# Components and Integration

nSHIELD

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# WP6 - Overview

## Deliverables

- D6.1, Lifecycle and SPD Support Plan (Internal, M18, finalized)
- D6.2, Prototype Validation and Verification (Internal, M20, in progress)
- D6.3, Prototype Integration Report (Internal, M22, initialized)
- D6.4, Lifecycle and SPD Support Report (Public, M30)
- D6.5, Platform Integration Report (Public, M34)
- D6.6, Platform Validation and Verification (Public, M36)

| Partner | MM | T6.1 | T6.2 | T6.3 |
|---|---|---|---|---|
| SG | 10 | 10 | | |
| ASTS | 6 | 3 | 3 | |
| AT | 19 | 13 | 6 | |
| ATHENA | 21 | 9 | 9 | 3 |
| SE | 26 | 10 | **16** | |
| TECNALIA | 15 | | | **15** |
| ETH | 3 | 3 | | |
| HAI | 32 | **18** | 8 | 6 |
| ISL | 24 | 24 | | |
| ISD | 6 | 2 | 2 | 2 |
| MAS | 7 | 5 | 2 | |
| MGEP | 3 | 3 | | |
| ATAFROLL | 5 | 5 | | |
| S-LAB | 29 | 5 | 12 | 12 |
| THYIA | 12 | 8 | 4 | |
| UNIUD | 6 | | 6 | |
| UNIROMA1 | 4 | 4 | | |

# WP6 - Tasks

## T6.1 – Multi-Technology System Integration (HAI)

- Integration of components and prototypes
- Vertical testbed of nSHIELD layered architecture
- Demonstration of the interoperability of the various nSHIELD SPD modules

## T6.2 – Multi-Technology Validation & Verification (SE)

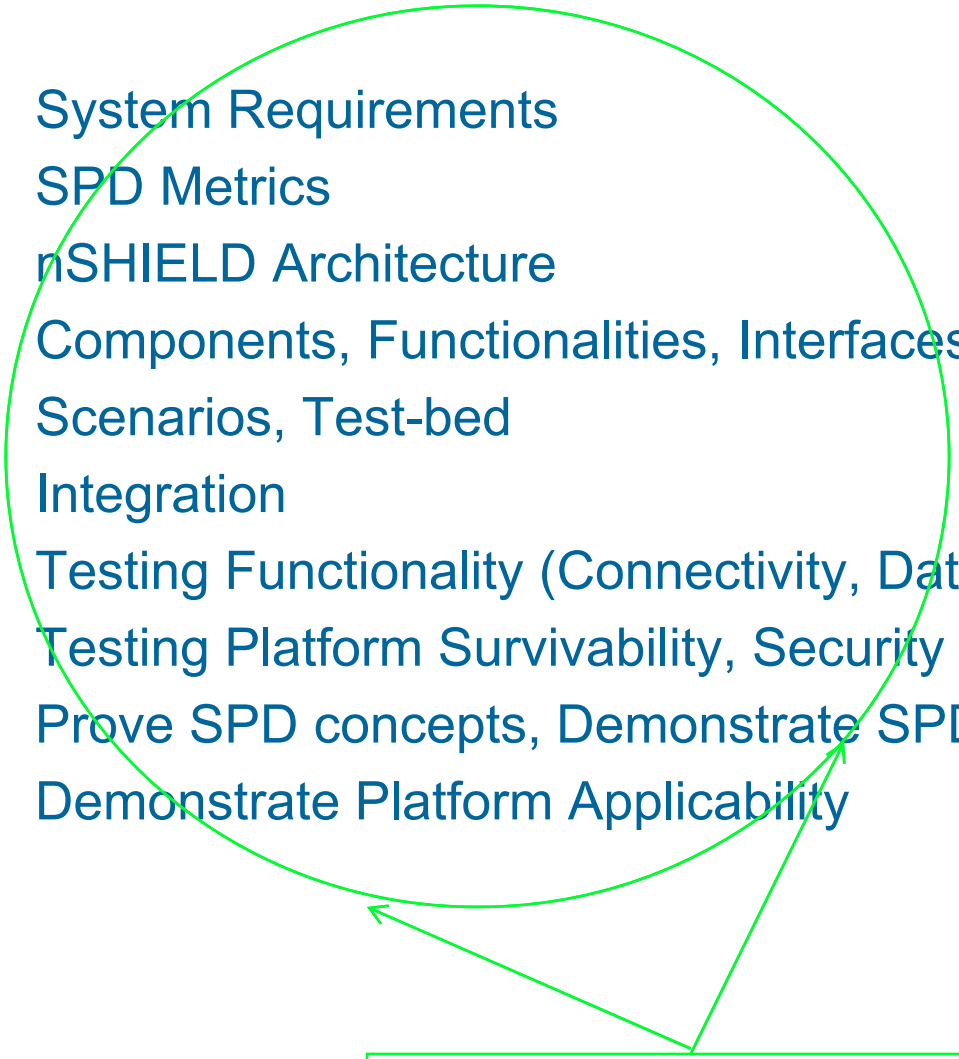
- Specification of test procedure assessing interface compatibility
- Validation of integrated testbed
- Validation of nSHIELD SPD fundamentals

## T6.3 – Lifecycle SPD Support (TECNALIA)

- Support the lifecycle of proposed solution
- Conform with international standards (ISO/IEC 12207)
- Analyzing the security implications of upgrades

# WP6 & WP7 – Work Plan (flow/interactions)

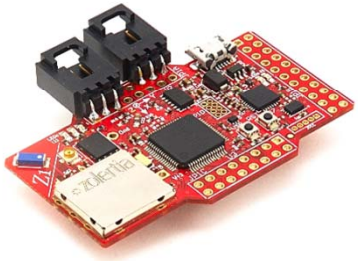
- System Requirements
- SPD Metrics
- nSHIELD Architecture
- Components, Functionalities, Interfaces
- Scenarios, Test-bed
- Integration
- Testing Functionality (Connectivity, Data flow)
- Testing Platform Survivability, Security and Reliability
- Prove SPD concepts, Demonstrate SPD levels
- Demonstrate Platform Applicability



WP6 & WP7: integrating things, composing applications

# Components/Node (1)

- SDR
  - ✓ Hypervisor (separates OS from Security modules, Beagleboard xM)
  - ✓ Secure Firmware (SHA1, RSA) encryption
  - ✓ Smart power unit
  - ✓ Smart card (embedded in Nano/Micro)



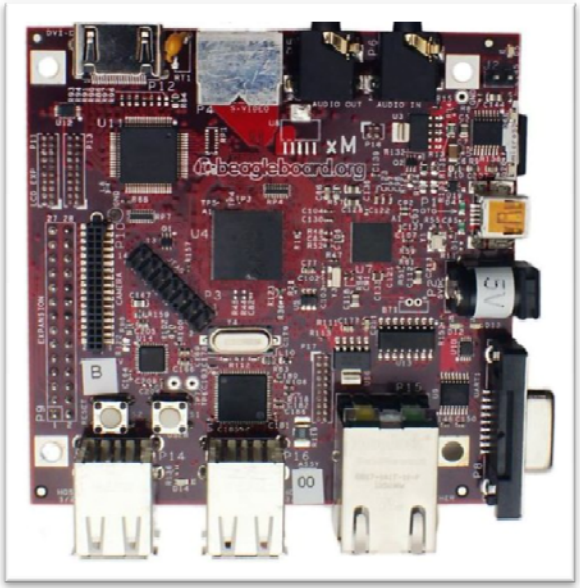
Zolertia Z1

- Micro/Personal Node
  - ✓ Face recognition (PCA based on Eigenface)
- Power Node
  - ✓ GPU hash lookup mechanism

# Components/Node (2)

- Self-X
  - ✓ OMBRA (Montgomery algorithm demo on elliptic curves), FPGA processors
  - ✓ Anonymity
  - ✓ Automatic access control (asymmetric cryptography, hash functions, CRC)
  - ✓ DDoS attack mitigation (anti-IP spoofing, could be part of IDS)

- Cryptography
  - ✓ Library of elliptic curve cryptography
  - ✓ Library of lightweight ciphers
  - ✓ Key exchange protocols



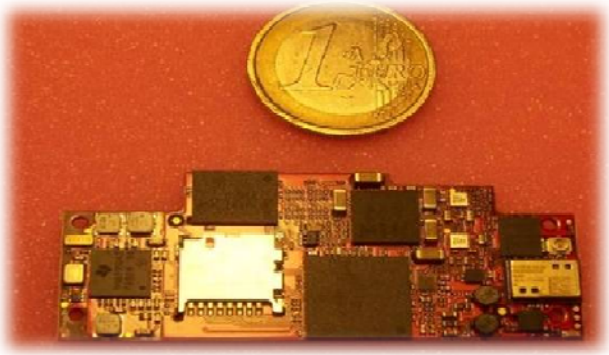
# Components/Network (1)

- Smart SPD transmission (SDR, Security in CR)
  - ✓ Smart transmission layer prototype (OMBRA-HH device, T7.3)
  - ✓ Countering smart jamming attack algorithms (C++ simulator/demontrator?)
- Distributed self-x models
  - ✓ Recognizing DoS (OMNET++)
  - ✓ Cellular automata (OSGi, T7.2)
- Reputation-based technologies
  - ✓ Trusted routing (DT+IT)
  - ✓ IDS (Beta distribution)

# Components/Network (2)

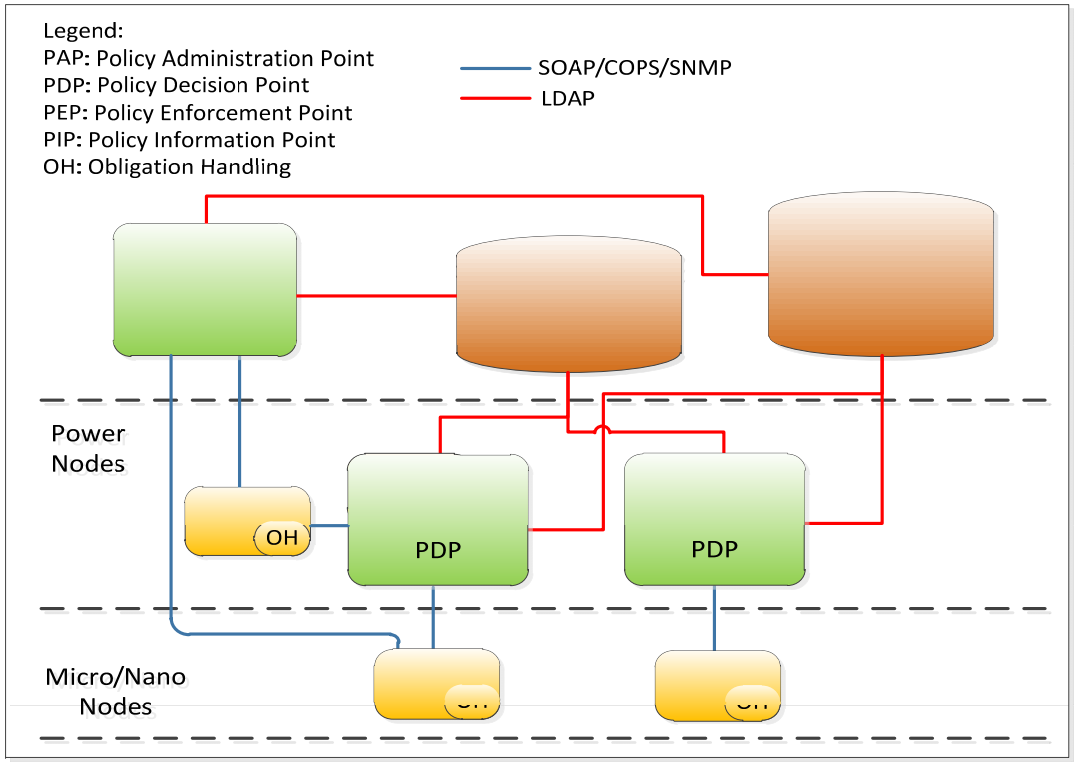
- Trusted and dependable connectivity
  - ✓ Link layer security (802.15.4, TinySec, EAP authentication (Linux), Constrained: Zolertia (Contiki, TinyOS), Unconstrained: Beagle-OMBRA)
  - ✓ Network layer security (6LOWPAN adaptation layer to produce compressed IPSec ESP with AES CCM )
  - ✓ Access control in smart grids (DLSM, C++ libraries)

OMBRA board



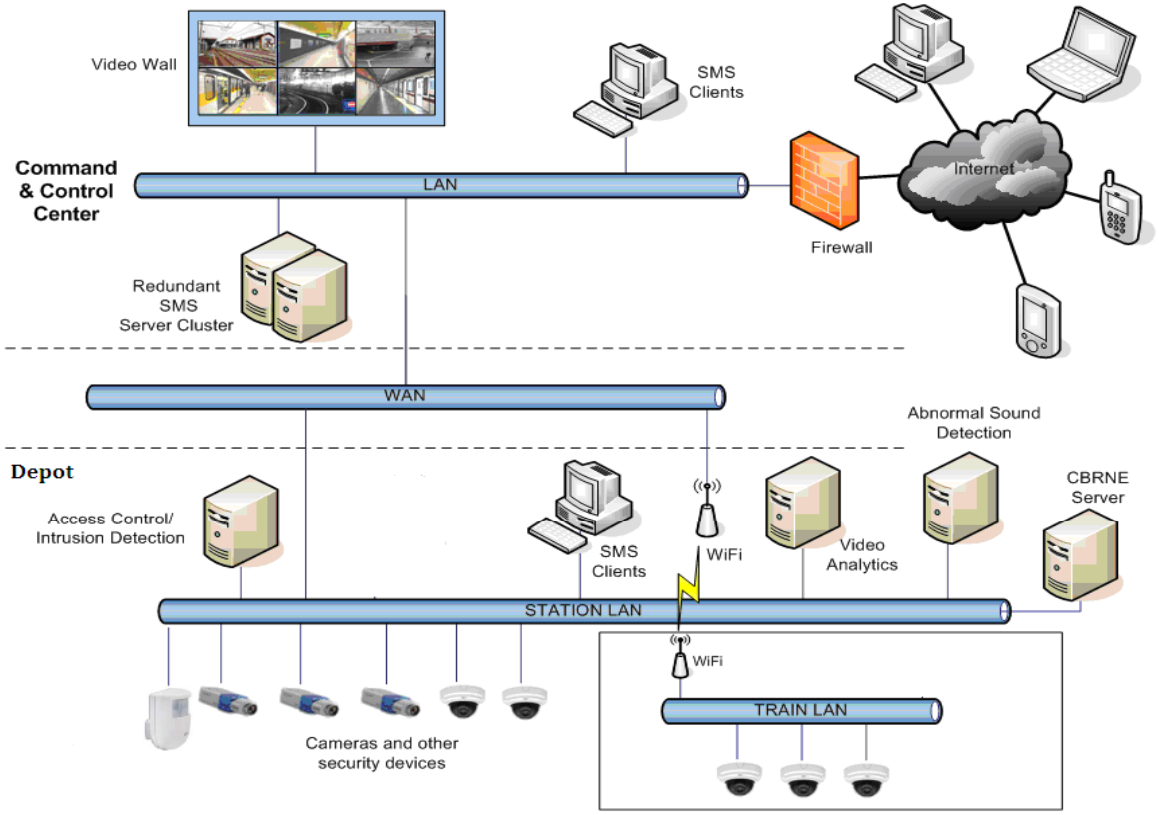
# Components/Middleware (1)

- Policy based management
  - ✓ Modules: PIP, PDP, PAP (Power) and PEP (Micro/Nano), OSGi between Power, DPWS (XACML) between Micro/Nano



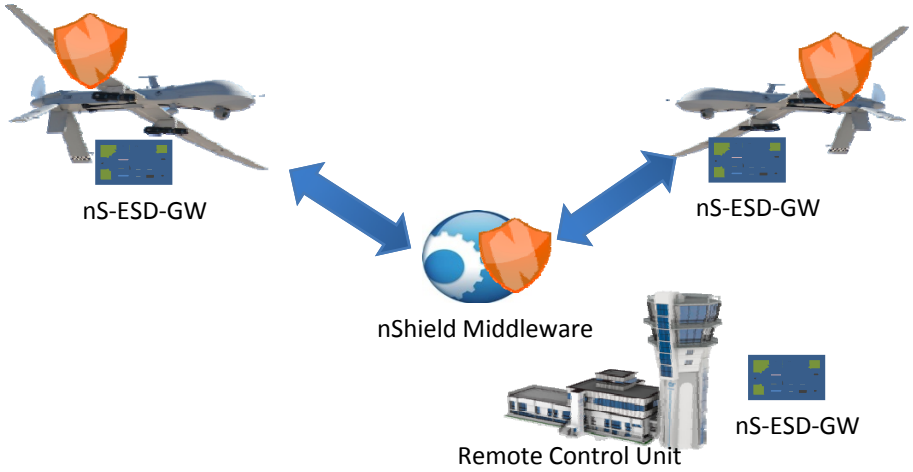
# Application 1 – Railways Security

- Scenarios
  1. Cameras-Server LAN (train station)
  2. Cameras-Control room WAN (shelter)
  3. Vehicle-Control room



# Application 3 – Railways Security

- Scenarios
  1. HW fault recovery (1 UAV)
  2. Error recovery using 2nd UAV



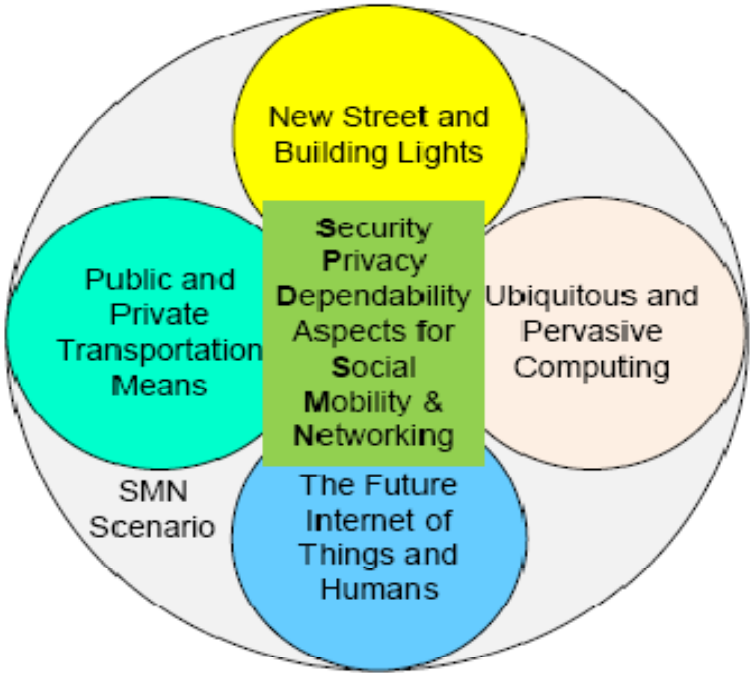

- Components
  - ✓ OMNIA (Middleware), OMBRA (SDR), nS-ESD-GW

# Application 2 – Voice/Facial Recognition

- Demonstration of SPD concept:
  1. Composability
  2. Security level
     - ✓ how:

# Application 4 – Social Mobility Network

- Demonstration of SPD concept:
  1. Composability
  2. Security level
     - ✓ how:



# Components/Nodes/Integration (1)

- Integration exploration starting from Nodes
- Nano
  - ✓ OS: Contiki
  - ✓ Network: 802.15.4/6LoWPAN
  - ✓ Platform: Zolertia Z1, Crossbow IRIS
- Micro
  - ✓ OS: lightweight Linux
  - ✓ Network: 802.15.4/6LoWPAN
  - ✓ Platform: Beaglebone
- Power
  - ✓ OS: lightweight Linux
  - ✓ Network: 802.15.4/6LoWPAN, IPv4/IPv6
  - ✓ Platform: Beagleboard xM, Beagleboard

# Components/Nodes/Integration (2)

- Integration issues/steps (i)

  - ✓ Node definition
  - ✓ OS definition (e.g. some OS include stacks)
  - ✓ Network definition (2 types: GW based, IoT standards for interoperability for different nodes (e.g. Zolertia/IRIS))
  - ✓ Application needs for interoperability must be examined
  - ✓ Network stack (PHY/MAC/NET), should be the same to communicate
  - ✓ Middleware and Overlay (which components, doing what, which MW part is implemented where)
  - ✓ Security

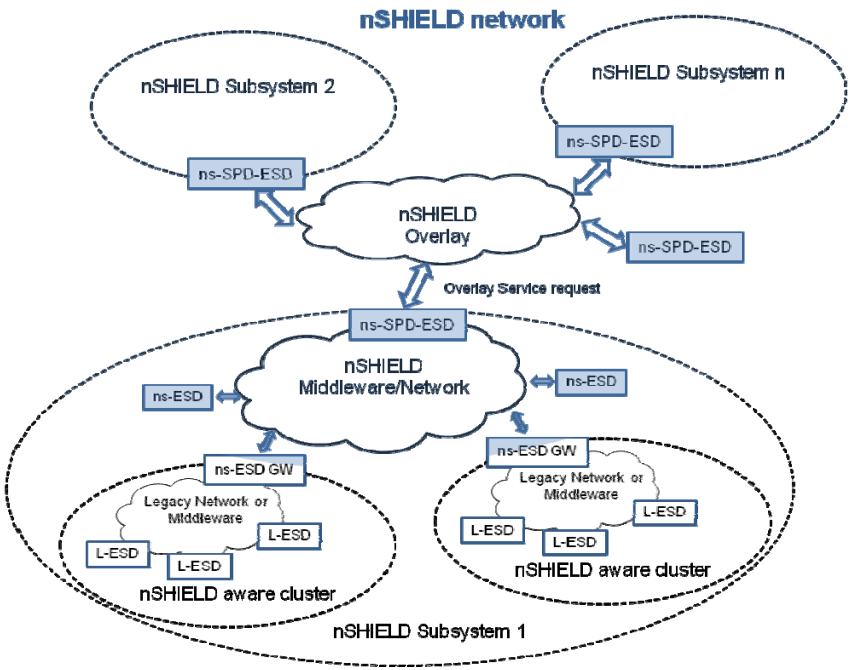
# Components/Nodes/Integration (3)

- Integration issues/steps (ii)

  - ✓ Functionalities/Capabilities (what is supported, resources needed, compatibility between functionalities)
  - ✓ Applied where ? (Applications Vs Functionalities)
  - ✓ First integrations: intra-layer, per application
  - ✓ First interfaces: intra-layer
  - ✓ Prototype implementation status: from simulation to real HW

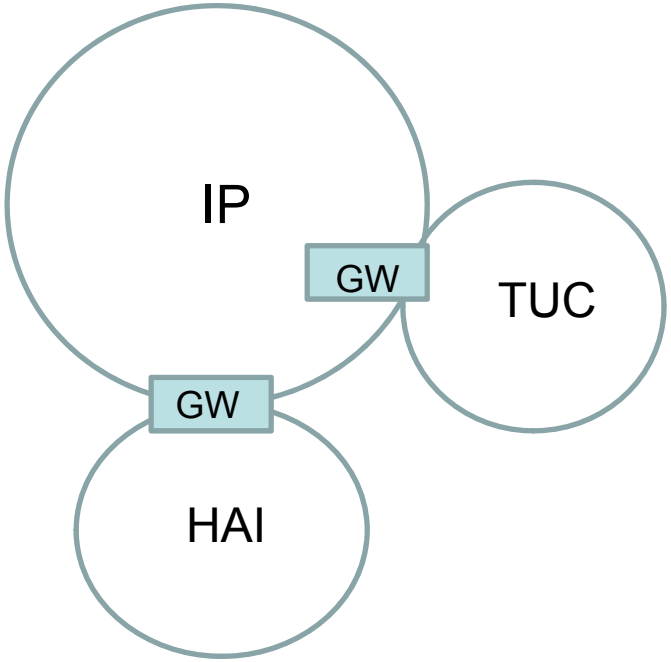
  - ✓ **Are there already synergies recognized?**

# Components/Nodes/Integration (4)

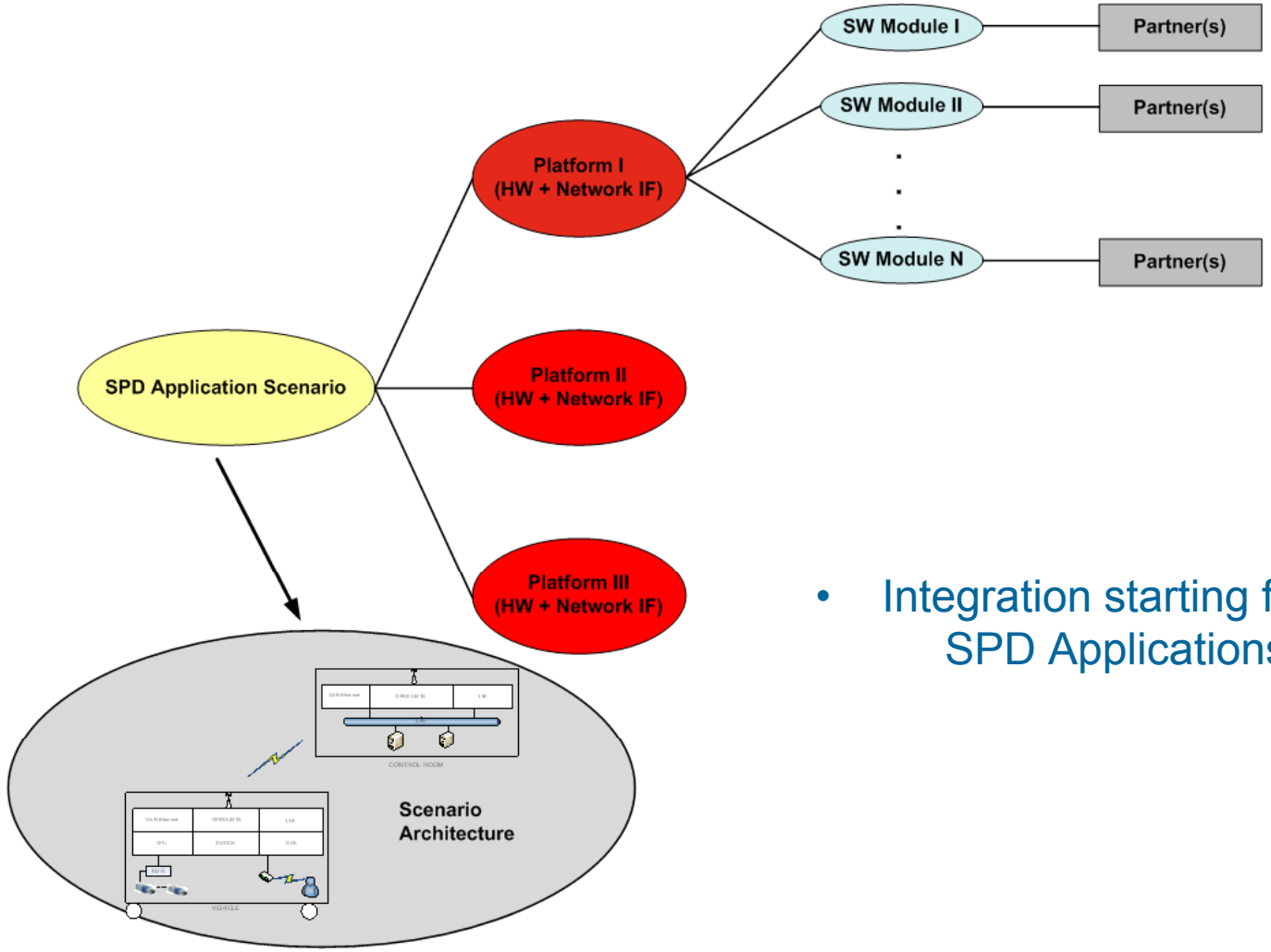



nSHIELD Architecture

Gateway based example



# Components/Nodes/Integration (5)




- Integration starting from SPD Applications

# Components/Nodes/Integration (6)

| Component | Nano | Micro | Power |
|---|---|---|---|
| Hypervisor | NA | N | Y |
| Secure Firmware | Y | NA | Y |
| Smart Power Unit | N | Y | NA |
| SDR | N | NA | Y |
| Trusted Routing | NA | N | Y |
| IDS | …. | …. | …. |
| Policies | …. | …. | …. |
| T7.1 | | | |
| T7.2 | | | |
| T7.3 | | | |
| T7.4 | | | |

- Integration starting from Nodes

*Thank you*