The Future of Requirements Exchange

GLOBAL PRODUCT DATA
INTEROPERABILITY
SUMMIT
2016

ELYSIUM   Parker | Aerospace   NORTHROP GRUMMAN   BOEING

The future of Requirements Exchange

- **Agenda**
  - **Current Methods of Requirement Exchange**
    - **Document Authoring**
    - **Database Authoring**
    - **Associated Costs**
  - **Future Method of Requirement Exchange**
    - **Web enabled Single Source**
    - **Integrated package of all elements**
    - **Associated Benefits**

- **Current Methods – Document Based authoring and distribution**
  - Requirements Management focused, verification methods and deliverables manually associated to requirements
  - MSWord, Adobe PDF, Drawings, Associated Files
  - Separately managed activities for validation, allocation and verification
  - Documents distributed to supplier
  - Reuse consists of uncontrolled copy paste
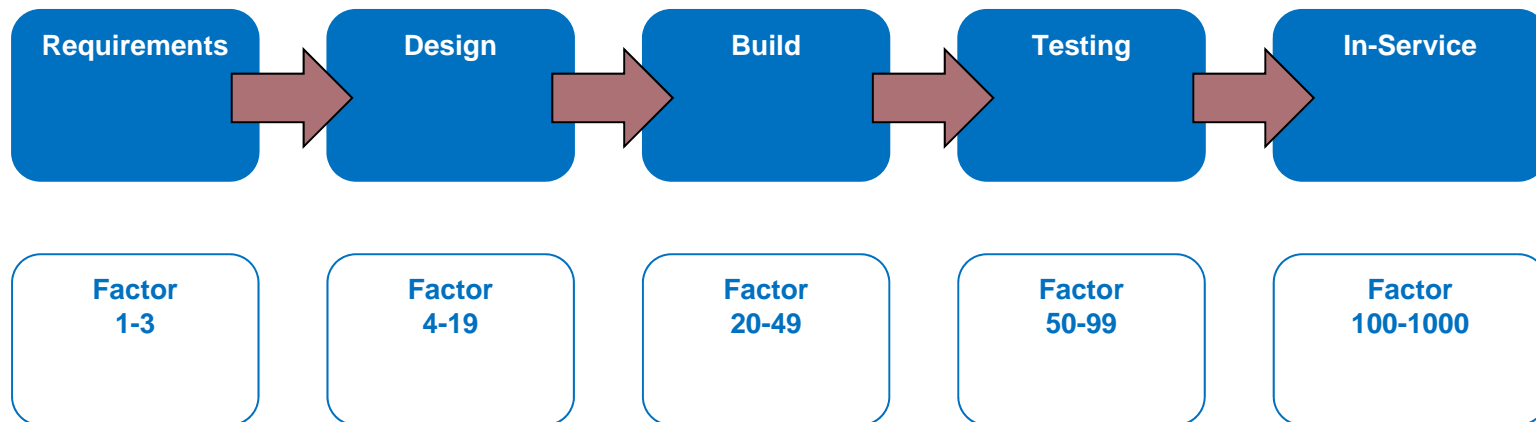 - Metrics almost non-existent

- ## Current Methods – Database authoring and distribution
  - **Requirements Management focused, verification methods and deliverables weakly associated to requirements**
  - **Separately managed activities for validation and allocation**
  - **Database extracts distributed (or documents created and distributed)**
  - **Reuse is limited and complicated**
  - **Metrics are focused on performance to schedule**

- ## Current Methods – Cost Impacts
  - ### Quality of Requirements are costly

Requirements	Design	Build	Testing	In-Service

Factor 1-3	Factor 4-19	Factor 20-49	Factor 50-99	Factor 100-1000

Causes of cost growth impacts from requirements:

Requirement Revisions

Design Gaps

Build Errors

Test Failures

In-Service Problems

- **Future Requirements eXchange**
  - **Web enabled data base infrastructure**
    - **Object Oriented Requirements Database**
    - **Associated Files, CAD Models, ICDs, Envelope Models, other supporting files**
    - **Product design offload is not limited to requirements focus**
    - **Metrics can be focused to benefit user role (i.e. Author, Manager, Program…)**
    - **Ability to co-author with suppliers in a shared work space**
  - **Single Source Repository**
    - **OEM and supplier are accessing the same data source concurrently**
 - **AP239 and ReqIF compliant**

- **Future Package Management**
  - Create and Reuse Structured Requirements and relationships
    - Collaborative Supplier Access Requirements Development
  - Apply Development Assurance Industry Practices
    - Requirement Verification Planning (i.e. Testing, Analysis, Similarity)
    - Deliverables Planning and Identification
    - Requirement Allocation to Objectives
    - Requirement Validation
    - Identification of Safety Requirements

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- ## Future Package Integration
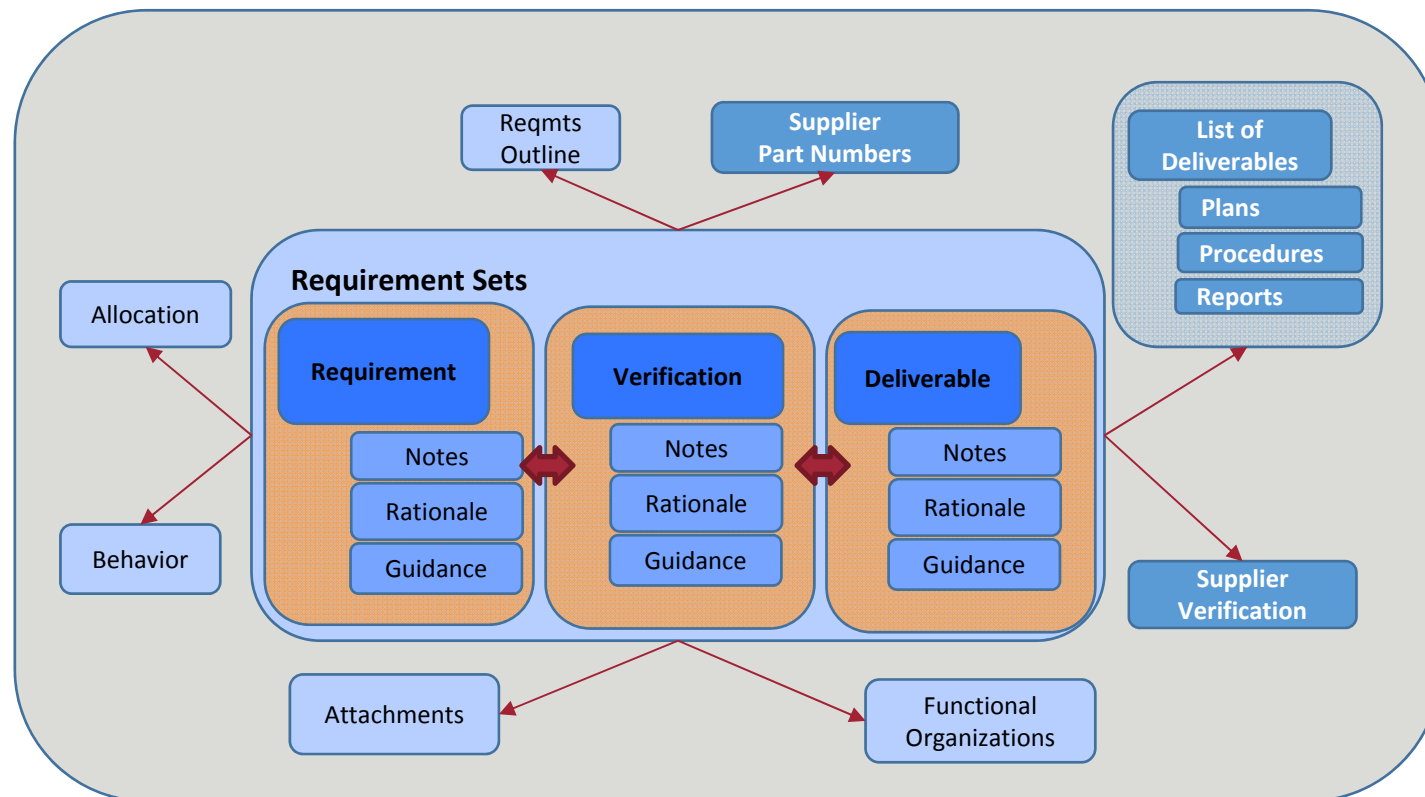
- **Future Package Management**
  - **Stakeholder and Approver Review and Comment**
    - **Use of relationships to Identify Stake holders and focus review efforts**
    - **Manage Resolution of comments to improve first time quality**

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- **Future Package Management**
  - Procurement Integration and Supplier Assignment
  - Supplier Access
    - ➢ Direct supplier interaction with requirements Package
    - ➢ Supplier Acceptance
    - ➢ OEM Supplier Interaction

  - Supplier Verification Evidence
    - ➢ Schedule and List of Deliverables

  - Supplier Data Submittal
  - Compliance
  - Deviation Management

- **Future Package - Single Source of Data**
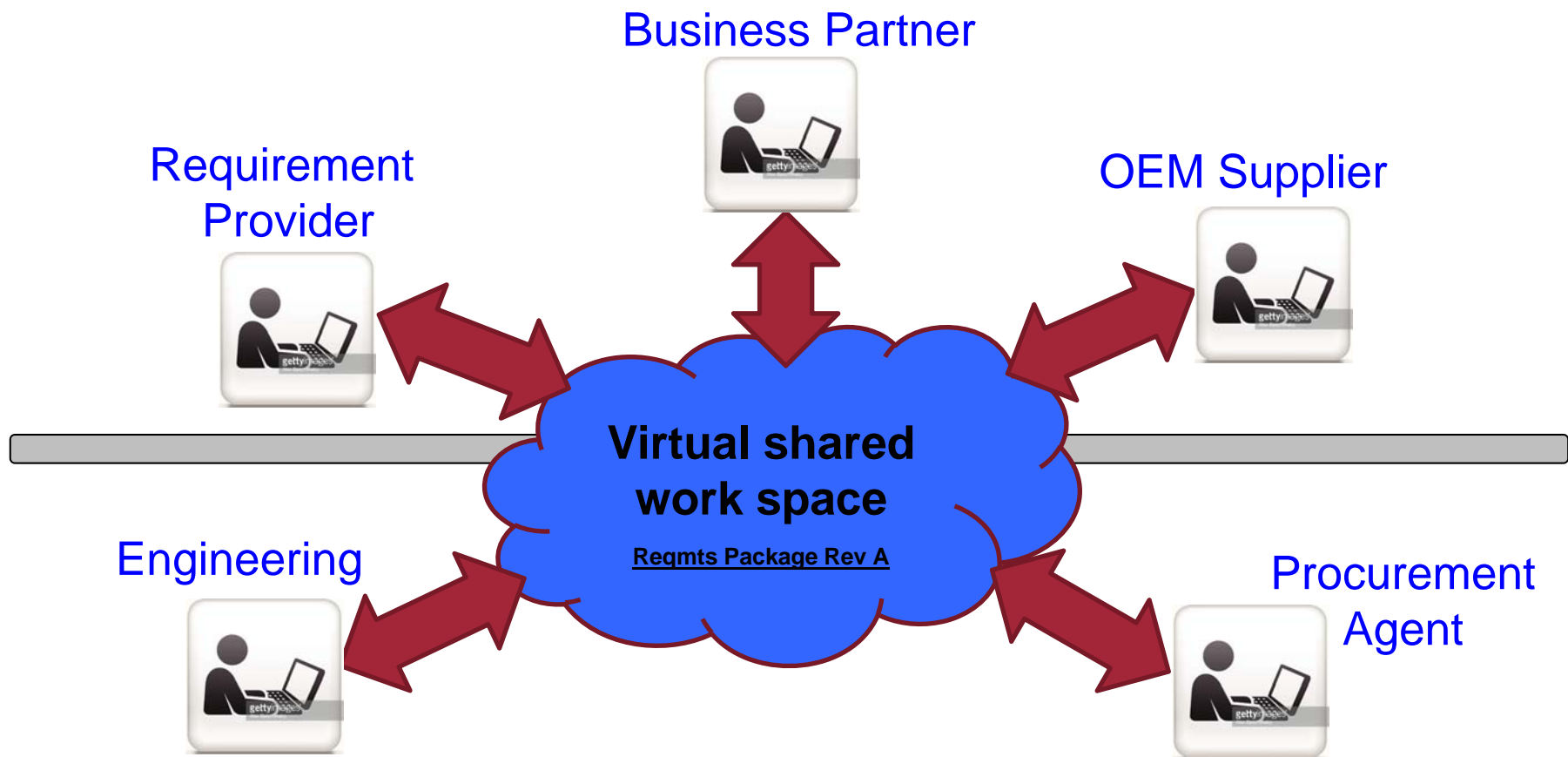
Business Partner

Requirement Provider

OEM Supplier

Virtual shared work space

Reqmts Package Rev A

Engineering

Procurement Agent

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- **Opportunities presented with a Web based integration of Requirements Packaging**
  - Reuse
    - Improves requirement Quality
    - Reduces effort for creation and review
    - Takes advantage of previous work
    - Provides consistency to supplier
  - Advanced Analytics Available
    - Ability to use metrics to assist the user in creating quality requirements, relationships and package
    - Availability of customized group and program metrics and reporting

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- **Opportunities presented with a Web based integration of Requirements Packaging**
  - Product Reliability & Maintainability
  - Object Oriented Requirements Data
  - expanded capability of industry tools
  - Improved requirement quality

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- ## Future Methods – Cost Avoidance
  - **Requirements delivered at a much higher quality avoiding costly errors found later**
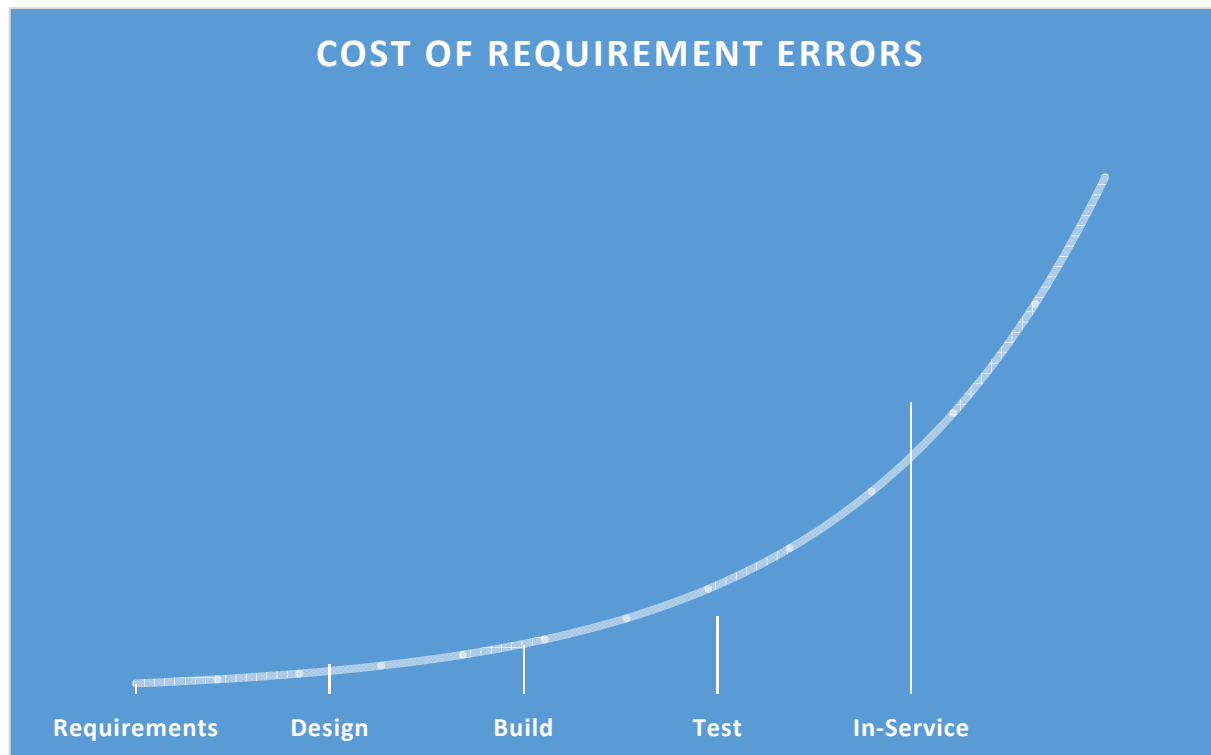
COST OF REQUIREMENT ERRORS

Requirements   Design   Build   Test   In-Service

- ## Enables Model Based Systems Engineering

Design, Verification, Validation Activities →

Life Cycle Tasks (continuous)

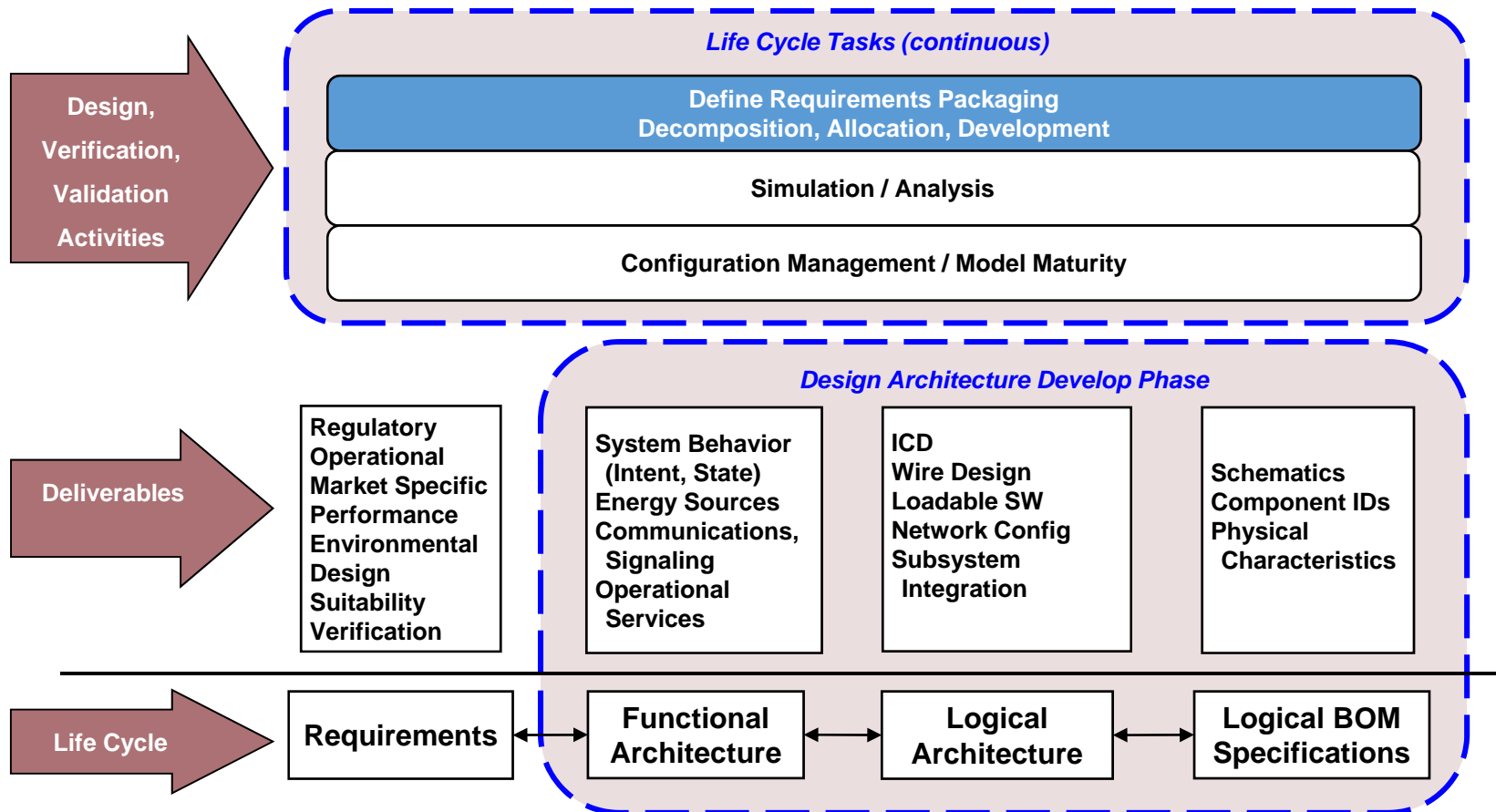| Define Requirements Packaging
Decomposition, Allocation, Development |
| :---: |
| Simulation / Analysis |
| Configuration Management / Model Maturity |

Deliverables →

Regulatory Operational Market Specific Performance Environmental Design Suitability Verification

Design Architecture Develop Phase

System Behavior
(Intent, State)
Energy Sources
Communications,
  Signaling
Operational
  Services
	ICD
	Wire Design
	Loadable SW
	Network Config
	Subsystem
	  Integration
		Schematics
		Component IDs
		Physical
		  Characteristics

Life Cycle →

Requirements	↔	**Functional Architecture**	↔	**Logical Architecture**	↔	**Logical BOM Specifications**

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