Building a trusted national communications capability:

The ESSOR approach

Madrid, 23rd May 2018

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DGAM / SDGPLATIN

Overview

1. Spanish MoD SDR R&T
2. Building a military capability upon SDR
3. ESSOR as an enabler
4. Summary

Spanish MoD SDR R&T Activities

Who are we?

National Armaments Directorate (DGAM)

NAD Branch for R&T (SDGPLATIN)

Vice Admiral Jesús Manrique

R&T Management Area

Subdirección General de Planificación,
Tecnología e Innovación
C/ Arturo Soria 289
28033 MADRID

What we do

Portal de Tecnología e Innovación del Ministerio de Defensa @tid

Dissemination of R&T activities performed by the MoD

Interaction with international R&T organizations

EUROPEAN DEFENCE AGENCY

S&T organization

LoI

Strategic planning of R&T activities

SOPT

Technology Watch

Advising on the system procurement process

Management of R&T Programmes

ESSOR

FMN

NATO OTAN

MIDS JTRS

And much more…

Strategy for Defense Technology and Innovation (ETID)

- Strategy aimed to develop technology in support of military capabilities as defined in the *Defence Planning Process*.
- Set of *Technology Goals* (TG):
  - Guidance to determine R&T activities.
  - Link between R&T activities and the contribution to military capabilities.
- **TG 6.2.1: to achieve a trusted high performance tactical communications military capability *based on Software Defined Radio***

Current SDR R&T projects

- Ongoing **key international projects**:
  - **ESSOR OC1**
  - **FMN initiatives**

Early SDR R&T projects

- **ESSOR Phase 1 (2008-2015)**
- **COALWNW (2010-2017)**
- **TERSO (2005-2009)**
- **MIDS-JTRS 2-2 Transceiver (2006-2008)**

MIDS-JTRS

Building a trusted military tactical communications capability upon SDR

Main drivers

- National sovereignty
- Interoperability
- Innovation
- Improved logistics

National sovereignty on tactical communications

Key Goal: Black box avoidance

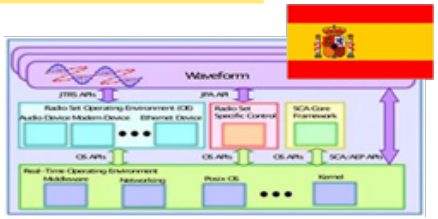
National sovereignty on tactical communications

Therefore, in order to be considered for procurement, radio **equipment SHALL be**:

- Certified by Spanish NSA (CCN)
- Able to incorporate national cryptography by:
  - Accepting crypto-subsystems (CSS) manufactured in Spain; or by
  - Allowing reprogramming and tailoring of its own CSS

Key management systems **SHALL** be also certified by Spanish NSA

Interoperability



- RF interoperability is a MUST
- WF procurement approach:
  - Only standards-based Waveform Applications (WFA) are to be accepted for procurement:
    - ESSOR HDRWF
    - SATURN
    - Future NATO NBWF
    - …
  - Proprietary WFAs are not to be considered, except temporarily for backwards compatibility with legacy radios in exceptional cases

Interoperability

- Cryptographic interoperability is also a MUST
  - NATO is promoting the usage of baseband cryptographic specifications to achieve interoperability at the tactical level.
  - STANAG 5068 will incorporate STaC-IS to gain secure interoperability between SCIP-based and TSVCIS-based tactical radios / ECUs.
  - STaC-IS will be used as COMSEC for different waveforms: SATURN, TACSAT, HF and others.

Innovation

- Spanish ETID mandates SDR (Technological Goal 6.2.1)

- SDR:
  - Opens the way to affordable R&D on military communications
    - Enabling implementation of emerging technologies

  - Allows the establishment of new business models:
    - New actors may show up in the market
    - Traditional inefficiencies may be lowered
    - More competition may be introduced in the market
    - Better procurement conditions are to be met; and
    - More value is to be expected

Improved Logistics

- Gradual introduction of SDR-based communication systems is expected to ease and simplify life cycle management
- Radio equipment may be awarded to manufacturers other than the original one
  - **Goal**: *Vendor lock-in* avoidance
  - **Key requirement**: WFA SHALL not be owned by the hardware vendor exclusivity
- WFA management simplified and under national control
- Obsolescence management facilitated

The ESSOR Programme as enabler

ESSOR Assets

➢ ESSOR Architecture:

- Software architecture for SDR platforms
- Complements JTRS SCA non available parts.
- Fully available to the Spanish MoD.

➢ High Data Rate Waveform (HDR WF):

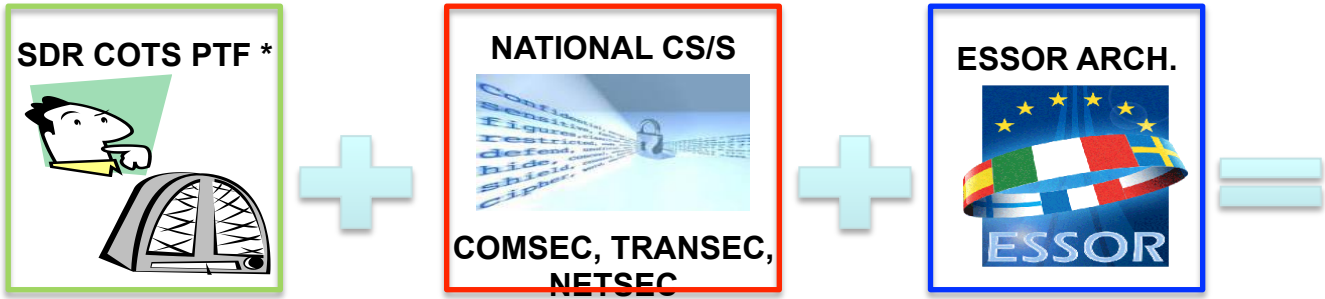
- Mobile ad-hoc networking waveform for tactical communications in land deployments.
- **Secure radio network** for coalition operations.

ESSOR Architecture – Great value for the Spanish MoD

- Implementable in **different SDR platforms**
- Makes possible to acquire **full national control** over any COTS SDR platform:
  - Own internal CS/S .
  - WF porting.

ESSOR Architecture – Great value for the Spanish MoD

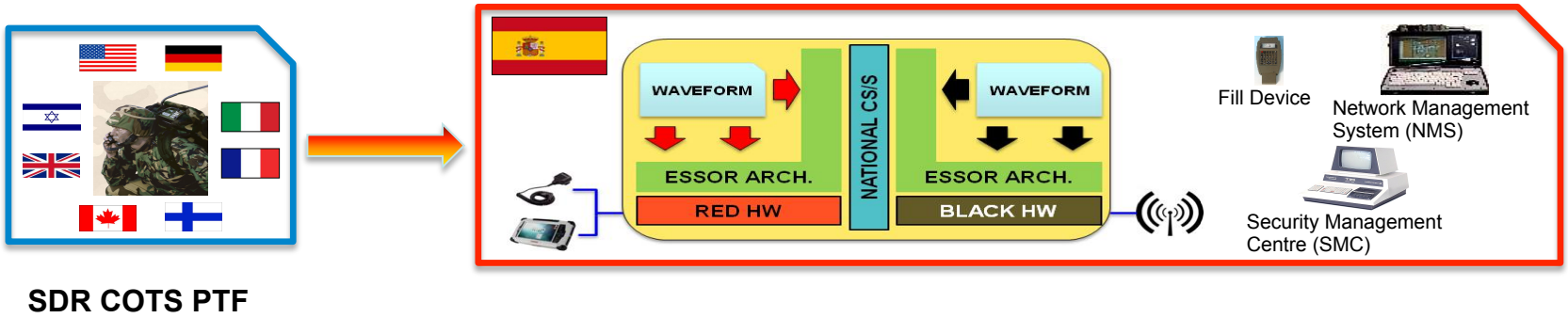
- **Formula** to obtain national control over any COTS SDR platform:



National sovereignty over cryptology and waveforms

** SDR PTF yet to be selected*

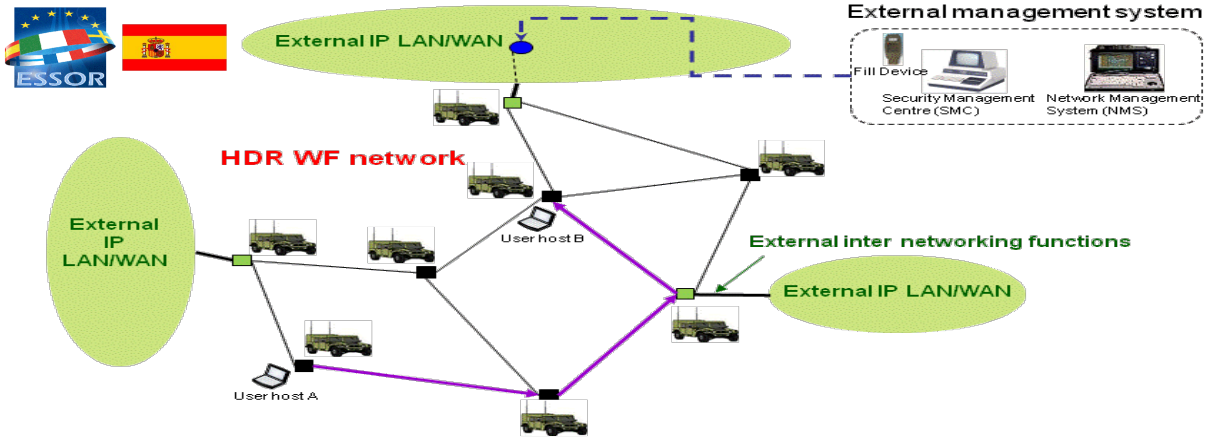
ESSOR Architecture – Great value for the Spanish MoD



ESSOR HDR WF – Great value for the Spanish MoD

The **HDR WF ported onto a SDR platform under national control** allows:

- **Waveform for coalition or national purposes:** easily replaceable cryptology.
- **Transmission of classified information only with internal CS/S**. Better performance than a external crypto (e.g.: bypass of the packet fields containing the QoS info).
- **IP services over a mobile ad-hoc network** (VoIP, situational awareness, targeting, C2, video, etc.).



Way forward: The goal

To achieve a **national SDR capability** able **to provide independence** in tactical communications

Way forward

2030

Next Exit ↑ (2025-2030)
SDR Lab

Next Exit ↑ (2020-)
Security Accreditation Process

Next Exit ↑ (2020-2025)
ESSOR OC-1
PTF -Procurement

Next Exit ↑ (2019-2024)
Narrowband WF

Next Exit ↑ (2020-)
SDR Management Tools

2020

Summary

Summary

- The **goal**: *A trusted tactical communications military capability*
- The **main drivers**:
  - National sovereignty
  - Interoperability
  - Innovation
  - Logistics
- The **enablers**: *Software Defined Radio* and *the ESSOR Programme*
- The **assets**: ESSOR Architecture and ESSOR HDRWF
- A future ***Waveform Procurement Approach*** will basically establish that:
  - Only non-proprietary standards-based WFA will be accepted.
  - Proprietary WFA are to be phased and ruled out on a general basis.

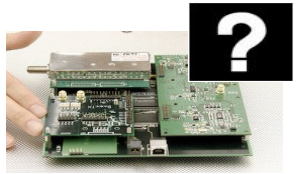
Parking Lot

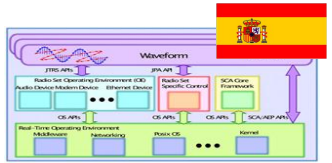
ESSOR Architecture – Great value for the Spanish MoD

- A SDR platform including a **national CS/S** and the **ESSOR Architecture** allows:
  - **National portability of coalition waveforms** (ESSOR HDR WF, COALWNW, etc.) and **adaption for national-only purposes**.
  - Development of **new waveforms**: national VHF NBWF.
  - **National control over cryptology and communications**.
  - A national **network management system** and a **security management centre**.
  - Security accreditation for **transmission of national classified information**.
  - **In-Service Support performed at national level** (software). Dependence on the SDR platform vendor limited to hardware replacements.

Way forward (II): Requirement

- **Requirement**: **national control** over the whole product life-cycle:
  - **Hardware** may be provided by a private vendor, either **national** or **foreign**.
  - **Cryptography and software architecture** must be unconditionally under national control.
  - **Waveform porting national oversight.**
  - **Integration** of **management tools** into **national** C2 information **systems.**
  - **Software In-Service Support** might be provided nationally.



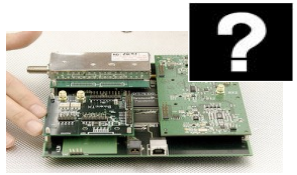


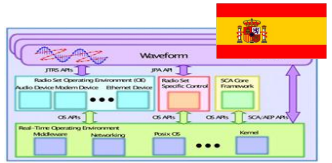
Way forward (III): Milestones

- Development of a **national internal crypto subsystem** for SDR.
  - **Potential collaboration with other nations** for the specification.
  - **Integration of the national CS/S** within the selected national SDR platform,
- **ESSOR Architecture** implementation.
- **Porting of ESSOR HDR WF and COALWNW** onto the national SDR platform.
- Development of **national management tools** to configure and control platform and waveform parameters and security material (**key generation included**).

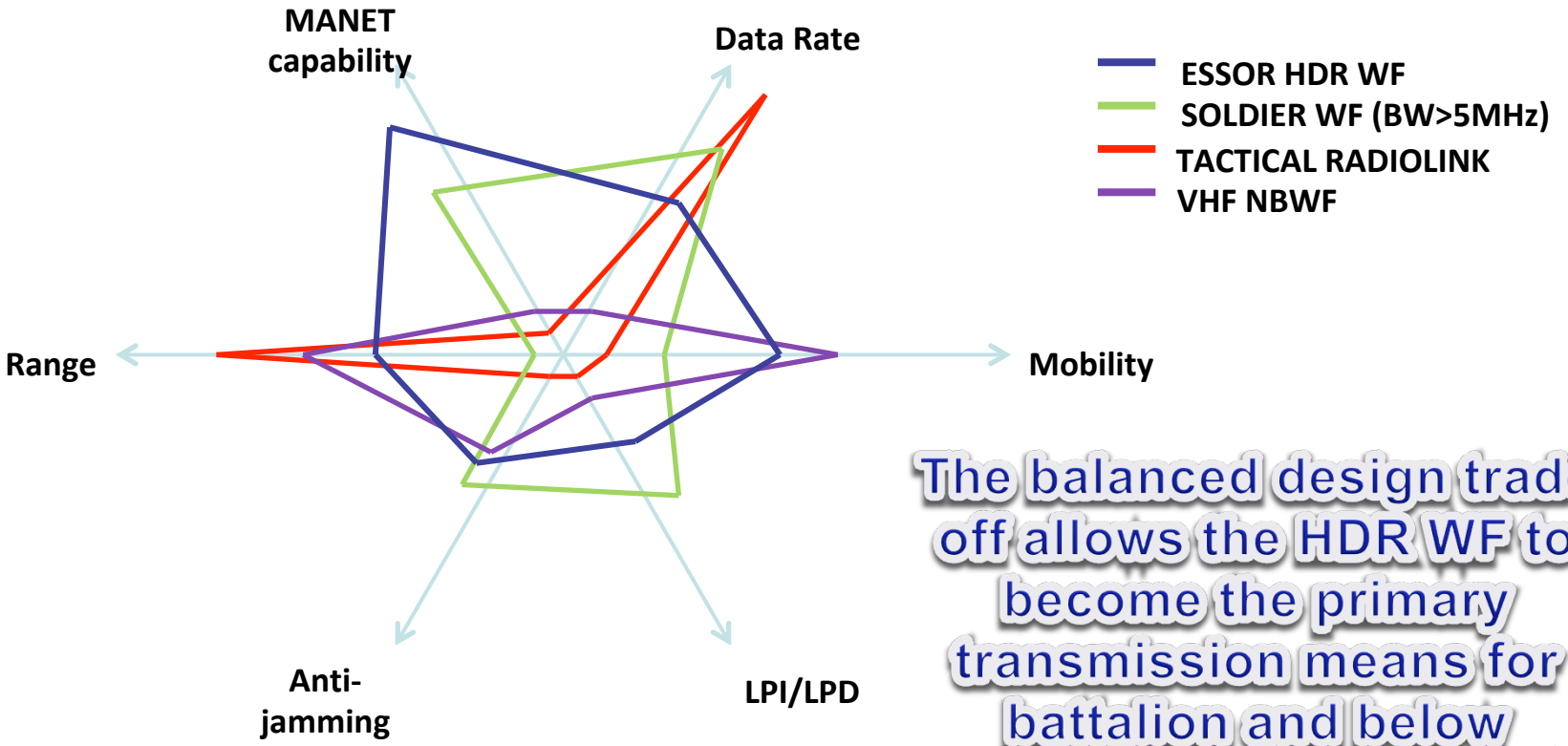
Way forward (IV): Final remarks

- Both **governmental and industrial involvement** is needed.
- The Spanish industry is in the position to **adapt existing COTS platforms** to **incorporate** ongoing **R&D activities outcomes as well as a national CS/S**.
  - Access to **low level HW details** is needed to implement the **ESSOR Architecture.**
  - Candidate COTS platforms must **support the execution of the ESSOR HDR WF:** *demanding performance requirements*.
  - Development of a brand new SDR platform by Spanish industry is also a possibility -> *roadmap rescheduling*





ESSOR HDR WF – Great value for the Spanish MoD



The balanced design trade off allows the HDR WF to become the primary transmission means for battalion and below