Reference Architectural Model Industrie 4.0 (RAMI 4.0)

An Introduction

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The Internet of Things and Services
Prerequisites

- Defining communication structures
- Development of a common language with its own signs, alphabet, vocabulary, syntax, grammar, semantics, pragmatics and culture
The Solution: RAMI 4.0 – The Reference Architectural Model for Industrie 4.0

**RAMI 4.0** is a three-dimensional map showing how to approach the issue of Industrie 4.0 in a structured manner.

**RAMI 4.0** ensures that all participants involved in Industrie 4.0 discussions understand each other.
RAMI 4.0 - Benefits

**RAMI 4.0** is a **SERVICE-ORIENTED ARCHITECTURE**.

**RAMI 4.0** combines all elements and IT components in a layer and life cycle model.

**RAMI 4.0** breaks down complex processes into easy-to-grasp packages, including data privacy and IT security.
Axis 1 – Hierarchy: The Factory

The Old World: Industrie 3.0

- Hardware-based structure
- Functions are bound to hardware
- Hierarchy-based communication
- Product is isolated
Axis 1 – Hierarchy: The Factory

The New World: Industrie 4.0

- Flexible systems and machines
- Functions are distributed throughout the network
- Participants interact across hierarchy levels
- Communication among all participants
- Product is part of the network

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Axis 2 – Product Life Cycle

The Product: From the First Idea to the Scrapyard

Construction Plan:
Development
Construction
Computer Simulation
Prototype
...

Construction Plan:
Software Updates
Instruction Manual
Maintenance Cycles
...

Production:
Product
Data
Serial Number
...

Facility Management:
Usage
Service
Maintenance
Recycling
Scraping
...

Graphics: Product Life Cycle, RAMI 4.0 © Plattform Industrie 4.0 and ZVEI, Additions by Dr. Peter Adolphs
Axis 3 – Architecture

- **Asset**: Physical Things in the Real World
- **Integration**: Transition from Real to Digital World
- **Communication**: Access to Information
- **Information**: Necessary Data
- **Functional**: Functions of the Asset
- **Business**: Organisation and Business Processes
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A Solution Space with a Coordinate System for Industrie 4.0

Architecture
- Business Processes
- Functions
- Data
- Communication
- Digitalization
- Physical Things

Hierarchy

Product Life Cycle

Development, Production / Sales, Service

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Who provides interpretation? The Administration Shell…

... is the interface connecting I4.0 to the physical Thing

... stores all data and information about the asset

... serves as the network’s standardized communication interface

... is also able to integrate passive assets
The Roles and Responsibilities of the Administration Shell

- Each physical thing has its own administration shell.
- Several assets can form a thematic unit with a common administration shell, several thematic units ...
The Industrie 4.0 Component

- Each object needs its own administration shell that allows its integration into Industrie 4.0
- The connection takes place over the I4.0 communication
- The administration shell forms the digital part
- The Thing forms the real part
Security as a Precondition and Enabler

- Security by design
- The basis of all Industrie 4.0 applications
Publications of Plattform Industrie 4.0

More information:

http://www.plattform-i40.de/I40/Navigation/EN/InPractice/Online-Library/online-library.html