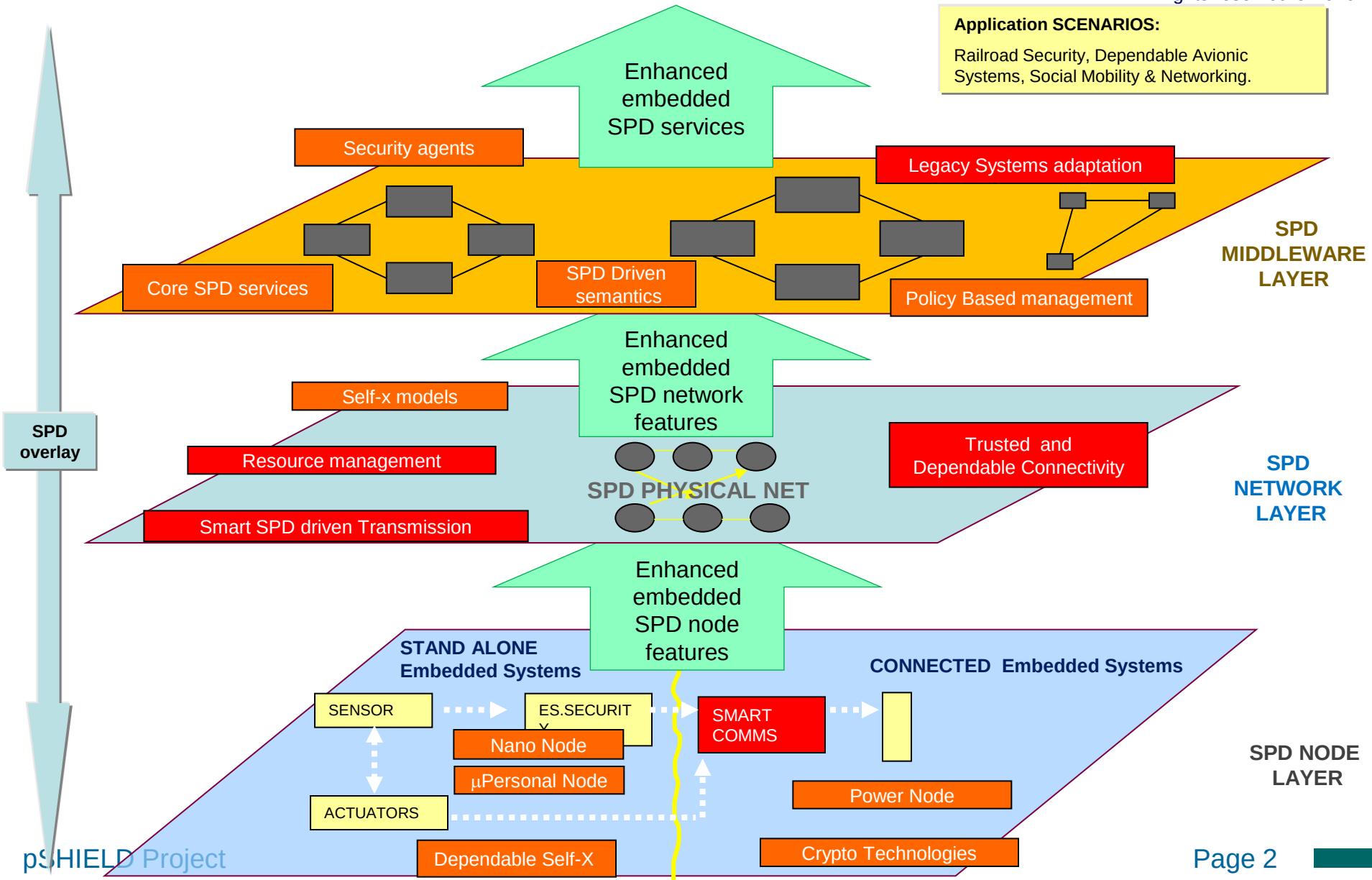
SELEX Elsag WP4

Final Review – Brussels

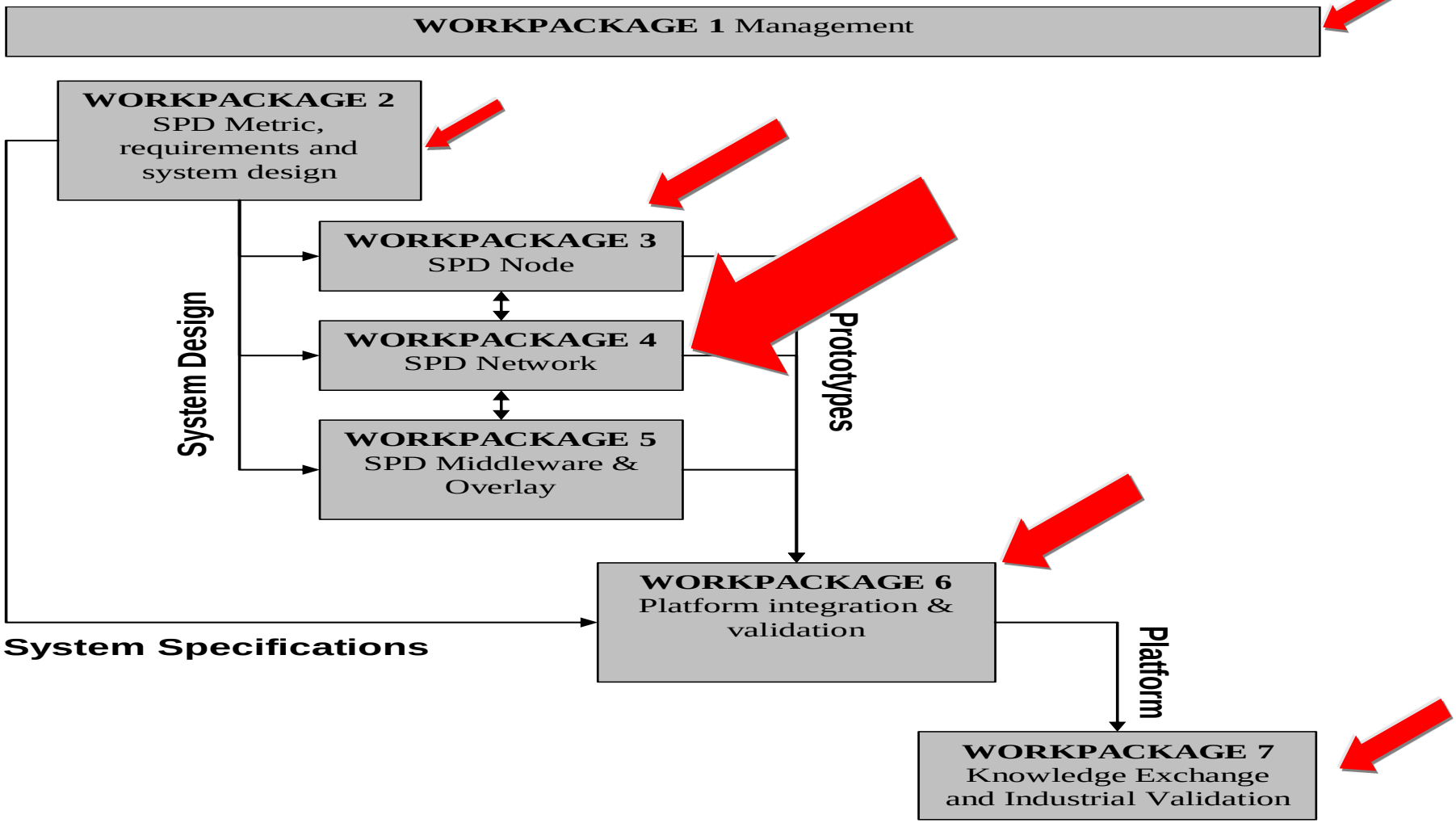
ARTEMIS Call 2009 – SP6100204

14 February 2012

pSHIELD functional architecture



nSHIELD: Block Diagram & WP4 partners effort



WP4 - SPD network – The SCOPE in synthesis

- The main objective of Smart Communications is to provide Trusted and Dependable Connectivity to Embedded Systems through the implementation of a radio system capable:

1. to maintain awareness of the operating scenario,

2. to detect possible threats and to counteract in such a way to ensure communications integrity to the maximum possible extent by reconfiguring the single nodes and/or the system itself.

3. To smart manage the crypto Keys in order to handle security in lightweight devices and in highly dynamical networks.

WP4 - SPD network – Basic Concepts

– Cognitive Engine defines an optimal configuration according to the environment and the goal (highly reliable communications, efficient use of the radio spectrum, maximize the throughput while keeping the *PER under a threshold, …) being

aware of its surrounding environment (i.e., outside world), and uses the methodology of understanding by-building to

learn from the environment, including intrusion detection and

adapt its internal states to the statistical variations in the incoming RF stimuli, intrusion alerts by making corresponding changes in certain operating parameters (e.g., transmit-power, carrier-frequency, modulation strategy, key redistribution, data base and intrusion signature updates) eventually in real-time.

***PER: Packet Error Rate**

WP4 - SPD network – Activities Carried Out

Understanding of the main features needed for making the pSHIELD SPD-Based Radio system working, that are:

- reconfigurable radio components with waveform parameters (frequency, bandwidth, …)
- sensing mechanism to acquire awareness about available/used resources
- Different IDS approaches (misuse vs. anomaly detection, architecture) taking into account the requirements of sensor networks
- cognitive algorithms elaborating the available infos and taking countermeasures decisions against the identified threats

- Simulator adaptation to be used for Smart SPD transmission environment simulations

- Embedded Platform adaptation to validate pSHIELD cognitive algorithms

WP4 – SPD network – Achievements

- Performance analysis of various waveforms has been completed to select best candidates for the foreseen applications, both at the physical and MAC layer
- Realization and adaptation of HW and SW of multi-core platform for the cognitive algorithm validation on embedded system
- Identification of spectrum sensing features for Cognitive Radio analysis
- Adaptation of sensing part of the Cognitive Radio simulator for pSHIELD

WP4 – SPD network - Achievements

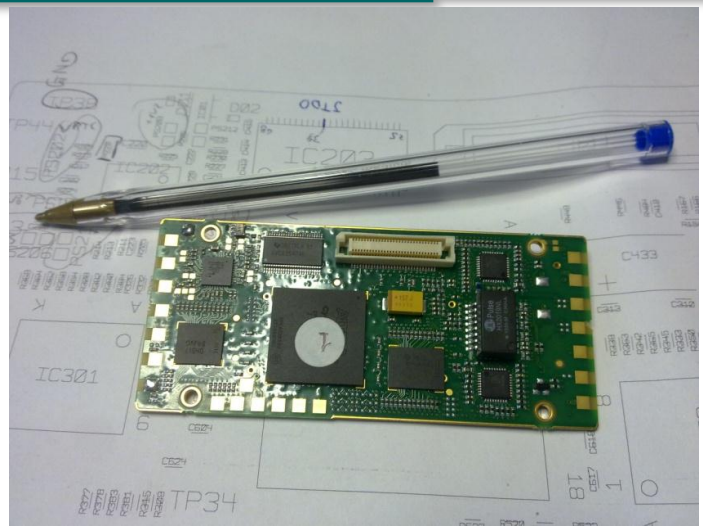
- Energy footprint of wireless communication protocols and its impact on performances on commercial devices regarding different topologies.
- Transmission parameters smart adaptation according to radio resources observation towards trusted and dependable connectivity implementation
- Implementation of a Cognitive Radio Node software simulator able to automatically detect a threat and adjust internal radio parameters to counteract
- Providing security in lightweight and networked embedded devices (novel cryptographic scheme)

WP4 - SPD network – Challenges

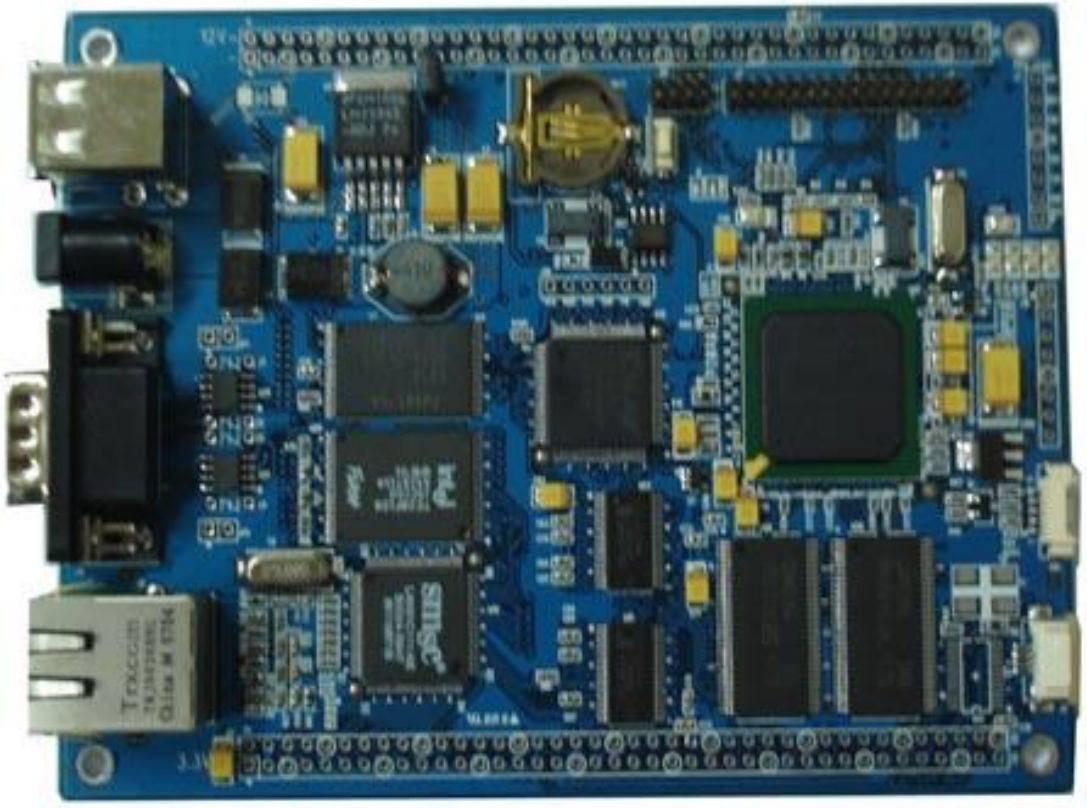
– pShield Analyzed and identified some blocks that have to be detailed, implemented, tested and validated:

- **Sensing:** awareness (active users, bandwidth, modulation, frequency, …)
- **Cognitive Manager:** decision making, reasoning, cross-layer optimization and resource allocation
- **Radio:** adjust radio parameters according to cognitive manager (dynamically exploitation of available resources, …)
- **Networking:** spectrum-aware routing, cognitive transport protocols
- **Optimize the IDS** architecture regarding dinstributed or centralized approaches or a combination of both
- **Reputation based IDS** approaches are to be implemented
- **Key Management**
- **Adaptation of the simulator**

WP4 - SPD network – ES Computational Hardware



PCB Standard - PXA270 uP (110x130mm)



Carrier Board OMBRA-SHIELD (40x80mm)

PCB OMBRA-SHIELD – OMAP uP (18x68 mm)
Computational Power 5X