



EXCELERATE '22

NO LIMITS

S
T
I
M
L
I
O
N

Opportunities in Digital Continuity for Complex Operations

Michel P. Gadbois
Sr. Vice-President, Chief Enterprise Architect

mgadbois@ibaset.com

<https://www.linkedin.com/in/michel-gadbois-0321812>

S
T
I
M
L
O
N

As Pressures mount for better profitability and faster turn-around times, there are FOUR major areas that stand out for significant improvement in Aerospace, Nuclear, Medical and Complex Industrial Equipment Industries.

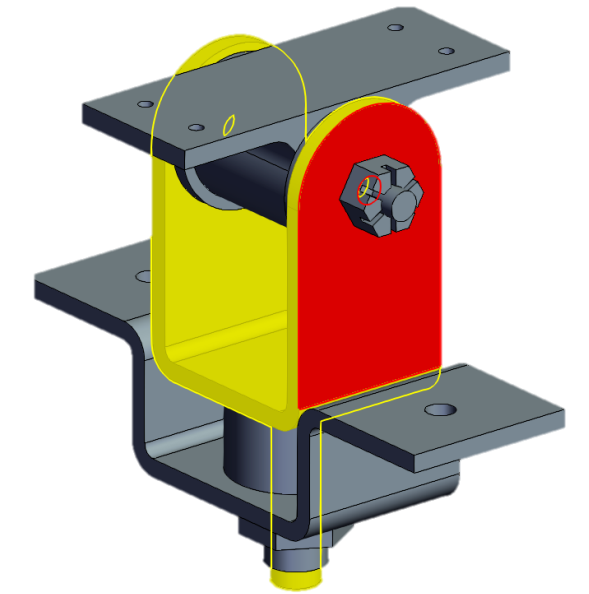
Top Opportunities:

- The Model-Based Enterprise
- The Industrial-Internet-of-Things
- The “Connected” Supply-Chain
- Next-Generation Sustainment

Each Opportunity at a High Level

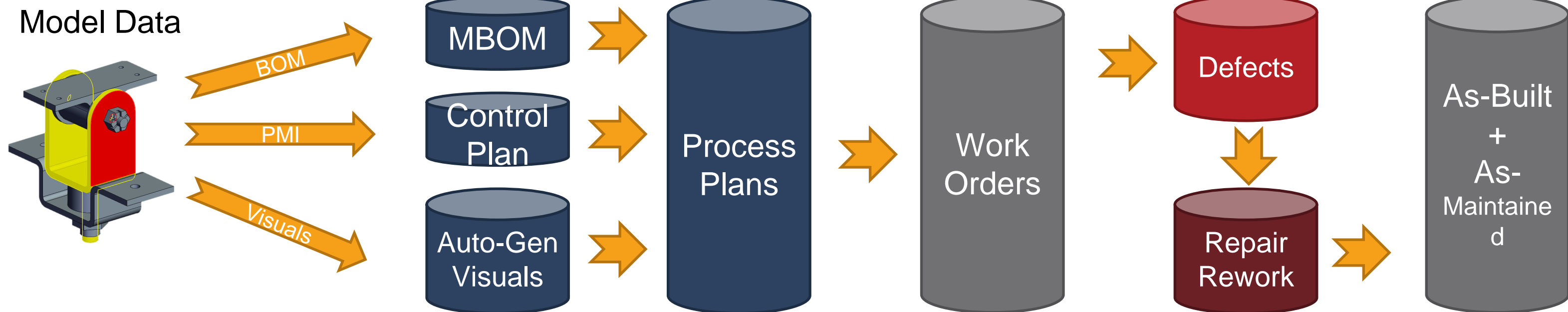
- Overview of Opportunity
- What Negative bi-products arise from the Current Process (COST of As-Is Process)
- What Short-term actions can one take, to embark on this Journey (Path-to-Be)
- Additional Resources that can be leveraged

The Model-Based Enterprise (MBE)



The Model-Based-Enterprise - Overview

Engineering Change Process – PLM-Driven



The Associativity is maintained via the CAD Occurrence Number and Item to Feature relationship

The Model-Based-Engineering Transformation

■ Cost of a Discontinuous Environment (Eng. to Ops)

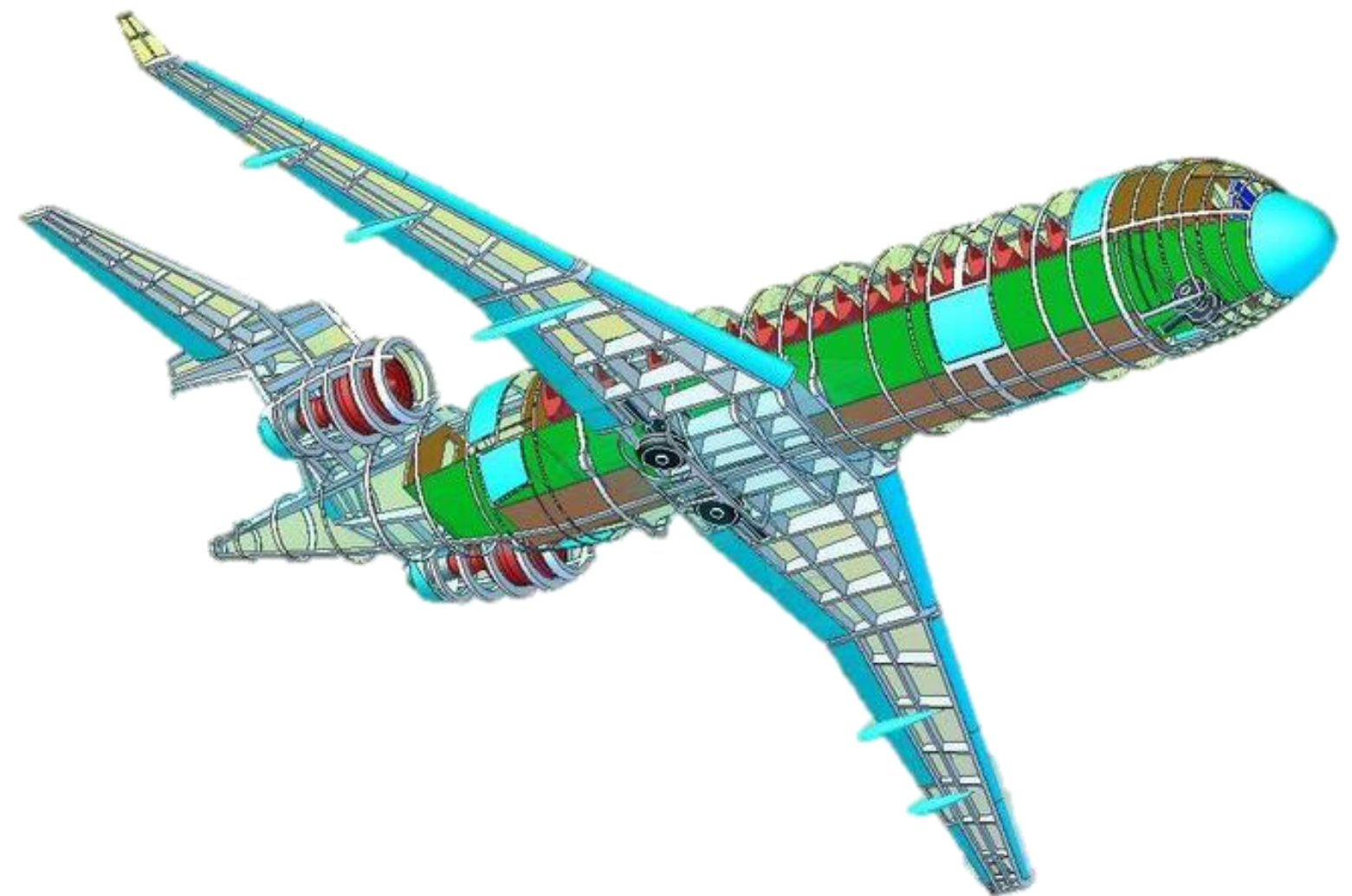
- 3-5% of Revenue is CONSUMED by non-Value tasks engendered by manual movement and interpretation of Data:
 - Bills of Materials – EBOM to MBOM to OBOM to SBOM
 - Work Instruction Graphics (Initial and Sustained)
 - Data Collections (Disconnected from PMI source)
 - Engineering Change + Shopfloor Redlines
- Cycle-time for any Data Preparation and ECO processing is 10X what happens in a Model-Linked environment.
- Manual Processes are highly Error-Prone.
- NOT Capable of supporting the Digital-Twin or Cyber-Asset

■ Benefits of a Model-Based Environment

- 3-5% of Revenue is Redirected to EBIT-DA:
 - Bills of Materials Are Associative E to M to O to S
 - Work Instruction Graphics are Auto-Generated from BOM and As-Built Tables + Defects and Shortages events
 - Data Collections are Associative to Released PMI data and Auto updatable with Log-Files
 - Engineering Change + Shopfloor Redlines Are MBE-Assisted
- Cycle-time for any Data Preparation and ECO processing is 1/10th that of manual processes and free of interpretation errors
- Creates the FOUNDATION for the Cyber-Asset to meet contract req's

The Model-Based-Enterprise – Suggested Short-Term Actions

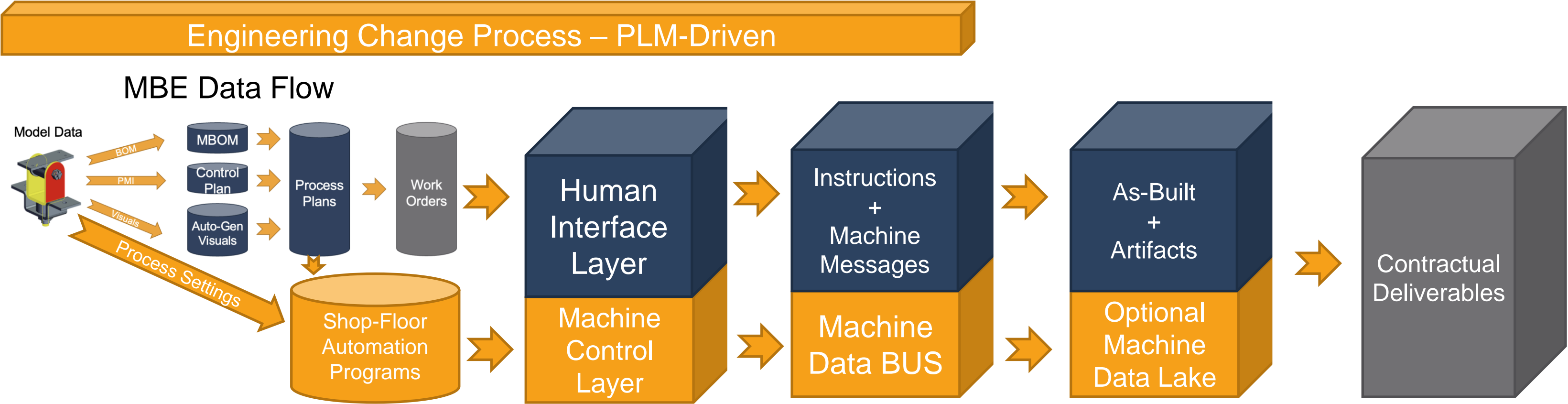
1. Audit and Evaluate Each CURRENT Program for both current GRADE and Possible End-State
 - A 1956 Program mostly reliant on TIF or PDF drawings will NOT Achieve an end-state grade of A without re-engineering.
 - Programs that are either End-of-Life or have very-low volumes (revenue) may not warrant the Process Re-Alignment.
 - **NOTE:** 3 Programs that Don't make the Cut is NOT a reason to stop or delay MBE deployments on the Programs that DO!
2. Prioritize the Top programs that Quality for MBE deployment
3. Start with ONE Top Program and learn.
4. Adjust Next Program based on Lessons-Learned
 - Be Agile, Don't waterfall
 - Get Executive commitment (Disruptions and Changes)





The Industrial Internet of Things (IIOT)

The Industrial Internet of Things (IIOT or Manufacturing 4.0)



All Control-Data (Settings and Actuals) are Linked to Part/Rev/Order/Unit/Program/Contract

The Industrial Internet of Things (IIOT or Manufacturing 4.0)

Cost of a Poor or Missing Machine Integration Layer

- Tens of Thousands of Data Variables are being collected and ultimately MOTHALLED – Inaccessible
- Few Product or Process Engineering decisions are being made with the benefit of Actual data from the Machine layer
- Changes in Design Engineering or Process Engineering cannot trigger Control-Program Updates and Alerts
- Machine Data is inaccessible to the next-generation neural engines for Predictive and Preventative Actions
- Product Quality is ISOLATED from Machine or Tool performance trends. REACT to defects

Benefits of a Machine Integration Layer

- Product and Process Engineers can now make INFORMED decisions as they strive for ROBUST designs and processes
- Feature and Spec Changes auto-Trigger Program updates in CONNECTED repositories
- Sustaining Engineers can now see REAL-TIME images and dimensional data to rationalize and optimize the Maintenance Requirements
- Customer-mandated artifacts are collected as a matter of course.
- Quality Engineers now can analyze real-time process capability trends and act BEFORE defects are allowed to occur

The IIOT Layer – Suggested Short-Term Actions

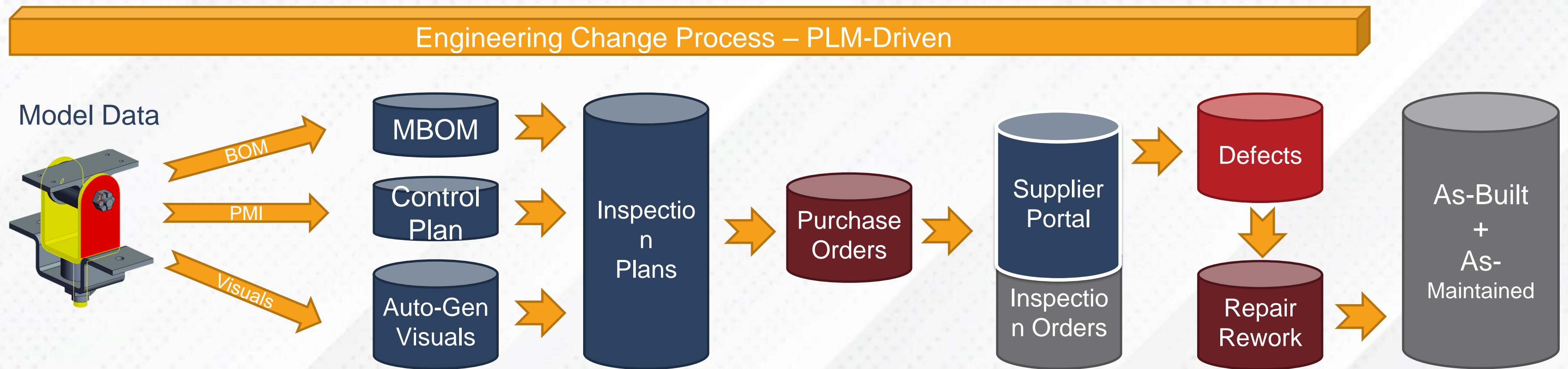
- Prioritize your Machine Integration Strategy based on:
 - Program Opportunity for Financial Return
 - Customer Contractual Requirements
 - Process Quality Paretos (Where can I best use the real-time feedback)
- Utilize a Commercial Machine BUS (Kepware) to enables existing machines in transmitting to MES
 - Start Small. Focus on key machines based on priorities identified above
 - Start to IMBED the Machine Control Programs and Settings INTO the Work Instructions at the step level
 - Enable the **OPC-UA** to **MQTT** to **MES** data flow path and stress test it
- Build a SIMPLE Machine-Data-Lake
 - Establish a standardized Machine-Data Schema that can be accessed by all key Actors
 - Grow the Schema capabilities based on Agile deployments, not pie-in-the-sky requirements
- As you acquire new equipment for new programs
 - Make sure your machine, scanner, printer decisions are empowered by your IIOT capabilities
 - Encourage the Machine providers to work with MES providers to facilitate data flows.





The "Connected" Supply-Chain

The CONNECTED Supply Chain



Upwards of 80% of the end-Item Cost-of-Goods Sold is Purchased.

The CONNECTED Supply Chain

Cost of a Traditional or Disconnected Supply Chain

- Communication to and from the Vendor predominantly happens via e-mails and Excel Spreadsheets
- The Process/Quality history and trends of your purchased parts stays hidden from your Process and Quality Engineering team
- Defects are found in Receiving Inspection making it impossible to maintain rates and delivery dates
- Multi-Level Part Origins and Traceability is difficult to Manage
- In-Process features are difficult or impossible to measure on a finished part
- No Digital Data available to incorporate into the As-Built

Benefits of a Connected Supply Chain

- Model and BOM Data Changes are propagated electronically to all the affected suppliers
- FAI/PPVs are automatically triggered
- Difficult to control Processes and deviations are visible in real-time
- Suppliers collaborate on Defects and Audit Findings for the best course of Action
- Entire Digital As-Built and Traceability/Origin data is seamlessly incorporated into the End-Unit (Cyber Unit) Data Package
- Receiving Inspection is reserved ONLY for Audits and Over-Inspections

The Connected Supply Chain – Suggested Short-Term Actions

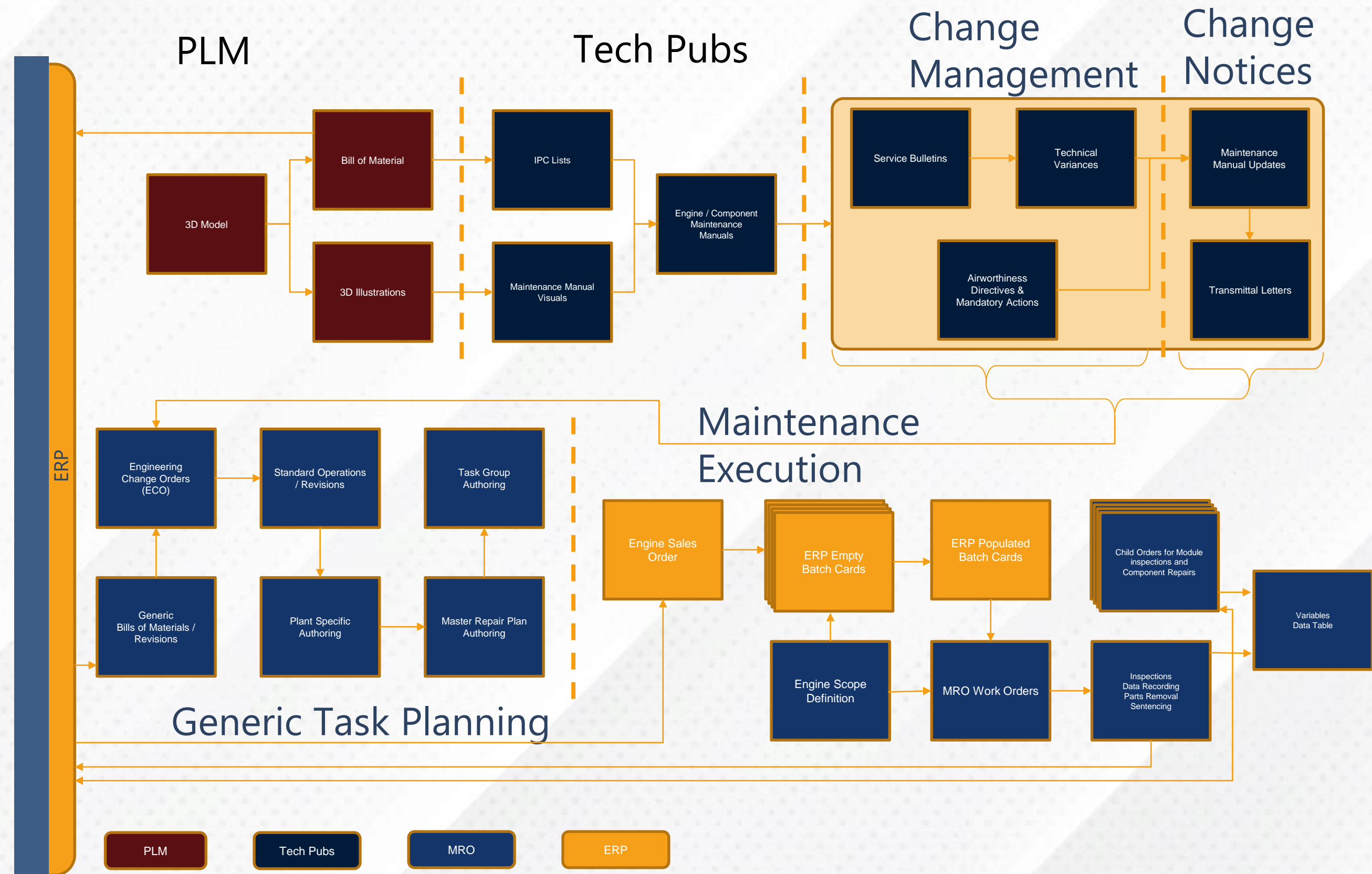
- Select a list of 5-15 KEY Suppliers interacting on an Important and growing Program
- Set-up the Quality Landing Page within your ERP Vendor "Portal"
- Select on a per Vendor part basis, what level of Oversight is desired:
 - PPAP / FAI Only
 - Certs and Reps verification and Approval
 - Full Feature by Feature tracking
- Add-Non-Conformance Collaboration
- Add Corrective Actions
- Add Audits
- Once above Mature, Add 15-30 Suppliers per month.





NEXT-GENERATION Sustainment

The Next Generation – CONNECTED – Sustainment Data Flow



Next Generation, CONNECTED MRO

Current State – Opportunities

- Most of Today's Overhaul processes are managed with paper binders
- Completions and Stamps are Physical
- Red-Lines and Scope Changes are done manually
- The ICA Content and Work Instructions are SEPARATE
- Validation is attempted end of day or end of week
- There is Little visibility to WIP Status:
 - Days in Service
 - Delays
 - Shortages
- Material Preparation (Carts & Kits) is VERY Difficult

To-Be Process

- ICA Content and Work Instructions are Unified
- SBOMs, which describe TARGET Unit configurations comes directly from PLM System and is propagated to ERP
- Each Instruction Package is equipped with a 3D Illustrated Parts Catalog (IPC) to allow three click materials requests for unexpected parts
- When the task is Complex, Instructions will supplement the auto-generated 3D views with full Assisted Reality (Vuforia) Instructions
- All Material Sentencing is done in real-time
- Assembly Carts are managed from the Assembly/Disassembly workbench electronically

STIMULON

Please reach-out this week to the following resources currently at the event to:

- Schedule deeper dives into your current operational methods and practices
- Review completed projects at other sites and enterprises
- Quantity the ROI in your environment

- iBASEt University (Dean: Mindi Gascho)
- PTC – ThingWorks Team
 - Kepware
 - Vuforia
- ATS Global
 - IIOT
 - Machine Data Lakes
- Accenture – DXC – Cyient – Transformational Consulting
- Speak to your Account Manager to Coordinate



THANK YOU

QUESTIONS?