













LAVOSAR – Functional & Technical Architecture

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Overview

- Basic Considerations for Architecture Development
- Identification of Suitable Architectural Structures
- Development of Architectural Views





Considerations for Development of LAVOSAR Architecture

Not only Interface Standardization & Design Constraints but: Comprehensive Open Reference Architecture

- Electronic & Information Technological 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, Certification & Accreditation
- Verification & Validation
- Roadmap, Transition for Existing System









Open Architecture: Technical Principles



[E.M. Nelson, "Open Architecture – Principles and Guidelines", IBM, 2008]



Levels of Conceptual Interoperability

Level 6 Conceptual Interoperability

Level 5 Dynamic Interoperability

Level 4 Pragmatic Interoperability

Level 3 Semantic Interoperability

Level 2 Syntactic Interoperability

Level 1 Technical Interoperability

> Level 0 No Interoperability

Full assumptions and constraints of meaningful abstraction of reality. Fully specified but independent model

Maintains state changes between systems during run time. Includes assumptions and constraints that effect data interchange

Systems are aware of methods & procedures of other systems. Context is understood by all participating systems

Meaning of data is exchanged through use of a common information model. The meaning of information is shared and unambiguously defined.

Common structure or common data format for exchanging information. The format of the information exchange is unambiguously defined

Communication protocol for exchanging data. Bits & Bytes are exchanged in an unambiguous manner

Stand alone systems that have no interoperability

@ RTI, Realtime Innovations



Modularization

Motivation

- Decoupling (Space, Time, Flow, Platform, Multiplicity)
- Separation of Interface & Implementation
- Reuse
- Evolutionary Enhancements

"SOLID" Principle [R.C. Martin, 2002]

- Single Responsibility (Separation of Concerns)
- Open/Closed Modules
- Liskov's Substitution Principle
- Interface Segregation
- Dependency Inversion

Architectural Structures - Decoupling different Innovation Speeds







Development of Architectural Views



Architectural Views

- Functional View: Overview





Architectural Views - Service View





Achitectural Views

- Layer Overview

IT Layer (Information & Communication)

Electronics Layer

(Plugs, Cabling, Power Mgmt, Electronics/Networking Infrastructure)

Mechanics Layer

(Common Mechanical Adaptation Schemes)



Achitectural Views - Detailed Layer View

Application Layer (Service Subscription Plugins)	
Service Layer (Decentralized/Publish-Subcribe Services, Definition & Orchestration)	Common Data Model (PIM >> PSMs) (QoS)
Middleware (Data Distribution Service)	
Physical (Ethernet, IP)	
Electronics Layer (Plugs, Cabling, Power Mgmt, Electronics/Networking Infrastructure)	
Mechanics Layer (Common Mechanical Adaptation Schemes)	

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Development of Architectural Views

- Further Examples and First Ideas -



Architectural View Example - Logical Data Model View





Architectural View Example

- Mission System Elements View





Architectural View Example - Communication Domain View





Thank you for your attention Questions? Discussion!