



**SEVENTH FRAMEWORK PROGRAMME**

**THEME ICT-2009-1.1**

**The Network of the Future**

**SACRA**

**Spectrum and energy Efficiency through multi-band Cognitive RAdio**

**Project Number: 249060**

**Dominique MEREL - THALES Communications, France**  
**Future Networks 5<sup>th</sup> FP7 Concertation Meeting**  
**Brussels, 27<sup>th</sup> January 2010**

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Never stop thinking

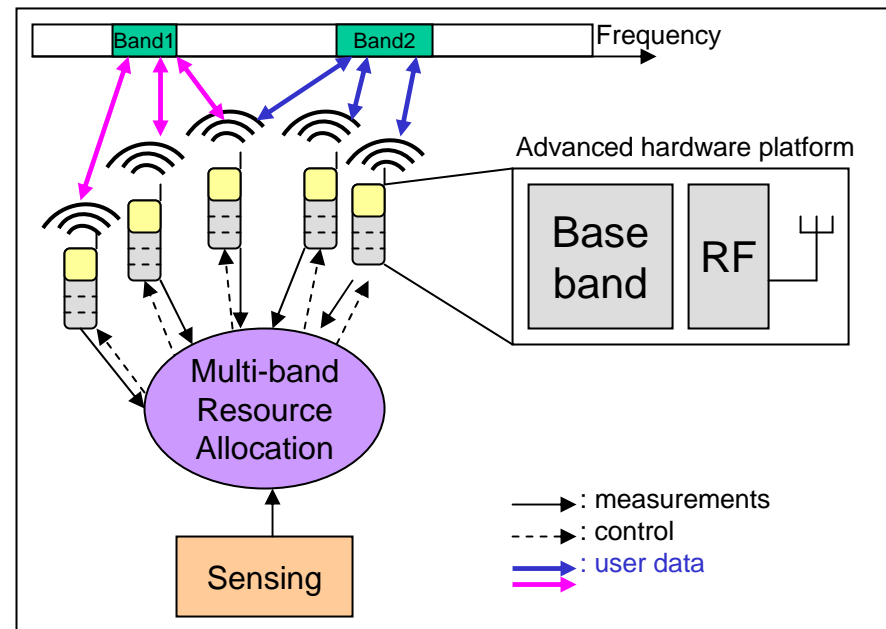


# SACRA overview

- Objective: study and demonstration of **spectrum and energy-efficient communications through multi-band cognitive radio**
- Key topics addressed:
  - Multi-band optimized communications
  - Power efficiency
  - Dynamic resource allocation
  - Advanced hardware and software components design
- STREP
- Duration: 36 months
- Outcomes: 29 deliverables including proof-of-concept
- Effort: 505 PM
- Budget: 5.95 MEuros
- EC contribution: 3.77 MEuros

# SACRA motivations (1/2)

- Radio spectrum is a scarce resource: innovative **SHARING techniques** are needed to use it in an optimal way, especially in Digital Dividend / White Space UHF.
- The **JOINT/AGGREGATED** use of separate bands is a promising research direction for advanced radio access strategies
  - It requires **advanced hardware components** and **advanced allocation strategies**: both are combined within SACRA
- SACRA proposes an **integrated hardware and software PLATFORM** to support cognitive operation



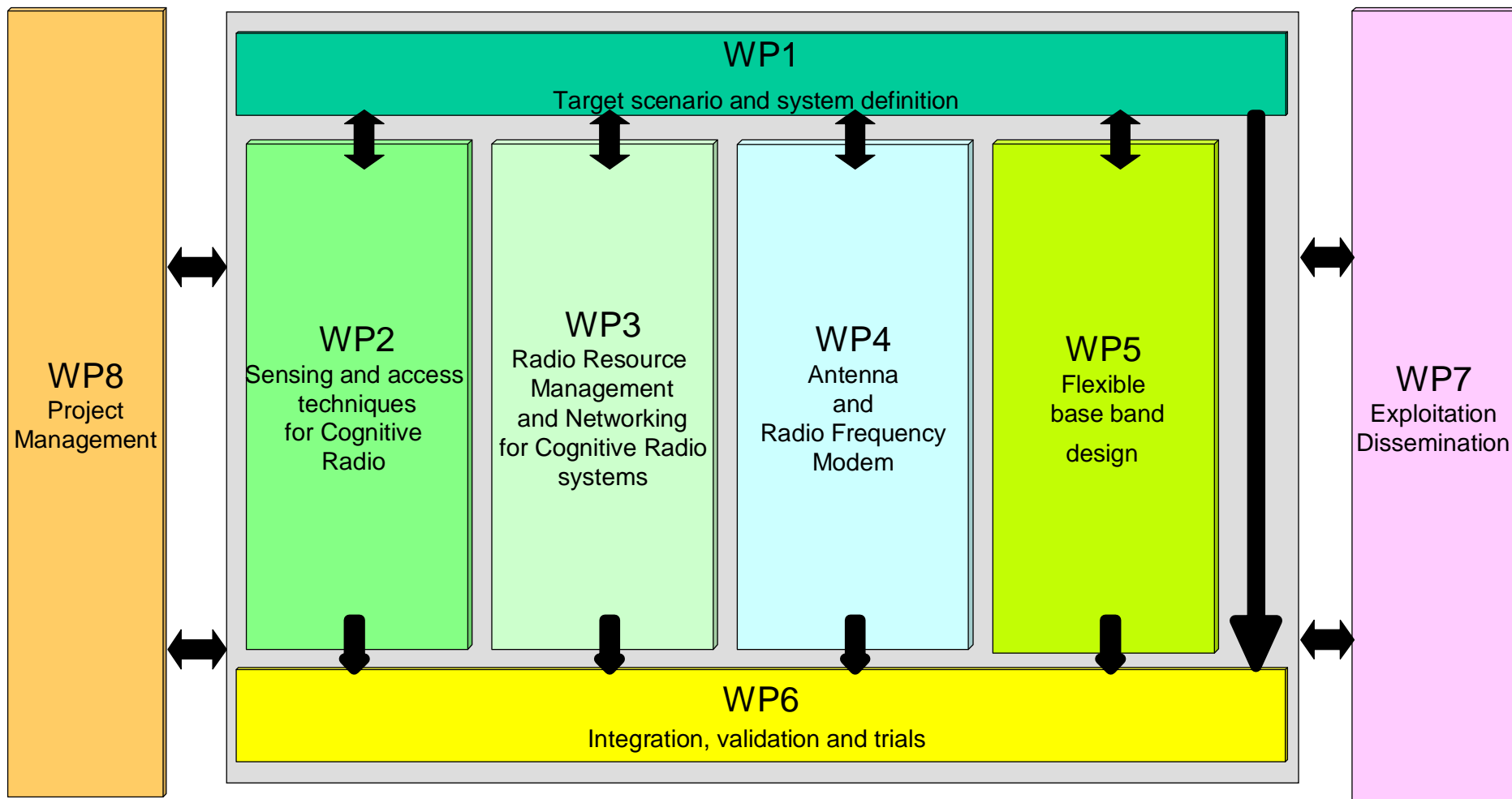
# SACRA motivations (2/2)

- **Coordinated research in RF and Baseband components** in order to globally optimize the terminal.
  - Mutualisation of components is required
- SACRA will provide a real-time demonstrator, allowing:
  - to prove the **multi-band cognitive radio concept** as a key enabler for IMT-advanced / LTE(-A),
  - to measure the efficiency in terms of spectrum use and estimate the terminal power efficiency,
  - and the demonstrator will become a strong tool to investigate future radio communications challenges on cognitive radio related topics.

# Main SACRA objectives

- The design of enabling techniques for dual-band cognitive operation.
  - This objective consists in providing **complementary enabling techniques** for cognitive systems, increasing the system gain (throughput/power compromise), especially for IMT-advanced target.
- The demonstration of the project concept based on a RF/baseband platform
  - Demonstration of a **cognitive radio network** based on the SACRA platform that allows **Wideband RF power efficient solutions and dual-band communications**, including **spectral efficiency in the radio resource management** (to be compared with state-of-the-art technology).
  - The final goal is that the resulted SACRA platform is able to communicate in real time over the air, with a real IP application on the top of the protocol stack.
- The dissemination of SACRA results especially towards workshops and actions toward results standardization
  - 3GPP Release 10+, IEEE SCC41, ETSI RRS & follow-up.

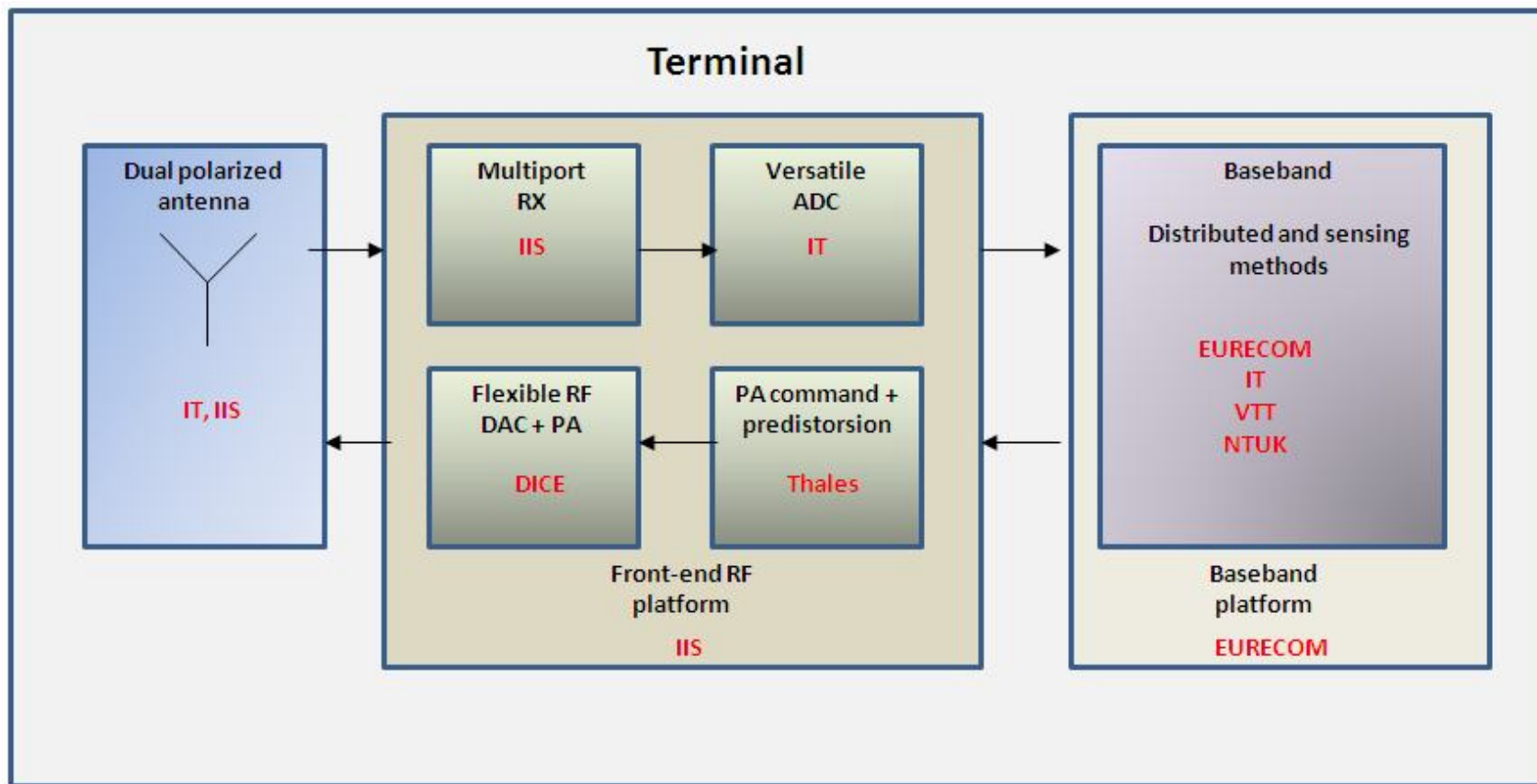
# SACRA WP breakdown



# SACRA research areas

- **Advanced allocation strategies based on:**
  - Sensing and access techniques and especially advanced space-time frequency polarization diversity coding schemes,
  - Radio resource management: interference management and allocation techniques for multi-band operation.
  
- **Advanced wideband hardware components:**
  - Integrated RF receiver front-end and versatile ADC,
  - Compact multi-band dual polarized multiple antennas,
  - Integrated RF transmitter, DAC and power amplifier pre-distortion,
  - Flexible base band design,
  - Framework for embedded software design and validation.

# Partners contributions





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 ΕΘΝΙΚΟΝ & ΚΑΠΟΔΙΣΤΡΙΑΚΟΝ  
ΠΑΝΕΠΙΣΤΗΜΙΟΝ ΑΘΗΝΩΝ  
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