EDA INDUSTRIAL WORKSHOP ON EUROPEAN REQUIREMENTS FOR MISSION SYSTEMS OF LAND VEHICLES

WP 1 - Architectural Domain Analysis and Requirements

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WP 1  Architectural Domain Analysis and Requirements  
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- **1.1: Analysis of Relevant Programs and Activities**
  - analysis of background material
  - ongoing work and new findings since LAVOSAR I
  - identify useful results

- **1.2: Characterization of Required Architectural Domain**
  - define LAVOSAR architectural domain based on results from WP1.1
  - context and dependencies of international and national standardisation initiatives (also EDA EG20 “System Architecture”)
  - specific European requirements

- **1.3: Definition of Any Needed Additional Architectural Layers**
  - Define need for additional architectural LAVOSAR layers (as recommended in LAVOSAR I)

- **1.4: Evaluation of Benefits to be Gained**
  - Potential benefits when applying LAVOSAR to the defined architectural domain
  - Take into account specific European requirements
  - Refine outcome of LAVOSAR I with findings

- **1.5: Estimation of Cost of Implementing**
  - financial and qualitative impacts of implementing the Open Reference Architecture

- **WP Output**
  - Presentation for WS1 and WS2
  - WP1 Report
T1.1 - Analysis of Relevant Programs and Activities

- **EG20 System Architecture**
  - Recommends a set of best practice standards in the domain of “System Architecture” to be added to the European Defence Standards Reference System (EDSTAR). 24 standards and frameworks recommended out of 60 in the final report.

- **LAVOSAR I**
  - Conceptual Level Open System Architecture for Mission Systems of Land Vehicles to be applied to "Generic Vehicle Architectures", e.g. NGVA, UK GVA.

- **LAVOSAR II**
  - Extension of LAVOSAR I to become more specific in areas not covered by NGVA, especially Maintenance and Logistics. More requirements in all covered aspects.

- **NGVA (STANAG 4754)**
  - NATO Architecture for Military Land Vehicles with Interface Definitions for Data and Power Infrastructure, with Crew Terminal Software Architecture, with Safety, with Verification and Validation.

- **UK GVA (Def Stan 23-09)**
  - UK Architecture for Military Land Vehicles with Interface Definitions for Data / Power Infrastructure and HMI.

- **NAF**
  - The NATO Architecture Framework is an Enterprise Architecture framework by the NATO derived from DoDAF and MoDAF. It holds seven main views.
• TOGAF®
  – TOGAF®, The Open Group Architecture Framework, is a proven enterprise architecture methodology and framework used by the world's leading organizations to improve business efficiency. TOGAF is a framework for developing an enterprise architecture. TOGAF is developed and maintained by the Open Group and the current version is 9.1.

• FACE™ - Future Airborne Capability Environment
  – The FACE Technical Standard defines software computing environment architectures and interfaces intended for the development of applications made up of portable components targeted for general-purpose, safety, and/or security purposes.

• PMG recommendations on EU Rapid Response Capabilities and EU Battlegroups
  – On the 6th November 2013 the EU Politico-Military Group (PMG) delivered recommendations on EU Rapid Response Capabilities and EU Battlegroups to the Political and Security Committee. The PMG underlines the need for improvements in EU Rapid Response and the EU Battlegroups. Concerning modularity EU BG should be “capable of meeting all the standards and criteria of the EU BG Concept. It underlines that the further work on modularity should also take into account the possible effects on areas such as military effectiveness, interoperability and command & control.”
TOGAF® - The Open Group Architecture Framework

- TOGAF has a process, called the Architecture Development Method (ADM), which is a step-by-step approach to develop an enterprise architecture. The TOGAF ADM describes a method for developing and managing the lifecycle of an enterprise architecture, and forms the core of TOGAF. It integrates elements of TOGAF as well as other available architectural assets, to meet the business and IT needs of an organization.
FACE™ - Future Airborne Capability Environment

The FACE Reference Architecture is comprised of a set of segments. The five (5) segments of the FACE Reference Architecture are:

- Operating System Segment (OSS)
- I/O Services Segment (IOSS)
- Platform-Specific Services Segment (PSSS)
- Transport Services Segment (TSS)
- Portable Components Segment (PCS)

The FACE Software Architecture purpose is to provide the basis for reducing development and integration costs, as well as time to field.
EU Military Rapid Response Concept

From: European External Action Service
To: European Union Military Committee
Subject: EU Military Rapid Response Concept

Brussels, 17 December 2014
17036/14
CSDP/PSDC 745

This figure is extracted from the reply “EU Military Rapid Response Concept” on “PMG recommendations on EU Rapid Response Capabilities and EU Battlegroups” delivered Nov. 2013 (on page 5)

This is how EU Military Rapid Response forces capabilities should be layered. It is very dependant on a modularised building concept which would be very string driver for the LAVOSAR concept.

Figure 5 – Example of modular EU RR force composition based in an EU BG operation
Software Layers
(LoCE - Land Capability Environment)

The first standard could be basic Transport Services including standardised interface (API) for the Portable Applications & Services and for the Platform Specific Services.

Portable Applications are the specific customer applications, which may be developed by different vendors.

This middleware holds all communication services, all application-internal as well as the inter-application communication. These transport services will be based on the NGVA/GVA Data Model.

The Platform Specific Services provides a standard API and message set to facilitate the use of the available platform I/O Services. The standard API will be based on the Data Model for Transport Services.
T1.2 - Characterization of Required Architectural Domain

Covered Aspects:
- Procurement
- Operational Issues
- System Architecture
- Power/Data Infrastructure
- Safety
- System Acceptance VV&A
- Business Model
- Software Architecture
- Development
- Security Technologies
- Maintenance
- Logistics
- Through Life Support
T1.2 - Characterization of Required Architectural Domain

- **EG20 System Architecture**
- **LAVOSAR I**
- **NAV v3**
- **UK GVA (DefStan 23-09)**
- **NGVA (STANAG 4754)**

**Type**
- Ongoing Study
- Future Standard
- Study

**Maturity**
- Low Maturity
- High Maturity

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What are the key requirements today and tomorrow when a Land Vehicle, including a Mission System, is to be bought? (e.g. lead-time, initial cost, LCC, training modularity/flexibility, system safety, IT security)

*) Some parts, covered by LAVOSAR, might not be implemented in the final product and is therefore not part of the Vehicle Mission System of the product.
LAVOSAR will be described by Guidelines and method descriptions and the design uses the Data Model from NGVA/UK GVA.

Supply Chain: The products (spares, subsystem components etc.) and user services will be placed in “Fleet Assets Pool” (which also could be a Pooling & Sharing function). The software applications will be found in the “Appstore”. All kind of LAVOSAR Mission System related productions are symbolised with the truck.

Software development is done via “Cloud Computing” (Share Point as we do today could be a start).
LAVOSAR Subsystem Interfaces promote capability growth

What shall the LAVOSAR Domain **cover** or specify further?

What shall the LAVOSAR Domain **not cover** or not specify further?
Land Vehicle Stakeholders View

Who is the **Customer** for a vehicle with a LAVOSAR Mission System? Always a national purchasing organisation or might it be an EDA/EU organisation, e.g. OCCAR?

Further reading:
- PMG RECOMMENDATIONS ON EU RAPID RESPONSE CAPABILITIES AND EU BATTLEGROUPS, 6 Nov. 2013,
- EU MILITARY RAPID RESPONSE CONCEPT, 17 Dec. 2014.
T1.4 Evaluation of Benefits to be Gained

Common Stakeholders View

- Supplier
- Customer
- User
- Regulations
- Standards

Common View

- EU/EDA
- Nations
- Defence
- Forces and EU
- Collective
- Military Land
- Assets (EU
  RRC & EU
  BG*)

- Engineering
- Armoured
- Vehicles
- Aircraft
- Medium
- Transport
- Unprotected Vehicles

*) EU RRC = EU Rapid Response Capabilities
EU BG = EU Battlegroups

Further reading: PMG RECOMMENDATIONS ON EU RAPID RESPONSE CAPABILITIES AND EU BATTLEGROUNDS, 6 Nov. 2013.
The diagram is supposed to show how the benefits are evolving over time.

- **It starts with what we have, the existing system – the legacies. Some of the infrastructure and some sub-systems may be exchanged with LAVOSAR/NGVA compliant parts.**
- **Next step is to produce complete LAVOSAR Mission Systems and deliver services and not just functional hardware.**
- **The third step is to work fully model driven and offer interchangeable capabilities.**

**Legacy Assets**
- Communication Standard Integration
- Partial modular systems
- Physical sub-systems integration

**Modular Assets**
- Service Oriented Integration
- Modular systems
- Physical and logical sub-systems integration

**Capability Assets**
- Service and Capability Oriented Integration
- Modular systems
- Model Driven integration