

European SDR for wireless in joint security operations

Use of Software Defined Radio to support interoperability

JRC Interoperability Conference Ispra (IT)

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THALES



Summary

- Euler in brief
- Interoperability : main outcomes consideration
- SDR model
- Euler and SDR

EULER

European software defined radio for wireless in joint security operations

Project Details

Start Date: 2009-03-01 **End Date:** 2012-02-29 **Duration:** 36 months

Project Reference: 218133

Project Cost: 15.47 million euro

Programme Acronym: FP7-SECURITY

Subprogramme Area:
SEC-2007-4.2-04 Wireless communication
for EU crisis management

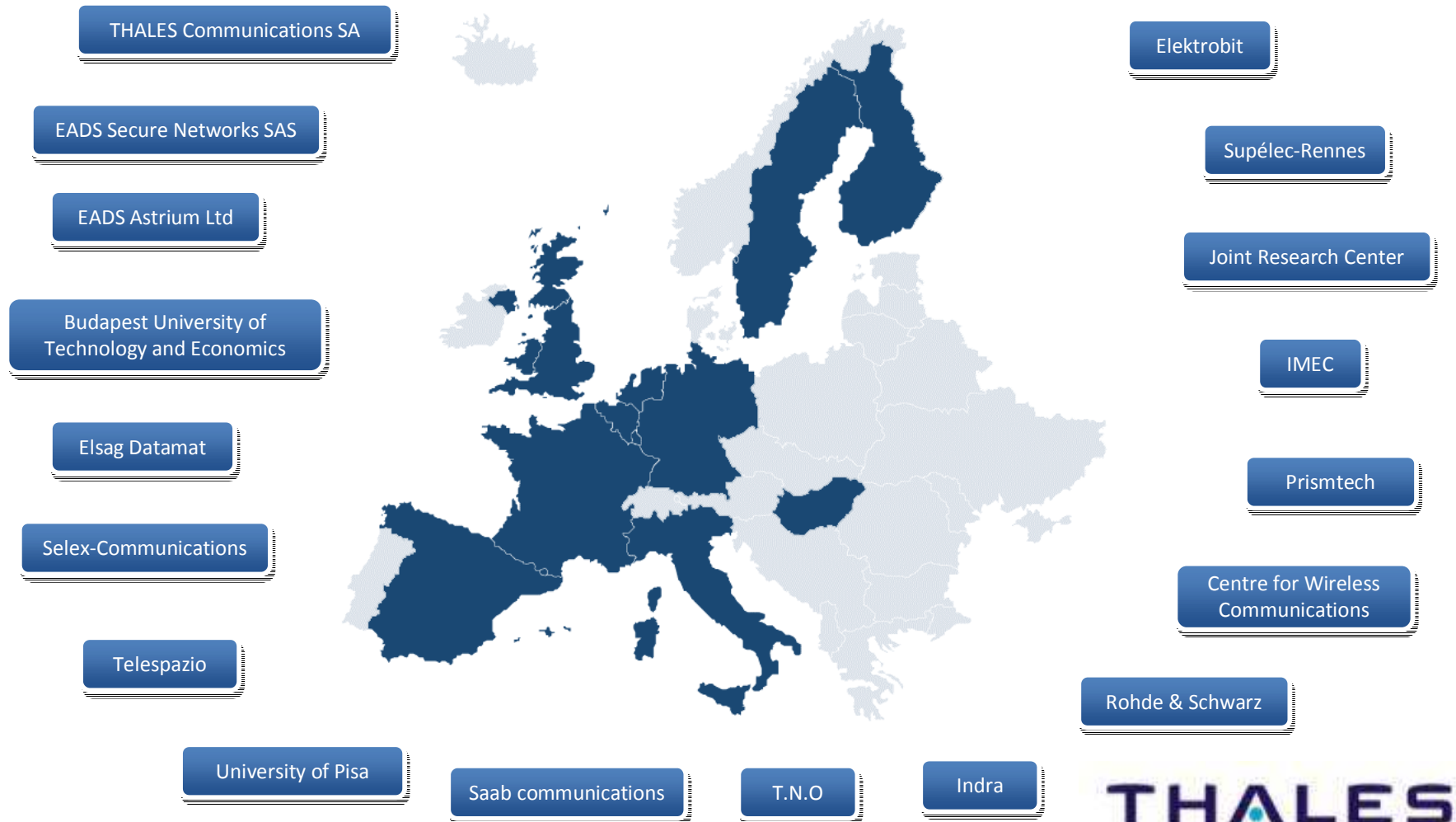
Contract Type: Collaborative project

Project Funding: 8.72 million euro

Programme Type: 7th FWP (Seventh
Framework Programme)







Project URL: www.euler-project.eu

EULER Partners



EULER End Users committee

under the JRC ISPRA coordination

Nation		Committee member national P&GS agencies (end users)	Partner ensuring liaison
ES		Spanish Mol (Telecom Area / Emergency Radio System)	INDRA
FR		French Mol (Group of Police Cooperation)	EADS, THALES
		ENSOSP (Ecole Nationale des Officiers Sapeurs Pompiers)	
		French MoD - CELAR (Centre Electronique de l'Armement)	
IT		Protezione Civile Nazionale	SELEX, ELSAG- DATAMAT
		Fondation Ugo Bordoni	
SE		MSB (Swedish Civil Contingencies Agency)	SAAB
UK		NPIA (National Policing Improvement Agency)	EADS Astrium
NL		Royal Marechaussee (Gendarmerie)	TNO
		Brandweer (Firebrigade)	
		DARES (Radio amateurs)	

Legend :



Law Enforcement



Fire & Rescue



Civil Protection



Military

Public Safety agencies & Interoperability issue

What is Interoperability ?

- ❑ Interoperability is the ability for first responders from different agencies to communicate among themselves, to exchange voice and/or data on demand and in real time, whenever necessary.

Why Interoperability remains a challenge ?

- ❑ The reasons include both:
 - ❑ Technical (Inadequate means for first responder communication due to different and incompatible radio systems or
 - ❑ Technical operational performances (infrastructures, field cond ...)
 - ❑ Non-technical issues (e.g., governance, policies, procedures, and training).

The EULER -project aims to demonstrate what benefits SDR (Software Defined Radio) should provide for interoperability in case of national and international joint emergency service operations

Several forum / standard bodies (MESA, P. 25, TETRA, ETSI RSS...) are addressing future communications user requirements.

The key items to be considered :

- Improving the interoperability between public safety communications systems
- Improving the efficiency of the existing spectrum usage
- Improving the crisis management operations through services enabled by new technology
- Voice predominant demand but not only
- Collect and share / access to imagery / video localisation indoor outdoor / weather ..
- Harmonized spectrum band in Europe cross border and decrease cost.

MESA Statement of Requirements v3.3.1(March 2008)

- Anticipates that convergence will be a natural progression within the public safety community as **new rate-intensive technologies**
- The gross data rates involve capabilities to be supported by the next generation of public safety **wireless, high-speed, digital**
- transport systems (at least 1.5 -> 2 Mbps)
- **Dynamic bandwidth and Self-healing Network**
- Transparent seamless applications, include **multiple levels of security and encryptions**
- For public safety organisations, but also vehicle tracking, environmental monitoring, traffic surveillance, hazardous areas, prisons ... including scenarios
- **Request certainly waveforms in addition to study Networks**

A complex paradigm : Interoperability Mission and Business models

The main Complexity is correlated to 3 models

- **Defence** : crucial issues re-configurability . Coalition joint operation , for which security , QOS and resilience are critical .
Unpredictable environment and Jamming coexistence with legacy radios and networks (retrofit).
- **PMR** : faces predictable and unpredictable events for which Resilience QOS and security are critical (and for now + 40 Mhz bandwidth will help)
- **Commercial** : predictable processes QOS and resilience are important versus Customer average quality
Key issue Average Revenue per Unit.

Model of shared spectrum proposed by ETSI RSS is interesting.

Fixed spectrum management for basic services voice security critical mission and Shared spectrum with commercial Ntw and operators extended services high data rate Video / data / messaging

EULER : New capabilities with SDR

Operational requirements

- Joint Operations with different agencies (possibly from different Countries)
- Public safety organizations operate in unpredictable conditions also from the point of view of spectrum availability (interferences)
- Public safety operations are usually unplanned and communications infrastructures may not be available.
- Public Safety operators may not have the interoperable terminals with the wireless networks existing in the emergency area.
- Evolving Technologies and standards may cause the existing wireless equipment to become obsolete.
- Limited budget for infrastructure/equipment upgrade
- Different levels of security among agencies

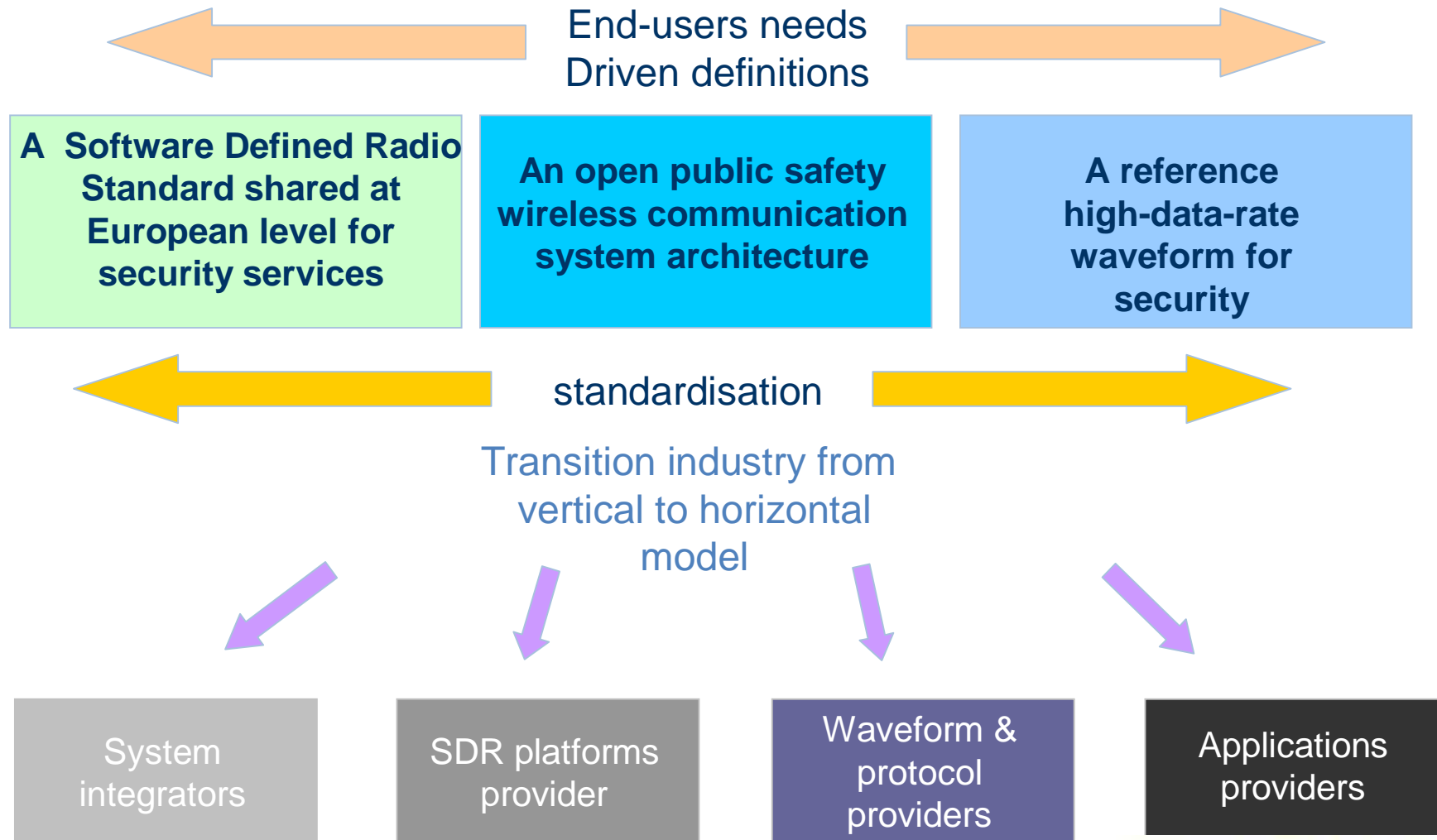
Required capabilities

- Interoperability
- Flexible Spectrum Management
- Reconfigurability
- Backward compatibility with legacy equipment
- Software upgrade vs. hardware upgrade.
- Support for multilevel security.



Software Defined Radio

SDR EULER - What is targeted :



EULER & Interoperability

EULER addresses interop “ at the equipments scale” by :

- ❑ Proposing a high-data-rate waveform supporting the complex requirements of security forces (joint) operations
- ❑ Defining precisely how SDR capabilities can be best integrated in a security (P&GS) communication system architecture
- ❑ Implementing the SDR open business model, with separation of roles between SDR platform and SDR waveform providers

The EULER -project aims provide proof-of-concept waveform implementation and portability on several software defined radio platforms and realize an integrated demonstrator targeted towards end-users.

Portability a step for interoperability

Portability requires :

- Waveform functionality realized in GPPs, DSPs and FPGAs
- Standards such as Standard Software Communication Architecture (SCA) for implementing SDR

The SCA defines standard interfaces that allow waveform applications to run on multiple hardware sets. The SCA defines a Core Framework (providing a standard Operating Environment) that must be implemented for all SCA capable hardware environments.

The use of SCA provides two main advantages:

- It enables software elements or modules to be written by different organisations and to be brought together.
- It enables the re-use of some modules, improving interoperability and cost savings.

EULER : radio waveform(s)

Providing complete interoperability may request the use of a particular waveform being used across the equipment from several manufacturers

• High-speed data waveform principles

- Identify Wimax (802.16e 2005) suitable subset targeting both wireless infrastructure and terminals

- Reuse state of the art radio techniques (notably PHY layer)
- Implement IP network functionality atop waveform
- Good reception quality in multi-path environment (e.g urban environment)
- Revisit Wimax Security (security threats analysis)
- Support for dynamic coexistence (w.r.t spectrum) of networks,
- Support for PMR-services
 - e.g call setup, fast communication establishment, group comms
- Impact of operation in PMR relevant frequency bands

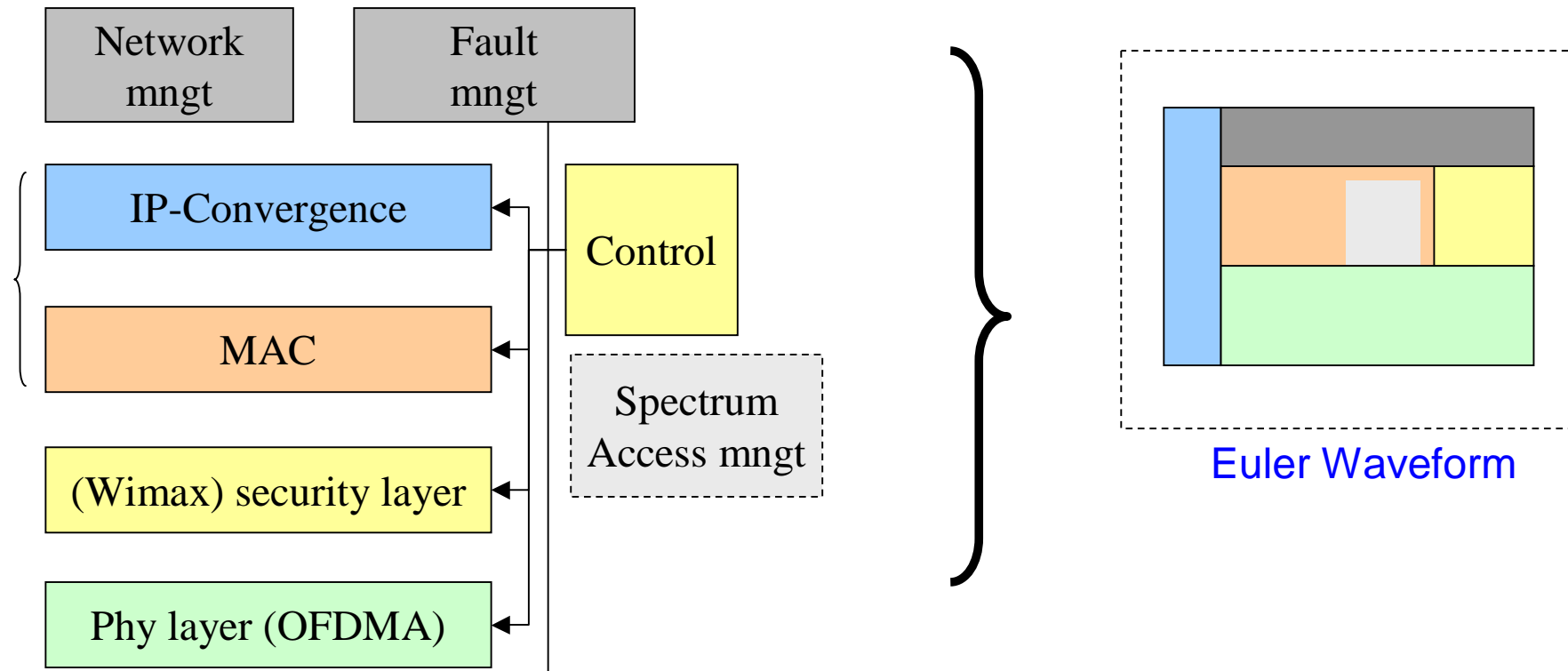
• Investigation of Satcom waveform for crisis management in SDR

- Complementary to land-waveform

EULER : Collaborative R&D project

□ Euler Waveform

- Waveform functionality realized in GPPs, DSPs and FPGAs
- Different layers providers



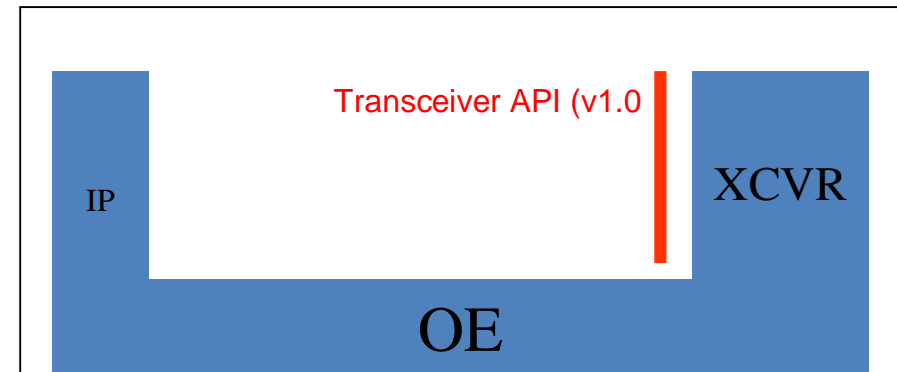
EULER : Collaborative R&D project

❑ SDR Platforms

❑ Different providers

❑ OE implementation

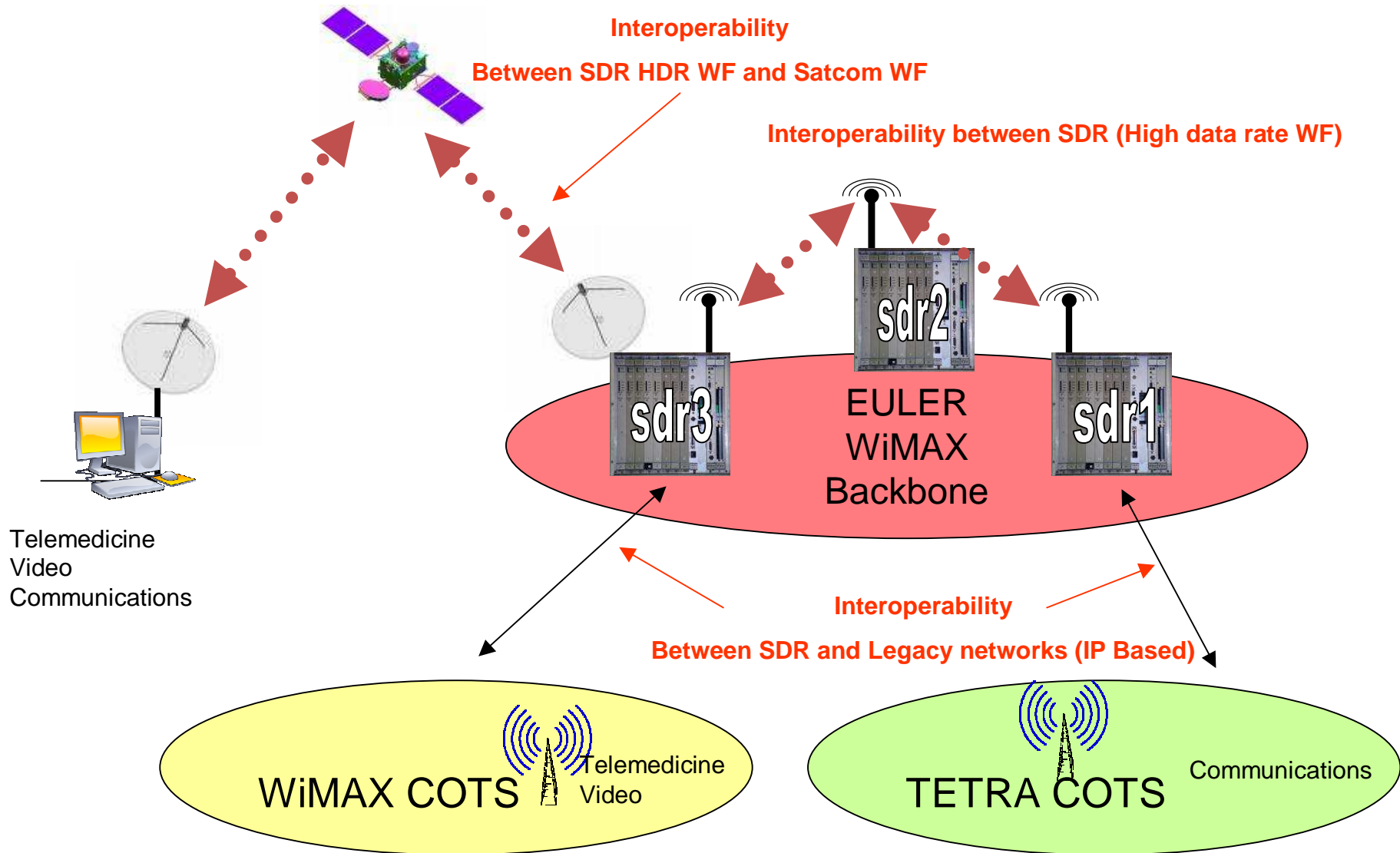
- ❑ The OE implements a basic set of core services and standardized component interfaces for waveform execution and portability.
- ❑ As defined by the SCA standard, this OE consists of:
 - ❑ **POSIX conformant operating system**
 - ❑ **TCP/IP stack**
 - ❑ **CORBA**
 - ❑ **SCA core framework**



❑ Transceiver Facility

- ❑ The Transceiver API (v1.0 version) has been selected as the interface between the WF and the Platforms, enabling the separated PF/WF providers business model
- ❑ EULER SDR Platforms implement a Transceiver compliant interface on top of which the EULER WF will be ported
- ❑ Since one of the main goals of EULER is to demonstrate portability for an SDR WF, this makes the Transceiver API a fundamental pillar for the success of the project

EULER : Possible Technical Demonstration



EULER & Stakeholders

- One EULER specific objective is to approach in a systematic way the Operational stakeholders community, to identify, operational needs and requirements.

Sp Fr Nl Sw Fi Uk ...

This is an on going action .

- comments advices recommendations are always welcomed

www.euler-project.eu

And join SCG IMGS community