Advancing The Digital Thread Throughout The Lifecycle

Kenney Crooks
NG Fellow

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BOEING ELYSIUM NORTHROP GRUMMAN Parker PDES, Inc.® Connecting the Digital Enterprise

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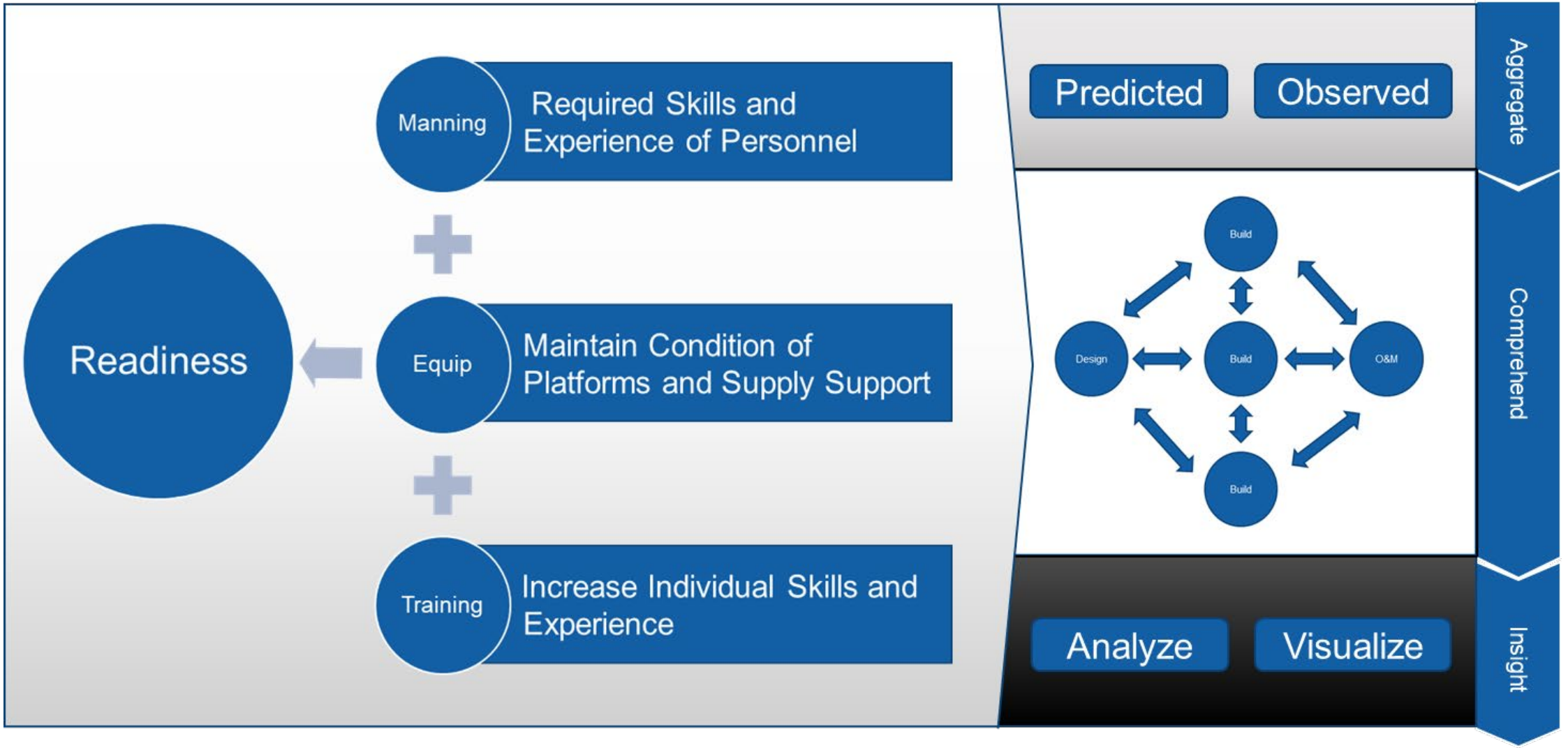
- **Kenney Crooks is the Northrop Grumman (NG) Fellow for Reliability, Maintainability and Testability (RM&T) and Lifecycle Model Based Sustainment (MBS) in NG's Aeronautics Sector (NGAS). He serves as the Digital Transformation Office (DTO) Enterprise lead for Digital Product Support and NGAS Product Owner for Model Based Sustainment as part of the company's Digital Transformation initiatives.**
- **Crooks previously held roles as Senior Engineering Manager for NG Strike Division and Lead Reliability Engineer on Strike, E-2D, Triton, NATO AGS, UK AWACS. He has supported several other programs with his technical expertise across the company in his 15-year career.**
- **In industry, He serves as Chair for Reliability and Logistics Working Group for Military Operations Research Society (MORS). He is a SAE voting committee member for industry standards for Reliability and Maintainability (R&M). He represents NG at the annual Department of Defense (DoD) R&M Roundtable forums that is hosted by Office of Under Secretary of Defense, Research and Engineering (OUSD R&E).**
- **Crooks is a published author in IEEE on topics of Supportability, Artificial Intelligence and Machine Learning (AI/ML), Robust Asset Tracking, and Condition Based Maintenance (CBM+) Strategies. He holds a US Patent resulting from his work at NG.**
- **Crooks holds a Bachelor's degree in Information Technology Management from Barry University and Master's degree in System Engineering from Florida Institute of Technology.**

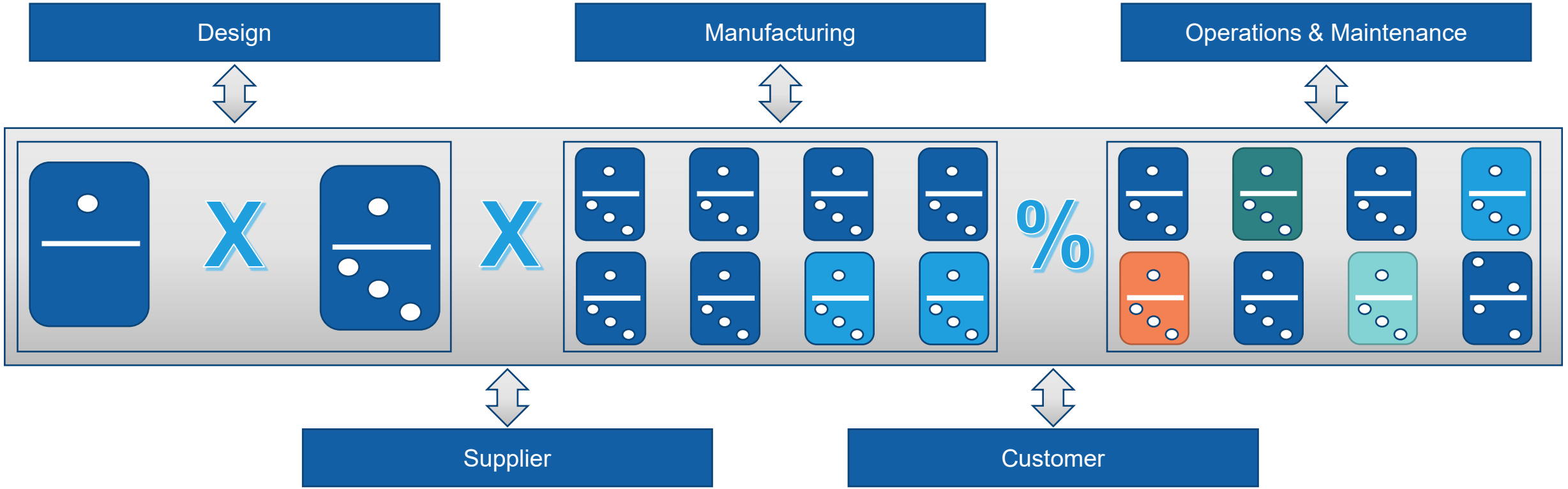
Improving Readiness



Challenge

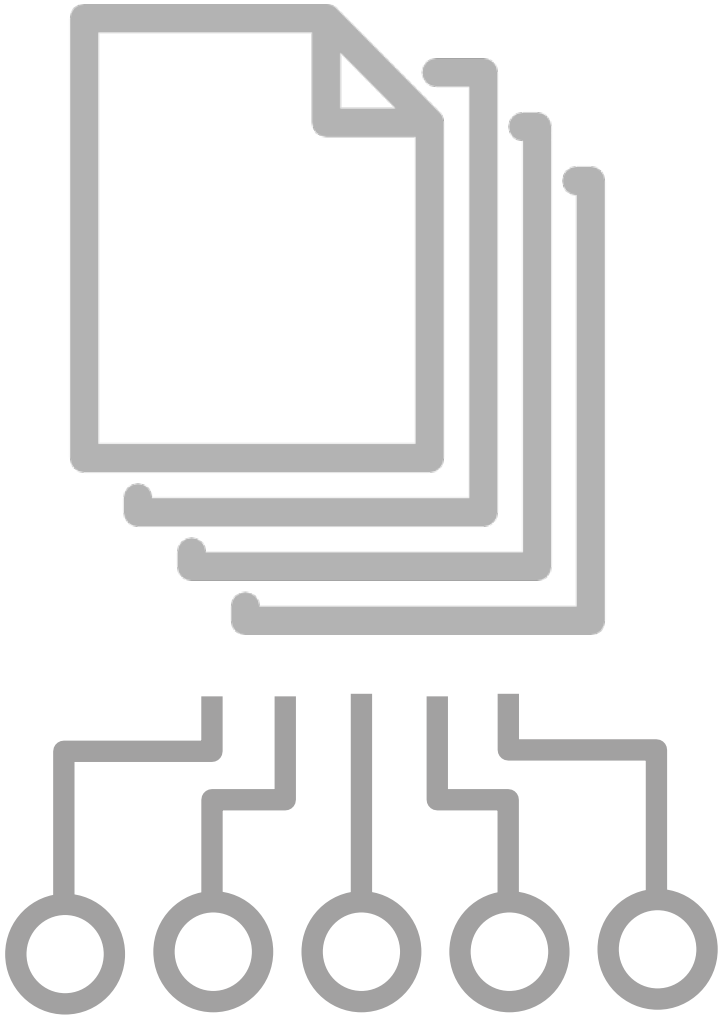
Objective

Retaining connectivity throughout the entire life cycle that is sustainable for Modeling and Simulation capabilities in support of program requirements and operational readiness.

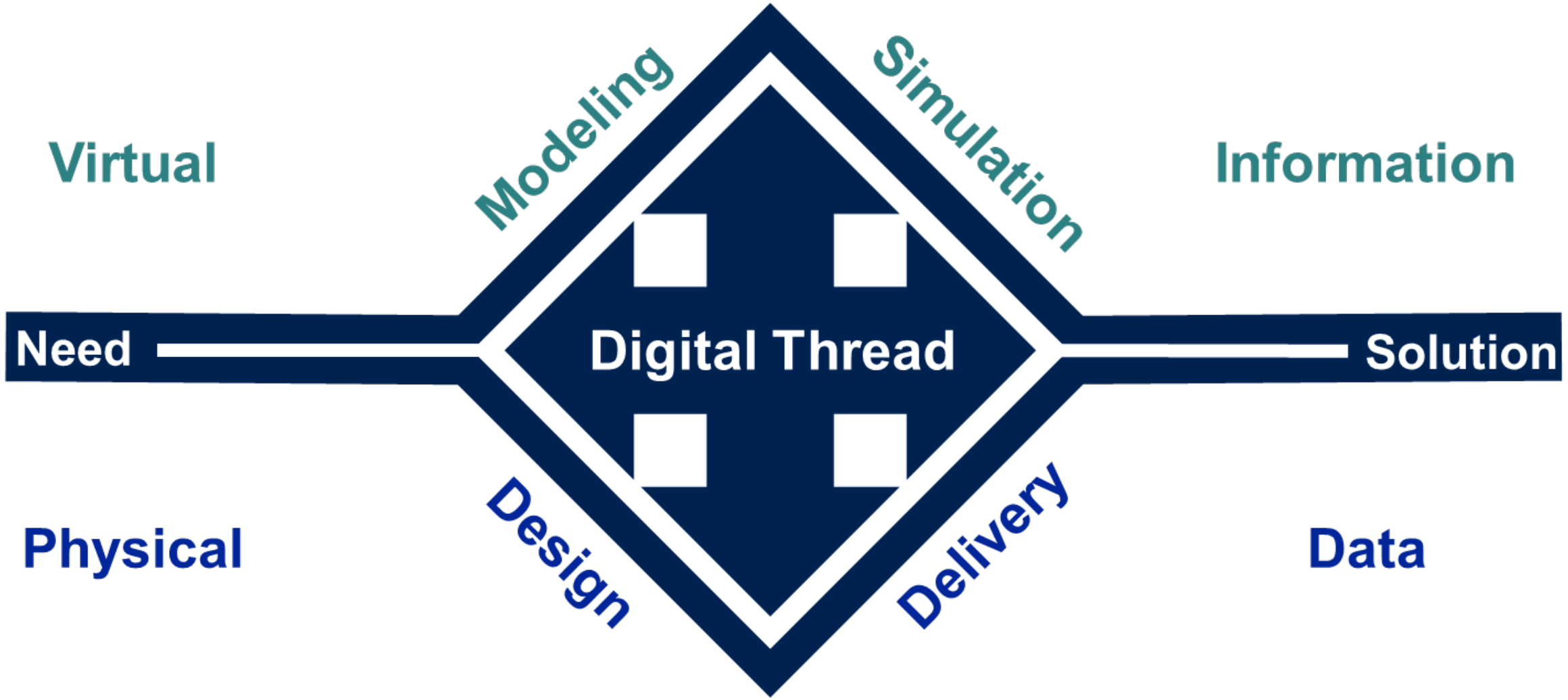


Digital Transformation

- Develop robust Modeling and Simulation capabilities for the entire life cycle
  - Drive innovation for information and insight
  - Improve operational excellence
  - Increase collaboration and experience
- Promote data reuse from design to operations and maintenance through the Digital Thread
- Evolve to Model Based and Model Centric approaches with Digital Technologies



Digital Twin



Our Plan to Transform

Bringing Sustainment to the left in design and integrating with Engineering

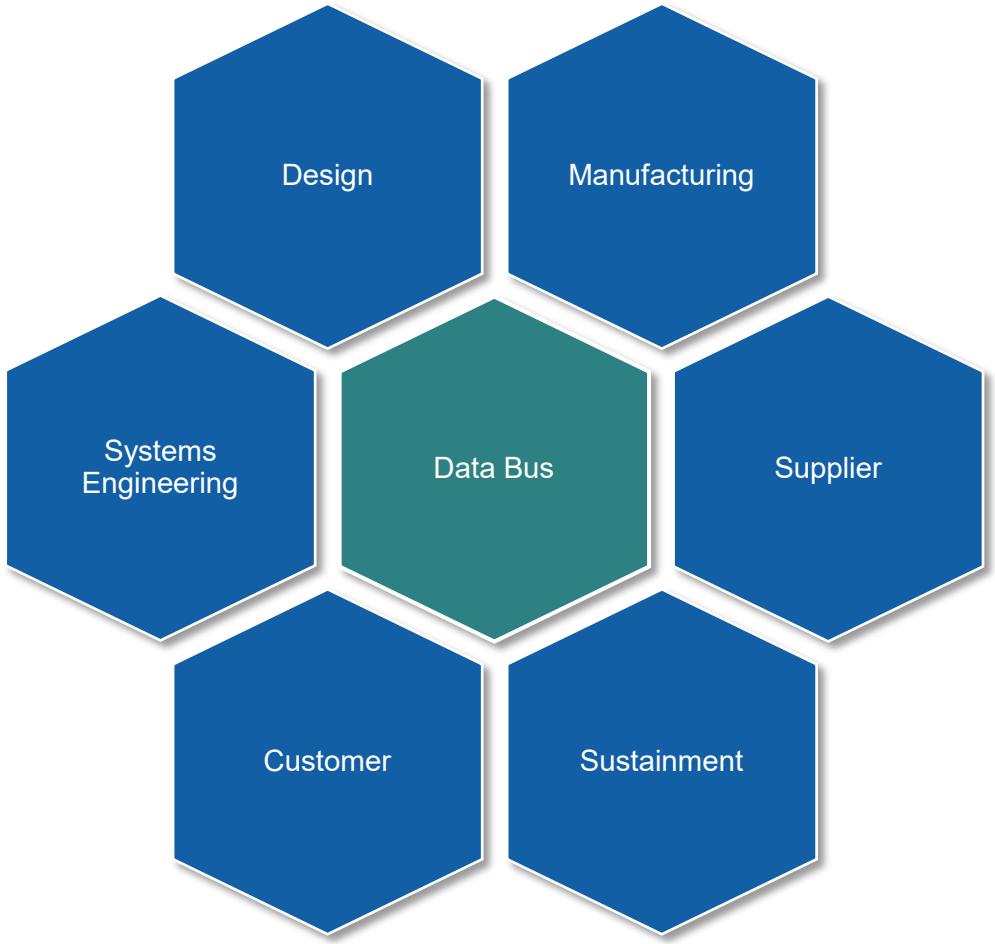
- Improve availability, supportability, maintainability and reduce rework
- Drive efficiency, affordability, and agility through data integrity and re-use

Develop Product Support Digital Backbone

- Established connectivity throughout life-cycle
- Define governance and traceability

Provide Continuous Improvements to our Customers

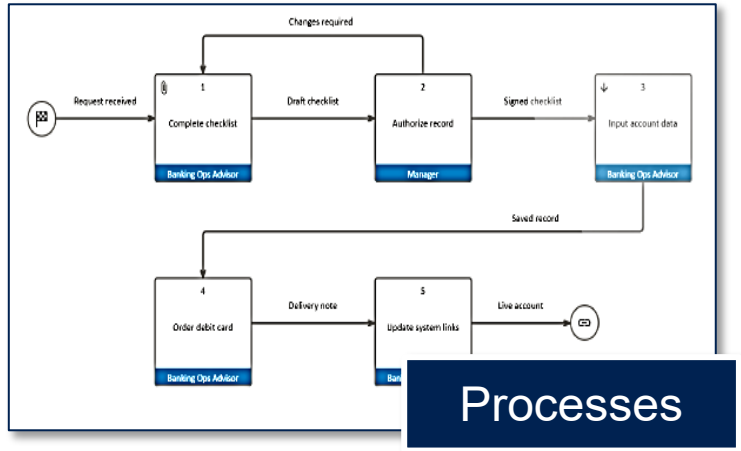
- Establish robust CBM+ and XR capabilities
- Increase Technical Data and Training throughput
- Increase visibility to Fielded Performance and Supply Chain



Improve total data quality of our systems' life cycle

Digitalization – Starting Point

Processes



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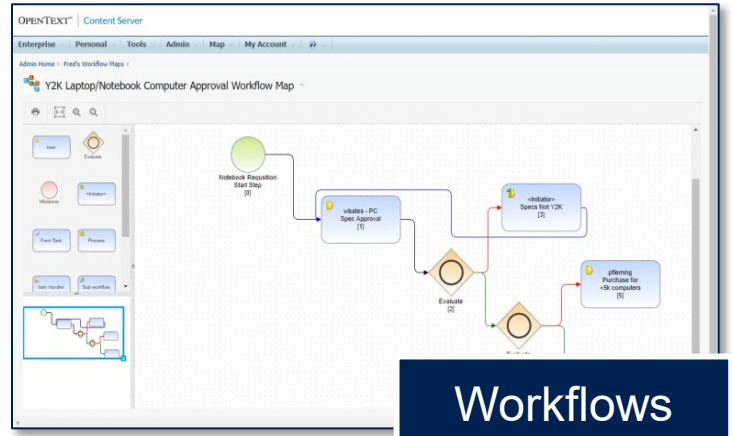
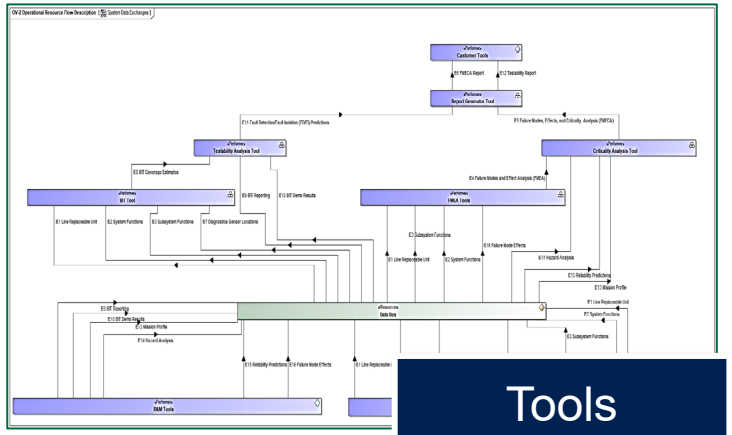


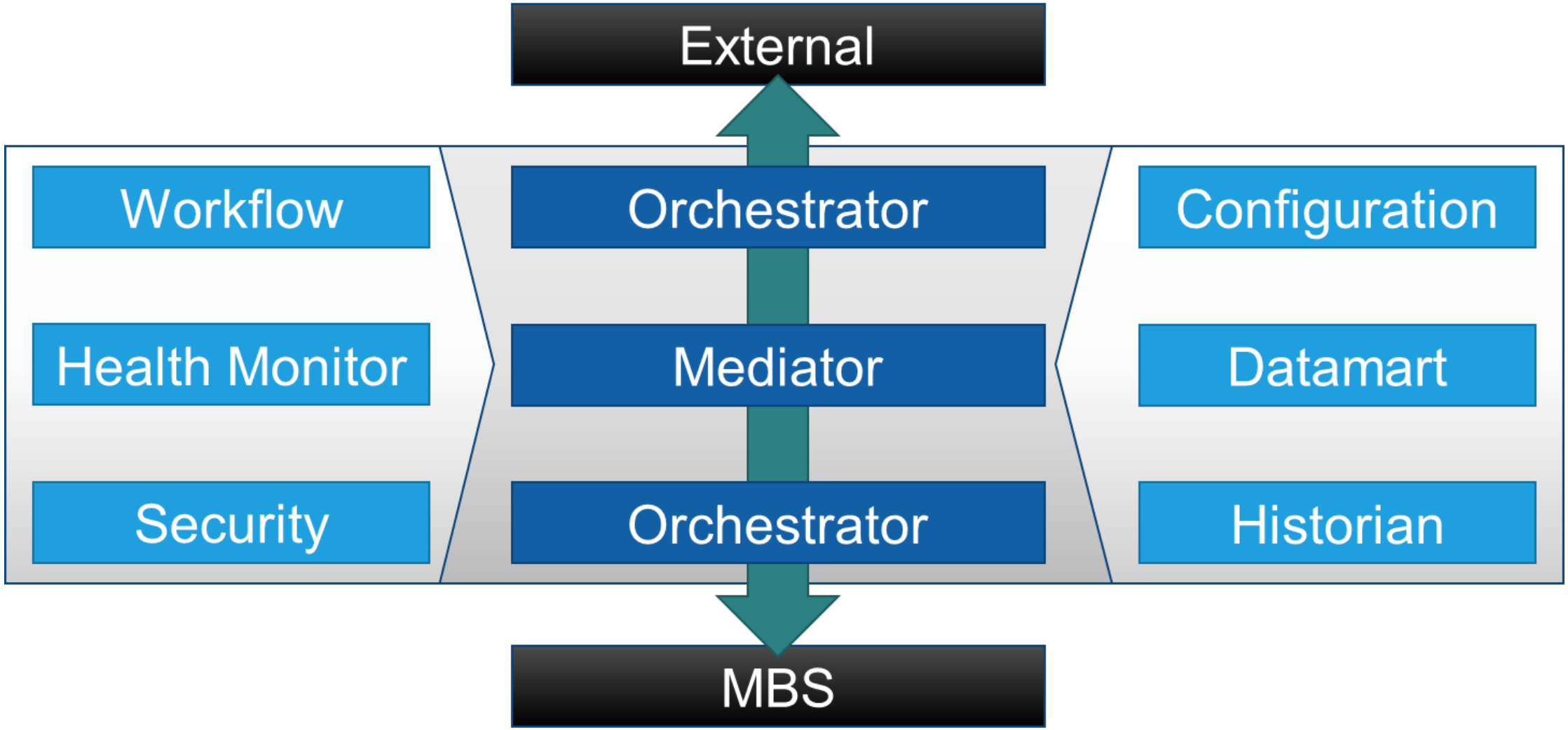
Workflows



Tools

Awareness

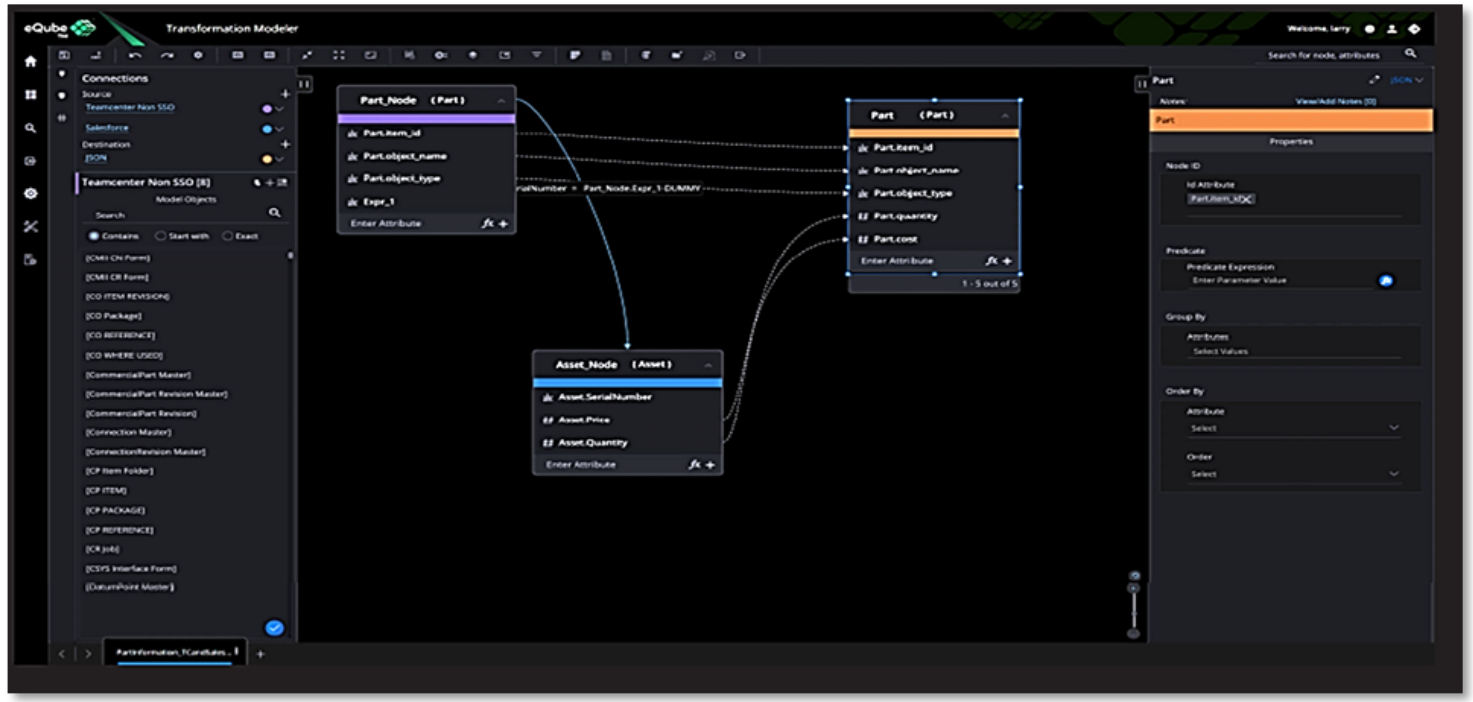
Technical Stack – Digital Backbone



eQube – Orchestrator

Data as a Service (DaaS) platform

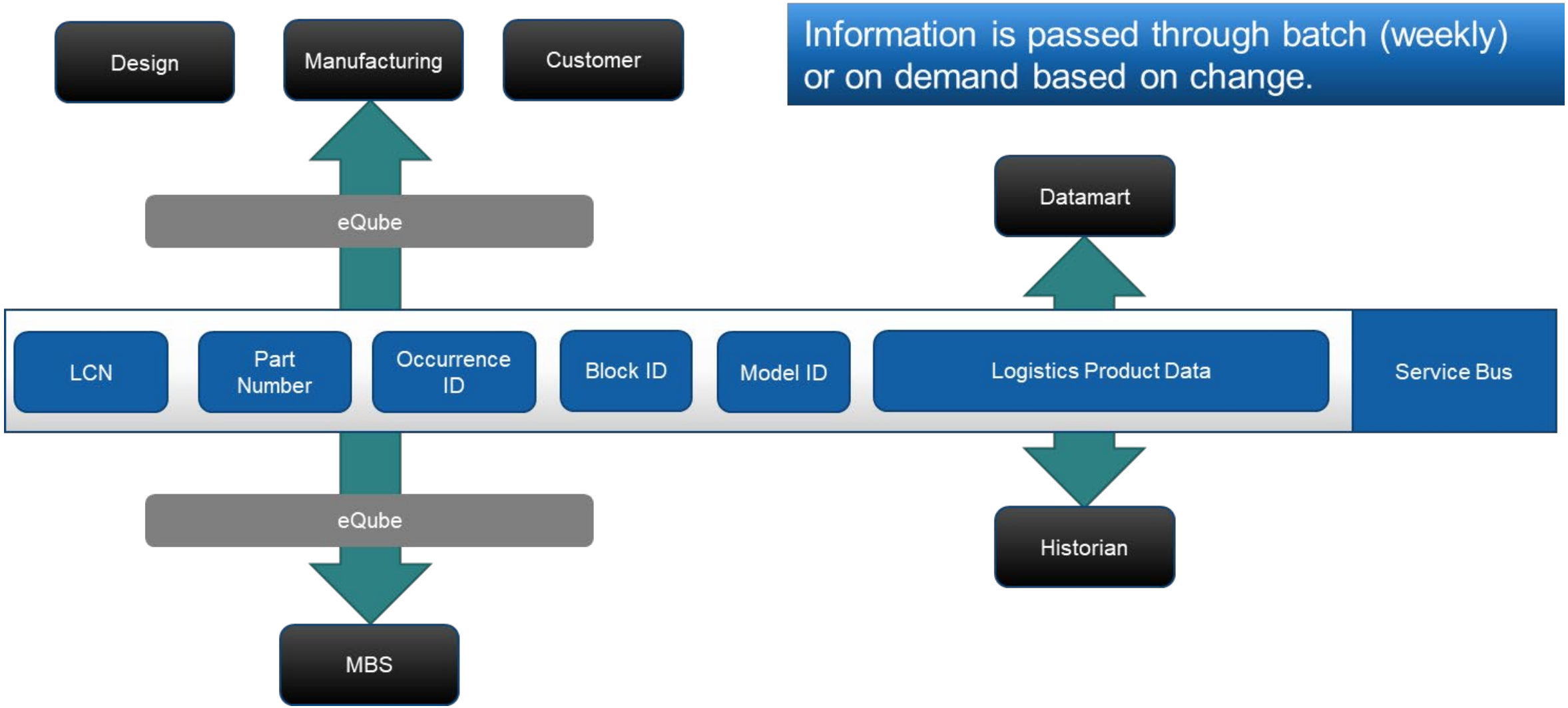
eQube digital backbone forms a data fabric of integrated data, applications, and devices that puts the power of analytics in the hands of end-users.



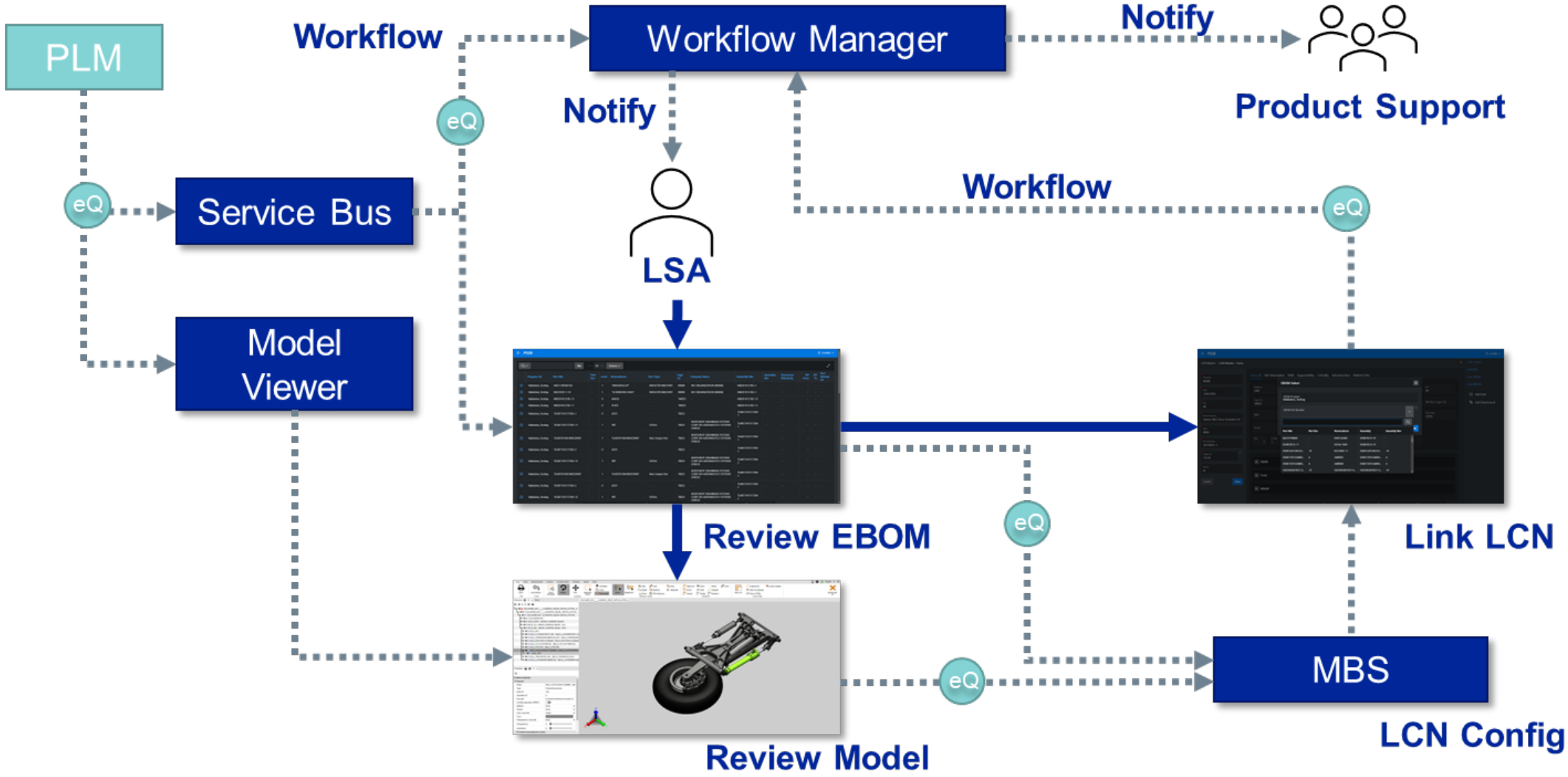
Standard Data Connectors

Cameo
Teamcenter
SAP/ S4
JIRA
Windchill
Solumina
Maximo
Saleforce
Microsoft Office
Ansys
ThingWorx
Aras
BitBucket
Confluence
…

Service Bus - Mediator
Configuration & Integration

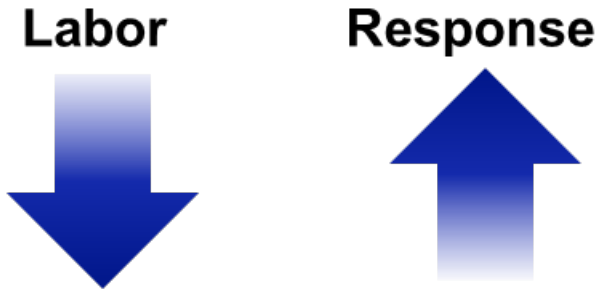


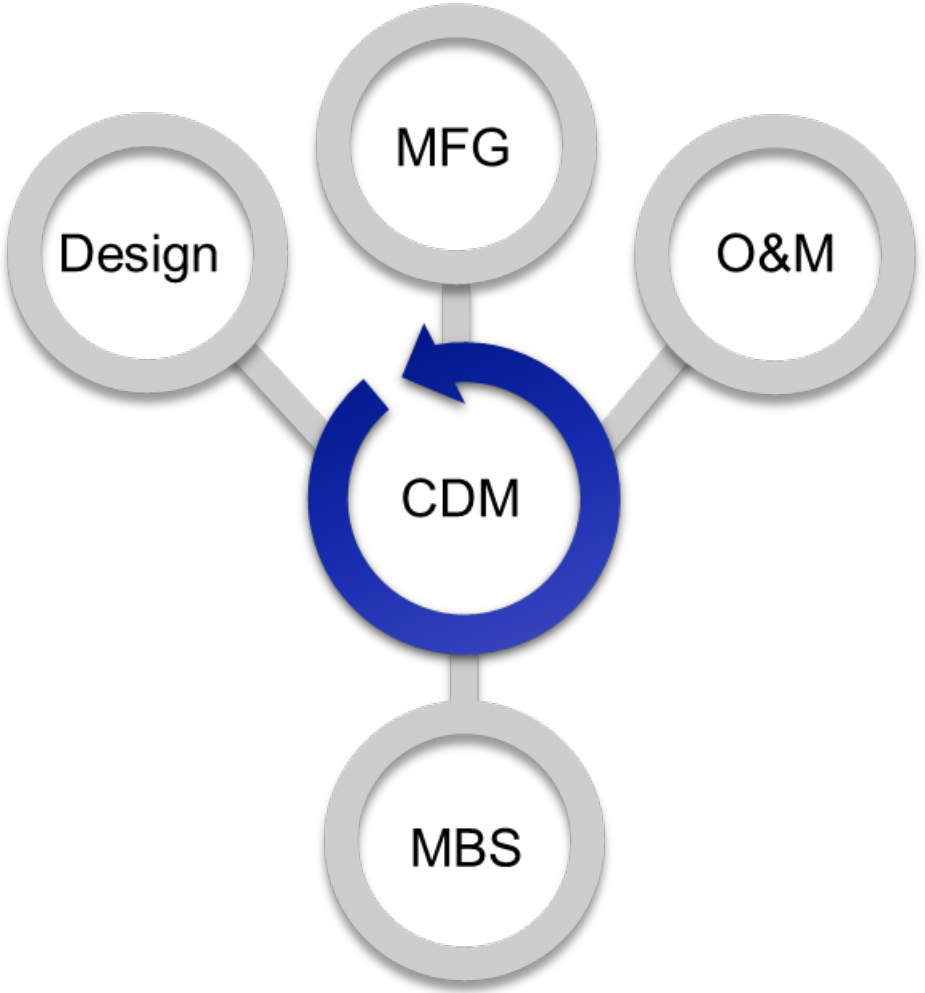
Example: Drawing Release



Result

- Integrate multiple data sources
- Enable Common Data Model (CDM)
- Increase data integrity and reuse
- Change Management Visibility
- Distributed Analysis and Result





Through Automation: Swing efforts from Data Management to Analysis and Result

Conclusion

- Model Based, Data Driven and Centralized
- Strong foundational definition of the digital thread for Sustainment
- Improve quality by avoiding duplicate efforts
- Reduce labor, Increase response
- Promote greater data reuse and analysis collaboration
- Proactive approach to mitigate unknown design constraint effects
- Higher visibility of causality to operations & maintenance gaps