eltic-Plus
Smart Connected World

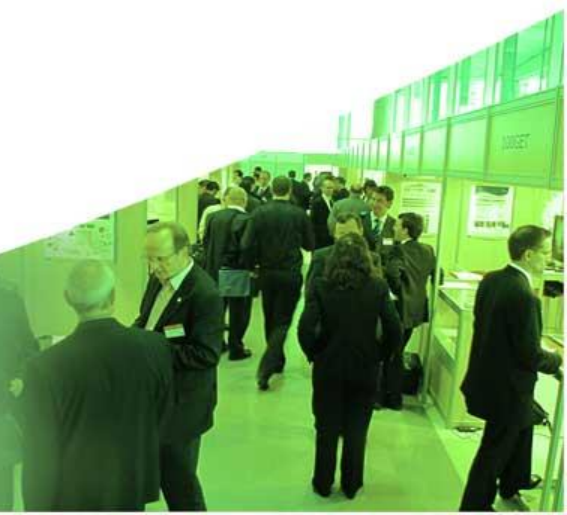
EUREKA

SPECTRA

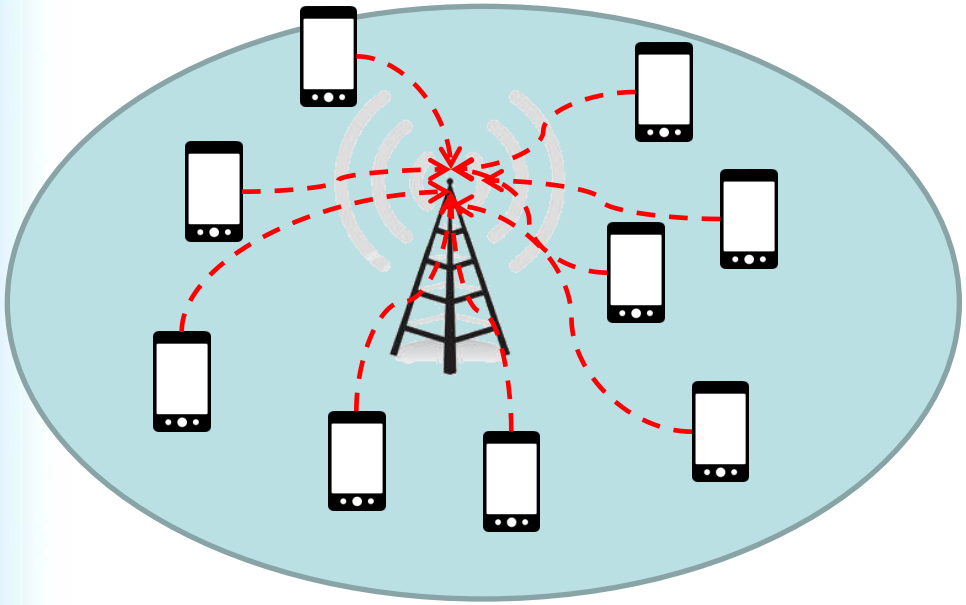
Spectrum and energy efficiency in 4G communication systems and beyond

Celtic-Plus Event 2014
Monaco, 24th of April 2014

Lorenzo Iacobelli
Thales Communications & Security



Traditional Mobile Networks



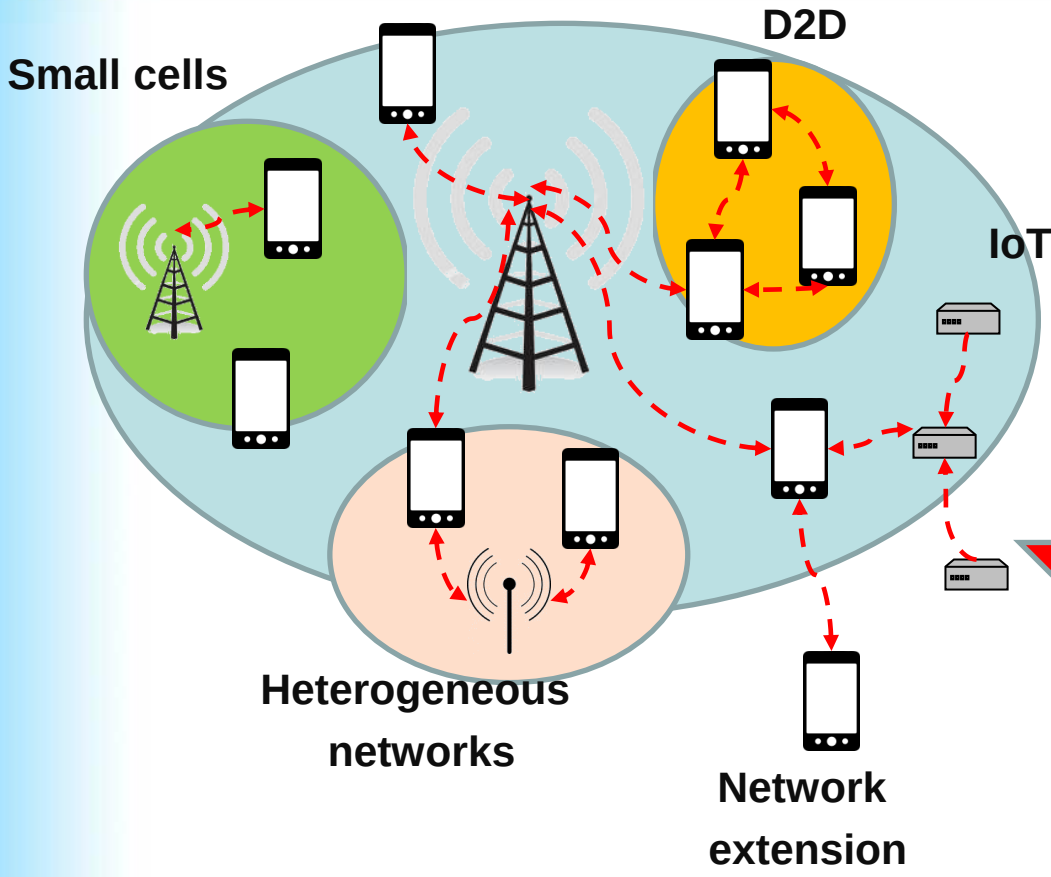
Characteristics

- Licenced bands
- Communications only between UEs and BS
- Everything controlled by the BS
- Human controlled devices

Drawbacks

- Poor exploitation of spectrum resources
- Limited energy efficiency
- Low flexibility

Future Mobile Networks



Practical expectations

- Ubiquitous broadband connectivity
- Green networks

Efficiency
Flexibility

SPECTRA Project

Celtic-Plus

EUREKA

THALES

indra

SPECTRA

CELTIC+ project

Start: 09/2010

End: 08/2014

www.spectra-celtic.eu

Monaco telecom

TELLEMENT MONACO

TeamCast

MINES TELECOM

INSTITUT Mines-Télécom

EURECOM

Sophia Antipolis

LEAT

LABORATOIRE D'ELECTRONIQUE ANTENNES ET TELECOMMUNICATIONS

SPECTRA Target

Spectrum and energy efficiency

- **Spectral efficiency**
  Thanks to the use of cognitive radio systems
- **Energy optimization in the terminals**

Green networks

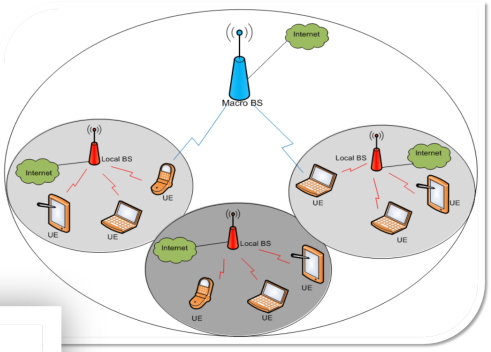
- **Minimization of the generated interference**
- **Minimization of the number of electronic components**

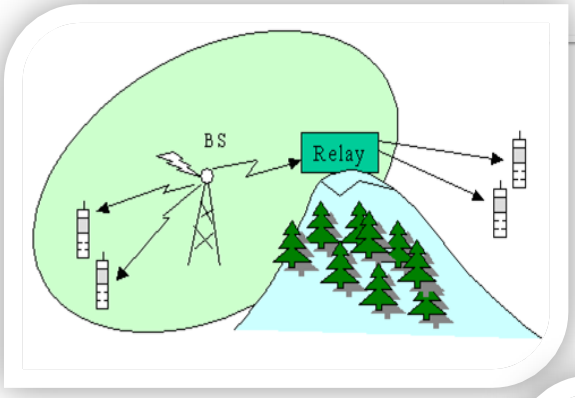
Resilient networks

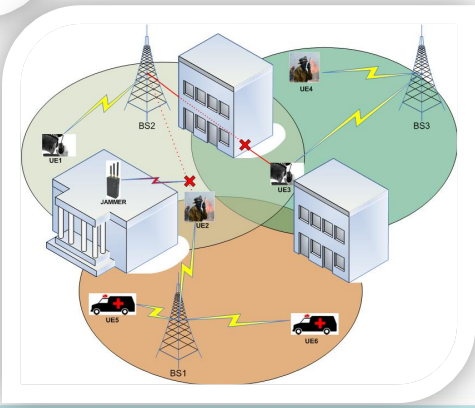
- **Reliability and robustness of communications**

Use cases

- Three use cases selected:
  - Broadband access around the home
  - Cognitive Relays
  - Robust, fast-to-deploy and reliable systems



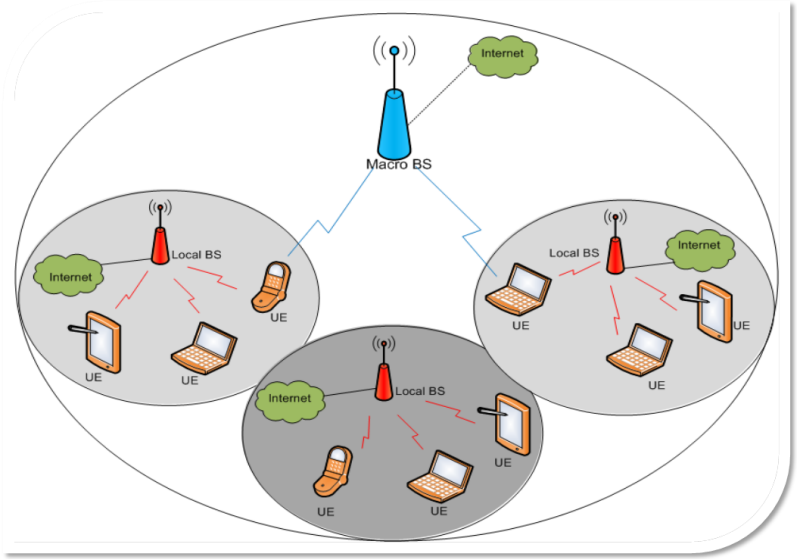




Use cases

1 - Broadband access around the home

- Users are expecting high QoS broadband internet access.
- Mobile operators operate dense femto BS deployment and employ advanced CR techniques to decrease their power consumption and increase their spectral efficiency.

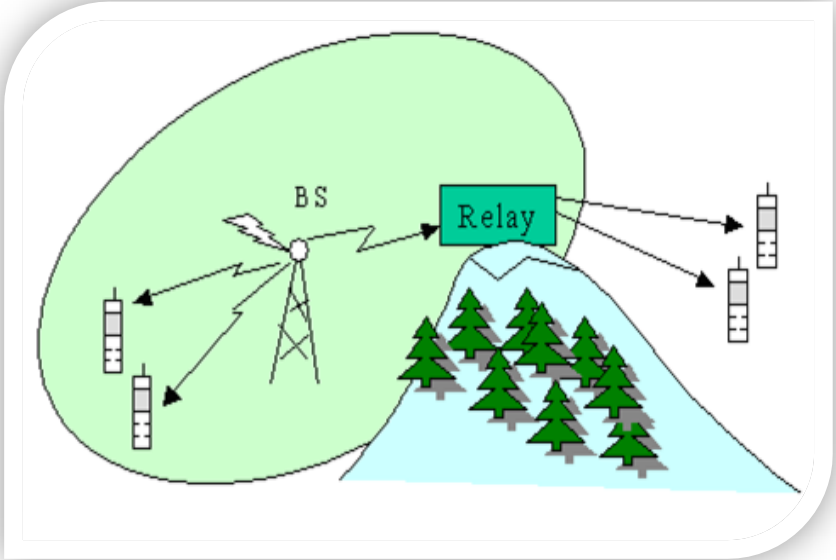


Use cases

2 - Cognitive Relays

- Degradation for the users at the cell edges due to weak received signal and interference of neighbour BS

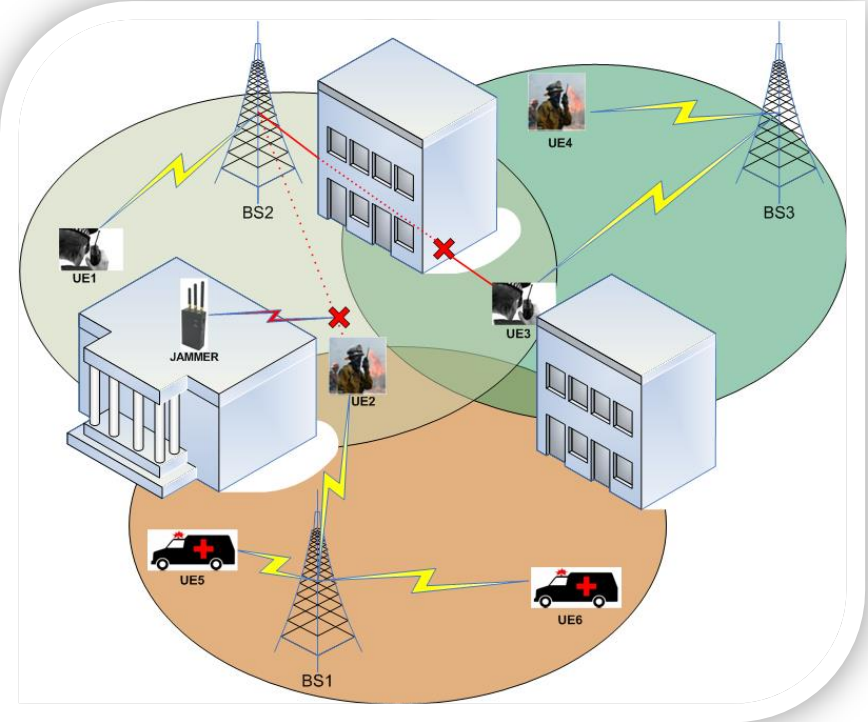
- Relays are deployed at the cell edges to extend coverage.



Use cases

3 - Robust, fast-to-deploy and reliable systems

- Communications robustness and reliability as top priority
- Interferences and jamming problems are cognitively solved using the most appropriate techniques



SPECTRA activities

New techniques and algorithms to enable and exploit cognitive radio systems

- Sensing algorithms
- MIMO techniques
- Spectral aggregation techniques
- Cognitive Radio Resource Management

→ Efficiency at spectrum and energy level

SPECTRA activities

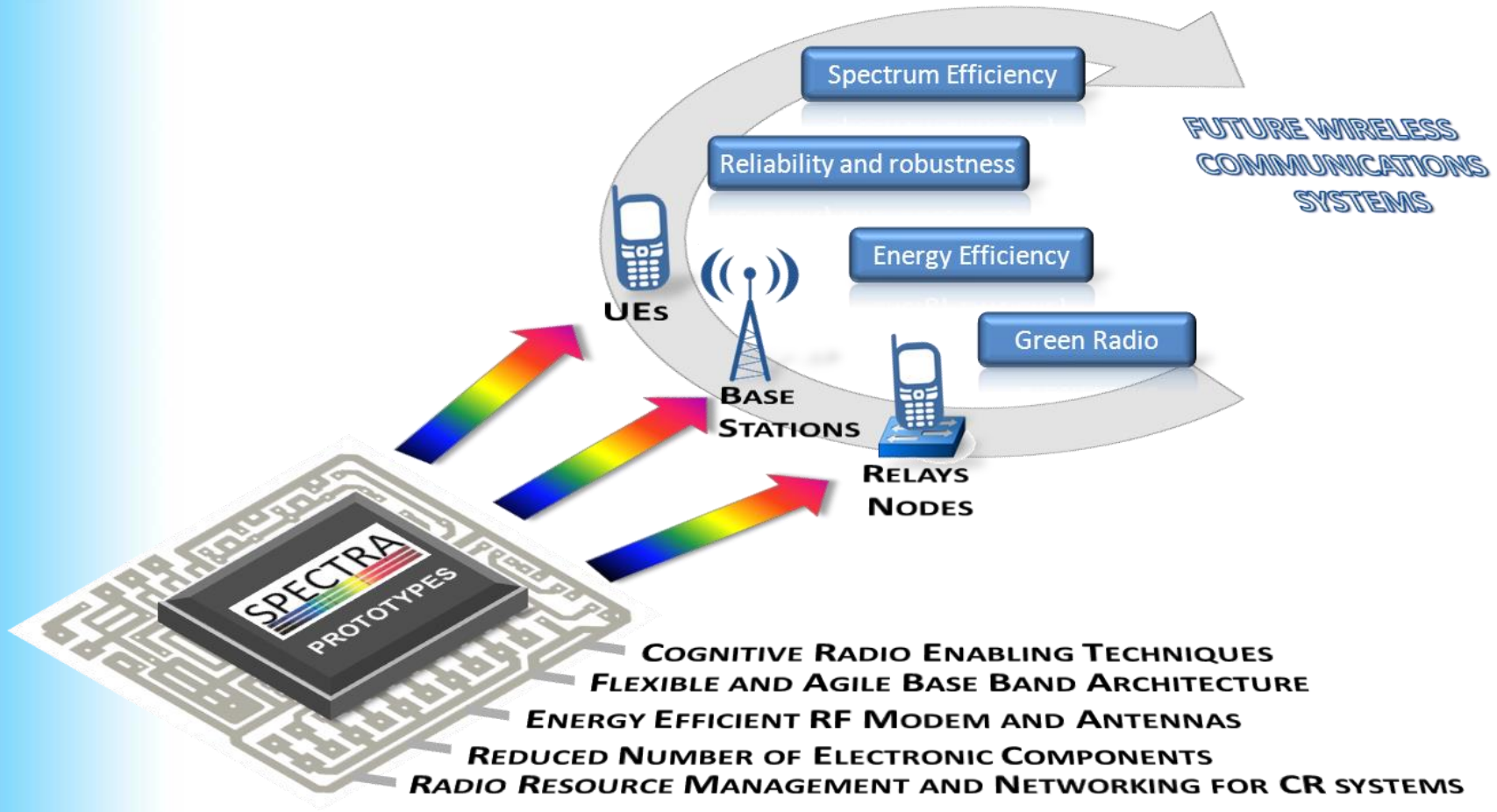
Hardware and RF

- Antenna design
- Base Band techniques and hardware development
- RF front end, power amplifiers
- RF/BB co-design
- Reconfigurable circuits design (SDR approach)

→Reduction of the emission power and overall electromagnetic radiation

→Reduction of the number of components

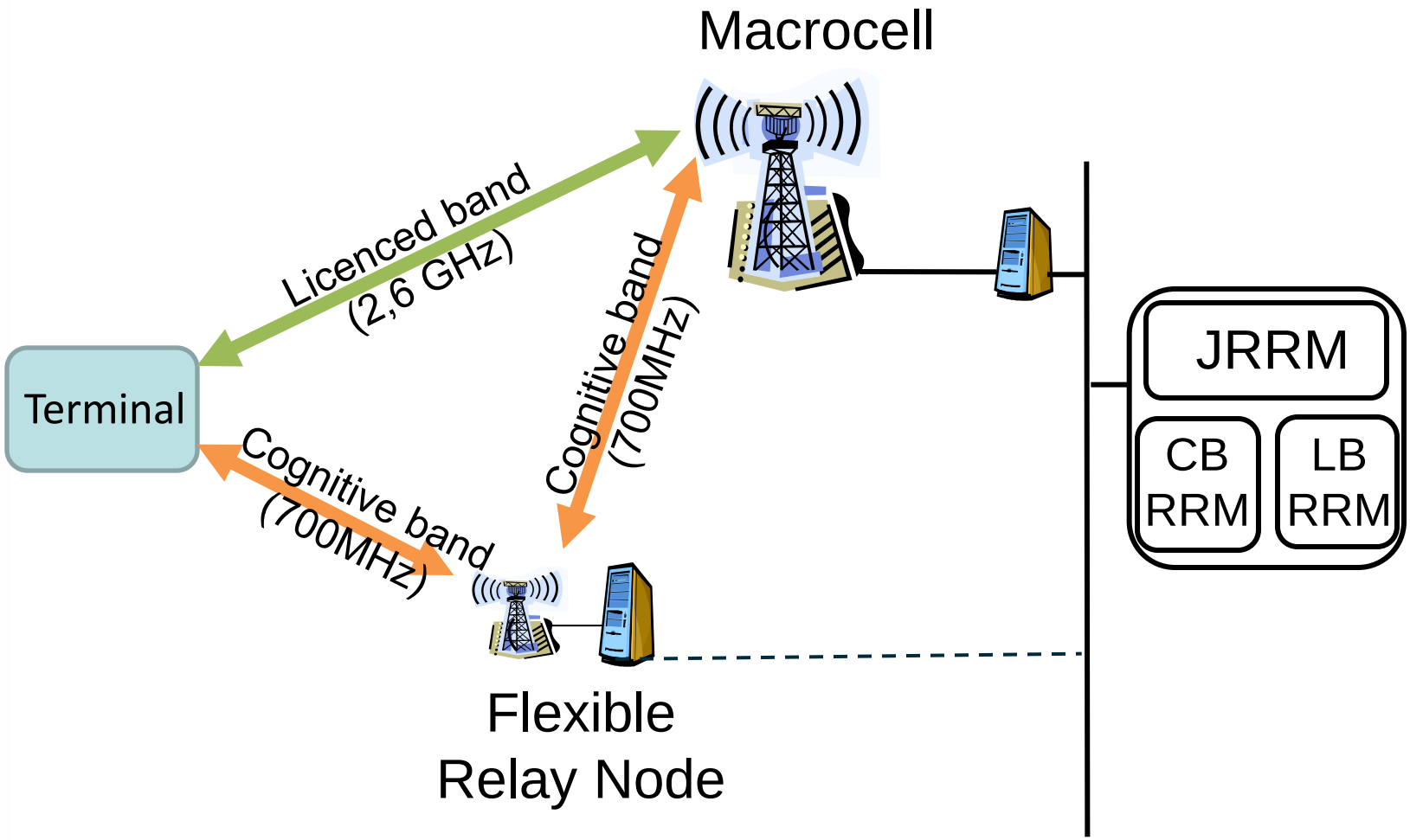
SPECTRA approach



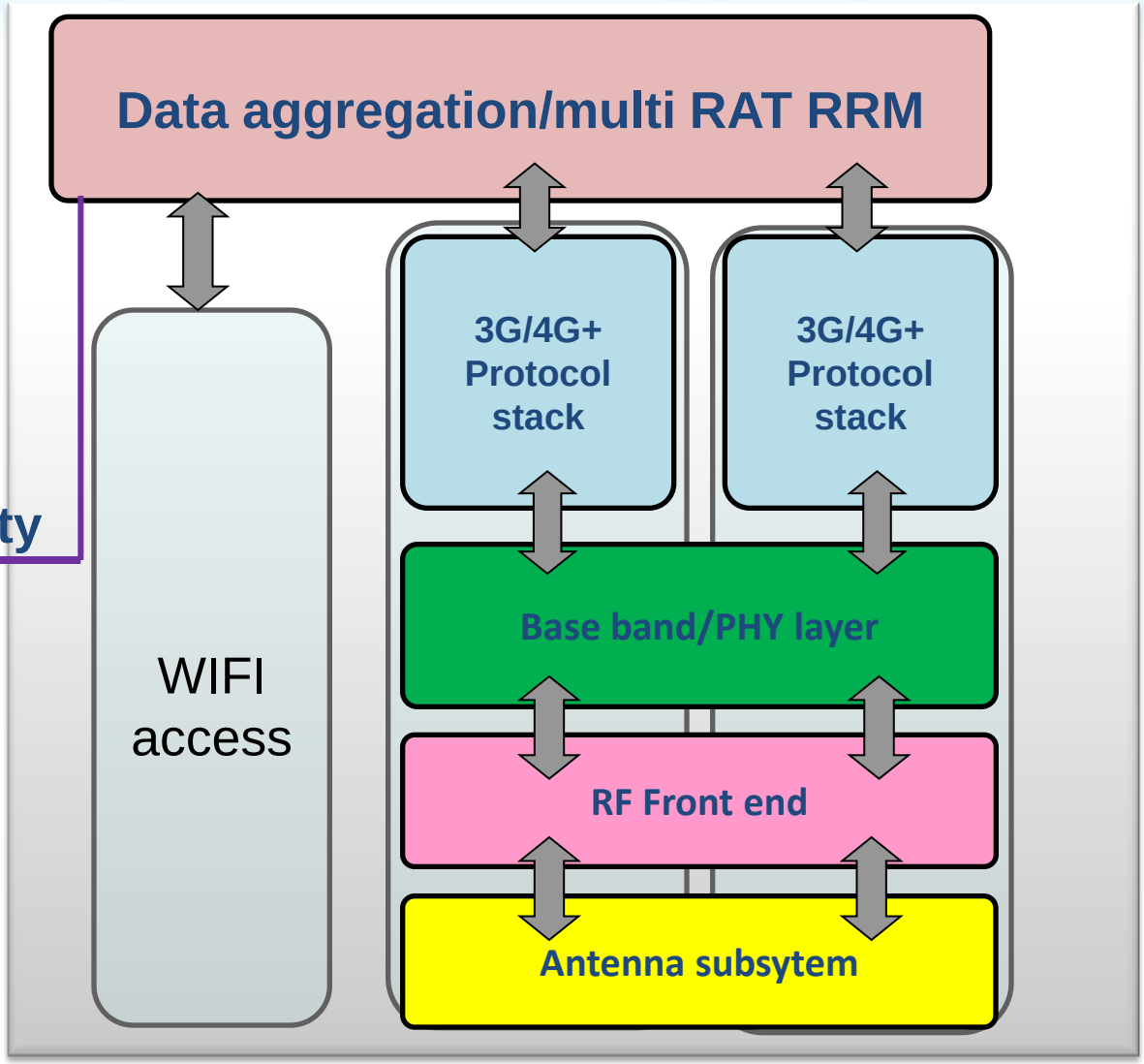
Experiments in Monaco

- Experimental network in Monaco:
  - 2 bands 700 MHz and 2.6 GHz
  - Real field trials, with a SPECTRA experimental cellular network.
  - Interoperability with a commercial equipment (real-time over-the-air operation between the SPECTRA relay and a commercial LTE equipment)

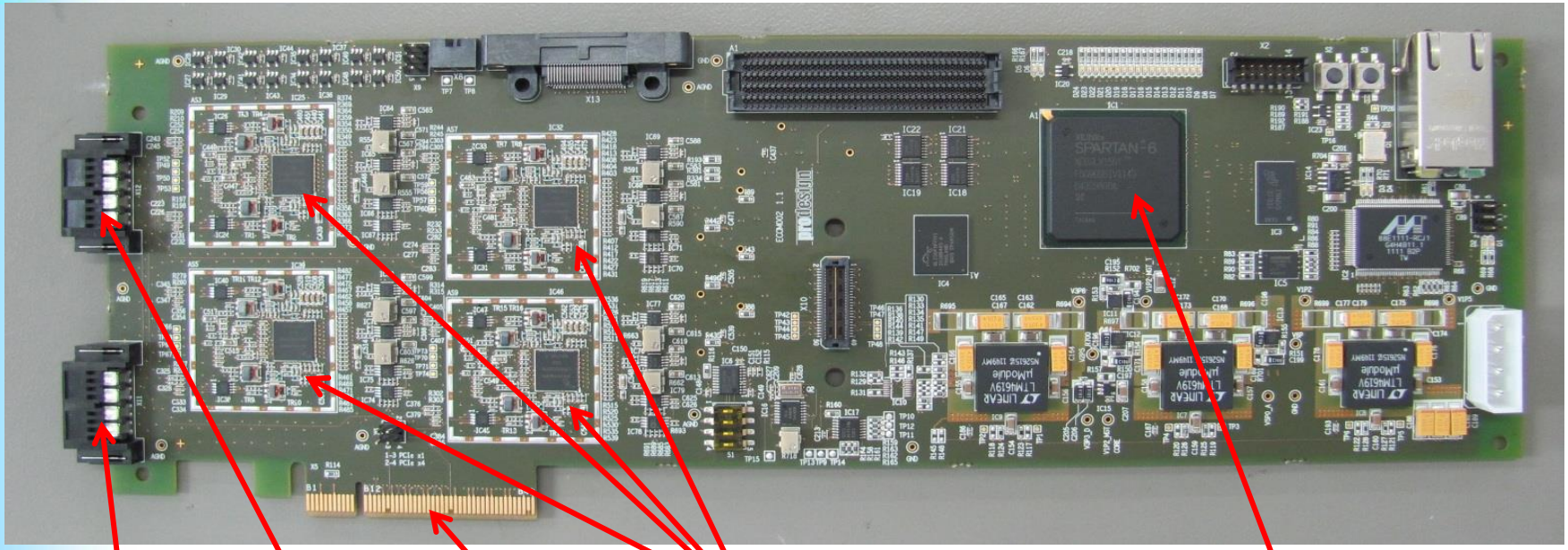
Relaying scenario deployment



Architecture of the flexible relay node



EXPRESSMIMO2



- 300 MHz to 4 GHz
- MIMO 4*4 (4 TX and 4 RX) : LTE-A compliant
- FDD and TDD
- Flexible and reconfigurable card, usable in real deployments

For more details

For more information:

http://spectra-celtic.eu/

Exhibition stand 2

Contact: lorenzo.iacobelli@thalesgroup.com