network resilience:** Mesh networking for facing nodes failure
- **Handover capability:** Pedestrian mobility for few nodes
- **Auto-repairing capability:** Proactive routing for facing topology changes due to environment

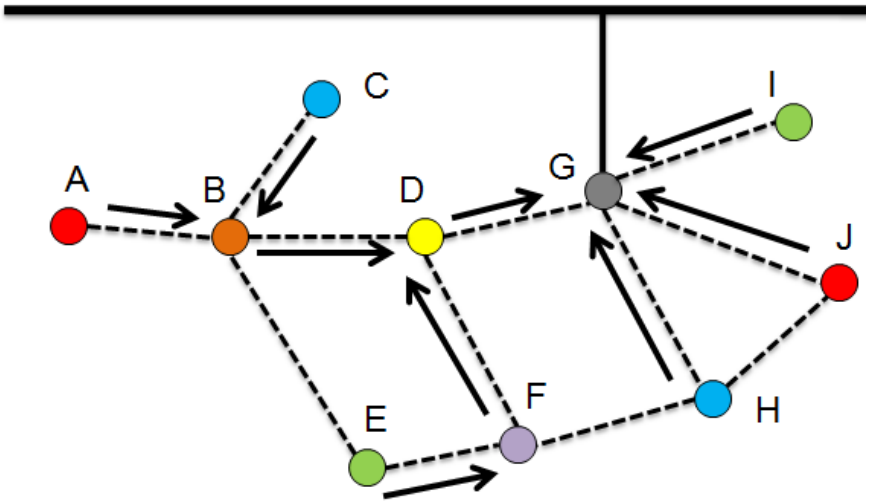
- **Collision-free scheduling** and **collection time optimized:** Activity scheduling mechanism based on a distributed three-hops coloring algorithm that minimizes the number of colors
- **Plug'n'play functionality:** Automatic integration of new nodes
- **Non-critical control loop:** Bidirectional communications

The deterministic operating cycle of OCARI



Network activity is organized cyclically:

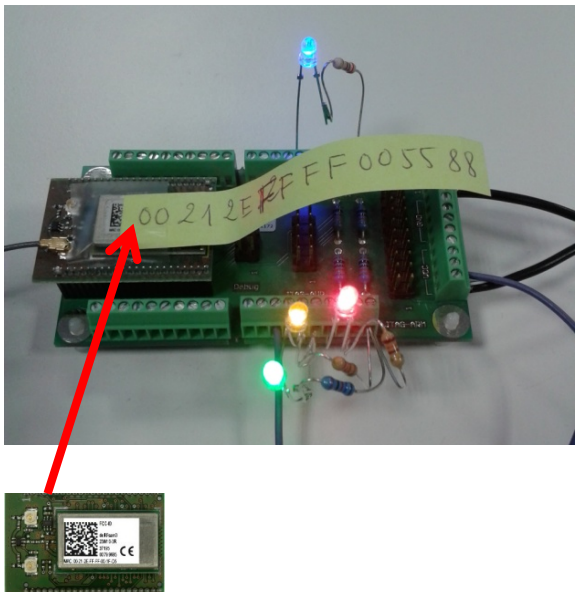
- [T0-T1]: Multi-hop deterministic **synchronization** of nodes using cascaded beacons
- [T1-T2]: Transmission of **signaling** data by competition (CSMA/CA)
- [T2-T3]: **Collection** of data messages without collision in colored slots
- [T3-T4]: **Dissemination** of data messages without collision in colored slots
- [T4-T0']: **Sleep** slot for every node including routers

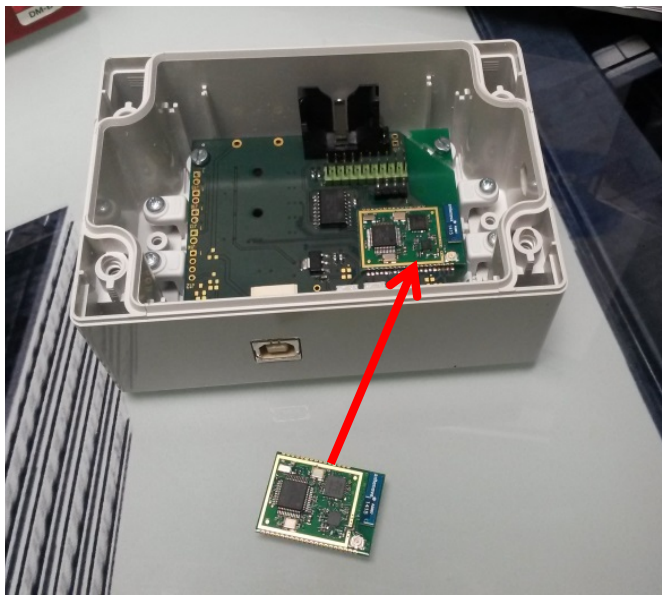


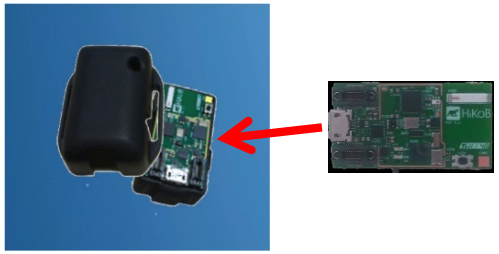
The ConnexSensors demonstration kit

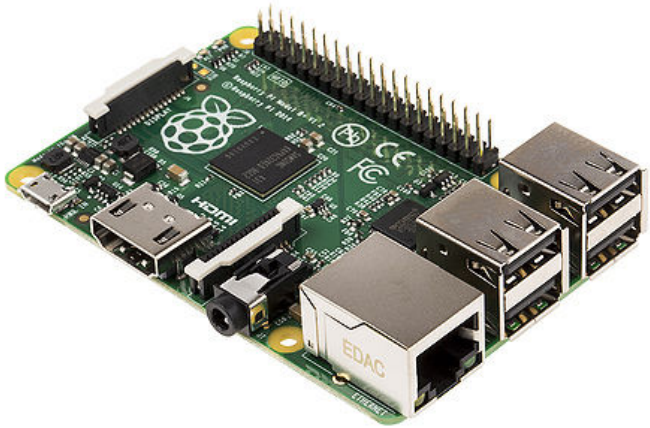
Multiple supported hardware

- ARM Cortex M3 (Atmel SAM3S) + Atmel RF AT86RF233 (standard IEEE 802.15.4)
  - Dresden Elektronik GmbH (deRFsam3-23t09-3)
  - Adwave (ADWRF24-LRS)
- ARM Cortex M3 (STMicro STM32F103) + Atmel RF AT86RF233 (standard IEEE 802.15.4)
  - HiKoB FOX
- Server OPC-UA → Raspberry Pi B+









ConnexSensors is governed by an industrial taskforce

Cost sharing

Common technical specifications

Industrial community around an Open Source solution

Implementer forum

Industrial Use Case sharing

To join the industrial taskforce and set up a demonstrator, contact us!

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