EDA LAVOSAR Workshop #2

"Industry Workshop" (Brussels, 25th June 2013)

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Land Vehicle with Open System Architecture (LAVOSAR)
- Agenda -

10:30 – 10:45	**Introduction by the EDA**
10:45 – 11:30	**LAVOSAR Study presentation**
11:30 – 12:45	**Requirements, Standardisation and Business Case**
12:45 – 13:30	**Lunch break**
13:30 – 15:30	**Computing and Communication Environment**
15:30 – 16:30	**Functional and Technical Architecture**
16:30 – 17:00	**Concluding Remarks and Way Ahead**

LAVOSAR Project Participants

- **EDA**
  - Marek Kalbarczyk (Project Officer)
- **Fraunhofer FKIE (DE)**
  - Daniel Ota
  - Ralph Erdt
- **Rheinmetall Defence Electronics GmbH (DE)**
  - Norbert Härle
  - Oliver Prenzel
- **Selex ES (UK)**
  - Edouard Mouchel
  - Guy Davies
- **Thales SA (FR)**
  - Benoit Senechal
- **Thales Communications and Security (FR)**
  - Olivier Schmidt
- **Thales Optronics Limited (UK)**
  - David Kempton
- **VRC (UK)**
  - Aditya Deshpande
  - Elias Stipidis
  - George Valsamakis

Visting Participants (status 20 June 2013)

Christopher HUGHES, AnCoast Ltd.
Kristoffer BIEL, BAE Systems Bofors
Ian NICHOLSON, BAE Systems Combat Vehicles
Uwe MUENCH, BAAINBw K1.2
Maximilian Bornefeld-Ettmann, BORNEFELD-ETTMANN CAUSA GmbH & Co. KG
Martin SCHOESSLER, CAUSA GmbH & Co. KG
Andre GOOSEN, Cassidian, EADS Deutschland GmbH
Francois PRENOT-GUINARD, Cassidian
Jürgen DEBUSMANN, Causa Consulting
Olivier VOISIN, DGA
Reinhard SCHMIEDL, Diehl Defence Holding GmbH
Jean Albert EPITALON, French Land Defense Industry Association GICAT
Kees-Jan HERMANS, FOX-IT
Mario CIAVATTA, Iveco
Mauro MARCHISOTTI, Iveco Defence Vehicles
Stefano PIOVAN, Iveco Defence Vehicles
Maximilian SCHOEPPNER, Krauss-Maffei Wegmann GmbH & Co. KG
Helge Eduard WERNER, Matrium GmbH
Florian WALZ, MBDA Germany
Jens KARLSSON, MilDef AB
Marian GILCEAVA, National Company ROMARM
Lorenzo ABAD MENOR, Navantia Sistemas
Jose DOMINGO SALVANY, NEXTER Electronics
Julia LOPEZ DE LA TORRE LUCHA, NTGS
Teemu ALAKOSKI, Patria Land Systems Oy
William CATHERINE, Renault Trucks Defense
Catherine WILLIAM, Renault Trucks
John STRETTON, Ricardo plc
Marco MANSO, RINICOM
Garik MARKARIAN, Rinicom Ltd
Petter GARDIN, Saab AB
Piergiorgio FOTI, Selex ES
Louisa DUBOIS, Steria
Joachim STRAY, Thales Norway
Mariusz WIŚNIEWSKI, WB ELECTRONICS S.A.

Background

- **EDA contracted the study Land Vehicles with Open System Architecture LAVOSAR (EDA Contract 12.R&T.OP.336 with 345K€)**
- **Study execution between 1 Feb. 2013 and 30 Nov. 2013 by**
  - Rheinmetall Defence Electronics GmbH with subcontractors
  - Fraunhofer FKIE,
  - Selex ES,
  - Thales Communications and Security,
  - Thales Optronics Ltd., and
  - Vetronics Research Centre
- **Objective is**
  - to define an electronic and information reference architecture for military land vehicles
  - to be published and proposed as Land Vehicle Open Architecture for Mission Systems
  - architecture
    - shall serve as a reference solution for developing and implementing mission systems for vehicles
    - is for integrating the mission subsystems into a completely networked vehicle capability configurable depending on the vehicle or mission requirement.
- **Study will make recommendations for an EU standard as well as influence the NATO Generic Vehicle Architecture.**

Workshop #2 "Industry Workshop

Objective is involvement of stakeholders

- **Workshop #1 with government officials at the 23 April 2013 (feedback from procurement and maintenance side)**
- **Workshop #2 with Industry (feedback about state of the art and potential future technology)**

APPROACH

- **inform industrial stakeholders about the current status and the current results.**
- **Feedback and refinement to the intermediate project results (WP1)**
  - normative framework,
  - best practices and standards, and the
  - business case and roadmap
- **as well as (WP2)**
  - computing and communication technologies,
  - mission system technologies,
  - current architectural structures,
  - forecasts
- **Feedback about current and potential future architectures (WP3)**

Terminology

Open Reference Architecture

- **Comprehensive best practice architecture with all necessary views from which a target architecture for a specific system can be derived *and which is maintained by an open, public consensus process of an open forum*.**

  There are no barriers to implementation by a third party:

  - **No Secrets:** MUST include all details necessary for implementation.
  - **Availability:** MUST be freely and publicly available (e.g., from a stable web site) under royalty-free terms.
  - **Patents:** All patents essential to implementation MUST:
    - be licensed under royalty-free terms for unrestricted use, or
    - be covered by a promise of non-assertion when practiced
  - **No Agreements:** There MUST NOT be any requirement for execution of a license agreement, NDA, grant, click-through, or any other form of paperwork, to deploy conforming implementations.
  - **No Incompatible Dependencies:** Implementation MUST NOT require any other technology that fails to meet the criteria above.

Terminology

Modular Architecture

- **designed in such a way as to allow the replacement or addition of sub-systems and upgrades as required without any undesirable emerging properties.**

Military Land Vehicle

- **Manned or unmanned mobile machine that performs a mission (surveillance, reconnaisance,, combat, transport, etc.). It is subdivided into**
  - a Vehicle Platform,
  - a Vehicle Mission System,
  - the Mounted User(s), and
  - Stores Item(s)
- **Each vehicle carries only one missions system at a time. The mission system might be changed by replacing, adding, or taking away one or several subsystems which will again build the single mission system.**

Vehicle Platform

- **The platform for the mission system which comprises all primary automotive subsystems and controls (incl. passive protection) and which is approved for driving on public roads**

Vehicle Mission System

- **Vehicle equipment which is not needed for the primary automotive function, but is needed to perform a certain mission such as surveillance, reconnaissance, combat, communication, etc.**

Open System Architecture Principles and Advantages

Open Architecture (OA) is Key to Cost Efficient Vehicle Life Cycle[1]

Characteristics:

- Open, publicly available specifications,
- Well-defined, Widely used Non-proprietary (Standard) Interfaces, Services and Formats
- Durable Component Interfaces (stable or slowly evolving)
- Decoupled Mechanical, Hardware, Software Interfaces

Advantages:

- Reduce Vendor Lock-in
- Larger Market, Enhanced Competition
- Continuous Innovation
- Independent Upgrade of Subsystems with minimal Impact on Overall System
- Decrease Costs for System Engineering, Integration, Verification & Validation
- Reduce Training
- Facilitate Equipment Sharing

[1] Definitions based on: Capt. T.J. Strei, United States Navy, "Open Architecture in Naval Combat System Computing of the 21st Century", 2003

Introduction & Background: DefStan 23-09, Generic Vehicle Architecture

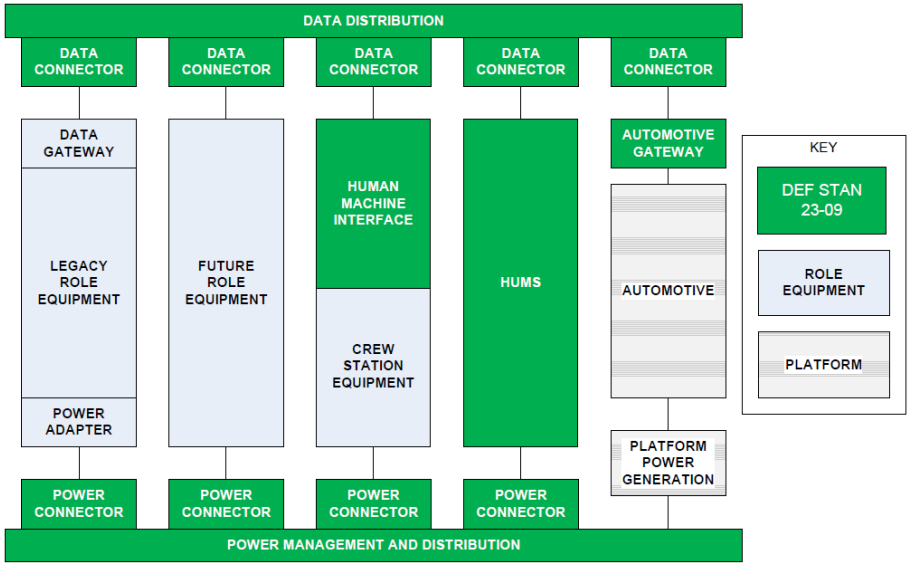
Approach: Interface Standardization & Design Constraints, e.g.

- IP-Networked Vehicle
- Data Distribution Service (DDS) as Data Exchange Mechanism
- Land Data Model
- Electrical Interfaces & Plugs
- Power Supply
- Common Crew Station
- IP-based Video Distribution (DefStan 00-82)

Objective:

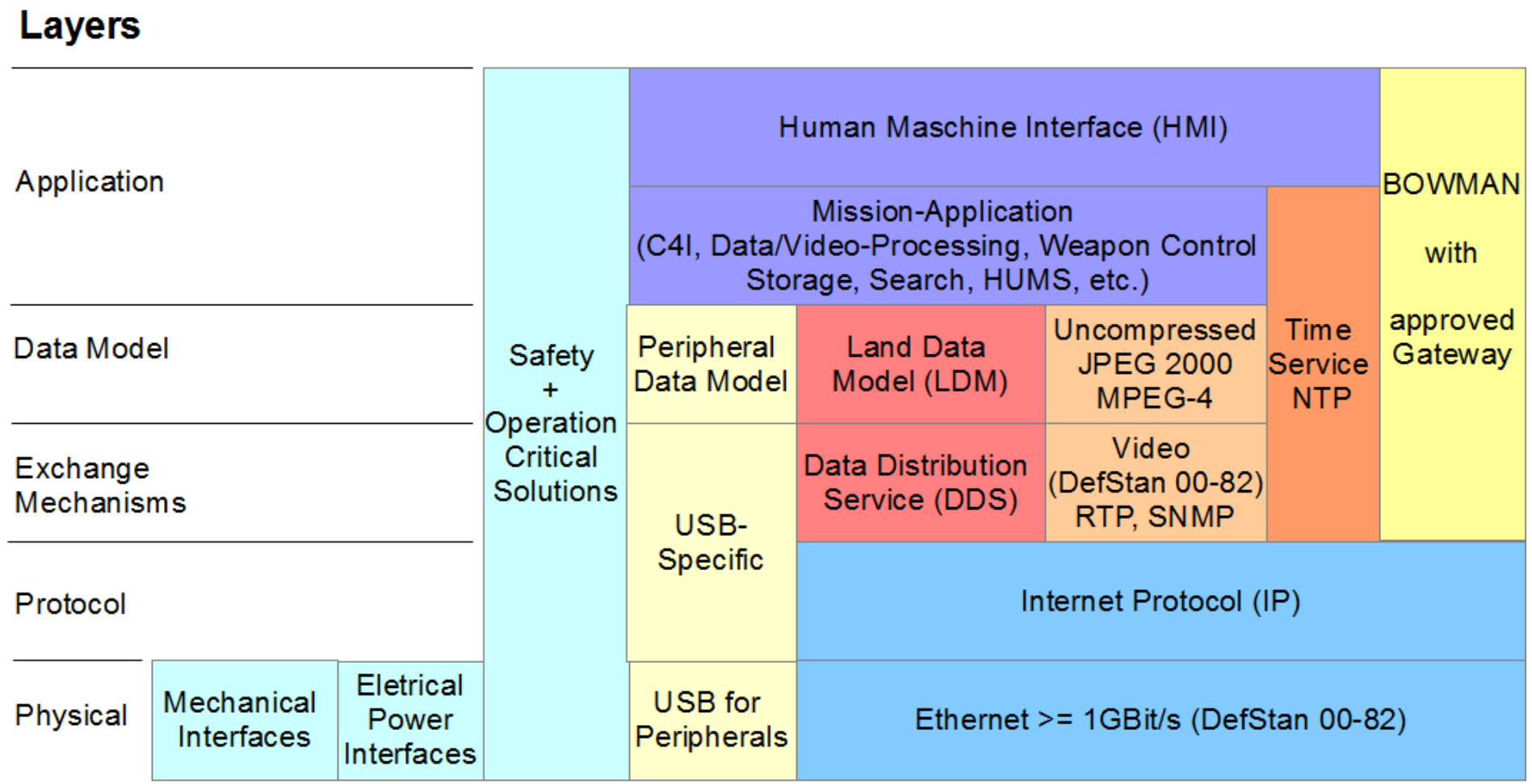
- Improved Operational Effectiveness
- Reduced Integration Risks
- Reduced Cost of Ownership

Interfaces & Boundaries



- Issue 1: 20 August 2010
- Issue 2: October 2011
- Issue 3: to be expected
  - Part 0 – GVA Approach Introduction
  - Part 1 – GVA Infrastructure
  - Part 2 – GVA Human Machine Interfaces (HMI)
  - Part 3 – GVA Health Usage Monitoring System (HUMS)
  - Part 4 – GVA Physical Interfaces

UK Generic Vehicle Architecture (DefStan 23-09)

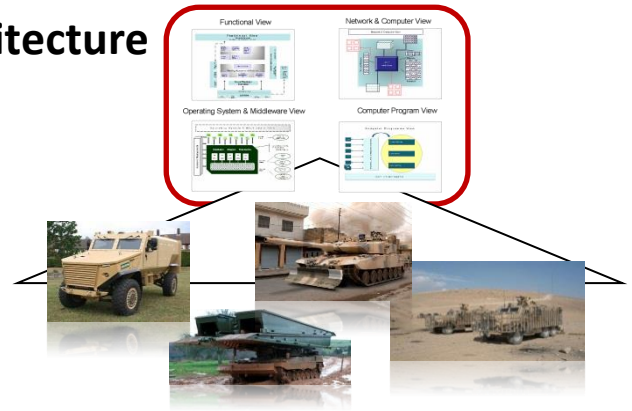


seperate independent implementations for „restricted and below“ and for „confidential and above“

Beyond DefStan 23-09

Not only Interface Standardization & Design Constraints

but: Comprehensive Open Reference Architecture



- Electronic & Information Technological Reference Architecture
- Consideration of Full Life Cycle of Vehicle
- Interoperability (Mechanics, Electronics, Software)
- Plug-and-Play
- Scalability & Extensibility
- Flexible & Modular Building Blocks
- Service Definitions & Orchestration (Common & Mission System Services)
- Standardized Gateways (e.g. to Soldiers, other Vehicles, C4I)
- Security & Safety Considerations

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WP0: Project Management

- Administrative Management
- Technical Management (WPs Coherence)
- Quality Assurance and Configuration Management
- Coordination and Consultation with Relevant Stakeholders

Stakeholder Engagement

- Workshop 1 Procurement / Maintenance
- Workshop 2 Manufacturers, Integrators, Suppliers
- Briefing 1 EDA Industry Conference
- Briefing 2 MSG + MSHT
- Briefing 3 EDA Future Land System Experts Working Group
- Briefing 4 MilVA

Selex ES
A Finmeccanica Company

WP1: Standardization and Business Case

- Review Standards and Best Practices
- Create Normative Framework
- Develop Initial Business Case and Roadmap

THALES

WP2 Analysis of Computing and Communication Environment

- Refine Scope
- Collect Information from Technology Stakeholders
- Define Criteria for Assessment
- Analyse and Review Technologies

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WP3 Functional and Technical Architecture

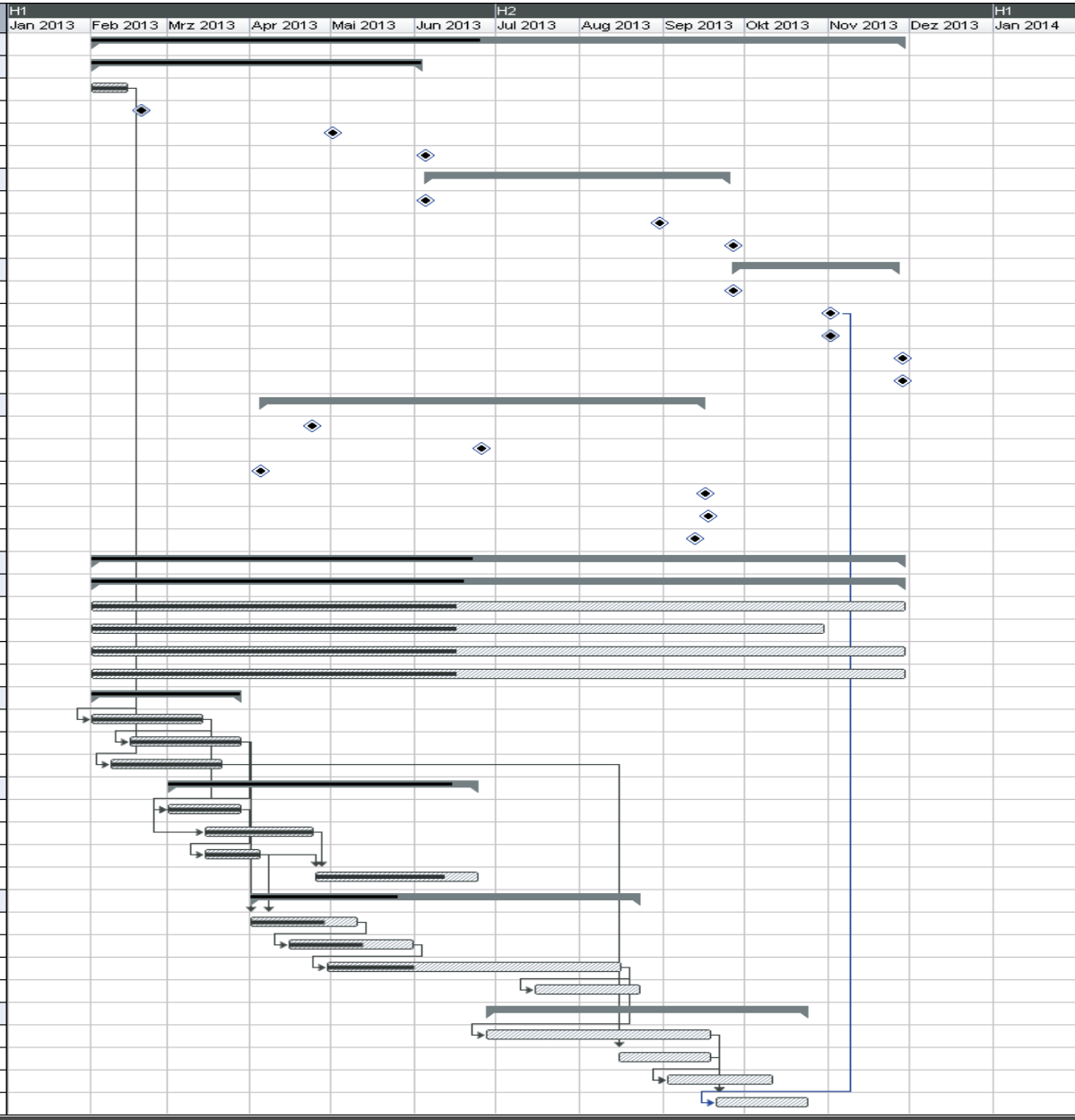
- Identify Domains and Interfaces
- Identify Suitable Architectural Structures
- Develop Architectural Views
- Verify with Normative Framework

THALES

WP4 Specifications, Standards and Design Guidance

- Generate Specifications And Design Guidelines incl. Standards
- Refine Initial Business Case and Roadmap
- Verify with Normative Framework
- Derive Recommendations for a EU wide Framework

	Task Name	Start	End	Completion
	LAVOSAR Project	**01.02.2013**	**29.11.2013**	**48%**
✓	**Phase 1**	**01.02.2013**	**04.06.2013**	**100%**
✓	Kick Off Meeting	01.02.2013	14.02.2013	100%
✓	Inception Report	19.02.2013	19.02.2013	100%
✓	Progress Report 1	01.05.2013	01.05.2013	100%
✓	Progress Meeting 1	04.06.2013	04.06.2013	100%
	Phase 2	**04.06.2013**	**26.09.2013**	**0%**
	Milestone 1	04.06.2013	04.06.2013	0%
	Progress Report 2	30.08.2013	30.08.2013	0%
	Progress Meeting 2	26.09.2013	26.09.2013	0%
	Phase 3	**26.09.2013**	**28.11.2013**	**0%**
	Milestone 2	26.09.2013	26.09.2013	0%
	Final Report	01.11.2013	01.11.2013	0%
	Public Executive S...	01.11.2013	01.11.2013	0%
	Final Meeting	28.11.2013	28.11.2013	0%
	Milestone 3	28.11.2013	28.11.2013	0%
	Stakeholder Engage...	**04.04.2013**	**17.09.2013**	**0%**
✓	Workshop 1: Gover...	23.04.2013	23.04.2013	100%
	Workshop 2: Indus...	25.06.2013	25.06.2013	0%
✓	Briefing at EDA Ind...	04.04.2013	04.04.2013	100%
	Briefing of MILVA	16.09.2013	16.09.2013	0%
	Briefing of EDA Fut...	17.09.2013	17.09.2013	0%
	Briefing of EDA MS...	12.09.2013	12.09.2013	0%
	LAVOSAR Work Pac...	**01.02.2013**	**29.11.2013**	**47%**
	WP0 - Project Ma...	**01.02.2013**	**29.11.2013**	**46%**
	0.1 - Administrat...	01.02.2013	29.11.2013	45%
	0.2 - Technical ...	01.02.2013	30.10.2013	50%
	0.3 - Quality Ass...	01.02.2013	29.11.2013	45%
	0.4 - Coordinati...	01.02.2013	29.11.2013	45%
✓	**WP 1 - Standardiz...**	**01.02.2013**	**28.03.2013**	**100%**
✓	1.1 - Review Sta...	01.02.2013	14.03.2013	100%
✓	1.2 - Create Nor...	15.02.2013	28.03.2013	100%
✓	1.3 - Develop Ini...	08.02.2013	21.03.2013	100%
	WP 2 - Analysis o...	**01.03.2013**	**24.06.2013**	**92%**
✓	2.1 Refine Scope	01.03.2013	28.03.2013	100%
✓	2.2 Collect Infor...	15.03.2013	24.04.2013	100%
✓	2.3 Define Criteri...	15.03.2013	04.04.2013	100%
	2.4 Analyse and ...	25.04.2013	24.06.2013	80%
	WP 3 - Functional ...	**01.04.2013**	**23.08.2013**	**38%**
	3.1 Identify Dom...	01.04.2013	10.05.2013	70%
	3.2 Identify Suita...	15.04.2013	31.05.2013	60%
	3.3 Develop Arch...	29.04.2013	16.08.2013	30%
	3.4 Verify Resulti...	15.07.2013	23.08.2013	0%
	WP 4 - Specificati...	**27.06.2013**	**24.10.2013**	**0%**
	4.1 Generate Sp...	27.06.2013	18.09.2013	0%
	4.2 Refine the Ini...	15.08.2013	18.09.2013	0%
	4.3 Verify Result...	02.09.2013	11.10.2013	0%
	4.4 Recommend...	20.09.2013	24.10.2013	0%



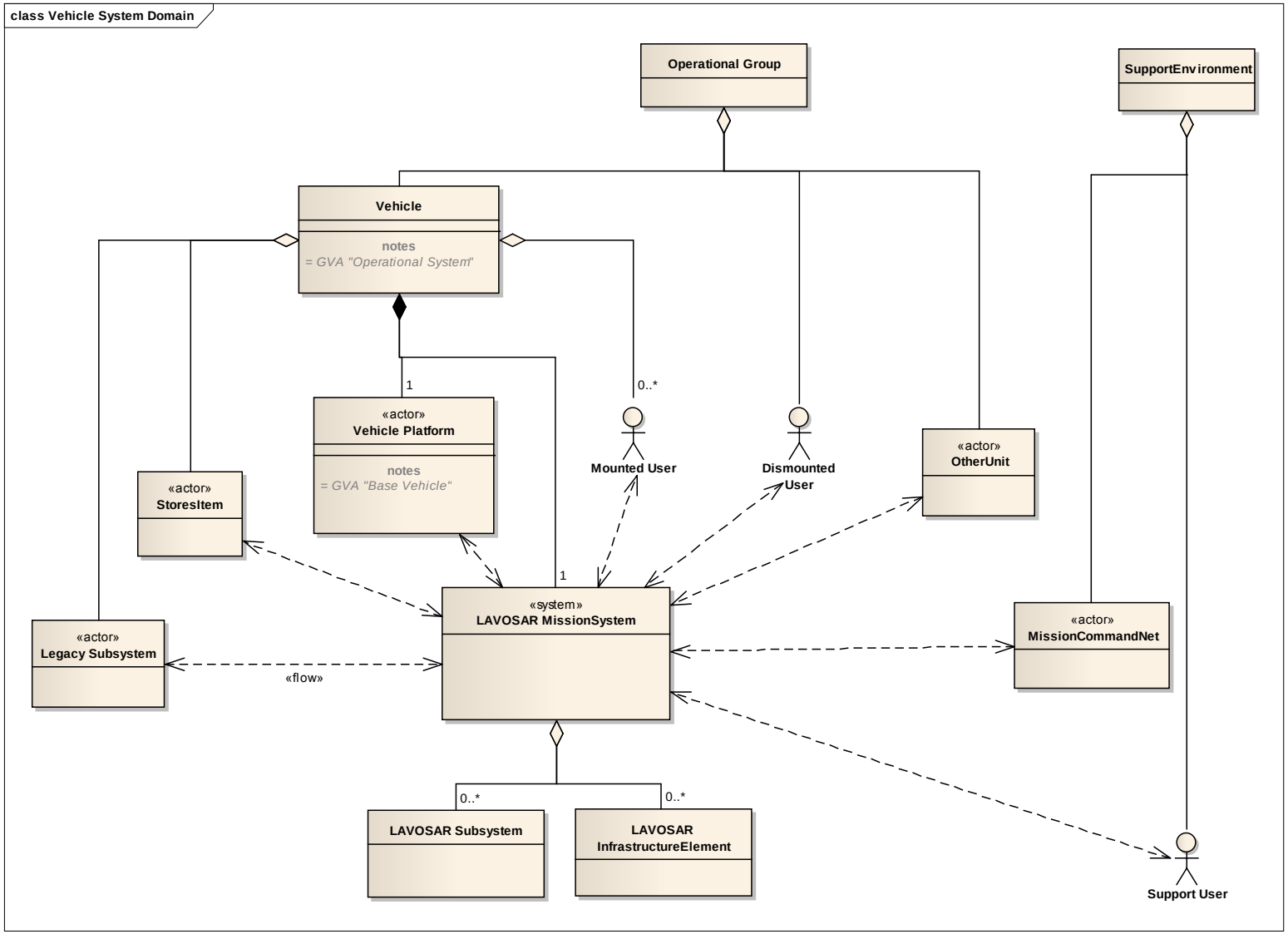
Workshops & Briefings

Deliverable	Date / Place	Description
Workshop 1 ✓	23-04-2013 EDA	Workshop with • government officials from the procurement and maintenance departments of the Ministries of Defence of all EDA participating Member States. Aim: • Information about project and first outcomes • Refinement of initial Work Package 1 results (Normative Framework, Best Practices and Standards, Business Case and Roadmap) • Collection requirements and ideas
Workshop 2	25-06-2013 EDA	Workshop with • platform manufacturers • system integrators • equipment suppliers Aim: • Information about project and outcomes to date • Refinement of Work Package 1 results (normative framework, best practices and standards, business case and roadmap) • Refinement of Work Package 2 results (computing and communication technologies, mission system technologies, current architectural structures, forecasts) • Input to Work Package 3 (current and potential future architectural structures)
Briefing 1 ✓	04-04-2013 EDA	Briefing to • EDA Industry Standardization Conference
Briefing 2	16/20-09-2013 Munich	Briefing to • Military Vetronics Association (MilVA)
Briefing 3	25-09-2013	Briefing to • EDA Future Land System Experts Working Group
Briefing 4	26-09-2013 EDA	Briefing to • EDA Materiel Standardization Group (MSG) and Materiel Standardization Harmonization Team (MSHT)

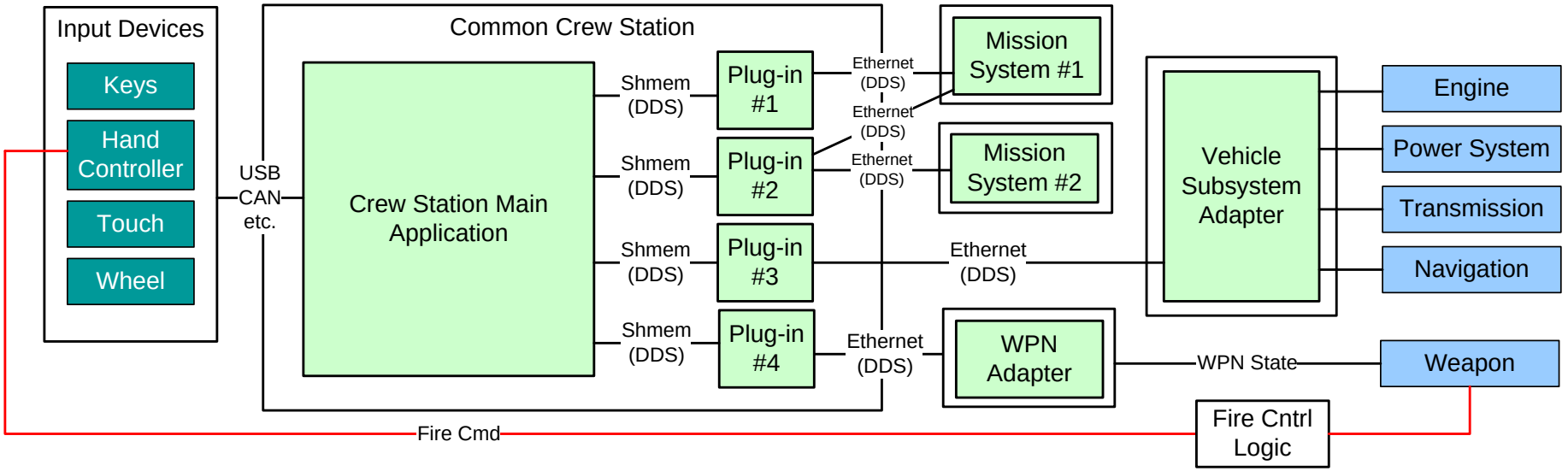
Current Status

- **Questionaires produced for**
  - Goverment Experts
    - procurement, concepts for support and training,required mission system features or mission subsystems, information and power exchange requirements
    - Main Battle Tank (MBT), Infantry Fighting Vehicle (IFV), Recce, All Purpose Carrier (APC) & Truck
  - Industry - Standards and Best Practices
    - crew stations, embedded systems, built-in-tests and health and usage monitoring systems, vetronics, network infrastructures, power infrastructures, mechanical infrastructures, safety, security, EMC and support infrastructures
  - Industry - Technologies
    - computing, operating system, middleware, network infrastructure, communications, security, safety

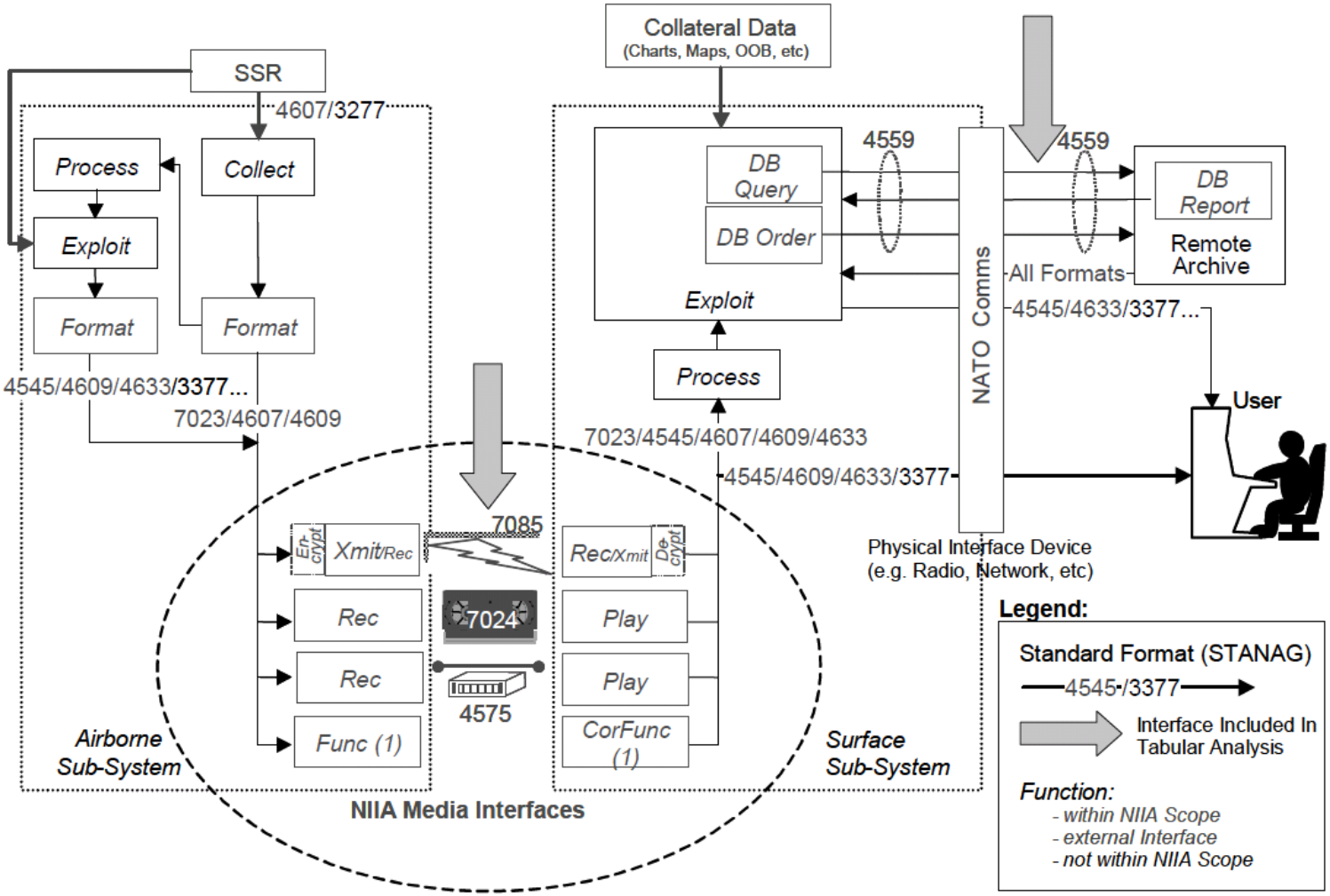
Architectural View Example
- Normative Framework - Terminology - Vehicle & Mission System



Architectural View Example
- Common Crew Station: Plug-ins



Architectural View Example
NATO ISR Interoperability Arch. NIIA - Interfaces and Standards



Architectural View Example
NATO ISR Inter. Arch. NIIA - Layer Model Mapping of ISR Standards

ISO Layer	Data Link				Wideband Tape	Advanced Data Storage	CD-ROM Transfers	Image Library
	Direct Connection		Network Connection					
7. Application Layer	Note: The NIIA assumes that applications are available that provide application layer interoperability for most interfaces.							4559
6. Presentation Layer	4545/ 4607/ 4633 [*1]	7023	4545/ 4607/ 4633	7023	4545/4607/ 4633/7023	4545/4607/ 4633/7023	4545/4607/ 4633/7023	4545 (4607/ 7023)
5. Session Layer	Not Rqd.	Not Rqd.	Netwrk Proto. [TBD]	Netwrk Proto. [TBD]	Not Required	4575	Not Required	4559
4. Transport Layer								
3. Network Layer								Defined By Communications Network(s) Being Used
2. Data Link Layer	7085	7085	7085	7085			ISO 9660	
1. Physical Layer					7024 [*2]			
Notes:		Protocol not explicitly defined in current NIIA.					Protocol not required for this configuration.	
	*1: STANAGs 4545 and 4607 include most aspects of Presentation Layer. *2: Wideband tape applications do not require management layers – only physical layers.							

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