

*ITEA/Artemis Co-Summit 24.-26.Oct2011*

# *Security challenges in the Internet of Things (IoT)*

*represented by:*

Josef Noll

Movation & University of

Oslo/UNIK

[josef@unik.no](mailto:josef@unik.no)

*on behalf of the*

**Artemis p- and  
nSHIELD projects**

pSHIELD (<http://pshield.eu>)

- *Integrated operations*: from oil and gas industry into the business of every sector
- Aspects of Integrated Operations
  - trust-based security
  - content-awareness (and context-awareness)
- Challenges in ICT security for the Internet of Things (IoT)
  - Security, privacy and dependability in sensor systems
  - Heterogeneous infrastructures
  - security metrics
- Example: Artemis pSHIELD project
  - Use case: Railway data through Telenor Objects Shepherd platform

# Focus: Security in Integrated Operations



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## Integrated operations

From Wikipedia, the free encyclopedia

In the **Petroleum industry**, **Integrated operations** (IO) refers to new work processes and ways of doing oil and gas exploration and production,

**Process control systems**

**Sensors**  
Downhole  
& onboard  
facilities



**Web services**  
Open IT standards

**Vendor**



**Operator**



**Vendor**



*40 bill US\$ added economic value (2007-2015)  
Integrated Operations on the NCS - OLF numbers*

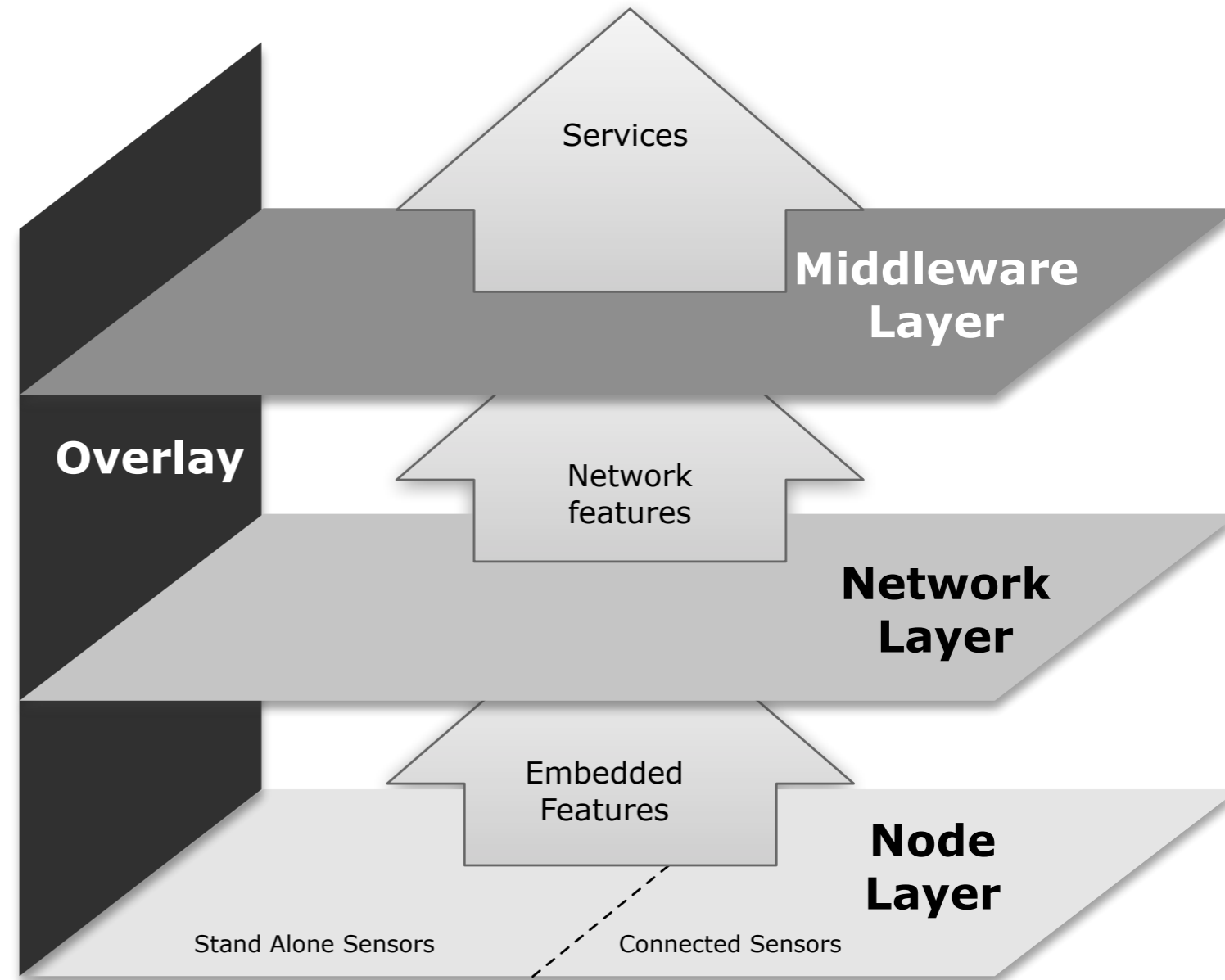
**Real-time integration solution**

**Semantic models**  
Open industry standards

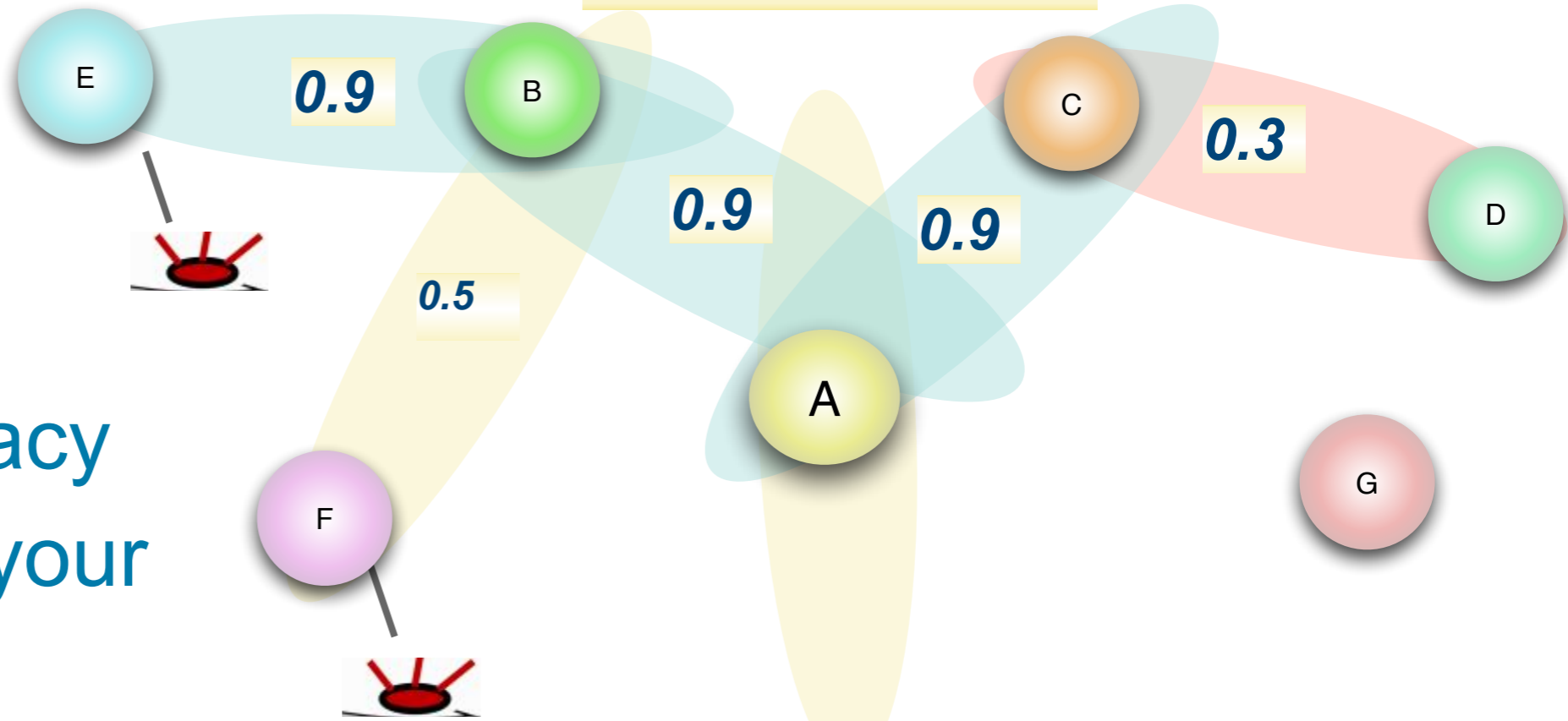
**Broadband communication**  
Fiber optic cables &  
wireless networks

source: Kaare Finbak, IBM

- Security, here
  - security (S)
  - privacy (P)
  - dependability (D)
- across the value chain
  - from sensors to services
- measurable security?
  - metrics for systems
  - metrics for attacks



**Company  
trust network**



**Topic**

**Context**

**Roles**

**Identities**

Thanks to Vladimir Oleshchuk for ideas and discussions

- “With whom to collaborate?”
- Share data?
- Trust-based privacy
- Information and your social life

- *Measurable trust? Transient Trust?*
- *Value chains: from sensors to systems*

## Measurement of Security, Privacy and Dependability (SPD) functions

### **SPD Function:**

a software, hardware or firmware component, that must be relied upon for the correct enforcement of the security, privacy and dependability policy.

### **SPD level:**

*To obtain* → a quantification of SPD function expressing the protection which can provide against Faults

# SPD Metrics specification

2012

Minimum attack potential value to exploit a vulnerability  
= **SPD value**

*Factors to be considered*

Calculated attack potential

- Elapsed Time
- Expertise
- Knowledge of functionality
- Window of opportunity
- Equipment

Attack scenarios



Base of knowledge



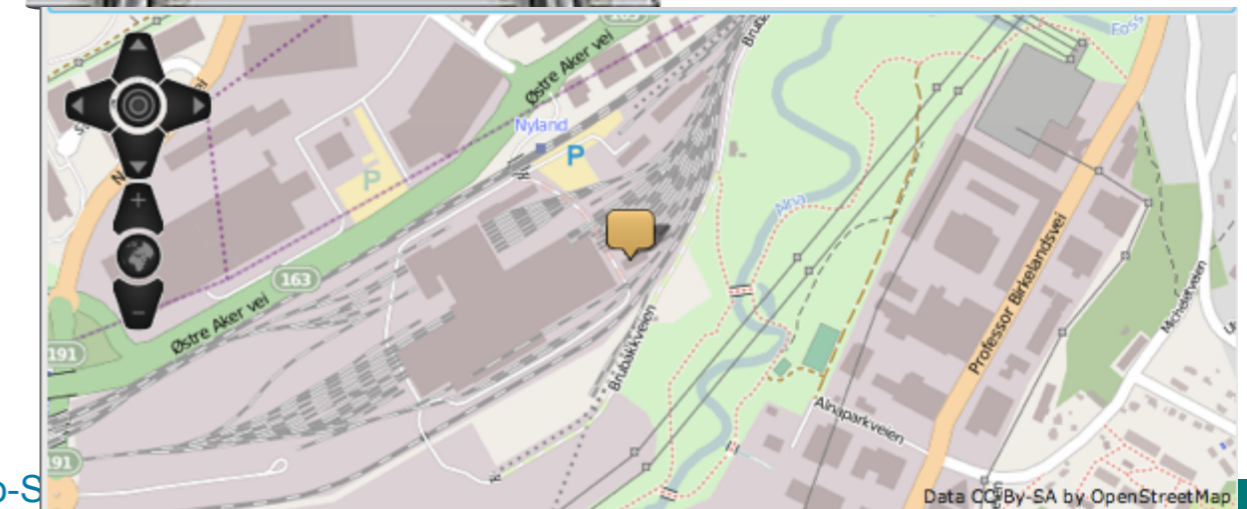
Factor	Value
<b>Elapsed Time</b>	
<= one day	0
<= one week	1
<= one month	4
<= two months	7
<= three months	10
<= four months	13
<= five months	15
<= six months	17
> six months	19
<b>Expertise</b>	
Layman	0
Proficient	3 <sup>*(1)</sup>
Expert	6
Multiple experts	8
<b>Knowledge of functionality</b>	
Public	0
Restricted	3
Sensitive	7
Critical	11
<b>Window of</b>	
Unnecessary / unlimited access	0
Easy	1
Moderate	4
Difficult	10
Unfeasible	25 <sup>** (2)</sup>
<b>Equipment</b>	
Standard	0
Specialised	4 <sup>(3)</sup>
Bespoke	7
Multiple bespoke	9

# Pilot application: SPD in heterogeneous systems



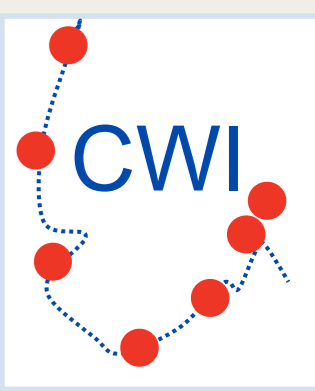
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- Nano-Micro-Personal-M2M Platform
  - identity, cryptography, dependability
- SPD levels through overlay functionality
  - answering threat level
  - composing services
- Policy-based management and hybrid-automata model
- Integration into Telecom Platform





- Security, privacy and dependability (SPD)
  - Sensor systems
  - Heterogeneous infrastructures
- The value of integrated operations
  - oil & gas: Billions of US\$/year
  - for every future business
- Artemis pSHIELD pilot and nSHIELD (*ongoing*)
  - security as “a number”
  - SPD for sensors and attack scenarios
  - heterogeneous infrastructures
- Open Issues
  - trust-based security
  - security metrics



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- and all those I have forgotten to mention

