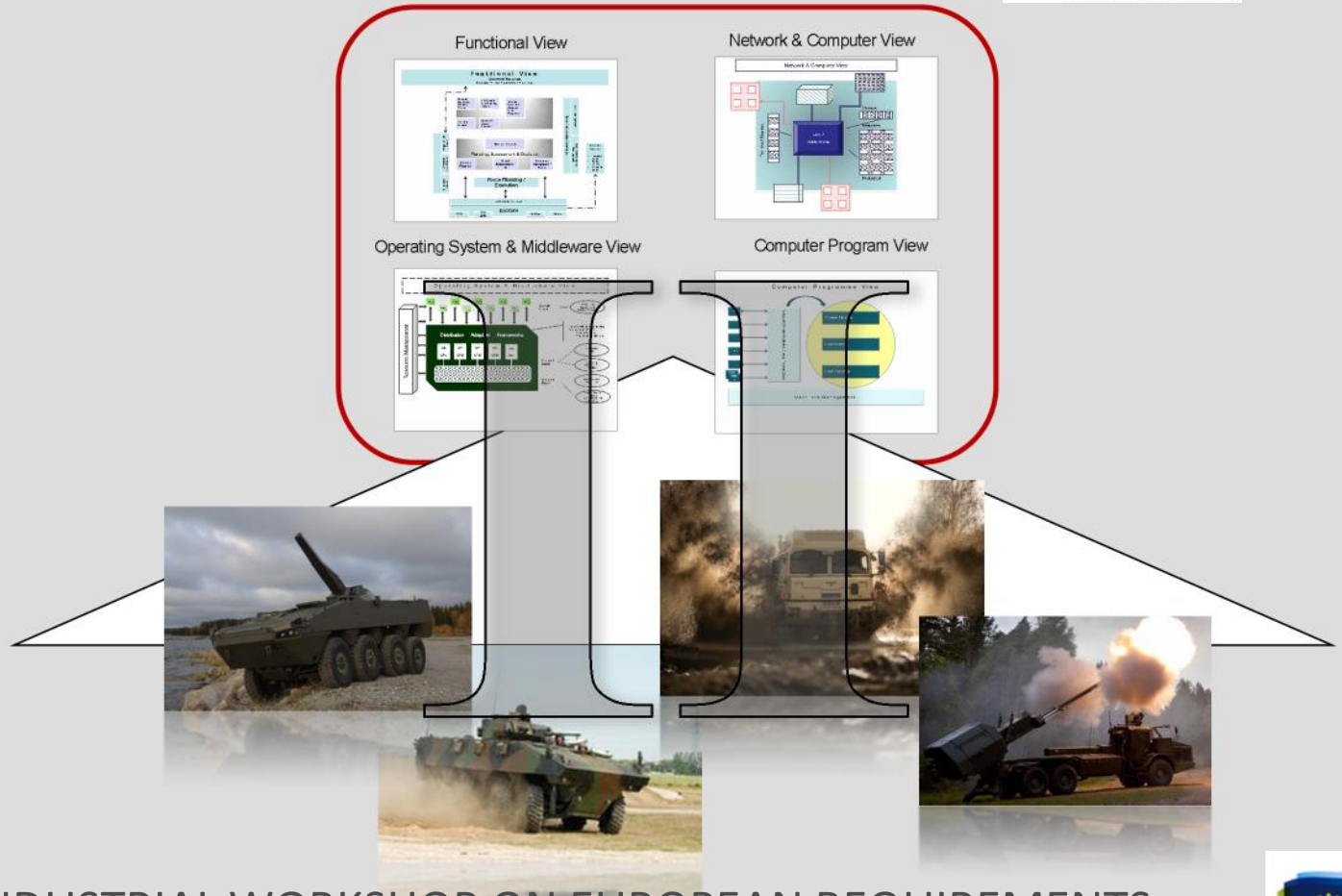
BAE SYSTEMS nexter RHEINMETALL DEFENCE VRC Vetronics Research Centre

Fraunhofer FKIE Patria Selex ES A Finmeccanica Company



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

WP 1 - Architectural Domain Analysis and Requirements

Kristoffer Biel, BAE Systems Bofors (Dr. Norbert Härle)

July 2015

EUROPEAN DEFENCE AGENCY

RHEINMETALL DEFENCE

WP0: Project Management

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

Stakeholder Engagement

- Workshop 1 Government Officials EU Standardization
- Workshop 2 Manufacturers, Integrators, Suppliers
- Briefing 1
- Briefing 2
- Briefing 3
- Briefing 4

BAE SYSTEMS

WP1: Architectural Domain Analysis and Requirements

- Analysis of Relevant Programs and Activities
- Characterization of Required Architectural Domain
- Definition of Any Needed Additional Architectural Layers
- Evaluation of Benefits to be Gained
- Estimation of Cost of Implementing

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WP2 Open Reference Architecture Standards Update

- Investigation and Update On Specific European Requirements
- Proposal for ORA Standards Update

nexter

WP3 Worksflow and Procedure Update

- Update of Operational Workflows
- Update of Logistics Procedures

Patria

WP4 Through Life Capability

- Harmonized Data Exchange Procedures
- Development of Roadmap

VRC
Vetronics Research Centre

WP5 Alignment with NGVA

- Concepts for LAVOSAR Contrib. to Future Developm. of NGVA
- Identification of Potential Contributions
- Development of Roadmap

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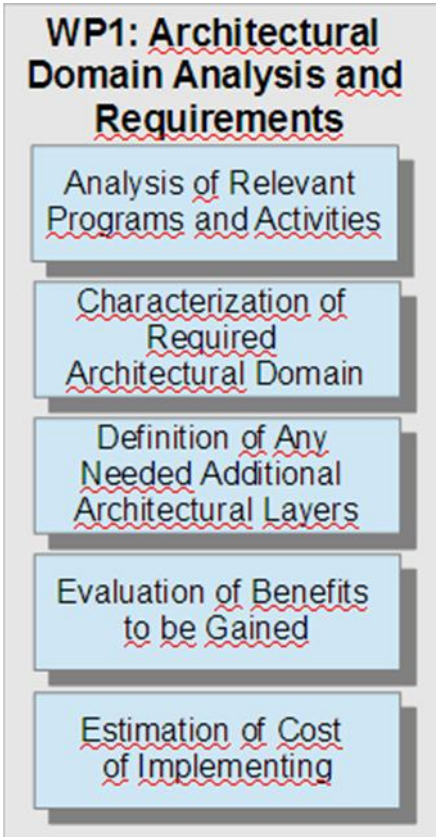
WP6 Architecture Contributions to EDA Repository

- Gathering EDA requirements for formal Architecture
- Modelling of required Architecture Views
- Generating Model Documentation
- Transferring Architectural Views to EDA

WP 1 Architectural Domain Analysis and Requirements - Lead: BAE SYSTEMS

- **1.1: Analysis of Relevant Programs and Activities**
  - analysis of background material
  - ongoing work and new findings since LAVOSAR I
  - identify usefull results
- **1.2: Characterization of Required Architectural Domain**
  - define LAVOSAR architectural domain based on results from WP1.1
  - context and depedencies 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.

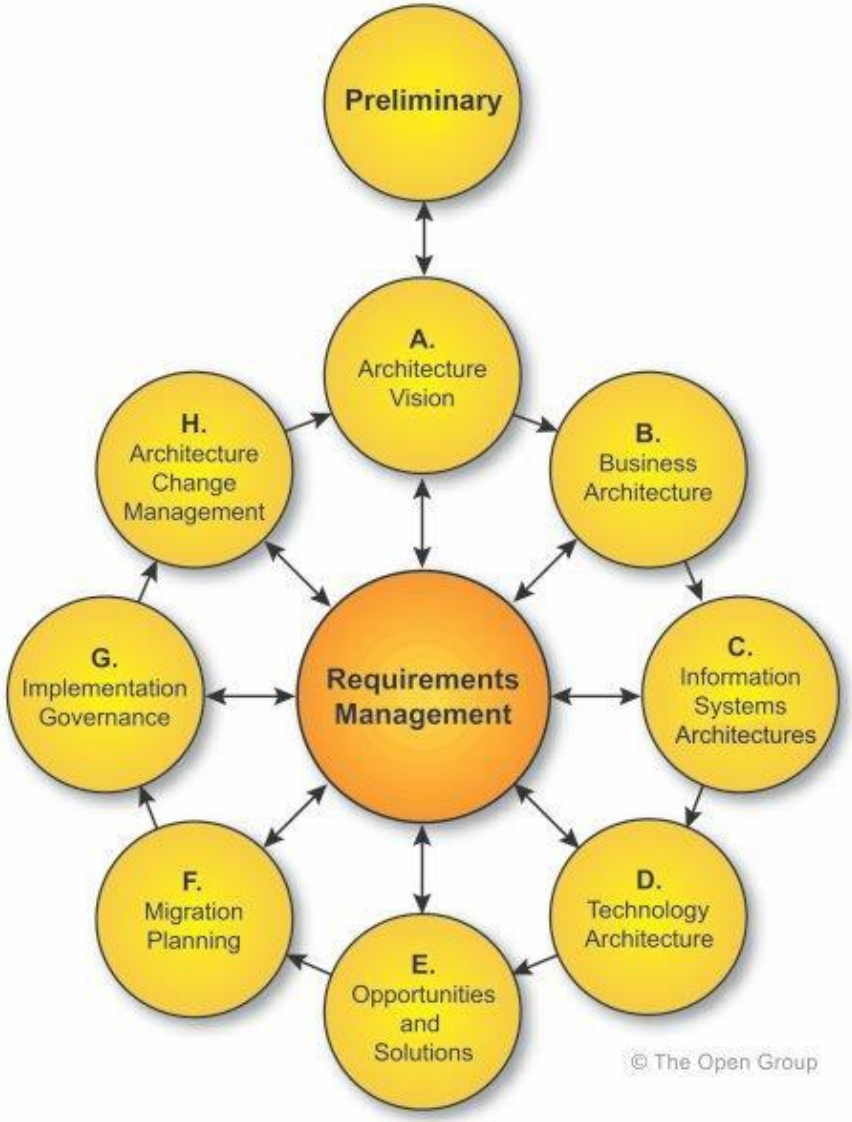
T1.1 - Analysis of Relevant Programs and Activities

- 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.
  - The FACE Consortium provides the Technical Standard as well as an accompanying Reference Implementation Guide, Business Guide, Procurement Guide, Conformance Policy, and Library Policies and Procedures. The Conformance Verification Matrix contains the Product Standard that identifies what is verified for conformance certification.
- 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**."

T1.1 - Analysis of Relevant Programs and Activities

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.



T1.1 - Analysis of Relevant Programs and Activities

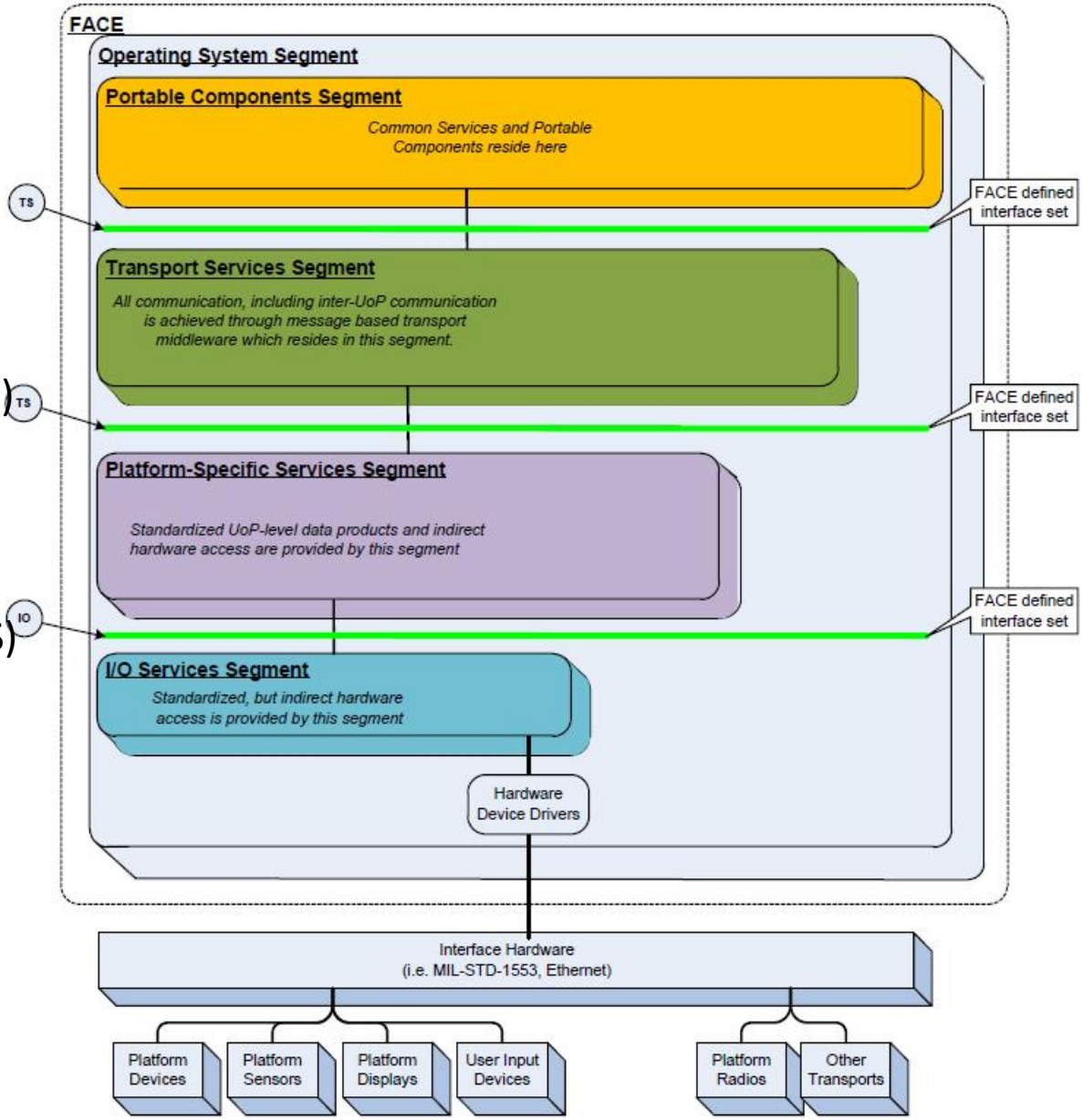
FACE™ - Future Airborne Capability Environment

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.



T1.1 - Analysis of Relevant Programs and Activities

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.

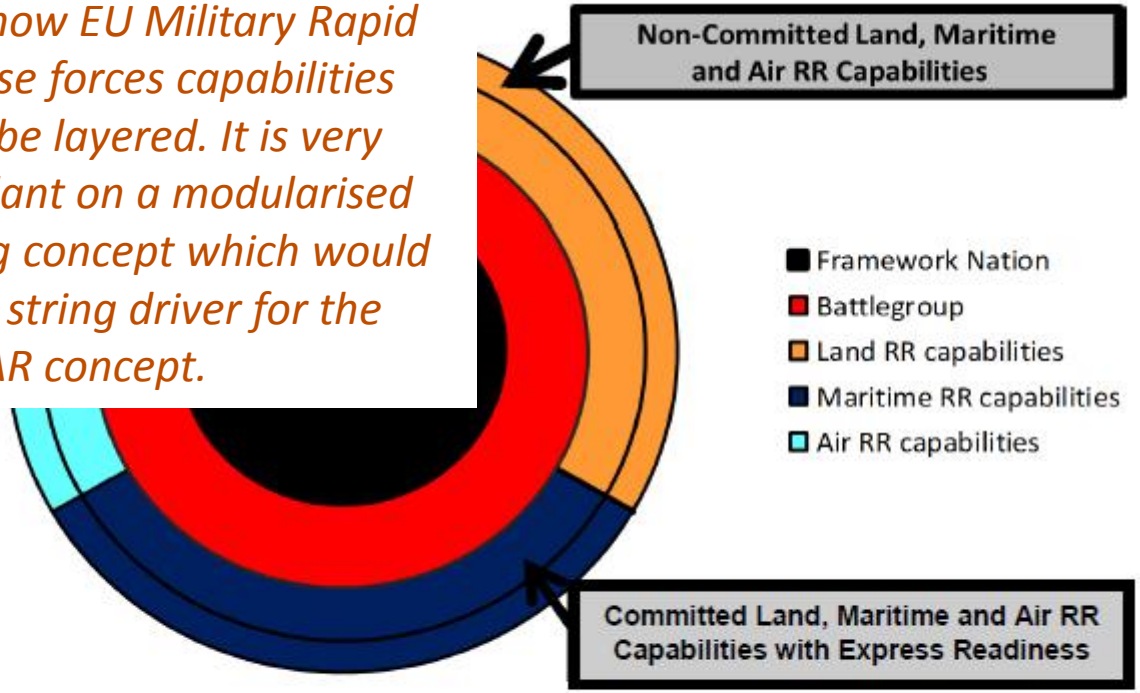


Figure 5 – Example of modular EU RR force composition based in an EU BG operation

T1.2 - Characterization of Required Architectural Domain

Software Layers

(LaCE - 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 & Services

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

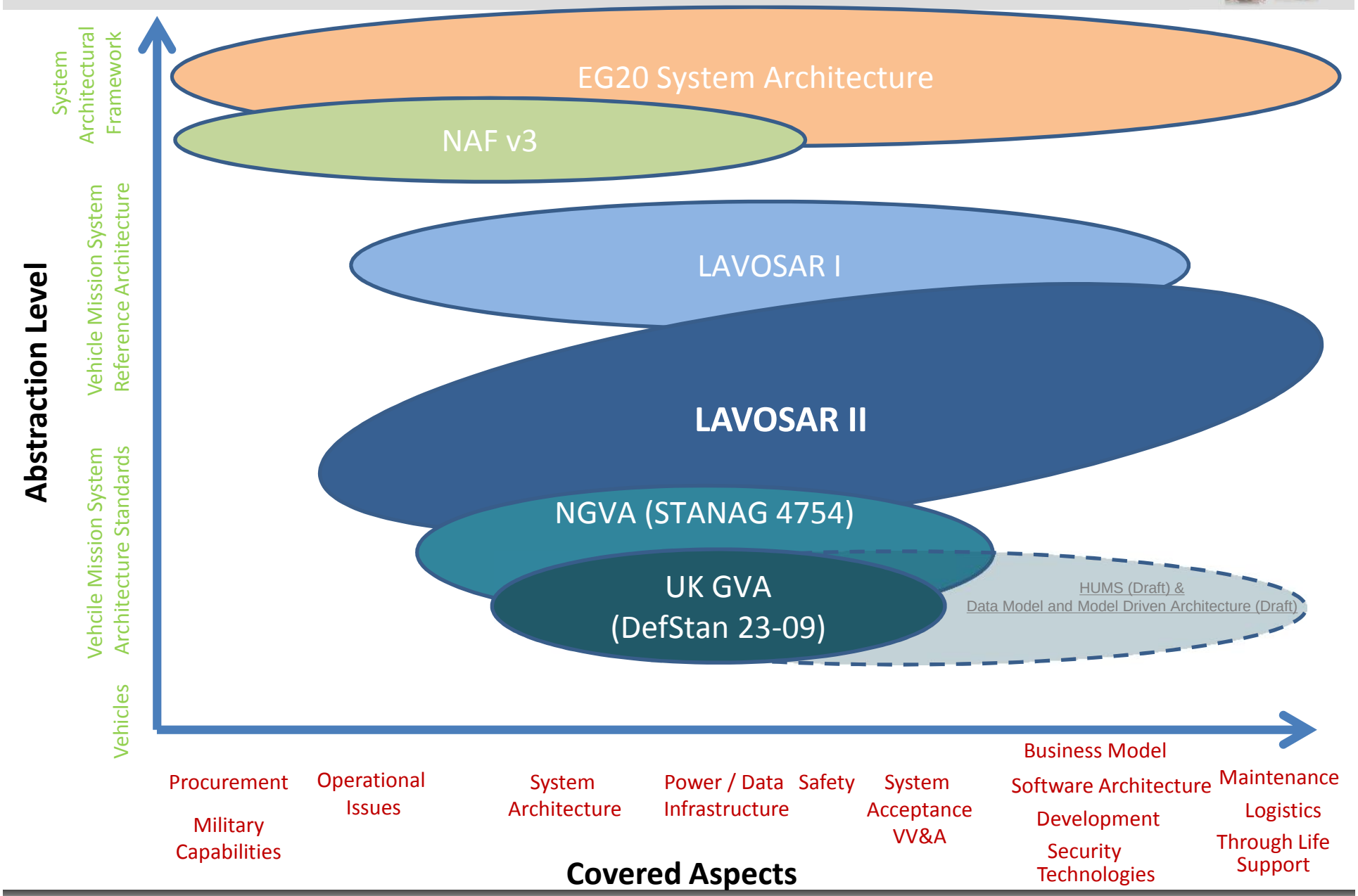
Transport Services

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

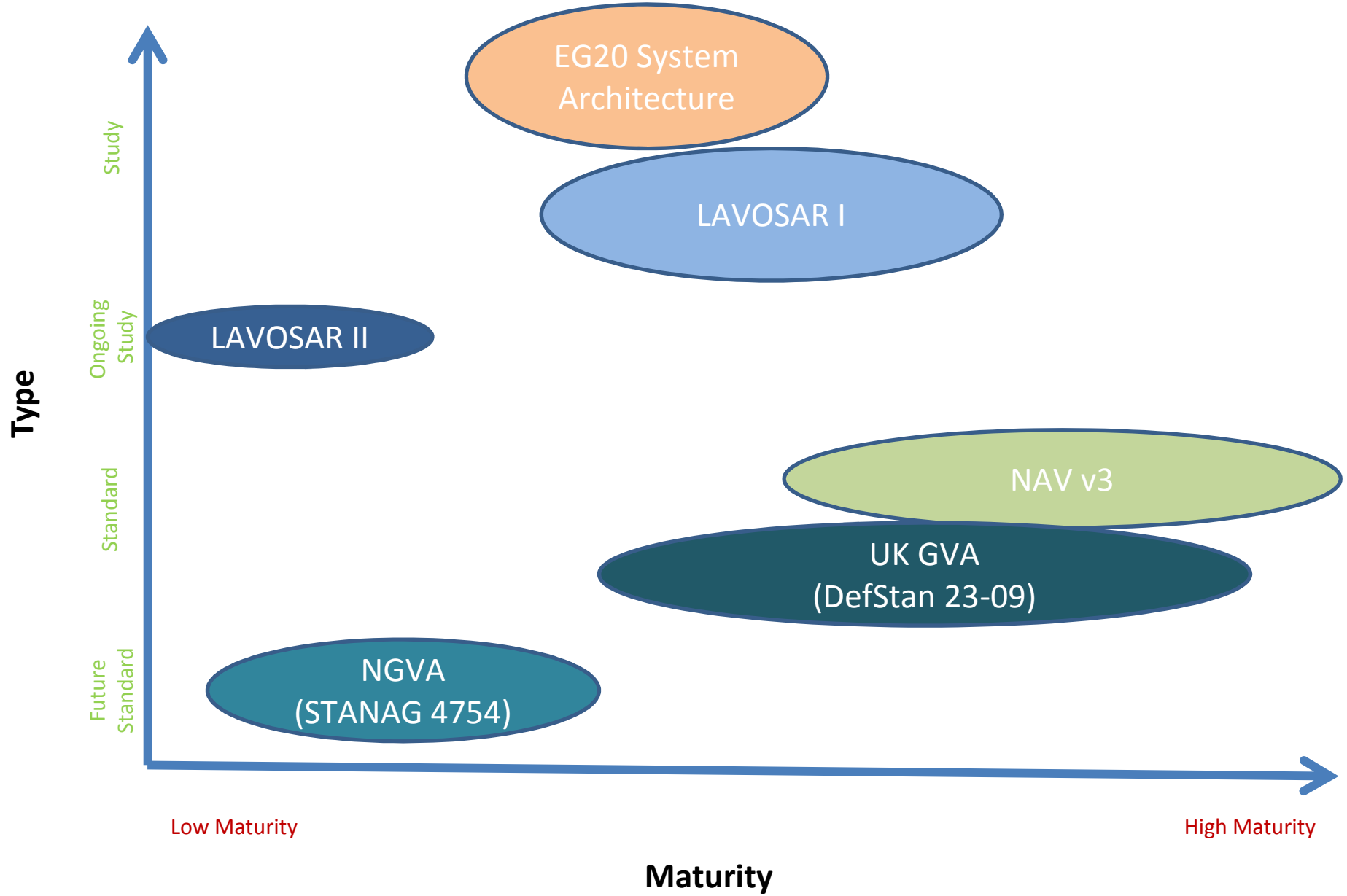
Platform Specific Services

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

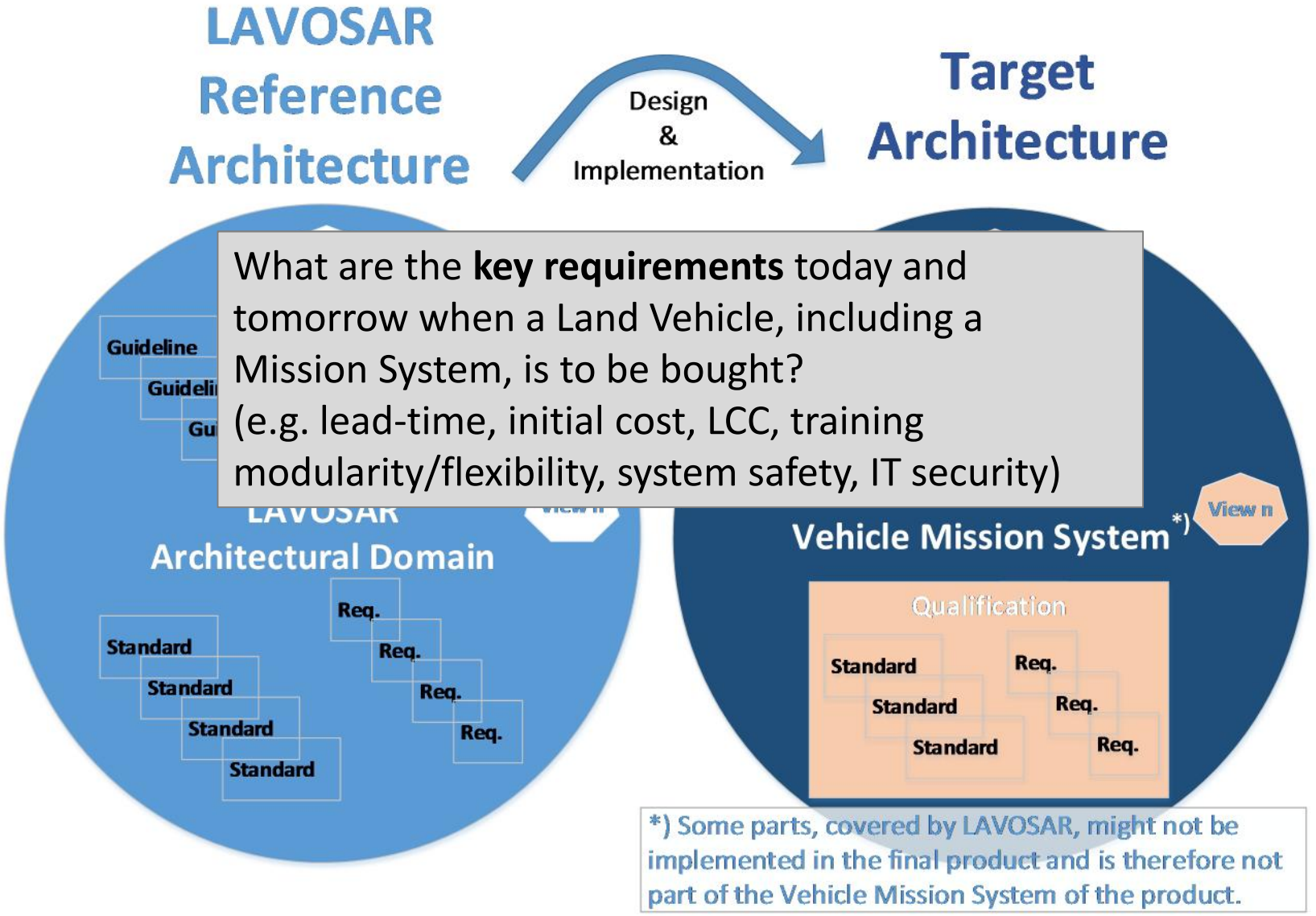


T1.2 - Characterization of Required Architectural Domain



T1.2 - Characterization of Required Architectural Domain

Transformation from LAVOSAR Open Reference Architecture to a Target Architecture



T1.2 - Characterization of Required Architectural Domain

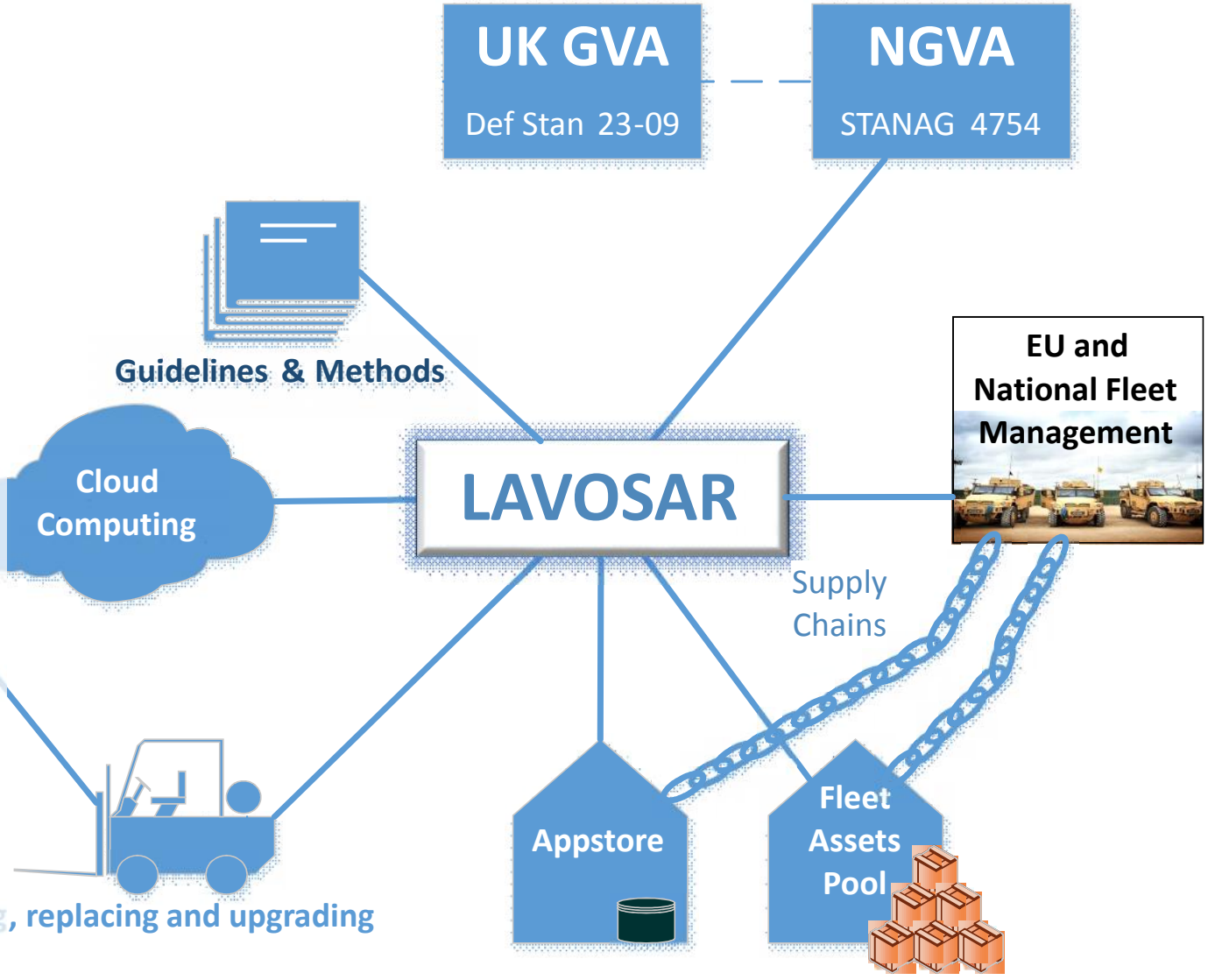
The diagram is supposed to show the interaction between industry and users (symbolised by EU and National Fleet Management).

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.

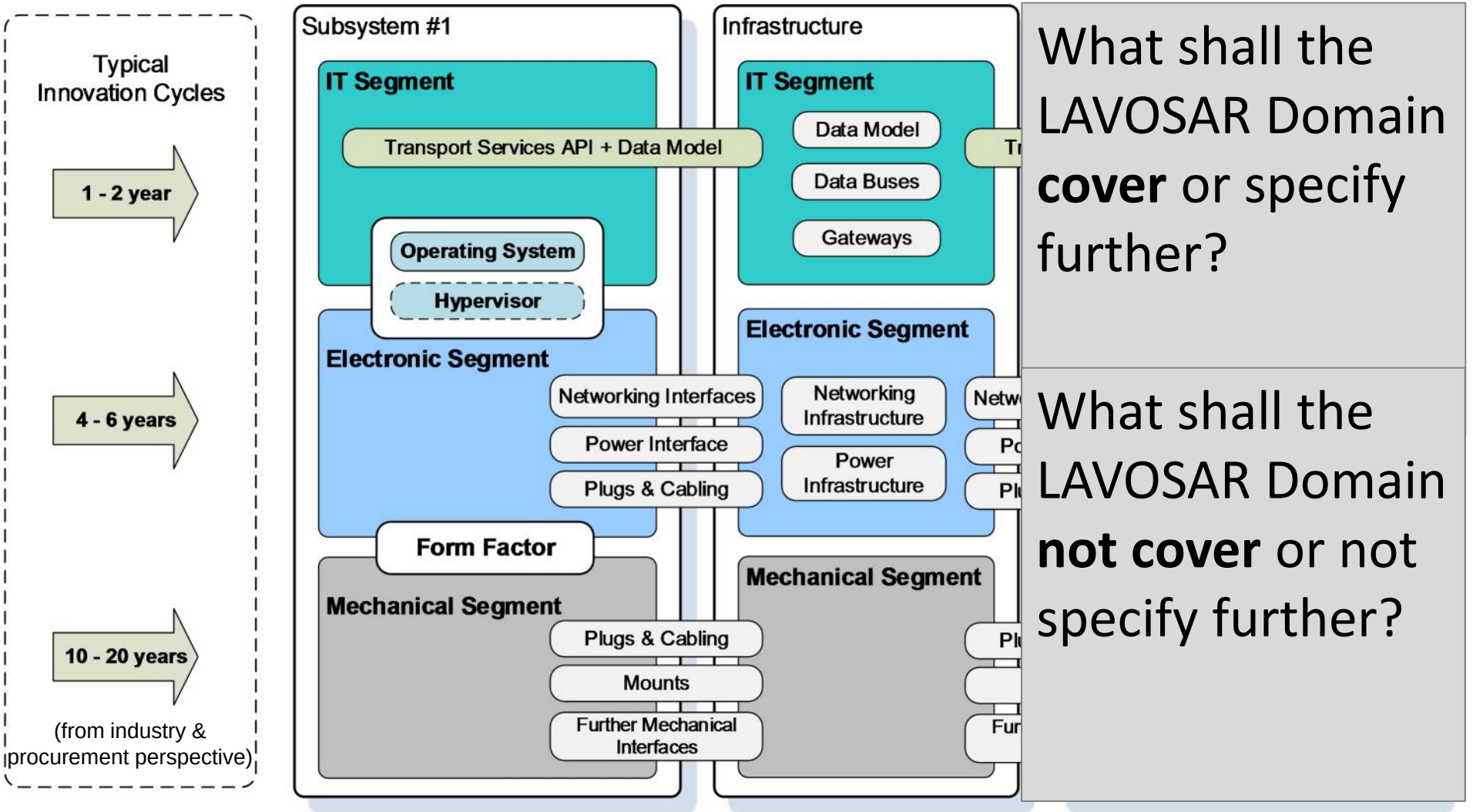
Software development is done via "Cloud Computing" (Share Point as we do today could be a start)

LAVOSAR promotes effective Fleet Management



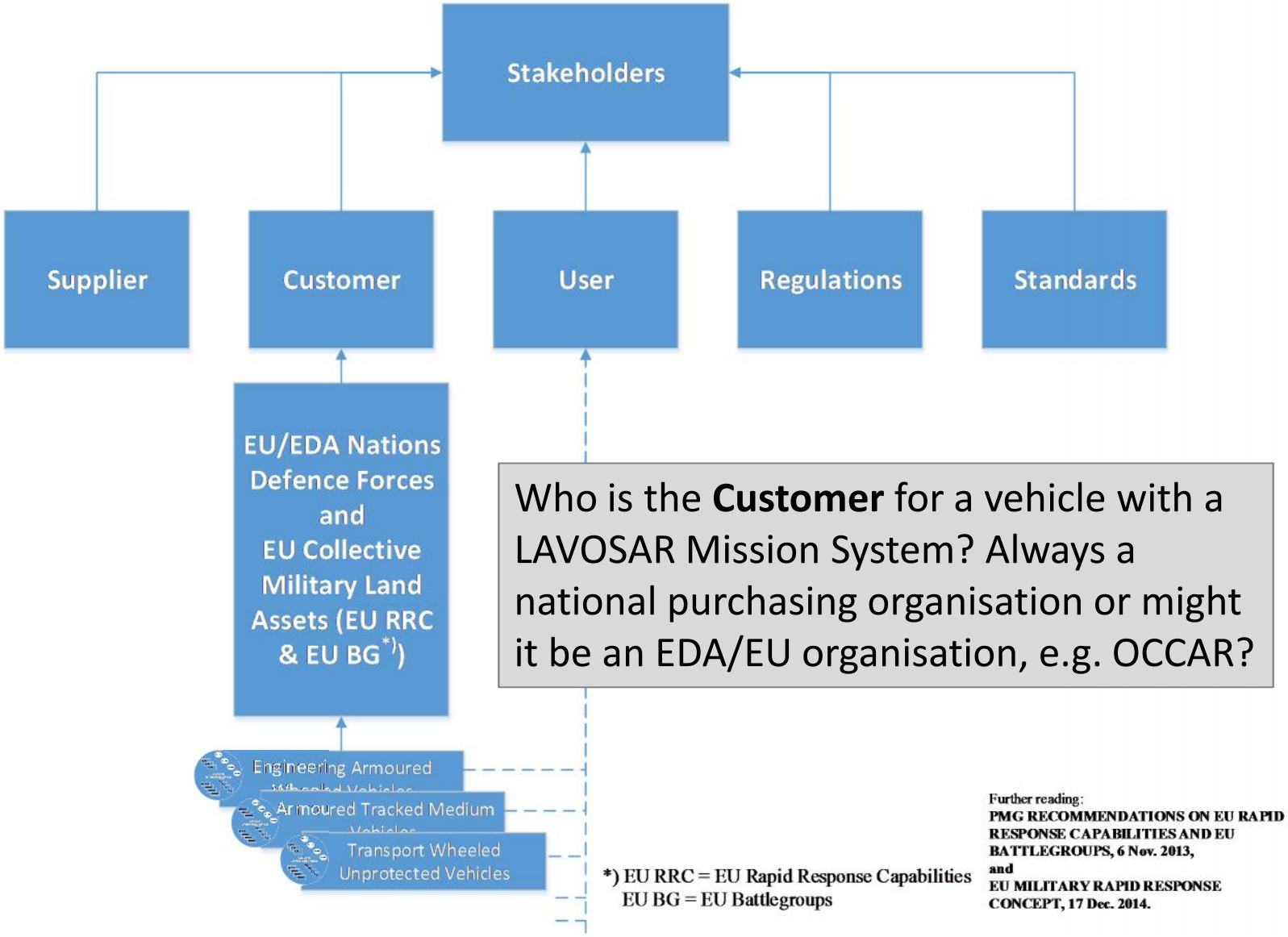
T1.3: Definition of Additional Architectural Layers

LAVOSAR Subsystem Interfaces promote capability growth



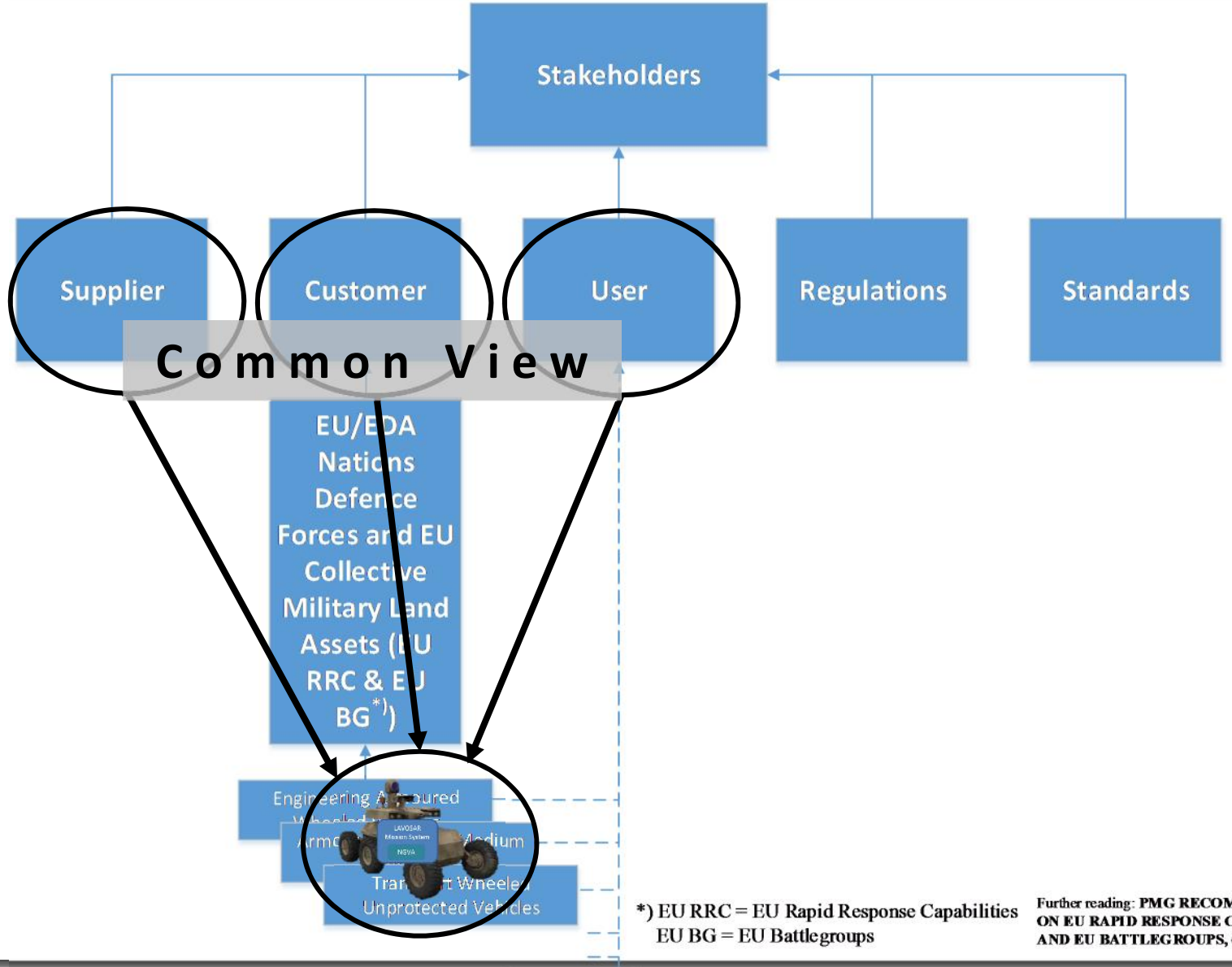
T1.4 Evaluation of Benefits to be Gained

Land Vehicle Stakeholders View



T1.4 Evaluation of Benefits to be Gained

Common Stakeholders View



T1.4 Evaluation of Benefits to be Gained

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.*