cost IC1004

Cooperative Radio Communications for Spectrum and Energy Efficiency in coming Traffic Scenarios

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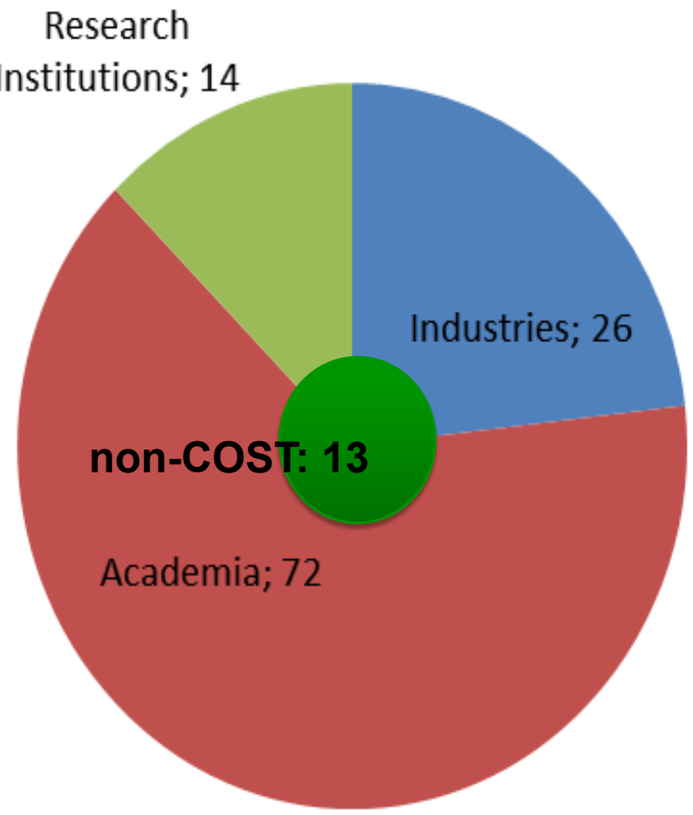
What is COST IC1004

IC1004 is a EU COST Action on Cooperative Radio Communications for Green and Smart Environments



460 registered participants from 37 Countries

Predecessors: COST 207, 231, 259, 273, 2100

Inclusive Scientific Forum becoming a stable Network of Knowledge

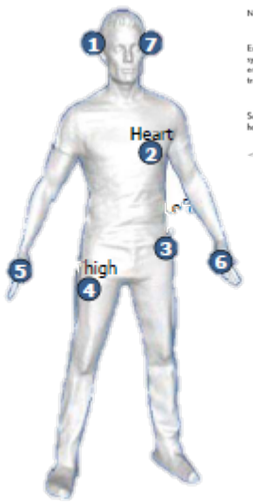
What is COST IC1004

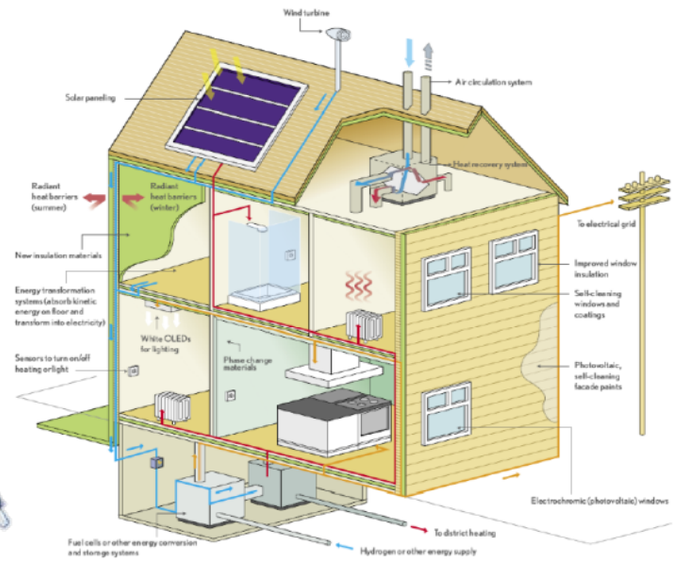
COST IC1004 relays on two main concepts:

1. **Scenarios** for our research:

"Green & Smart Environments"

Physical spaces populated by sensors, actuators, embedded systems, terminals, which cooperatively operate by exchanging information, and share resources, e.g. radio spectrum, energy.





What is COST IC1004

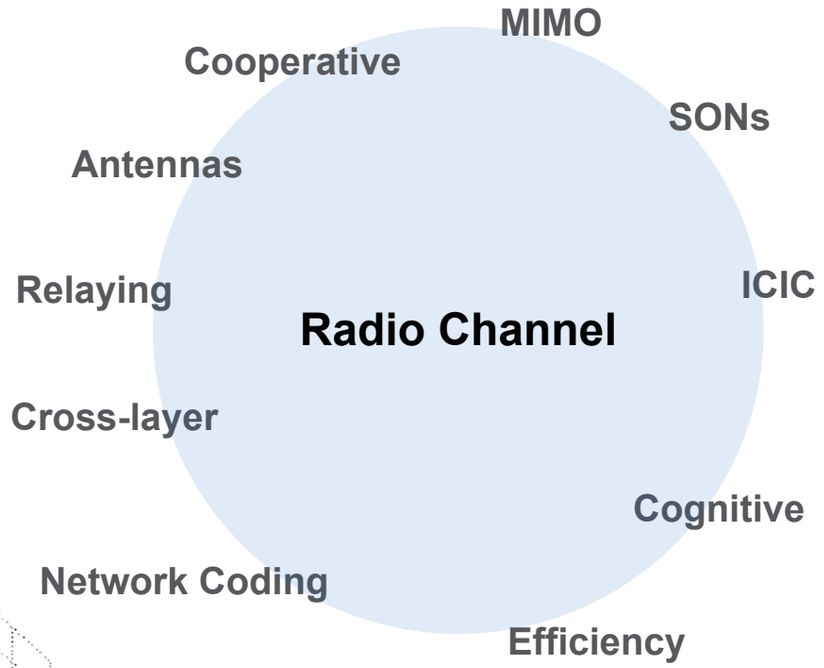
COST IC1004 relays on two main concepts:

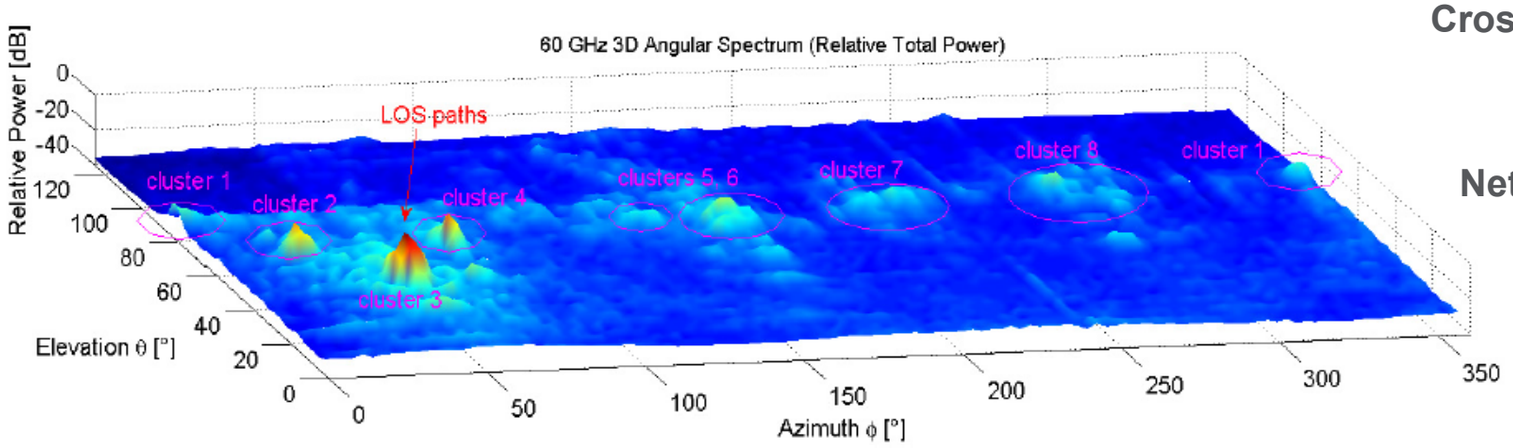
2. **Technologies** for the Radio Networks:
“Cooperative Radio Communications”

The **Radio Channel** is central to GSEs.

This Action is combining experience on

- Radio Channel Characterisation
- Transmission Techniques
- Radio Access Networks

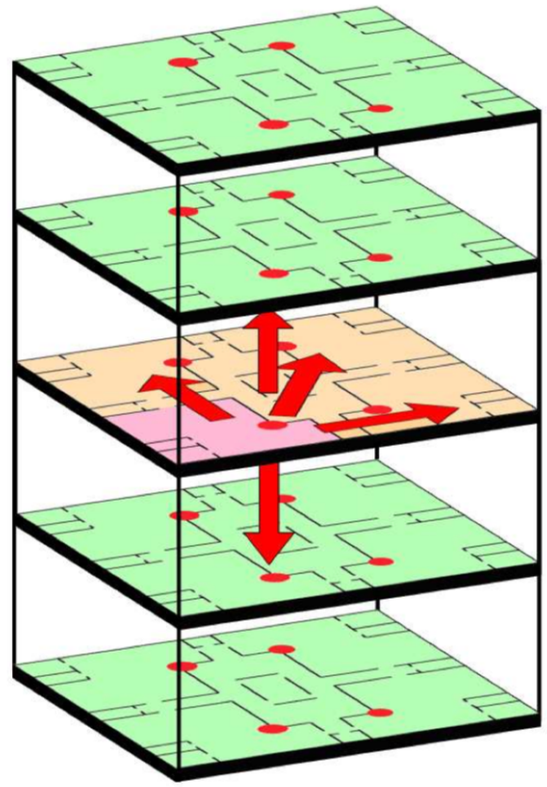


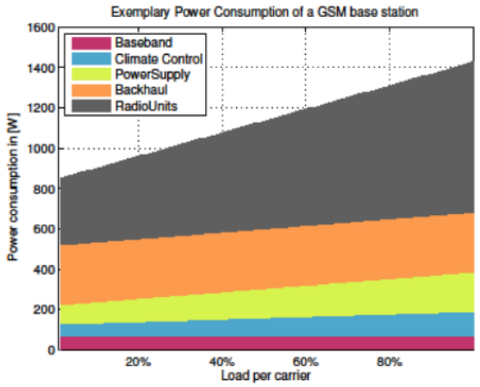


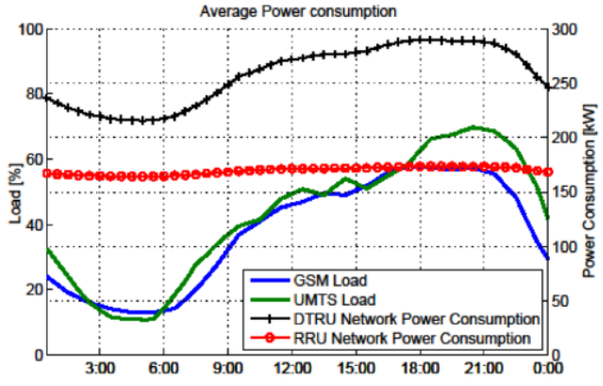
New Radio Communications Scenarios

Evolved Radio Access Networks in Urban Environments

- Urban Environment Reference Simulation **Scenarios**
- **Energy** efficiency and performance enhancements
- **Heterogeneous** networks (Multi-Layer and Multi-RAT)
- **MIMO** modelling in system-level simulations
- Comparison of Ray-Tracing **tools**
- Harmonization of system-level **simulators**
- Indoor-to-Outdoor-to-Indoor Propagation **models**



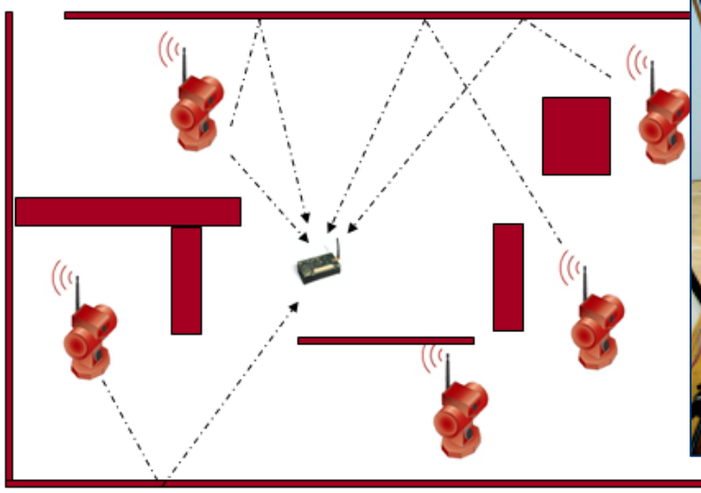


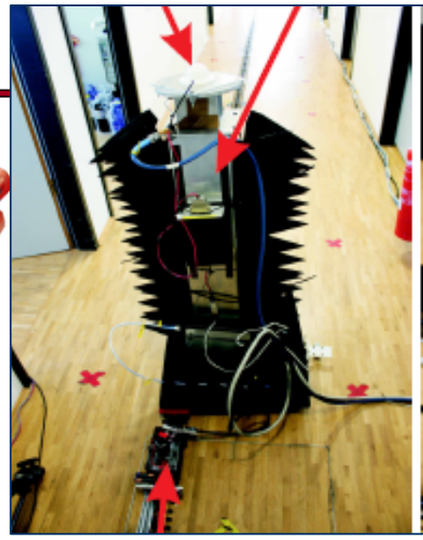


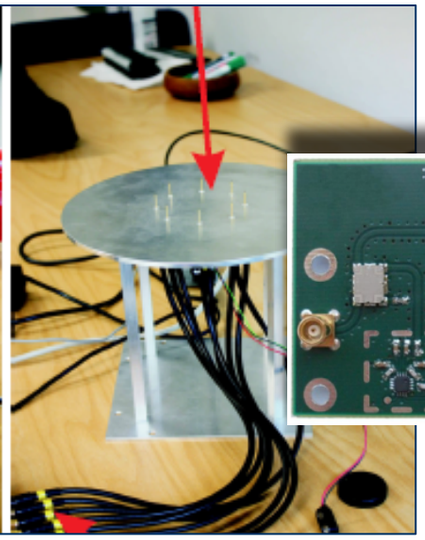
New Radio Communications Scenarios

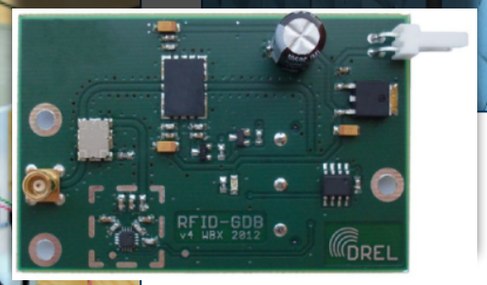
Indoor Environments

- **Femtocells** and Distributed Antenna Systems
- Indoor radio **channel** modeling
- **Ultra WideBand** systems
- Passive **localization** measurements and methodology. NLoS identification and mitigation techniques
- **RFID** systems
- Testing and measurements at 868MHz, 5.2 GHz, 11GHz, 60 GHz for localization and **medical** environments





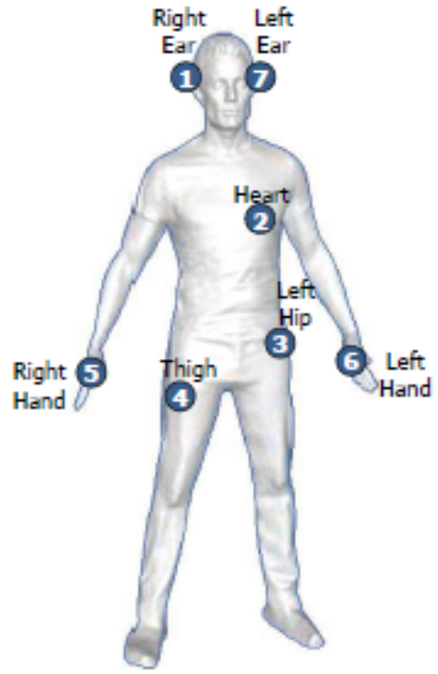




New Radio Communications Scenarios

Body Area Networks (BAN)

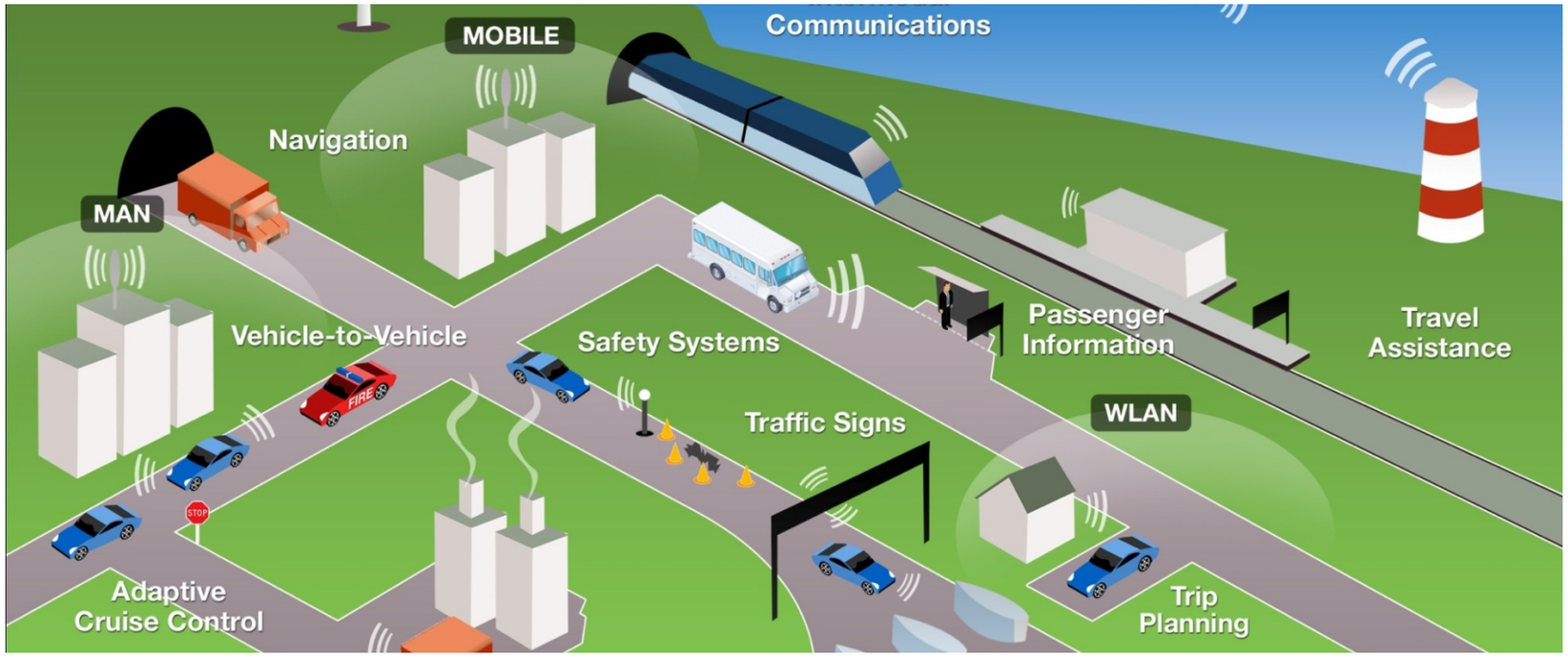
- COST IC1004 Working Group on BAN has developed radio channel models for Body Area Communications, as well as protocols for the optimum **networking of body area sensors**. Measurements in hospitals, experiments in anechoic chambers and office environments have validated the theoretical proposals.
- Strong interest in continuing the investigations in several bands, **60GHz** mainly, but also **UWB**, **ISM** and **MICS**.
- Interest in healthcare moving sensors and its **opportunistic networking in emergency** situations applications.
- Interest in **implementation** aspects, energy efficiency, high dense networking and reliability of BANs



New Radio Communications Scenarios

Vehicular Communications

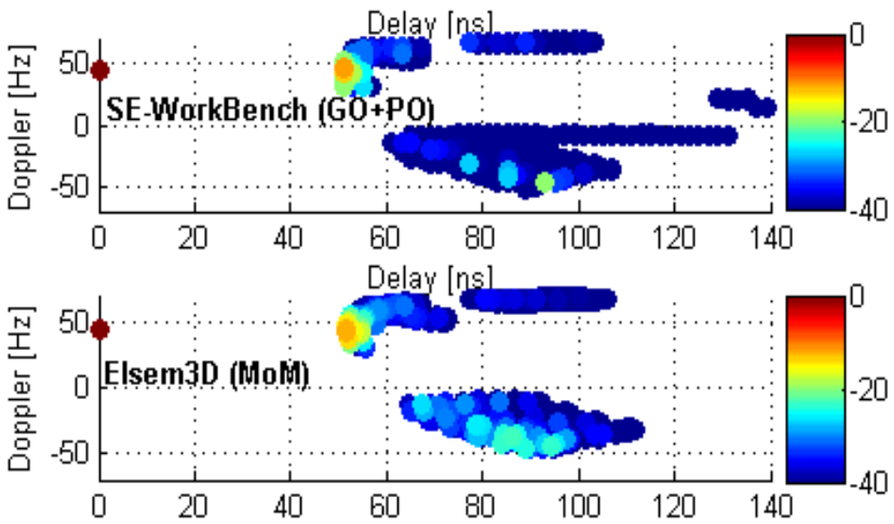
- The Vehicular Communications WG of IC1004 works on modeling, characterization, and estimation of the **vehicle-to-vehicle** and vehicle-to-road side radio channels at several frequencies, mainly at the 6 GHz band, allocated for **traffic safety applications**.
- Interest in evolving the current ITS standards and testing vehicular communications protocols in real scenarios, as well as defining the elements of an **integrated "ecosystem" for vehicular communications**

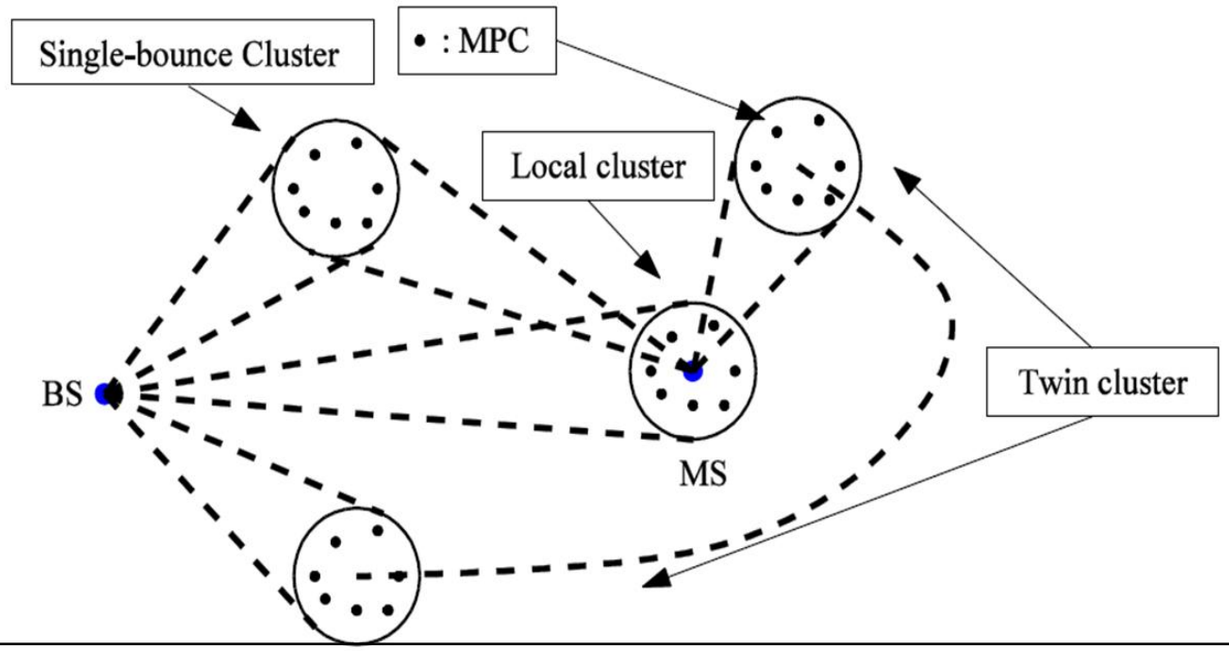


Cooperative Radio Research in IC1004

Multi-Link Radio Channel Modelling

- The cooperation between several Institutions in COST IC1004 made possible the implementation of the **COST 2100-IC1004 multi-link channel model**
- IC1004 includes MIMO and multi-link aspects for **beyond 4G** networks
- Ready for use by the community and for further extension:
  - Published in IEEE Wireless Communications Magazine and Available public googlecode
- COST IC1004 pioneer in the modeling of **dense diffuse multipath** component in wireless networks

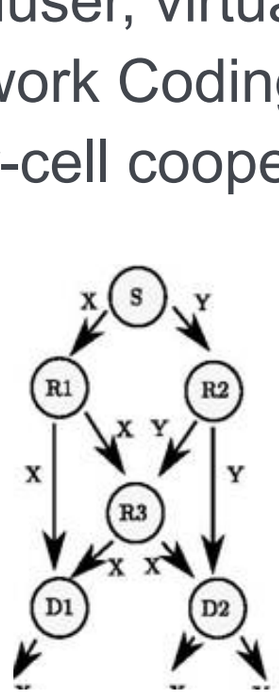


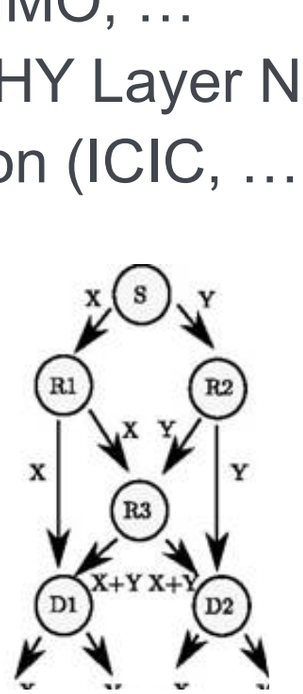


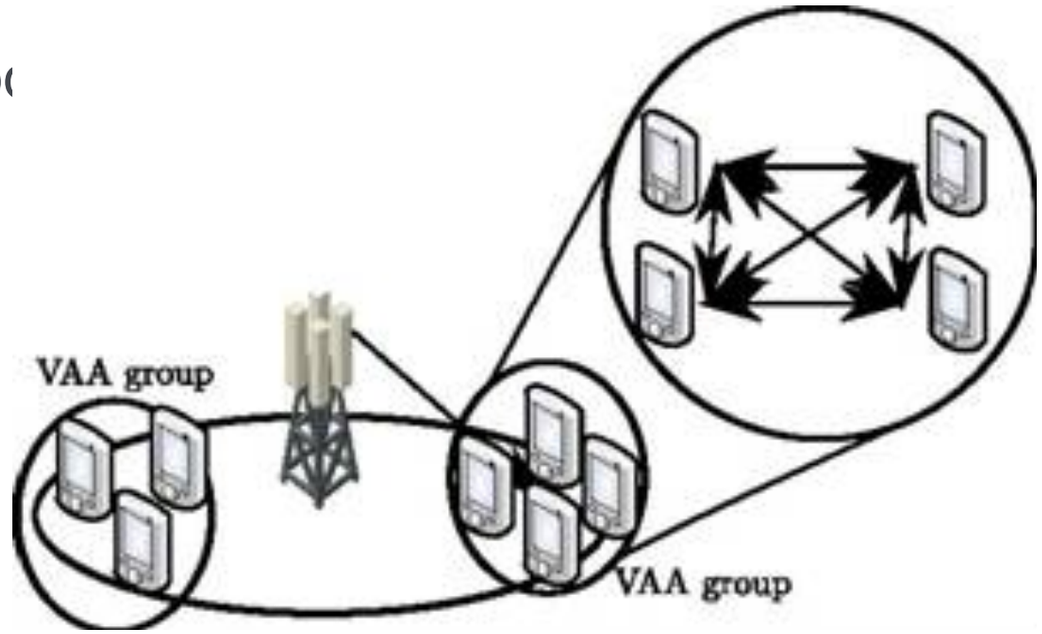
Cooperative Networking

Based on extending coverage/service from the existing infrastructure:

- Relaying (fixed …also mobile)
- Multiuser, virtual MIMO, …
- Network Coding (PHY Layer Network Co
- Inter-cell cooperation (ICIC, …)





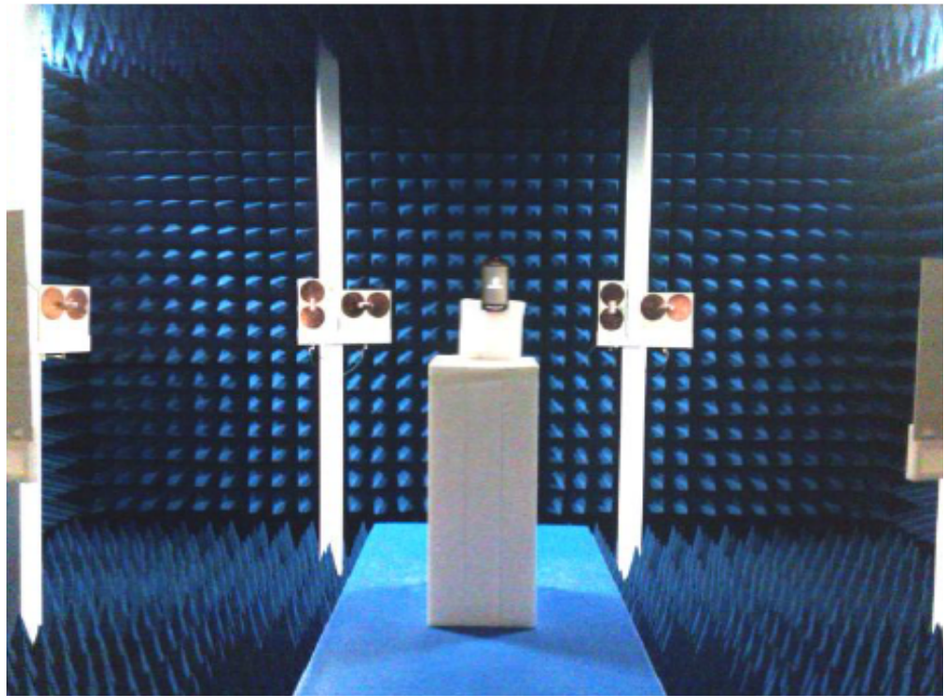


- The aggregation of cooperating terminals or cooperating cells creates "Cooperative RAN Areas", beyond the concept of "Cell", saving energy (at the BSs) and infrastructure costs.

Cooperative Radio Research in IC1004

MIMO-OTA testing, contribution to Standards

- COST IC1004 experts in the official LTE Round Robin for ETSI 3GPP RAN4, on OTA technologies, COST to be mentioned in 3GPP official documents.
- Bilateral liaison with the North-American CTIA MOSG (MIMO OTA Sub Group) established. Support the choice of MIMO OTA technologies.
- Training School for COST ESRs, on OTA Testing



COST IC1004 3rd Training School on Propagation Measurement, Modelling, and OTA-Emulation

Cooperative Radio Research in IC1004

Further Scientific Challenges and priorities:

- Networks beyond the Cellular concept... Cloud/virtual RAN
- Moving Networks
- Wireless for Traffic Safety and Efficiency
- Efficiency and Security at the Terminal side
- Testing adaptive, distributed, cognitive mobile systems
- ...

Read our Action NEWSLETTER
www.ic1004.org/newsletter

And the:
COST IC1004 Position Paper to Horizon2020

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