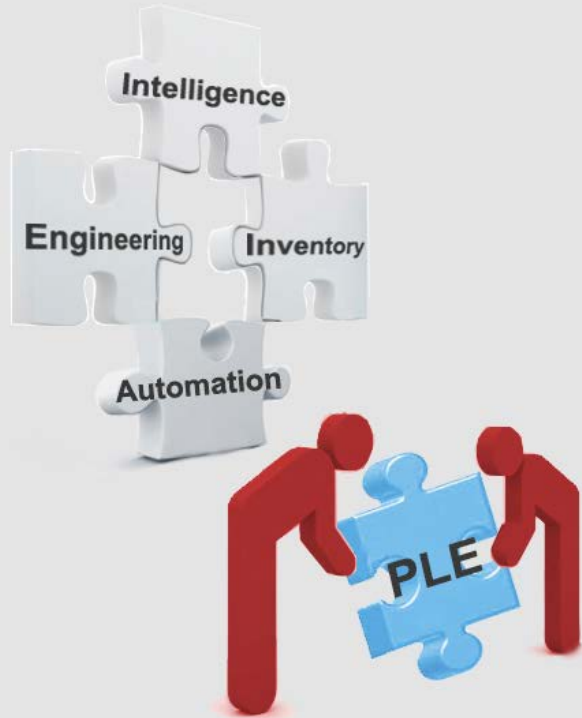


Connected Real-time Digital Enterprise



Building Blocks to a Connected Real-Time Digital Enterprise

Conrad Leiva

Oct, 2017

Agenda

- Goals of a Digital Thread
 - for a Connected Real-Time Digital Enterprise
- Building Blocks for a Digital Thread – Connecting the Dots
- How does the Digital Thread look like?
 - Yesterday, Today, Tomorrow

We have made some progress... right?



Engineering has always been very supportive of Manufacturing

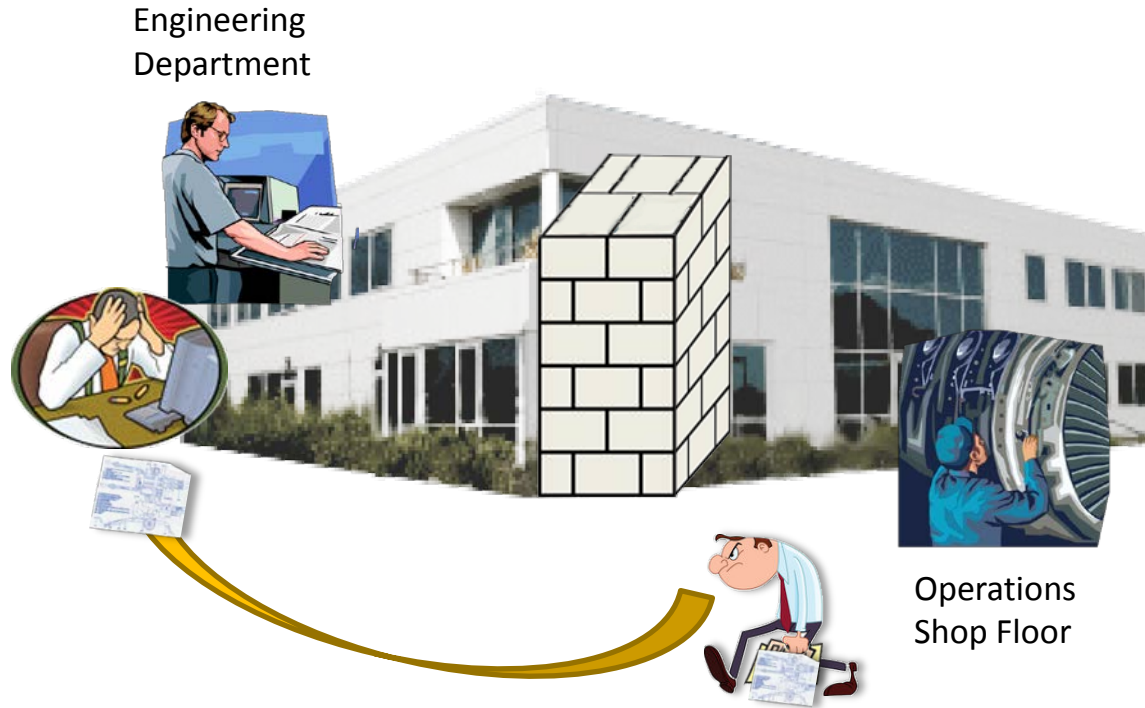
Yesterday

Engineering
Department

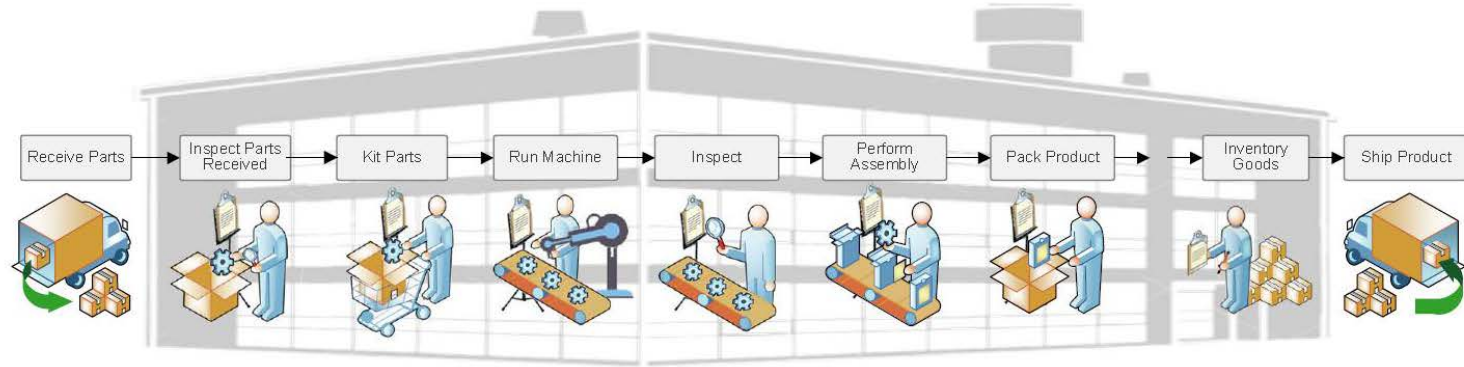


Operations
Shop Floor

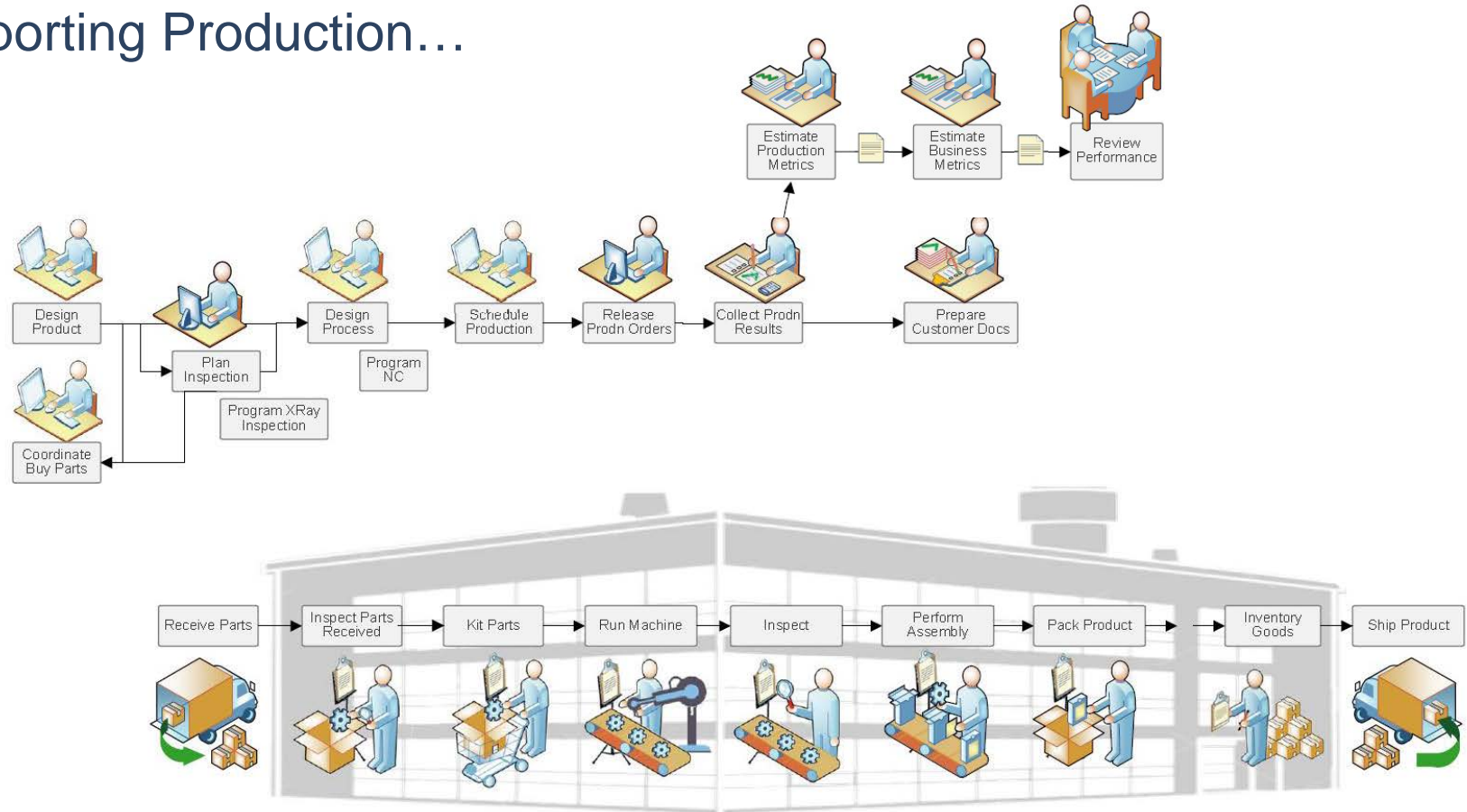
Especially when we needed changes...



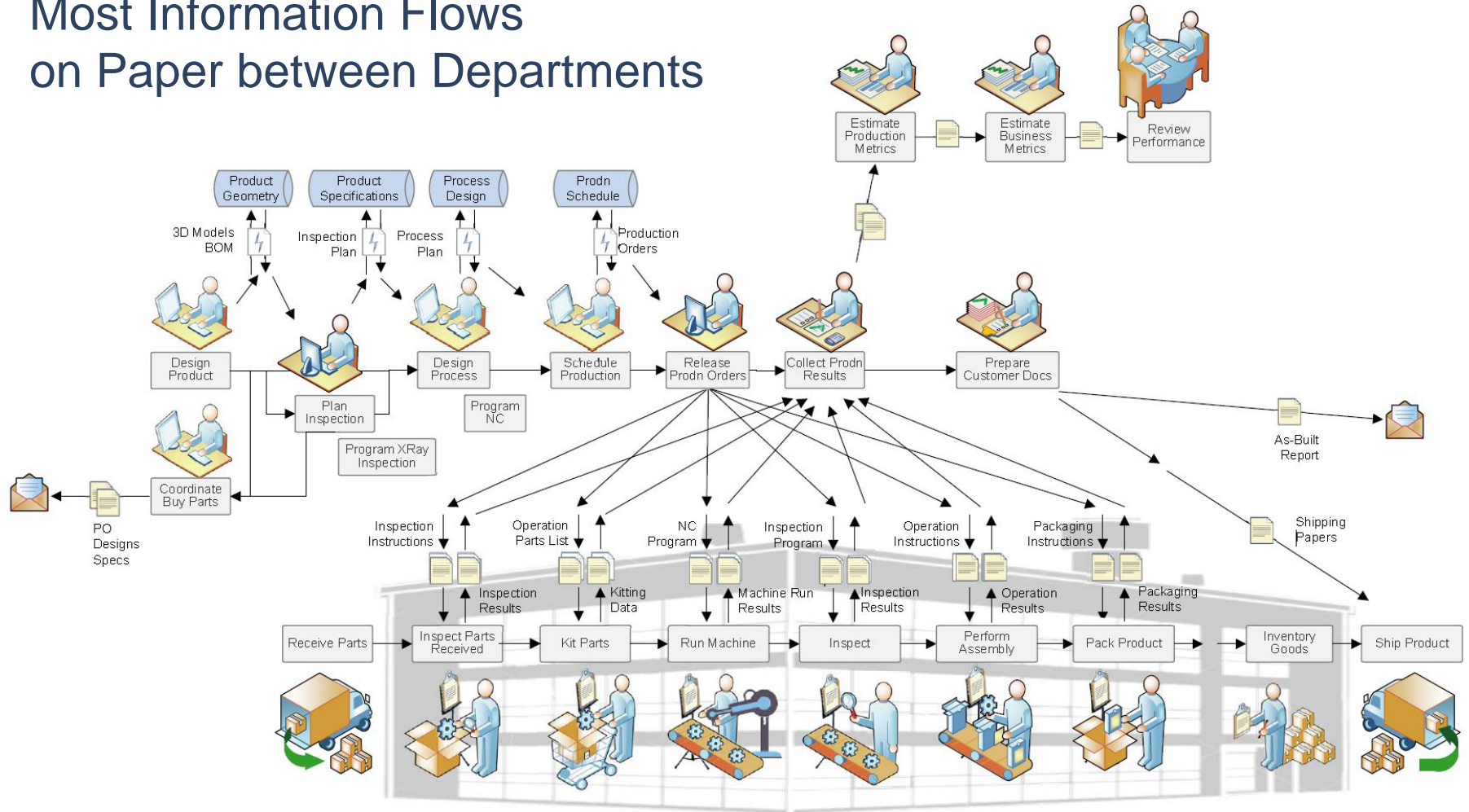
Physical Flow through the Plant...



Business Processes supporting Production...

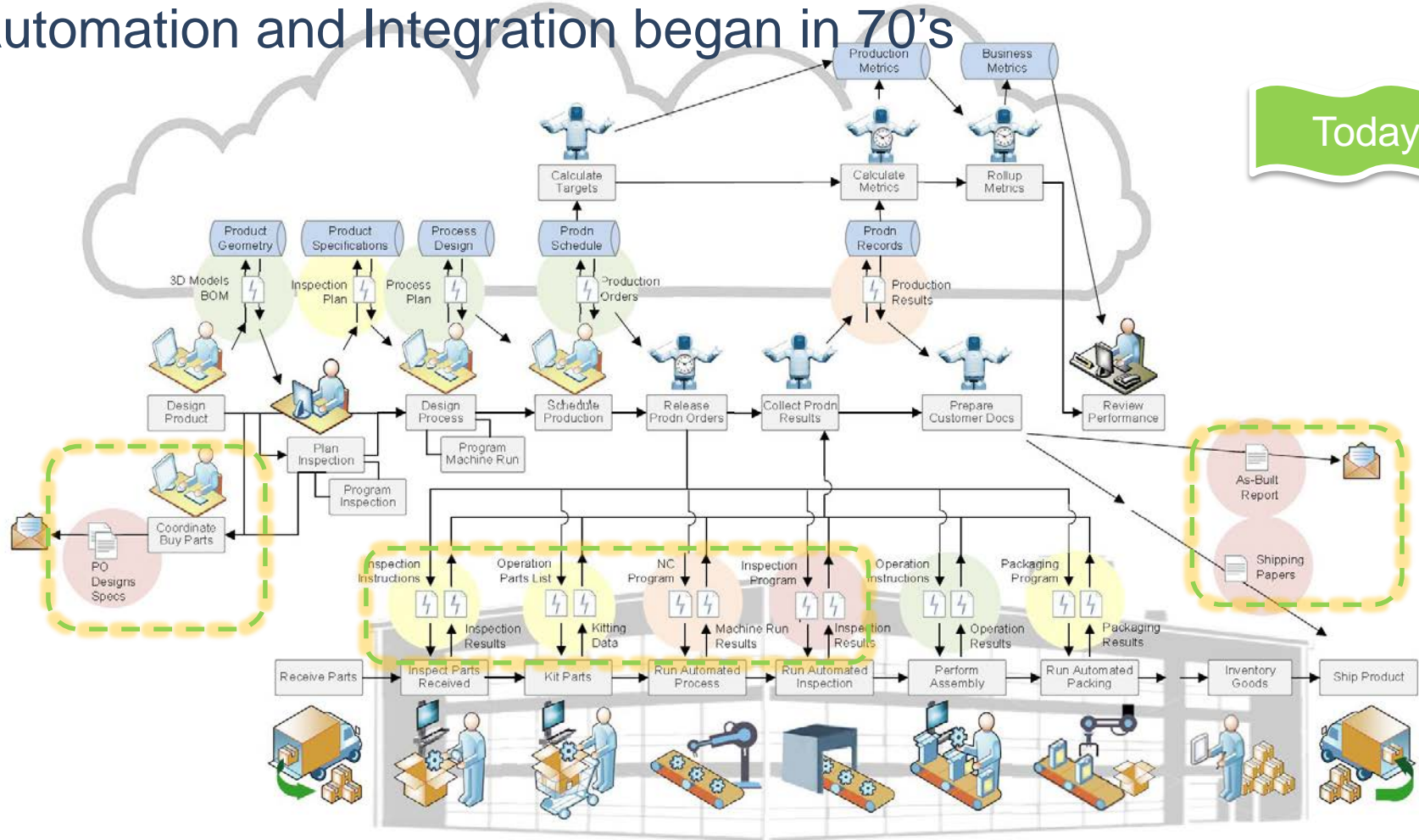


Most Information Flows on Paper between Departments

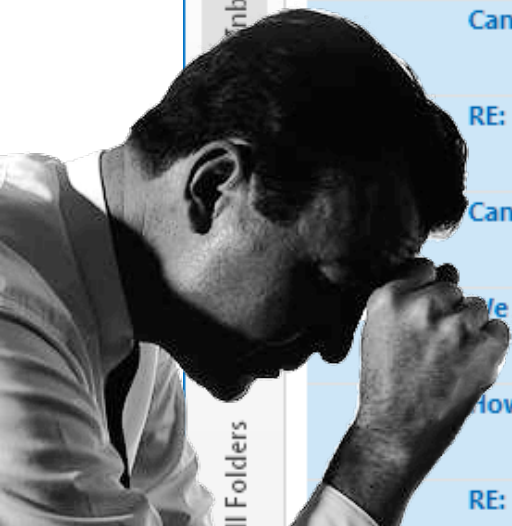


Automation and Integration began in 70's

Today



But Email is not a Digital Thread



FILE HOME SEND / RECEIVE FOLDER VIEW

All Unread

Search Current Mailbox |

! | | | SUBJECT

RECEIVED

▲ Date: Today

Eng Change effective next delivery

Wed 6/11/2014

We need to expedite part ABC1234 please

Wed 6/11/2014

Where is the part your promised?

Wed 6/11/2014

Can you clarify these specifications

Wed 6/11/2014

RE: Urgent- Please incorporate this engineering change ASAP

Wed 6/11/2014

Can you expedite this modification to that critical part?

Wed 6/11/2014

We will have to renegotiate price to implement these changes

Wed 6/11/2014

How can we improve communications?

Wed 6/11/2014

RE: Last Notice - Your supplier level will be demoted if you don't clear this problem right away

Wed 6/11/2014

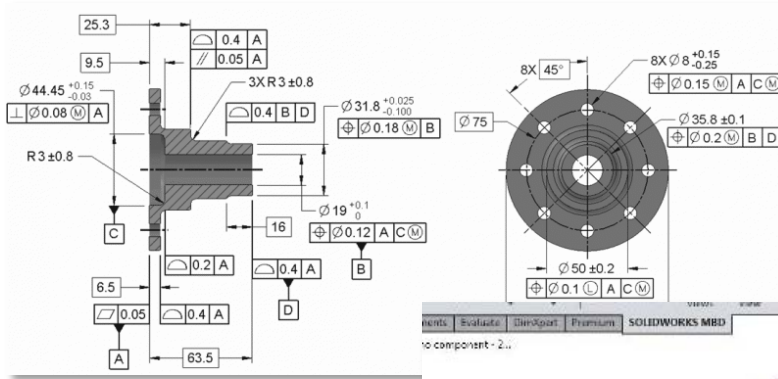
All day emails and
phone calls to try to
communicate changes accurately

Deltak 11

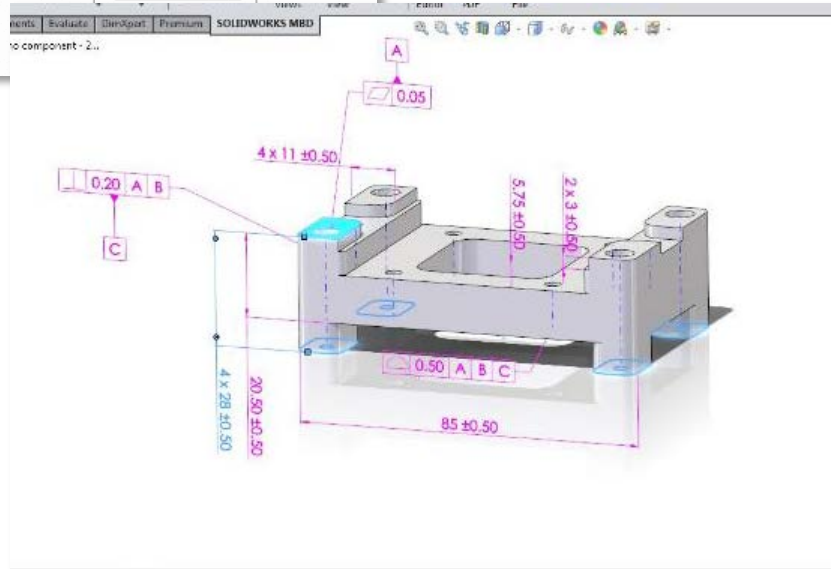
Inbox 6554

Il Folders

The Journey to the Model-Based Enterprise

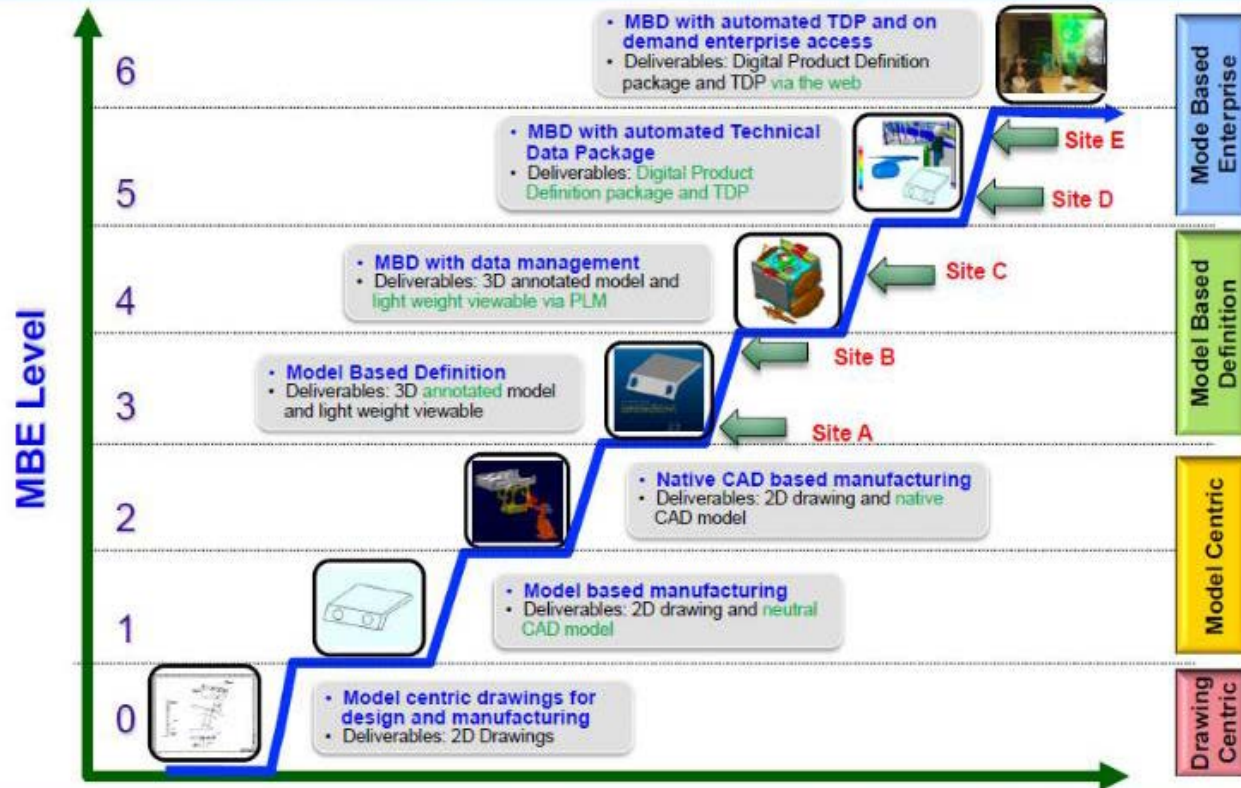


From 2D to 3D

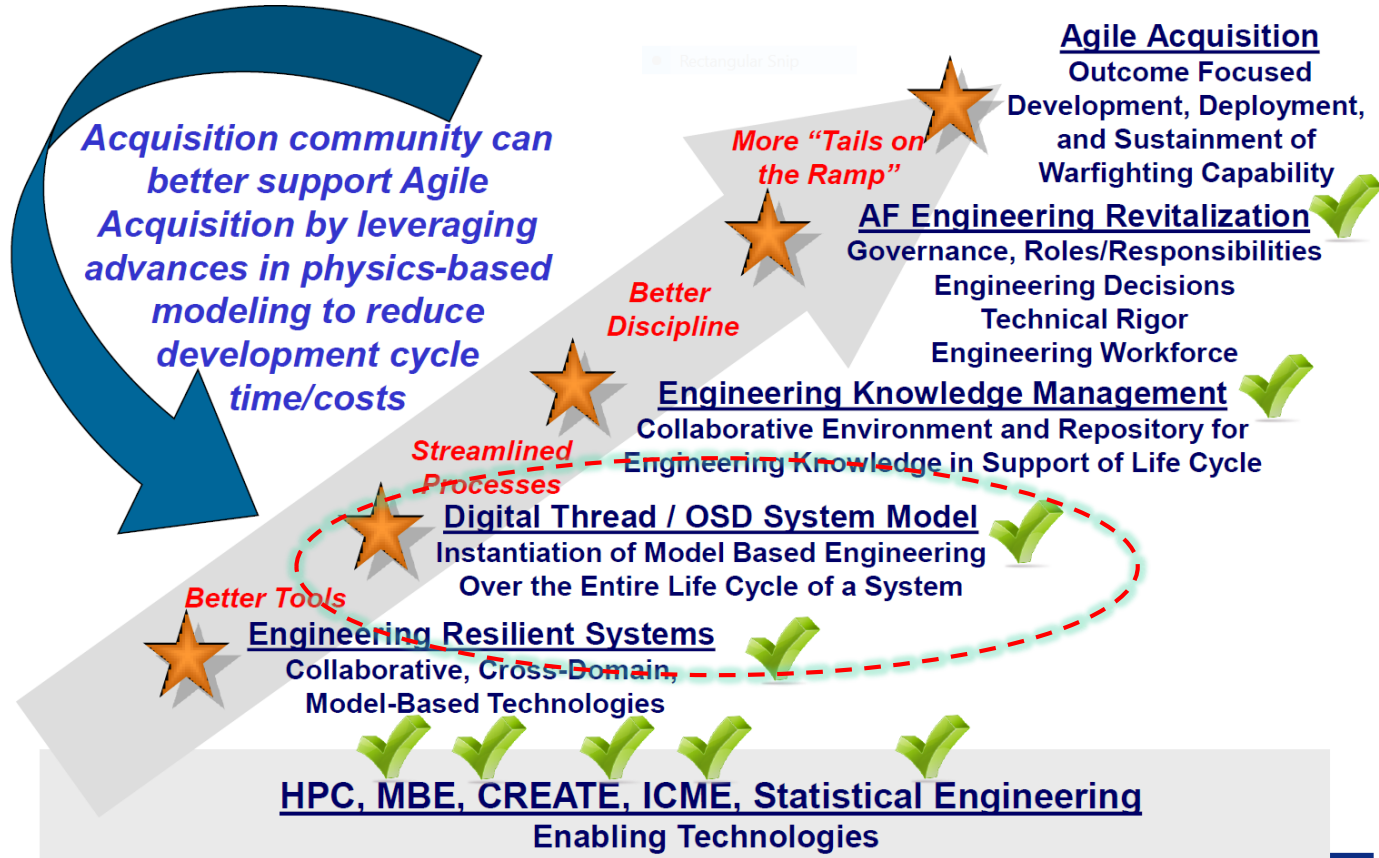


We are in the transition from MBD to MBE

Global Product Data Interoperability Summit | 2014

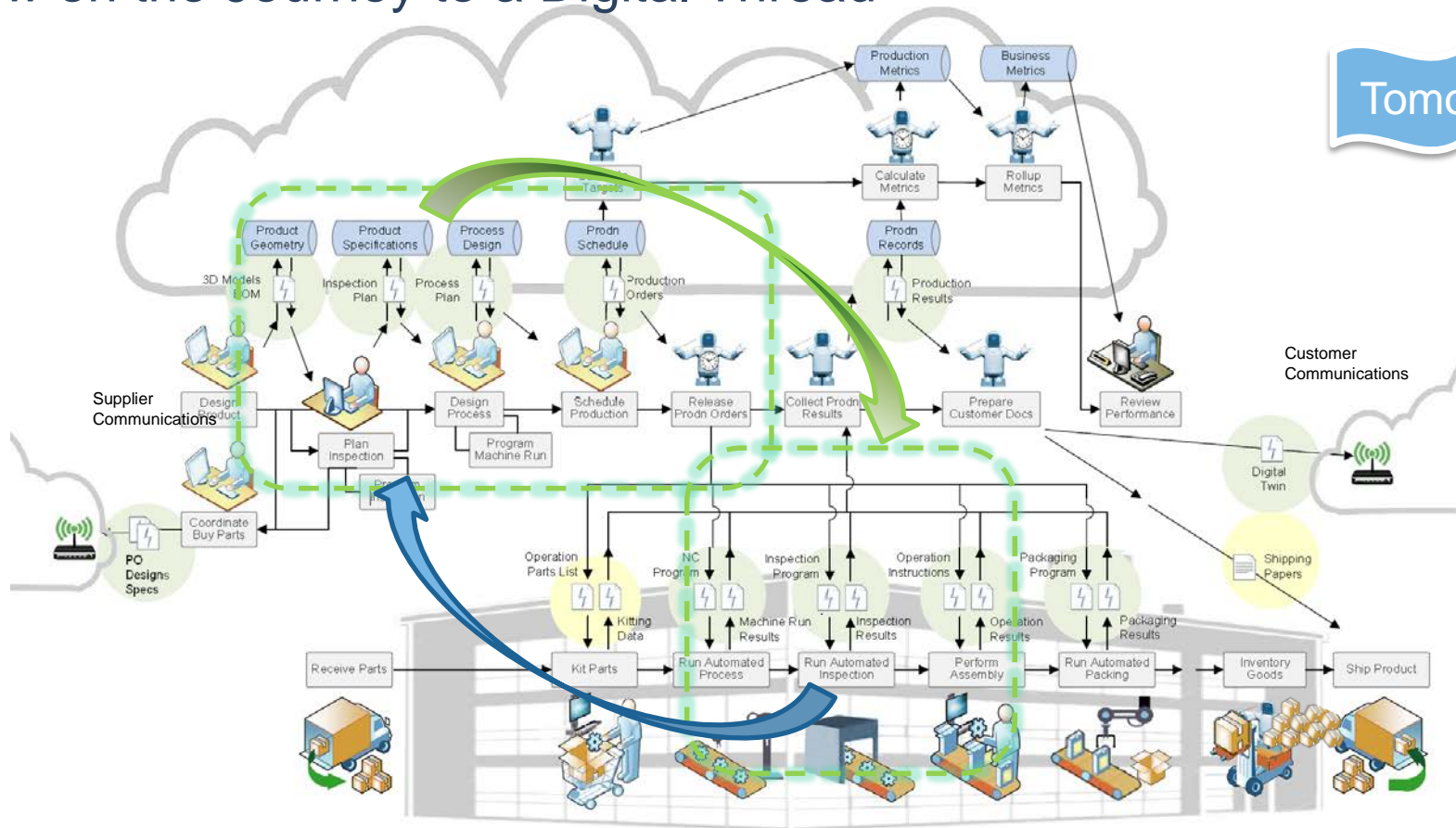


DoD adds Digital Thread as Acquisition Requirement



Now on the Journey to a Digital Thread

Tomorrow



iBASEt is a Recognized MES/PLE Leader in Complex Discrete Manufacturing

Airframe Assembly

Gulfstream



Aircraft Components



Industrial & Fabricated Parts



Space Products



Naval Components



Commercial and Military MRO



Defense Electronics



Military & Classified Weapons



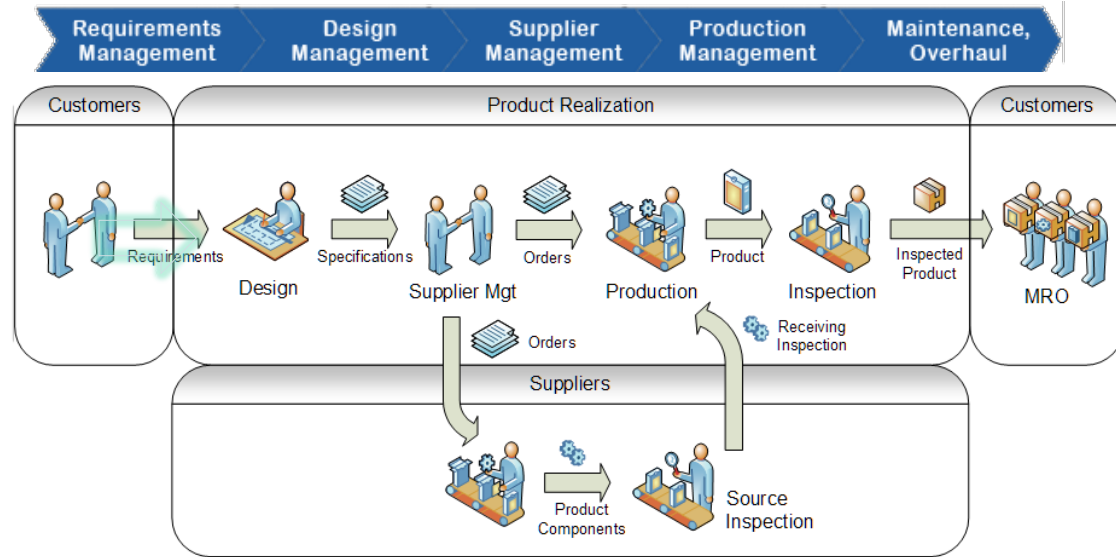
iBASEt's Solution = **Product Lifecycle Execution**

A key piece required for companies striving for ...

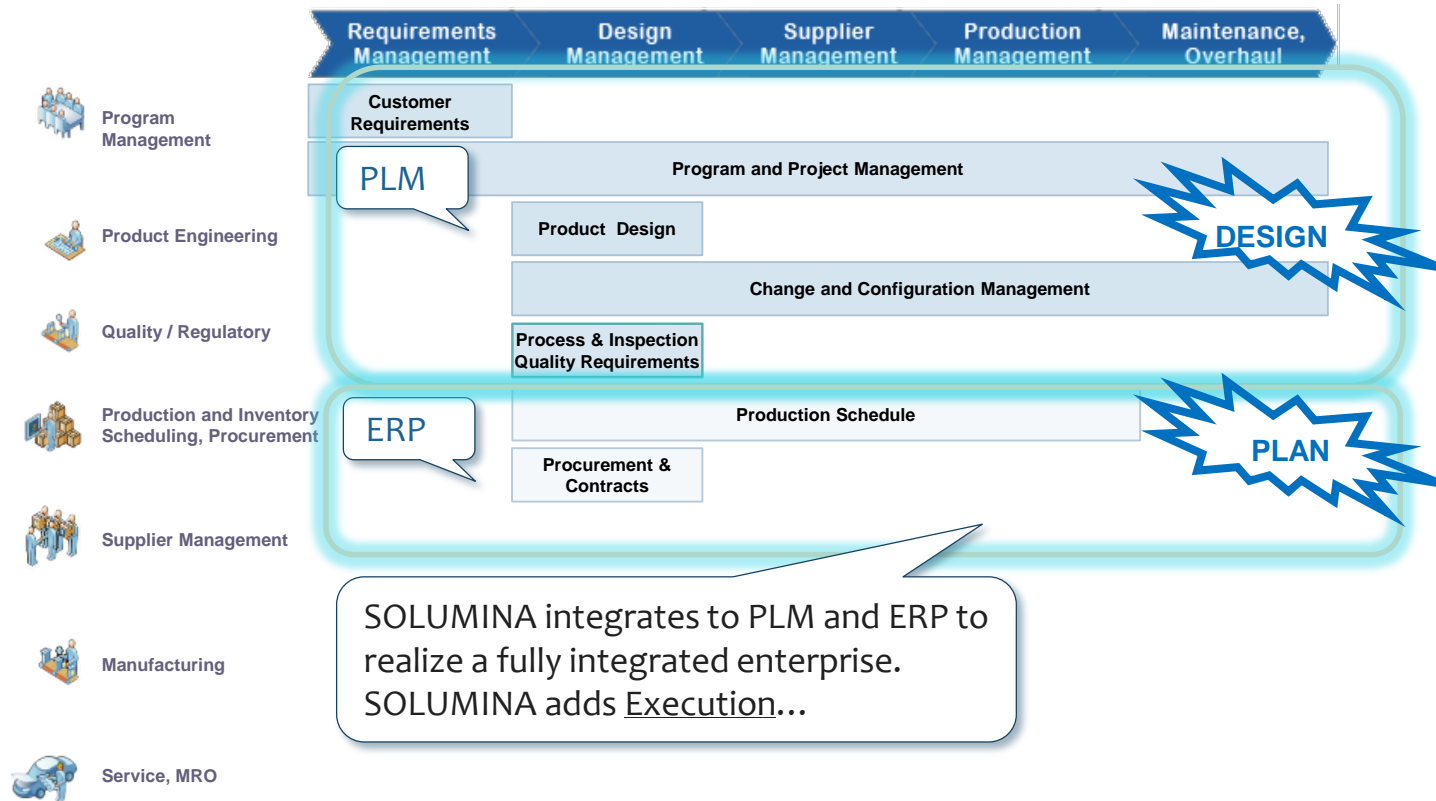
The Connected Real-time Digital Enterprise

The Digital Thread for the entire Product Lifecycle

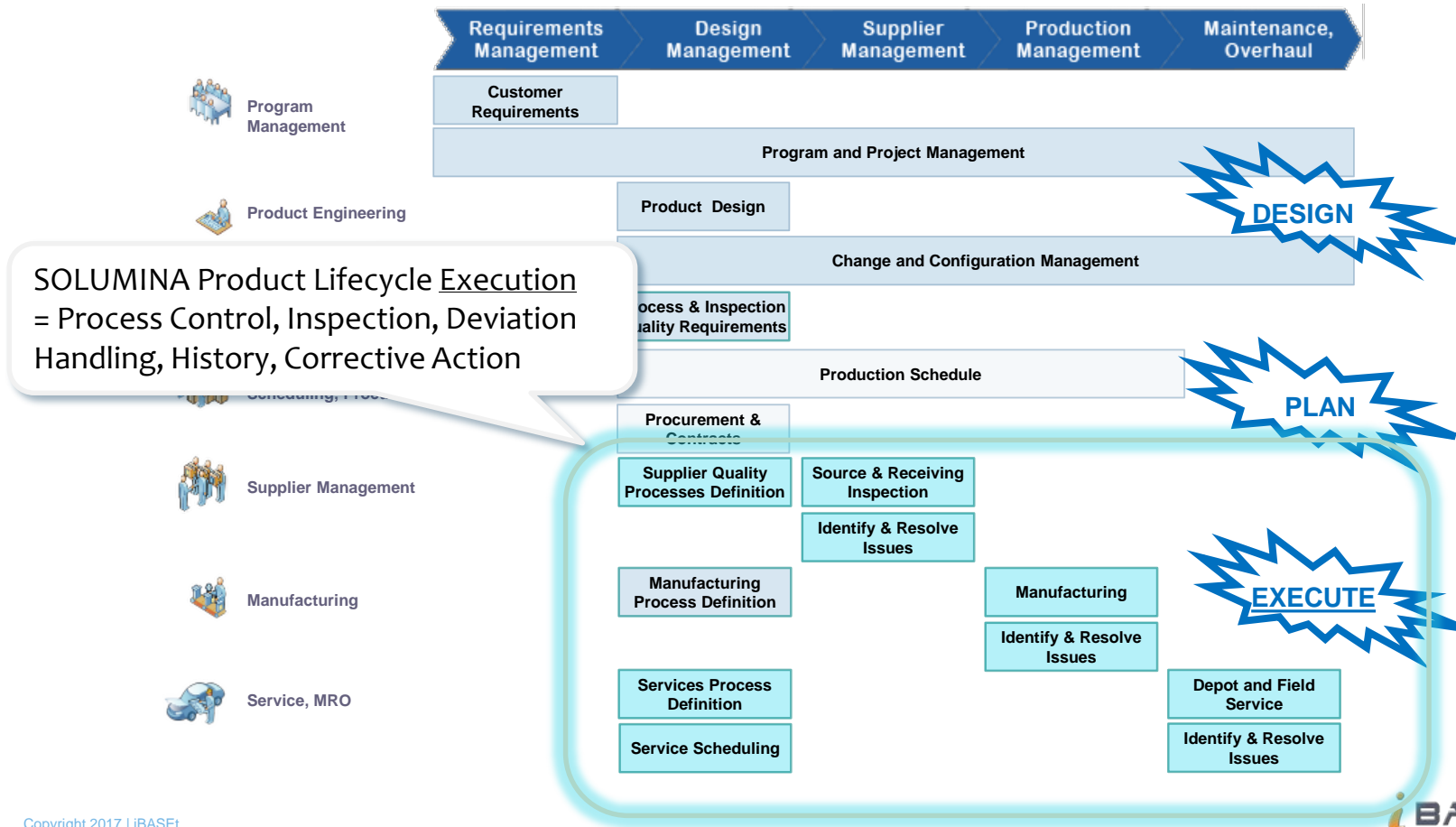
Product Realization Processes



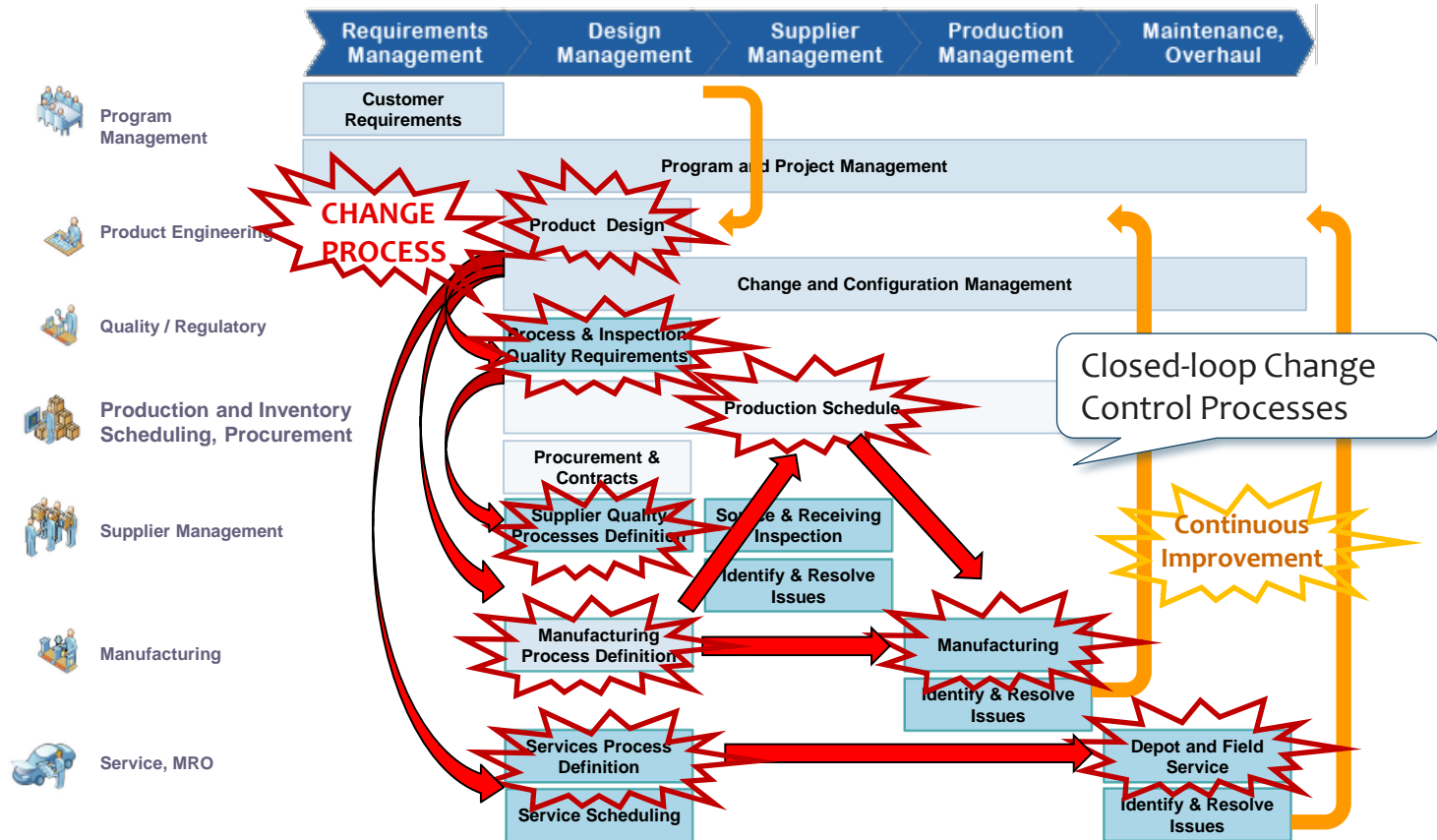
The Digital Thread for the entire Product Lifecycle



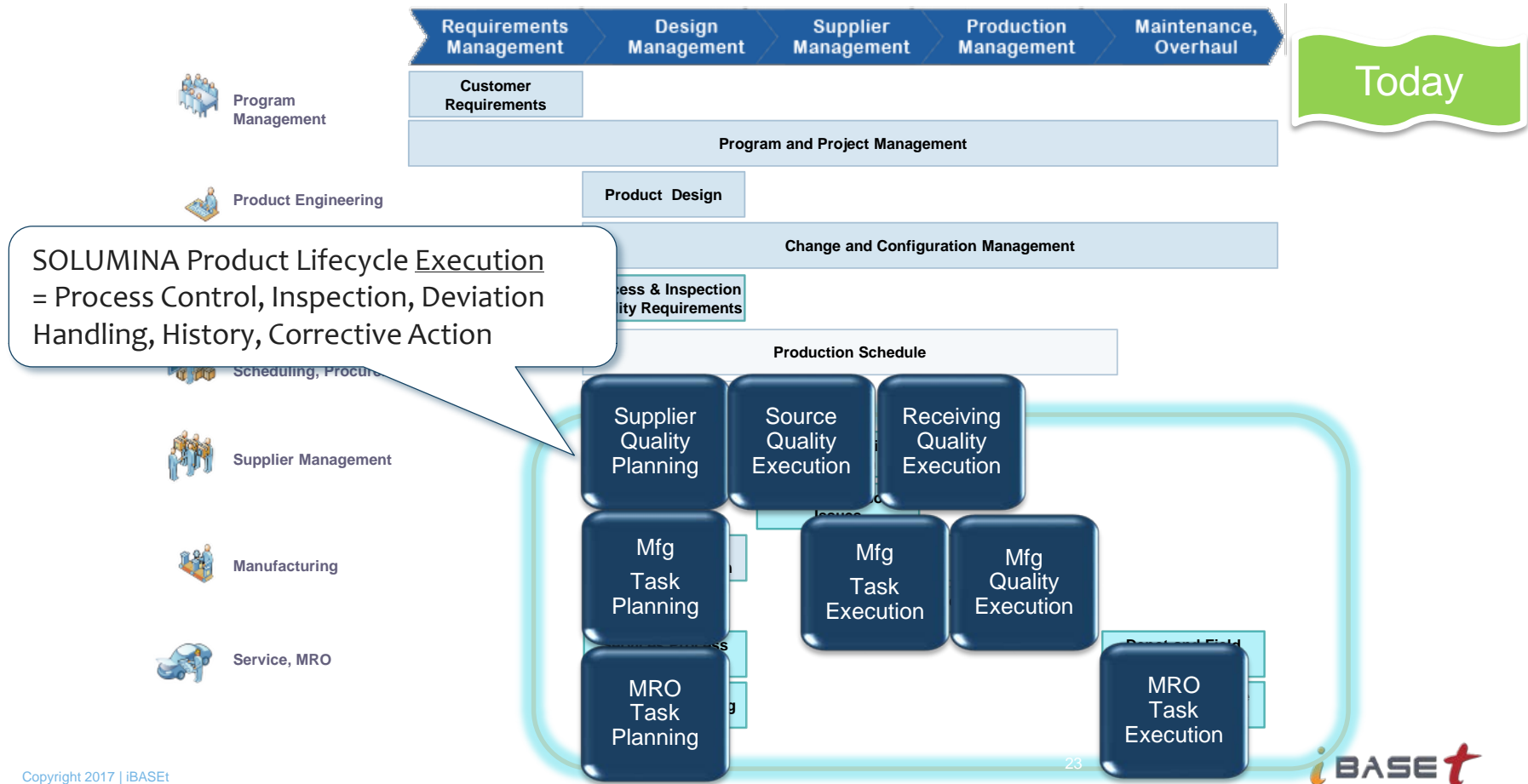
The Digital Thread for the entire Product Lifecycle



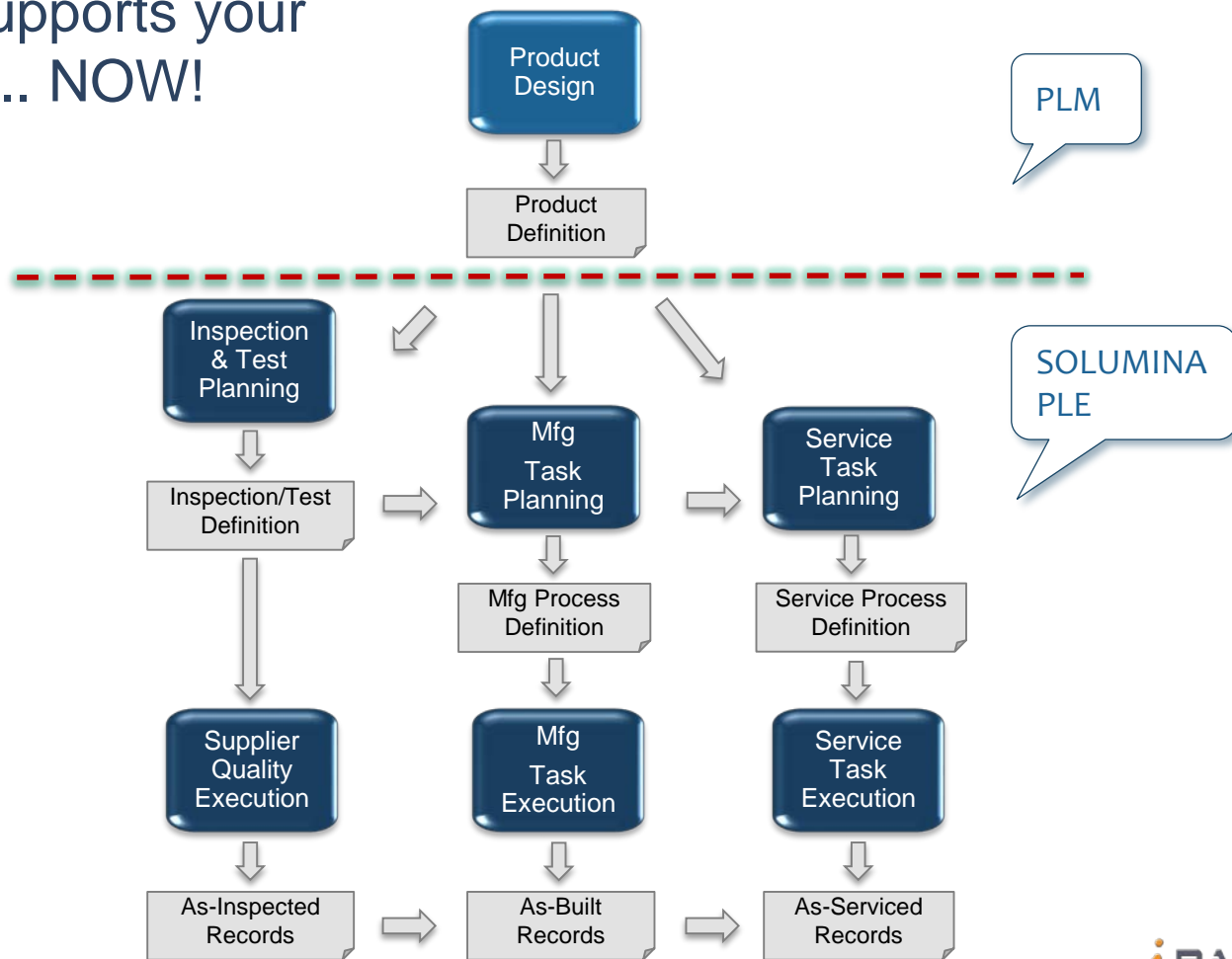
Controlled Closed-Loop Change Processes



The Digital Thread needs Product Lifecycle Execution



SOLUMINA supports your Digital Thread.. NOW!



Goals of the Digital Thread

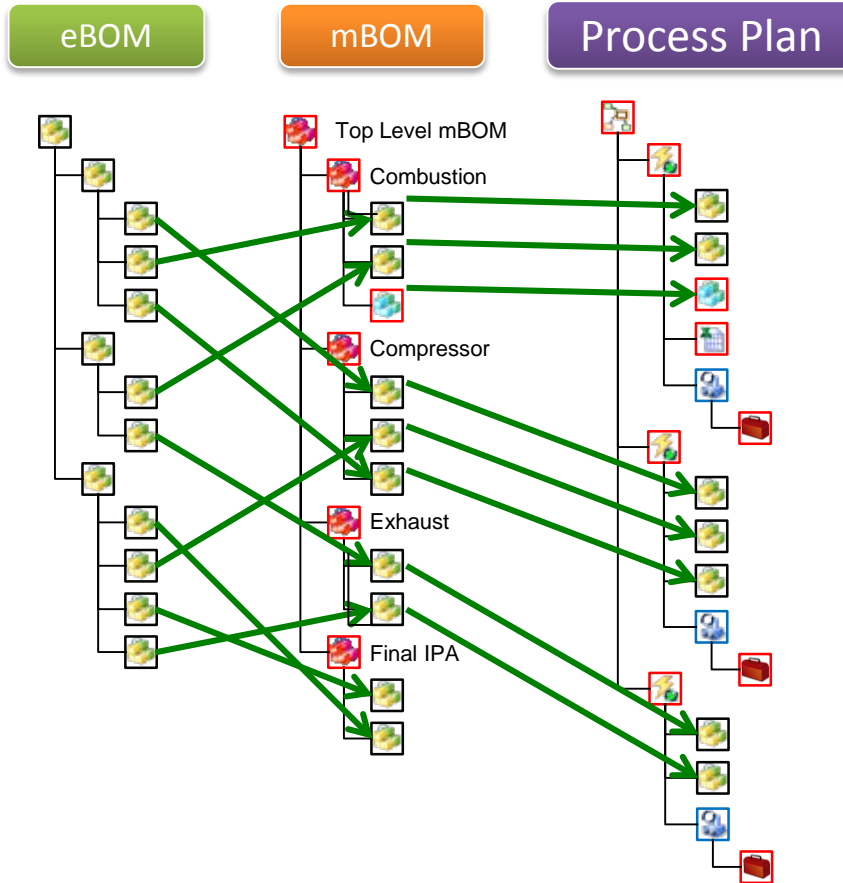
1. The Right Information at the Right Place at the Right Time
2. Data is only Entered Once !
Automatically distributed or linked to other systems as needed
3. Every Digital Handover is Structured, Parsable and Revision Controlled
4. Downstream processes Minimize Manual Translation or Transformation
5. Downstream systems Maintain Digital Associativity for Change Management of Derived Objects

Product Lifecycle Execution

Today

For Manufacturing...

PLM: eBOM to mBOM to Process Plan



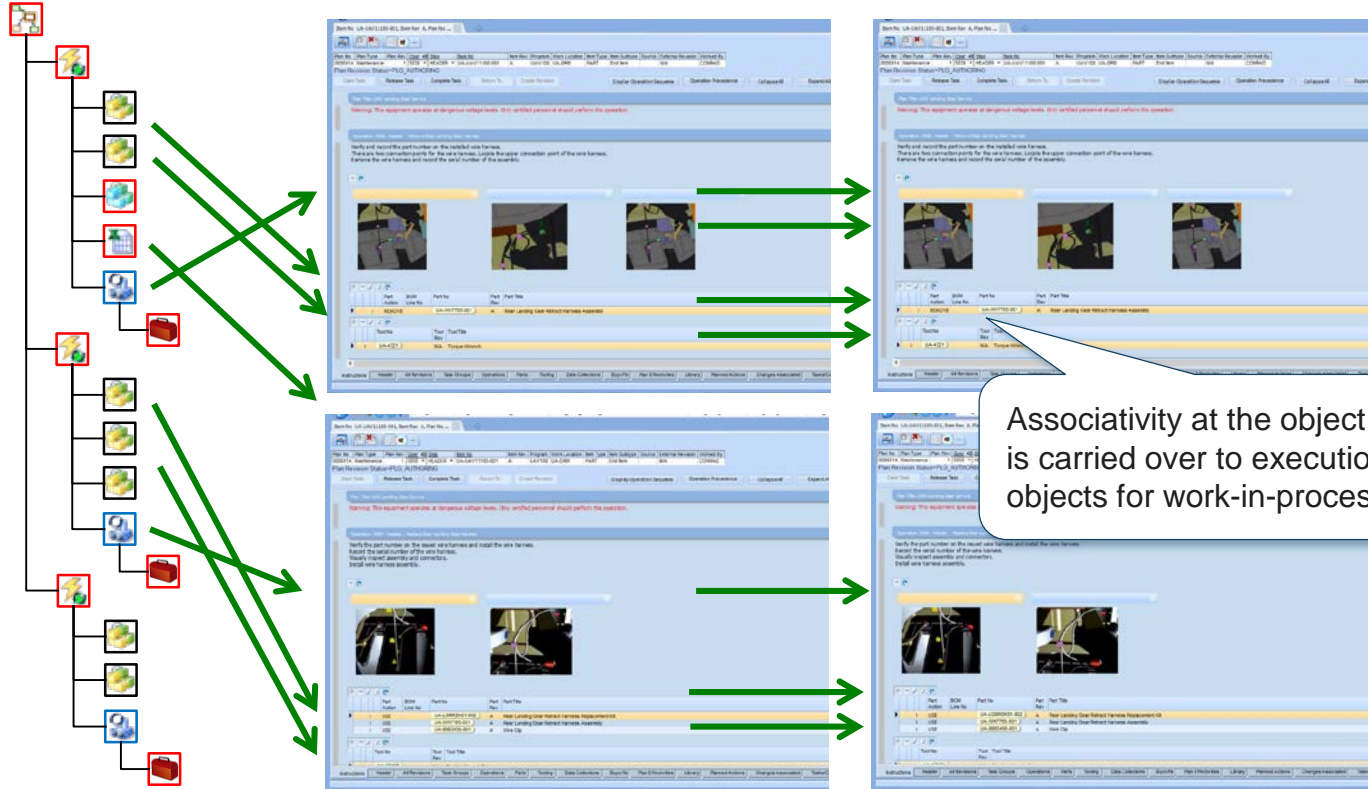
Associativity at the object level facilitates change management

PLM -> Solumina Execution

Process Plan

Work Plan

Work Order



Order No UC103, Item No 0000001067 <http://vmsrv-ptc10.ibaset.com/Windchill/serve...> <http://vmsrv-ptc10.ibaset.com/Windchill/serve...>

Order No UC103, Item No 0000001067

Oper No 0010, Step No HEADER

Next Sign On Initiate Discrepancy Display Print Label Scrap Units Need Assistance Partial Completion Collapse All Expand All

Operation: 0010 - Header - ACTIVE - Name_0010

Please read Work Instructions!

Compare Operation Alteration

1. Separate Hub from Differential Assembly.
2. Insert Differential into Main Case.
3. Press Hub into Differential Assembly.

Collect	Copy	Display	Skip	Ack All Parts
Hold?	Part Action	Part No	Part Rev	Part Title
<input checked="" type="checkbox"/>	USE	0000001073	A	DIFFERENTIAL, SUB
<input checked="" type="checkbox"/>	USE	0000001259	C	CASE, MAIN

Collect	Copy	Display	Skip	Ack All Parts
Hold?	Part Action	Part No	Part Rev	Part Title
<input checked="" type="checkbox"/>	USE	0000001059	A	CAP SCREW, CLUTCH SHAFT

Collect	Copy	Display	Skip	Ack All Parts
Tool No	Tool Title	Tool Rev		
0000000302	E	Pneumatic Wrench		

Tag : 0000000841_1121817-3233,Rev : 1

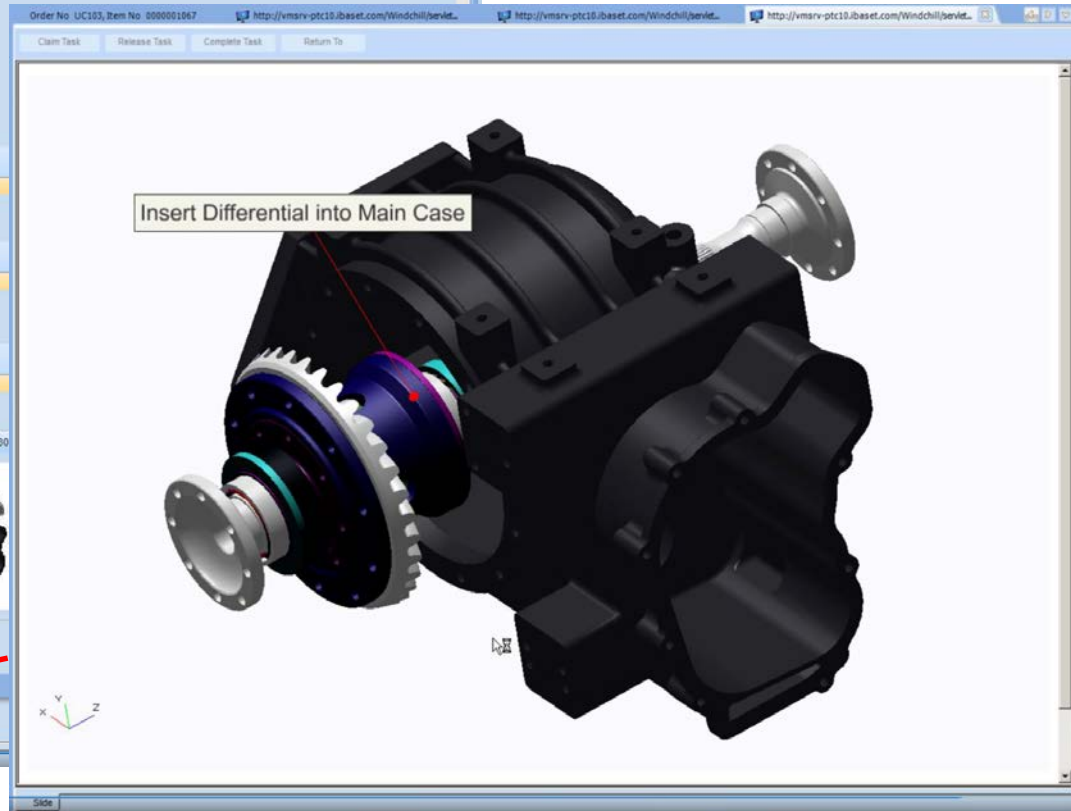
Tag : 0000000841_1121842-3232,Rev : 1

Tag : 0000000841_1121830

Operation: 0010 - Footer

Instructions Header SerialLot Issued Parts Planned Actions Changes Associated Order Notes Holds Alternate Items

Display illustrations



User SUPERUSER connected to http://VMSRV-UC2015
set.com:8088/localg8/boot\Instructions.MfgInstructions&@InvokeToolMode=EDITMODES.Edit_PL_ORDER_ID=MF1_F01919AF4F3886F9DE8D17789CFBA1E0,@UserId=SUPE

Order No UC103, Item No 0000001067
Order No UC103, Item No 0000001067
Oper No 0010, Step No HEADER

Next
Sign On
Initiate Discrepancy
Display
Print Label
Scrap Units
Need Assistance
Partial Completion
Collapse All
Expand All

Order Info: Gear Box Assembly Plan
Gear Box Assembly Plan

Operation: 0010 - Header - ACTIVE - Name_0010

Please read Work Instructions!
Compare Operation Alteration

1. Separate Hub from Differential Assembly.
2. Insert Differential into Main Case.
3. Press Hub into Differential Assembly.

Collect	Copy	Display	Skip	Ack All Parts					
<div> Holds? </div>	<div> Part Action </div>	<div> Part No </div>	<div> Part Rev </div>	<div> Part Title </div>	<div> Ref Des </div>	<div> UOM </div>	<div> BOM Line No </div>	<div> Qty </div>	<div> Opt? </div>
▶	USE	0000001073	A	DIFFERENTIAL, SUB	N/A	EA		1	N
	USE	0000001259	B	CASE, MAIN	N/A	EA		1	N

Collect	Copy	Display	Skip	Ack All Parts					
▶	USE	0000001059	A	CAP SCREW, CLUTCH SHAFT	N/A	EA	N/A	6	N

Collect	Copy	Display	Skip			
▶	Tool No	Tool Rev	Tool Title	Type	Qty	Opt?
	0000000302	E	Pneumatic Wrench	separable	1	N

Tag : 0000000841_1121817-3233,Rev : 1
Tag : 0000000841_1121842-3232,Rev : 1
Tag : 0000000841_1121830-3231,Rev : 1

Instructions
Header
Serial/Lot
Issued Parts
Planned Actions
Changes Associated
Order Notes
Holds
Alternate Items

Copyright 2017 | iBASET

Data Collection

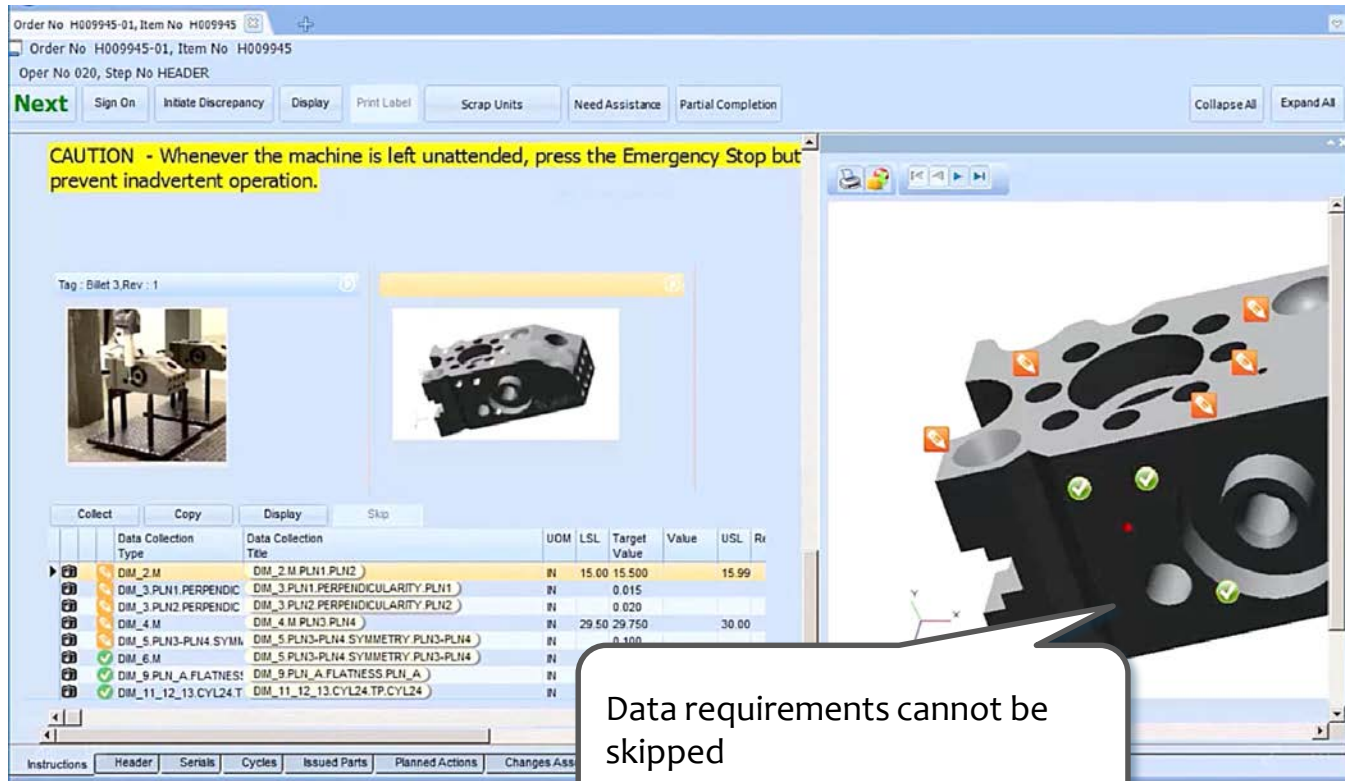
- Inspection Data and Job Buyoff Signatures

Order No H009945-01, Item No H009945
Order No H009945-01, Item No H009945
Oper No 020, Step No HEADER

Next Sign On Initiate Discrepancy Display Print Label Scrap Units Need Assistance Partial Completion Collapse All Expand All

CAUTION - Whenever the machine is left unattended, press the Emergency Stop but prevent inadvertent operation.

Tag: Billet 3, Rev: 1



Collect	Copy	Display	Skip	Data Collection Type	Data Collection Title	UOM	LSL	Target Value	Value	USL	Rr
				DIM_2_M	DIM_2 M PLN1,PLN2	IN	15.00	15.500	15.99		
				DIM_3_PLN1 PERPENDIC	DIM_3 PLN1 PERPENDICULARITY PLN1	IN		0.015			
				DIM_3_PLN2 PERPENDIC	DIM_3 PLN2 PERPENDICULARITY PLN2	IN		0.020			
				DIM_4_M	DIM_4 M PLN3,PLN4	IN	29.50	29.750	30.00		
				DIM_5_PLN3-PLN4 SYMM	DIM_5 PLN3-PLN4 SYMMETRY PLN3-PLN4	IN		0.100			
				DIM_6_M	DIM_5 PLN3-PLN4 SYMMETRY PLN3-PLN4	IN					
				DIM_9_PLN_A FLATNES	DIM_9 PLN_A FLATNESS PLN_A	IN					
				DIM_11_12_13 CYL24	DIM_11_12_13 CYL24 TP.CYL24	IN					

Instructions Header Serials Cycles Issued Parts Planned Actions Changes Ass

Data requirements cannot be skipped

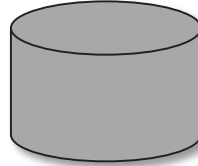
Data Collection

- Measurement imported straight from Machines



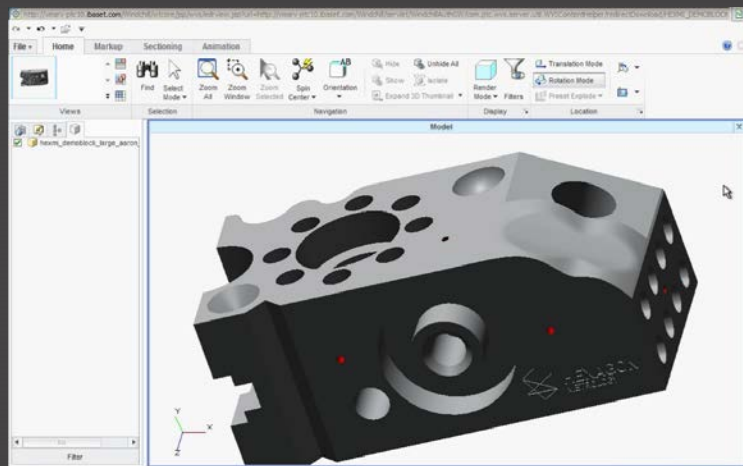
From Machine to XML
to database...

```
<?xml version="1.0" encoding="UTF-8" ?>
<WAI_Web_Report_DataSet>
  <PartInfo>
    <PartNumber>DEMO</PartNumber>
    <PartRevision />
    <SerialNumber />
    <PartDescription></PartDescription>
    <ToolNo>01903 205557</ToolNo>
    <CavityNo>work</CavityNo>
    <ToolVendorNo>XXX</ToolVendorNo>
    <Inspector>palmeira square</Inspector>
    <Customer>brighton</Customer>
    <SubmissionDate>4/7/2011 1:46:43 PM</SubmissionDate>
  </PartInfo>
  <Features>
    <V1 DimensionFeatureVariableName="CIR0.D" PartName="DEMO" Nominal="2" LSL="1.995" USL="2.005" />
    <MeasData>
      <Data Date="7/18/1993 4:09:54 PM" Value="2.000" />
      <Traces>
        <Data>
          <Traces>
            <Trace Name="OPERATOR" Value="MJM" />
          </Traces>
        </Data>
      </Traces>
    </MeasData>
  </Features>
  <V6 DimensionFeatureVariableName="CIR1.D" PartName="DEMO" Nominal="1" LSL="0.995" USL="1.005" LowerTolerance="-0.005" UpperTolerance="0.005" />
  <MeasData>
    <Data Date="7/18/1993 4:09:54 PM" Value="0.9990" />
    <Traces>
      <Trace Name="OPERATOR" Value="MJM" />
    </Traces>
  </MeasData>
</WAI_Web_Report_DataSet>
```



Is this IIoT?

Data that
matters!



CAD / PLM

Design engineers author 3D models and specifications which are published to manufacturing engineers for process planning in SOLUMINA and CMM programming in PC-DMIS.

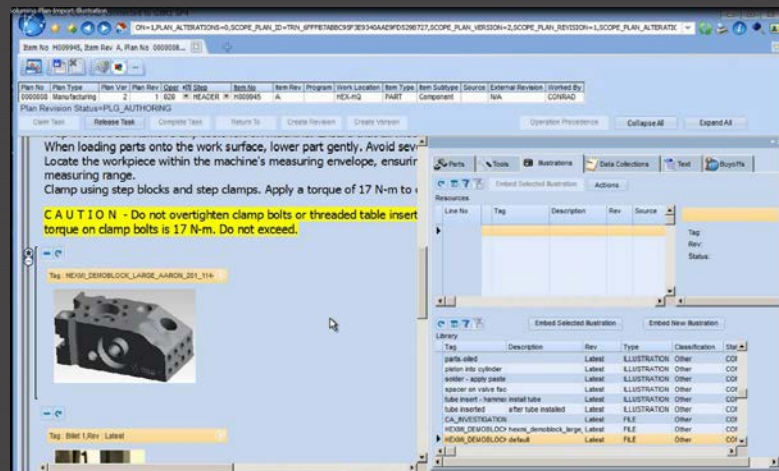
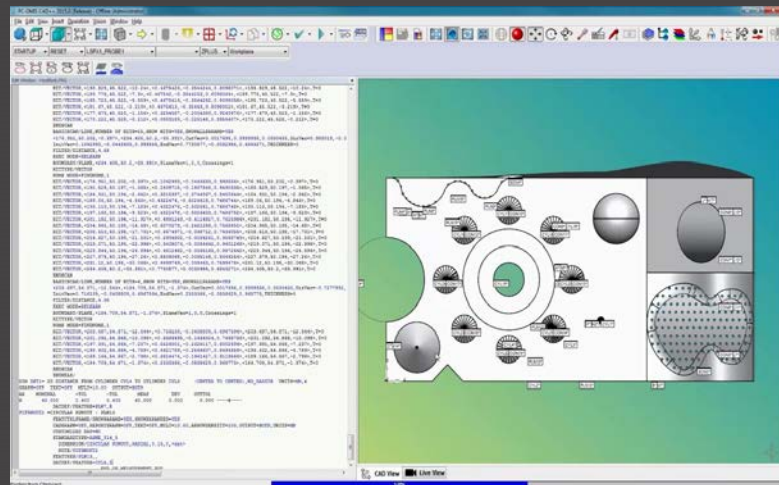


HEXAGON

PC-DMIS
Inspection
Programming



SOLUMINA
Process
Planning



CAD / PLM



HEXAGON

PC-DMIS_e



HEXAGON



SOLUMINA



CMM



HEXAGON

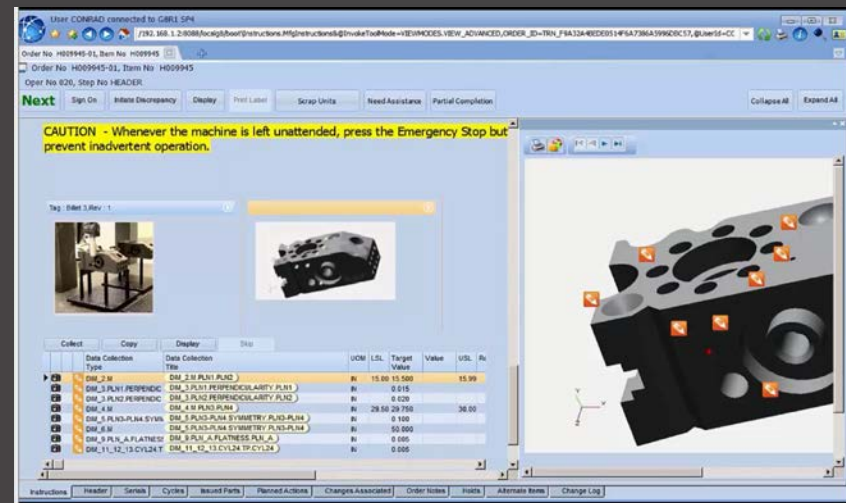
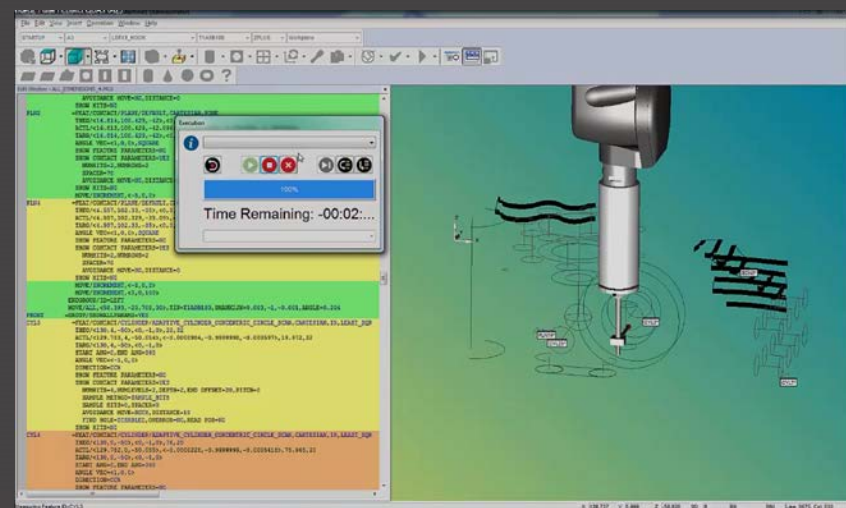
PC-DMIS
Inspection
Recording

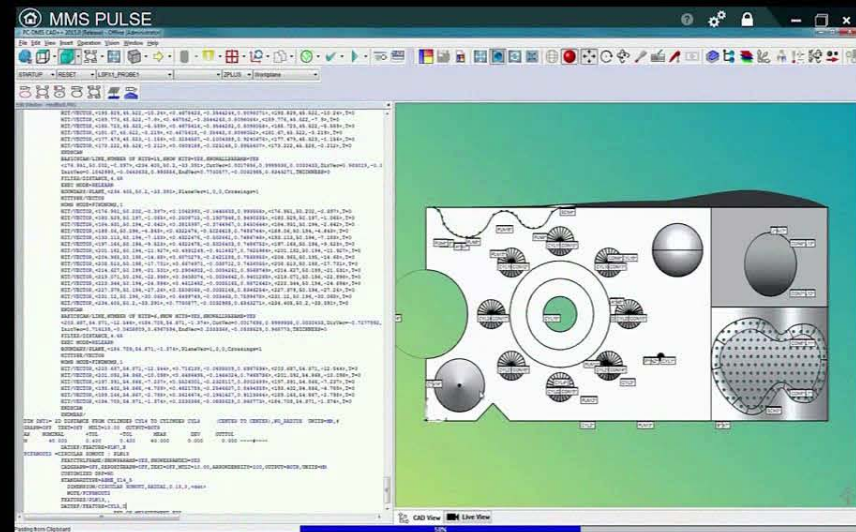


iBASE⁺

SOLUMINA
Manufacturing
Execution

Work Instructions explain how to
set up part for measurement on
CMM and start the data
collection program.

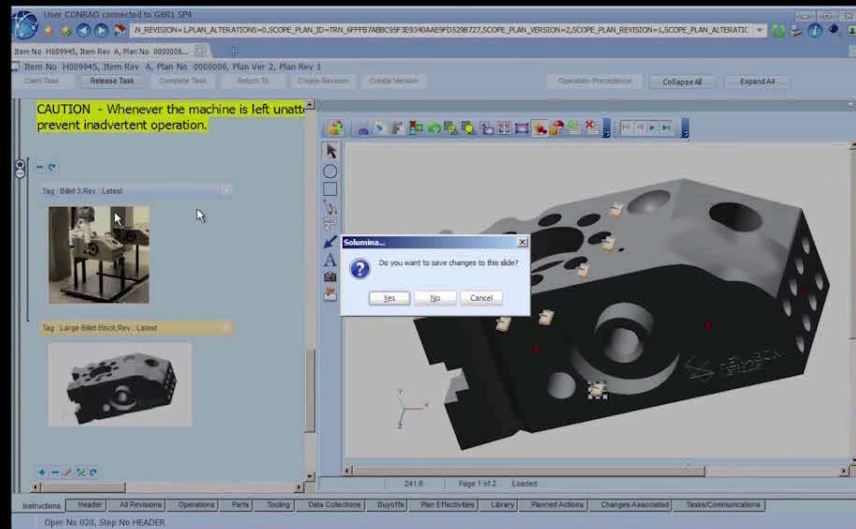
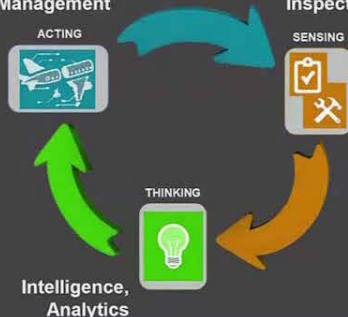


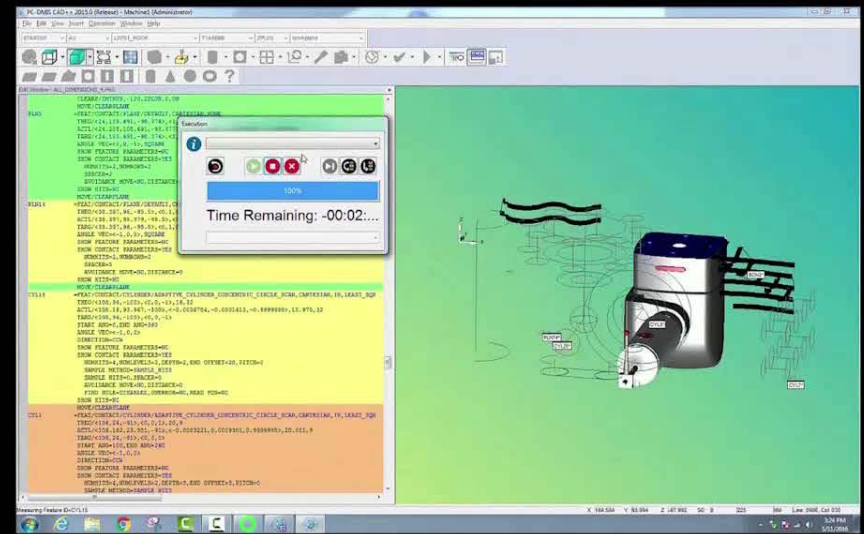


Connecting the Manufacturing Digital Thread

Production Planning,
Quality Management

Production Execution,
Inspection, Data Collection





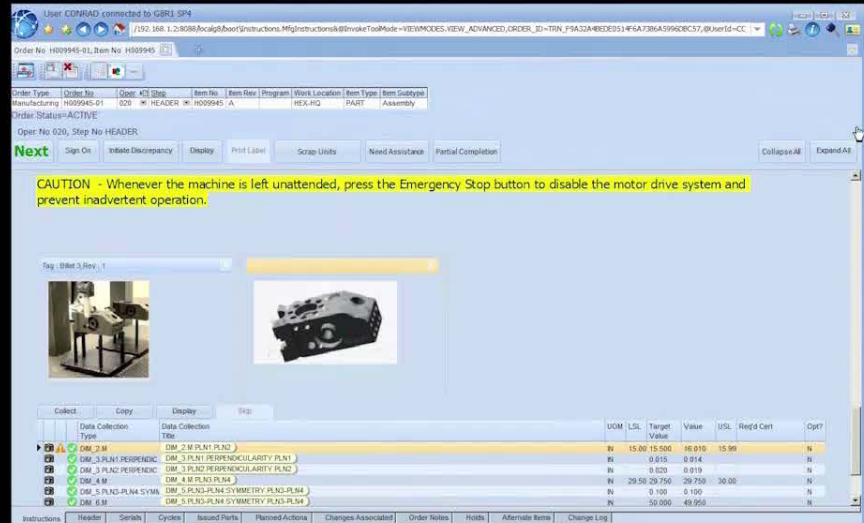
Connecting the Manufacturing Digital Thread

Production Planning,
Quality Management

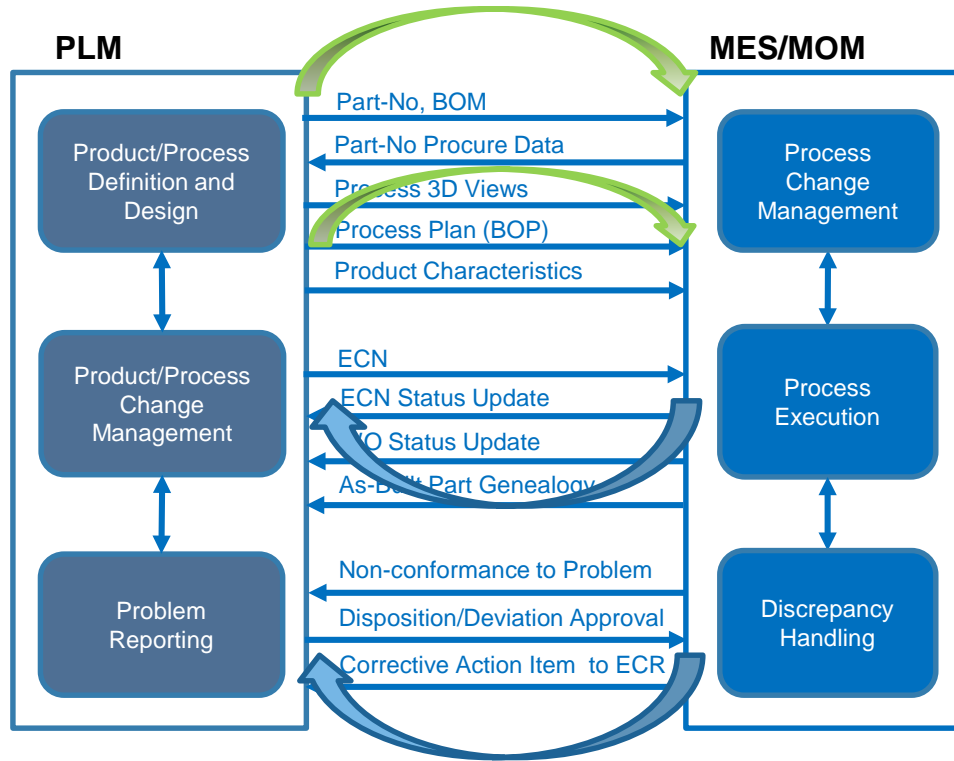
Production Execution,
Inspection, Data Collection



Intelligence,
Analytics

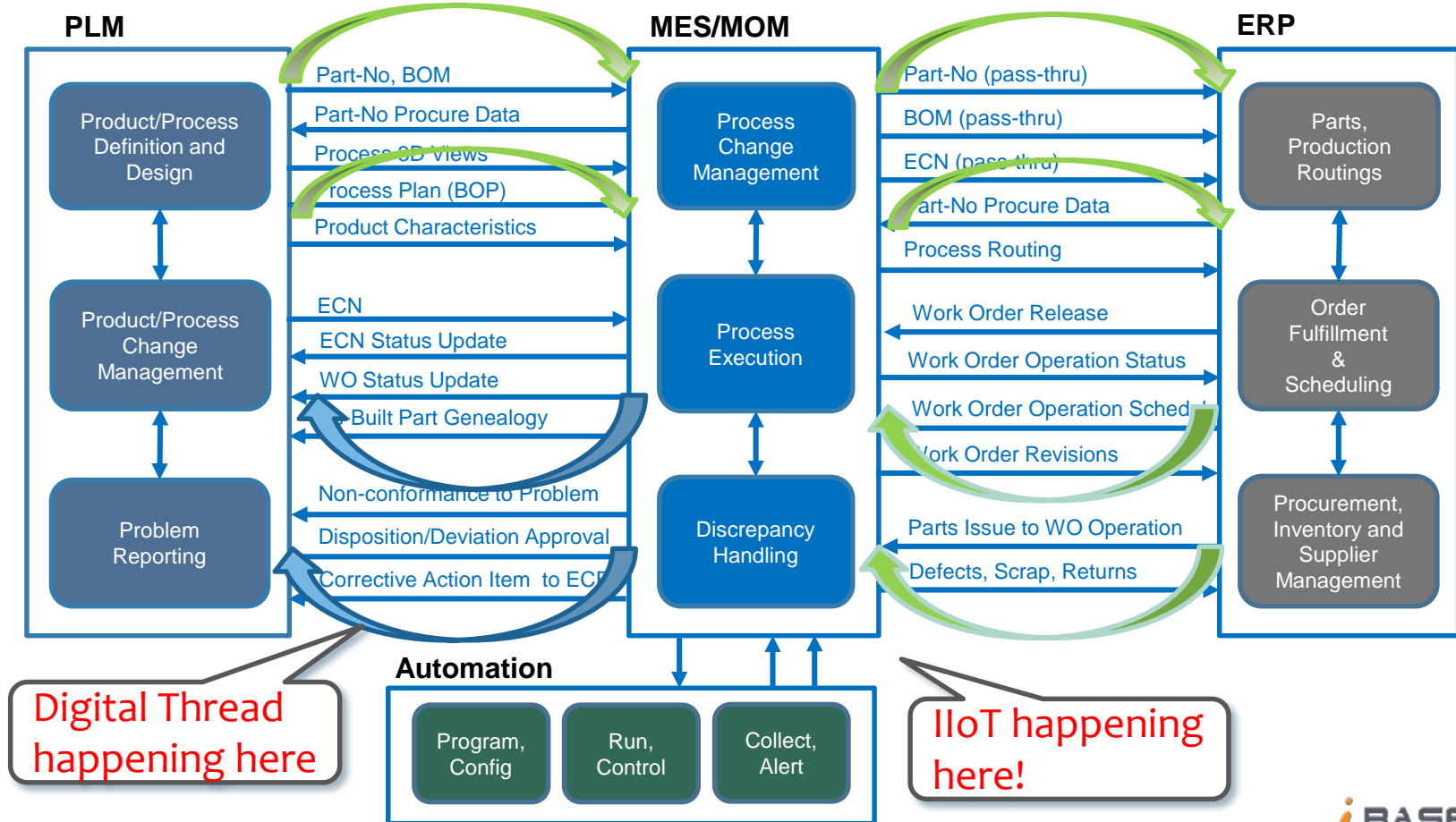


Enhanced Data Flow between PLM, MES



The Digital Thread is more than one threaded message!

Enhanced Data Flow between PLM, MES, ERP

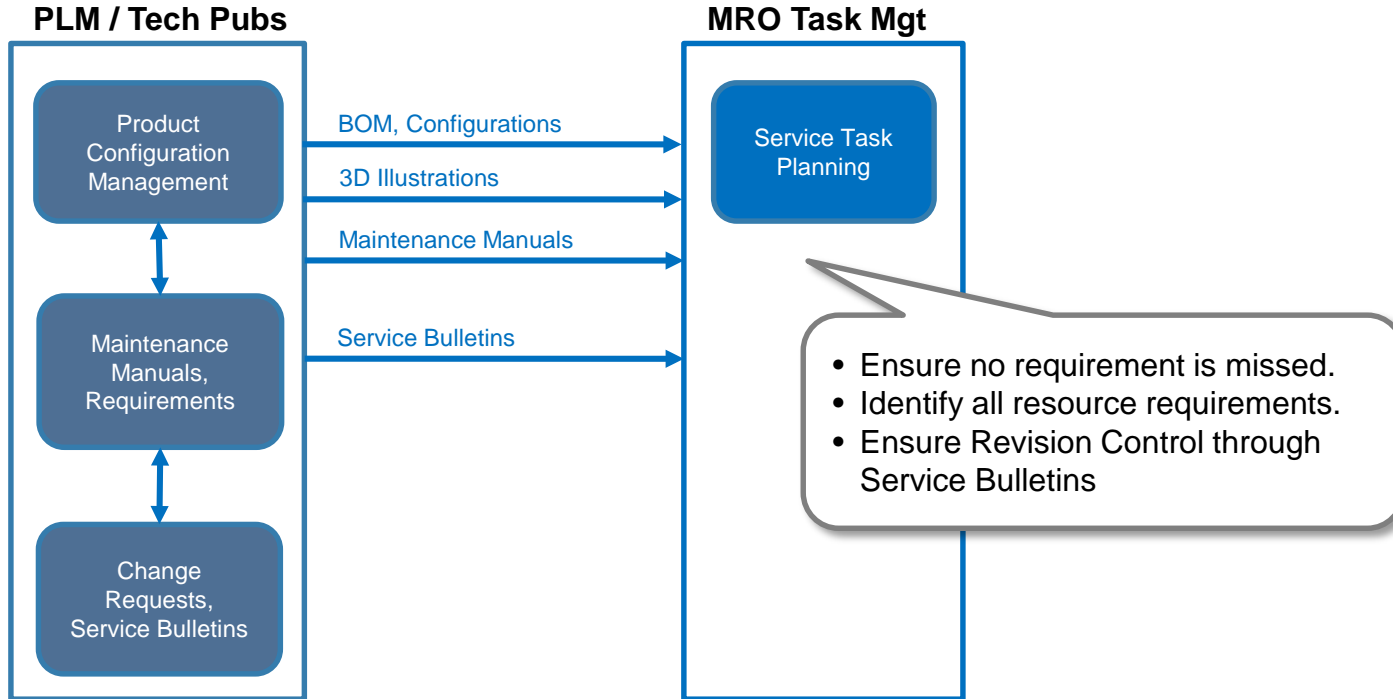


Product Lifecycle Execution

For Maintenance, Repair and Overhaul...

Enhanced Data Flow between PLM, MRO

Today



Service Plan

Order No UA-R2914457, Item No UA-UAV11100-001-W

Order No UA-R2914457, Item No UA-UAV11100-001-W

Oper No 5030, Step No HEADER

Release Order Start Alteration Display Print Label Print Work Order Need Assistance Partial Completion Display Operation Sequence

Order Info: UAV Landing Gear Service

Warning: This equipment operates at dangerous voltage levels. Only certified personnel should perform this operation.

Operation: 5030 - Header - PENDING - Remove Rear Landing Gear Harness

Verify and record the part number on the installed wire harness.
There are two connection points for the wire harness. Locate the upper connection point of the wire harness.
Remove the wire harness and record the serial number of the assembly.

3D Illustrations

Part Action	Part No	Part Rev	Part Title
REMOVAL	UA-WH7765-001	A	Rear Landing Gear Retract Harness Assembly

Tool No	Tool Rev	Tool Title	Type	Qty	Opt?
UA-4321	N/A	Torque Wrench		1	N

Operation: 5030 - Footer

Buyoff Type	Buyoff Title	Req'd Cert	Opt?
TECH	Operation Complete		N

Select Services for Work Order

Order No UA-R2914457, Item No UA-UAV11100-001-W

Order No UA-R2914457, Item No UA-UAV11100-001-W

Oper No 5030, Step No HEADER

Release Order Start Alteration Display Print Label Print Work Order Need Assistance Partial Completion Display Operation Sequence Collapse All Expand All

Order Info: UAV Landing Gear Service

Warning: This equipment operates at dangerous voltage levels. Only certified personnel should perform this operation.

Operations: 5030 - Header - PENDING - Remove Rear Landing Gear Harness

Verify and record the part number on the installed wire harness.
There are two connection points for the wire harness. Locate the upper connection point of the wire harness.
Remove the wire harness and record the serial number of the assembly.

Task Groups

Included/Excluded	Standard?	Task Group Status	Task Group No	Task Group Rev	Title	Notes
EXCLUDED	Y		30	1	Service UAV Forward Landing Gear	
INCLUDED	Y		50	1	Service UAV Rear Landing Gear	

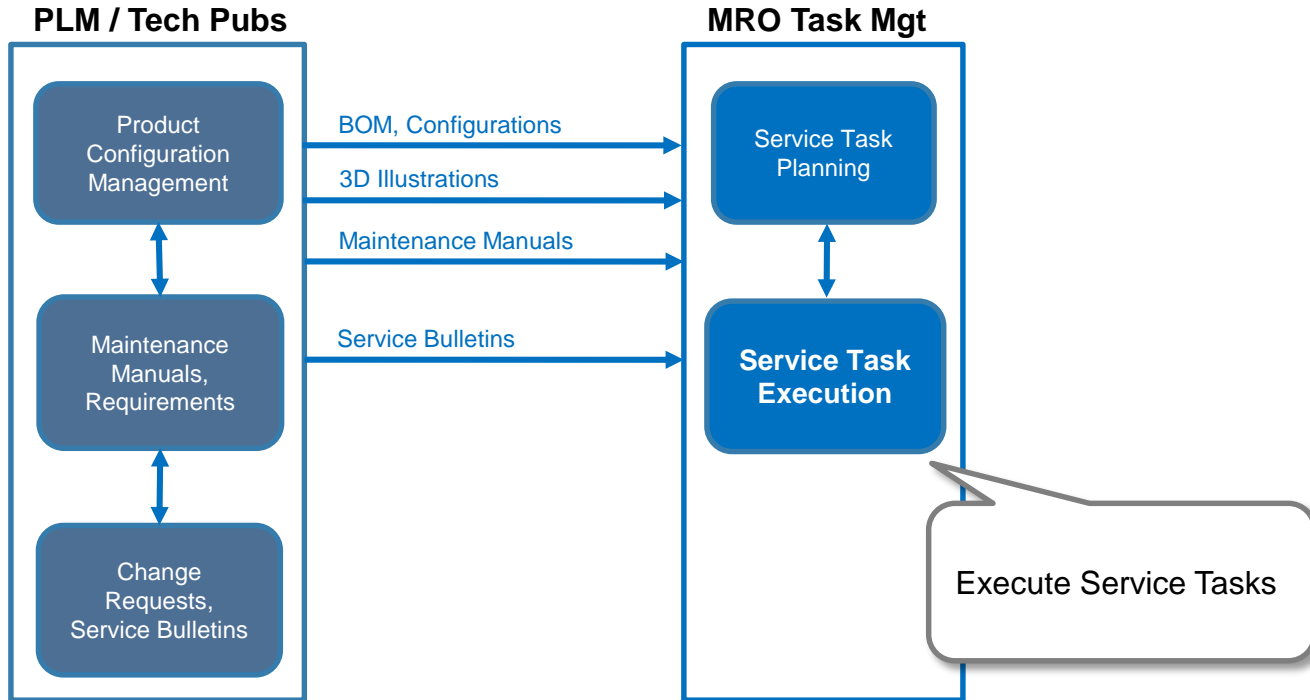
Task Group Operation

Included/Excluded	Standard?	Oper No	Oper Title	Oper Status	Update UserID	Update Time
INCLUDED	Y	1001	Disarm Weapon System	PENDING	CONRAD	2/28/2017 4:20:19 PM
INCLUDED	Y	5010	Remove Rear Landing Gear Door	PENDING	CONRAD	2/28/2017 4:20:19 PM
INCLUDED	Y	5030	Remove Rear Landing Gear Harness	PENDING	CONRAD	2/28/2017 4:20:20 PM
INCLUDED	Y	5050	Replace Rear Landing Gear Harness	PENDING	CONRAD	2/28/2017 4:20:20 PM
INCLUDED	Y	5080	Reinstall Rear Landing Gear Door	PENDING	CONRAD	2/28/2017 4:20:20 PM

Select Task Groups required

Instructions Header Task Groups Operations Serials Cycles Issued Parts Planned Actions Changes Associated Order Notes Holds Alternate Items Change Log

Enhanced Data Flow between PLM, MRO



Perform Service Task

The screenshot displays the SAP Production Control Work Center Management interface. The top section shows a list of work orders with columns for End Unit No., Order Type, Order No., Oper No., Operation Title, Order Status, and Qr. Below this is a Gantt chart showing the timeline of operations for selected work orders. The bottom section displays the 'Work Center Crew' table with columns for Name, Shift, Rank, User Type, and User. A callout box points to the 'Assign' button in the 'Work Center Crew' section, with the text 'Assign skilled'.

Assign skilled personnel

Perform Service Task

User CONRAD connected to http://vmrsv-train01:8089/local2g8/gateway

http://vmrsv-train01:8089/local2g8/boot/instructions.MfgInstructions&@InvokeToolMode=EDITMODES.Edit_RL", ORDER_ID=TRN_F05FB6CD3F0B16CD3F0B375BC1273763EB24544D, @UserId=CONRAD

Order No UA-R2914466, Item No UA-UAV11100-001-W

Order No UA-R2914466, Item No UA-UAV11100-001-W

Oper No 5030, Step No HEADER

Next Sign On Initiate Discrepancy Display Print Label Scrap Units Need Assistance Partial Completion Collapse All Expand All

Order Initia UAV Landing Gear Service

Warning: This equipment operates at dangerous voltage levels. Only certified personnel should perform this operation.

Operations 5030 - Header - IN QUEUE - Remove Rear Landing Gear Harness

Verify and record the part number on the installed wire harness.
There are two connection points for the wire harness. Locate the upper connection point of the wire harness.
Remove the wire harness and record the serial number of the assembly.

Collect Copy Display Skip Ack All Parts

Part No	Part Title
UA-WH7765-001	Rear Landing Gear Retract Harness Assembly

Collect Copy Display Skip

Tool No	Tool Title
UA-4321	N/A Torque Wrench

Operations 5030 - Footer

Accept All Reopen Display Skip Partial

Instructions Header Task Groups Operations Serials Cycles Issued Parts Planned Actions Changes Associated Order Notes Holds Alternate Items Change Log

Guide Technician with illustrated Work Instructions

Perform Service Task

User: CONRAD connected to http://vmsrv-train01:8089/local2g8/gateway

Order No: UA-R2914466, Item No: UA-UAV11100-001-W

Order No: UA-R2914466, Item No: UA-UAV11100-001-W

Oper No: 5030, Step No: HEADER

Buttons: Next, Sign On, Initiate Discrepancy, Display, Print Label, Scrap Units, Need Assistance, Partial Completion, Collapse All, Expand All

Order Info: UAV Landing Gear Service

Warning: This equipment operates at dangerous voltage levels. Only certified personnel should perform this operation.

Operation: 5030 - Header - IN QUEUE - Remove Rear Landing Gear Harness

Verify and record the part number on the installed wire harness.
There are two connection points for the wire harness. Locate the upper connection point of the wire harness.
Remove the wire harness and record the serial number of the assembly.

Tools Data Collection Dialog:

Tool No	Tool Rev	Planned Qty/Tool	Tool Serial No	Qty	Exp Date	Skip	Comments
UA-4321	N/A	1	UA-4321-01	1			

Buttons: Ok, Cancel

Tools Data Collection

Buttons: Collect, Copy, Display, Skip, Ack All Parts

Holds?	Part Action	Part No	Part Rev	Part Title
	REMOVE	UA-WH7765-001	A	Rear Landing Gear Retract Harness Assembly

Buttons: Collect, Copy, Display, Skip

Tool No	Tool Rev	Tool Title
UA-4321	N/A	Torque Wrench

Buttons: Accept All, Reopen, Display, Skip, Partial

Buttons: Instructions, Header, Task Groups, Operations, Serials, Cycles, Issued Parts, Planned Actions, Changes Associated, Order Notes, Holds, Alternate Items, Change Log

Verify equipment

Perform Service Task

User CONRAD connected to http://vmsrv-train01:8089/local2g8/gateway

http://vmsrv-train01:8089/local2g8/boot\instructions.MfgInstructions&@InvokeToolMode=VIEWMODES.VIEW_ADVANCED,ORDER_ID=TRN_F05F66CD3F053758C1273763EB24544D,@UserId=CONRAD

Order No UA-R2914466, Item No UA-UAV11100-001-W

Order No UA-R2914466, Item No UA-UAV11100-001-W

Oper No 5030, Step No HEADER

Next Sign On Initiate Discrepancy Display Print Label Scrap Units Need Assistance Partial Completion Collapse All Expand All

Order Info: UAV Landing Gear Service

Parts Data Collection

Serial No	Part Action	Part No	Part Rev	Ref Des	Planned Qty/Part	UOM	BOM Line No	Qty	UID Label	Part Serial No	Part Lot No	Exp Date	Spool No	Ack	Skip	Remove From Part	Remove Action
UA-A7576	REMOVE	UA-WH7765-001	A	W4	1	EA											REMOVE AND REPLACE S

Parts Data Collection

Collect Copy Display Skip Ack All Parts

Holds? Part Action Part No Part Rev Part Title

REMOVE UA-WH7765-001 A Rear Landing Gear Retract Harness Assembly

Collect Copy Display Skip

Tool No Tool Title

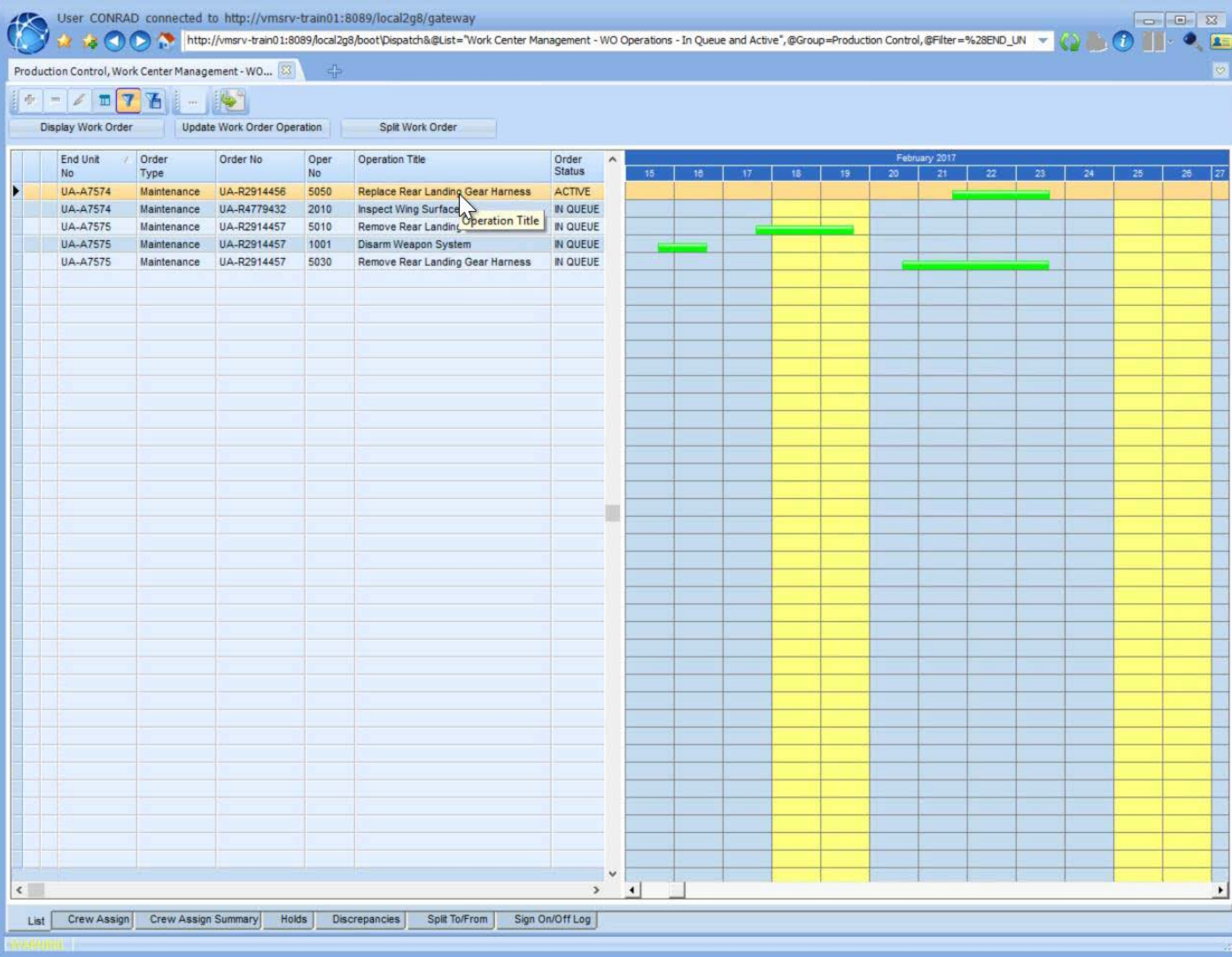
UA-4321 N/A Torque Wrench

Operations: 5030 - Footer

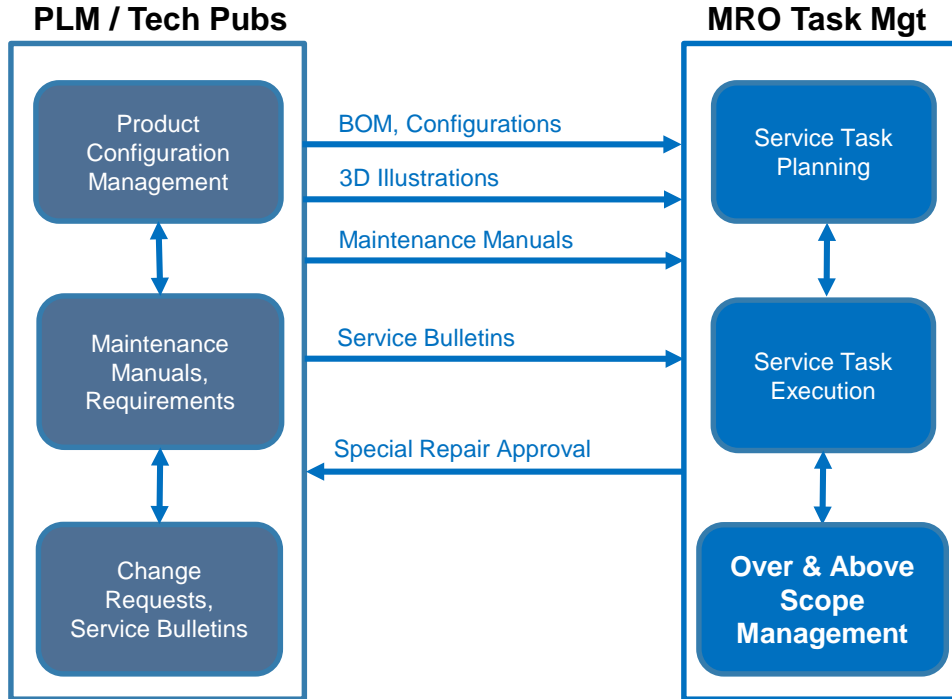
Accept All Reopen Display Skip Partial

Instructions Header Task Groups Operations Serials Cycles Issued Parts Planned Actions Changes Associated Order Notes Holds Alternate Items Change Log

Collect data to verify unit is up to specifications

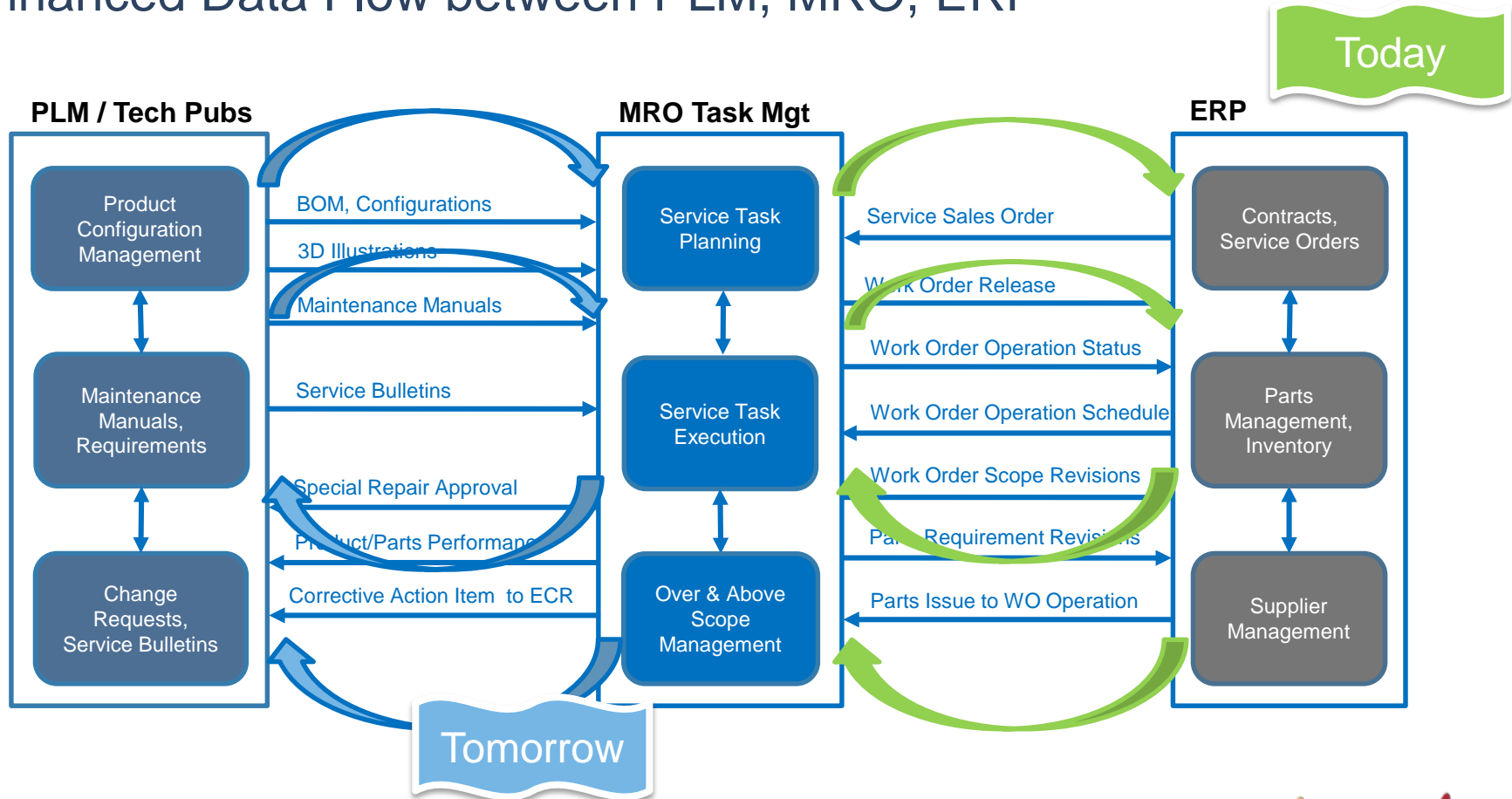


Enhanced Data Flow between PLM, MRO

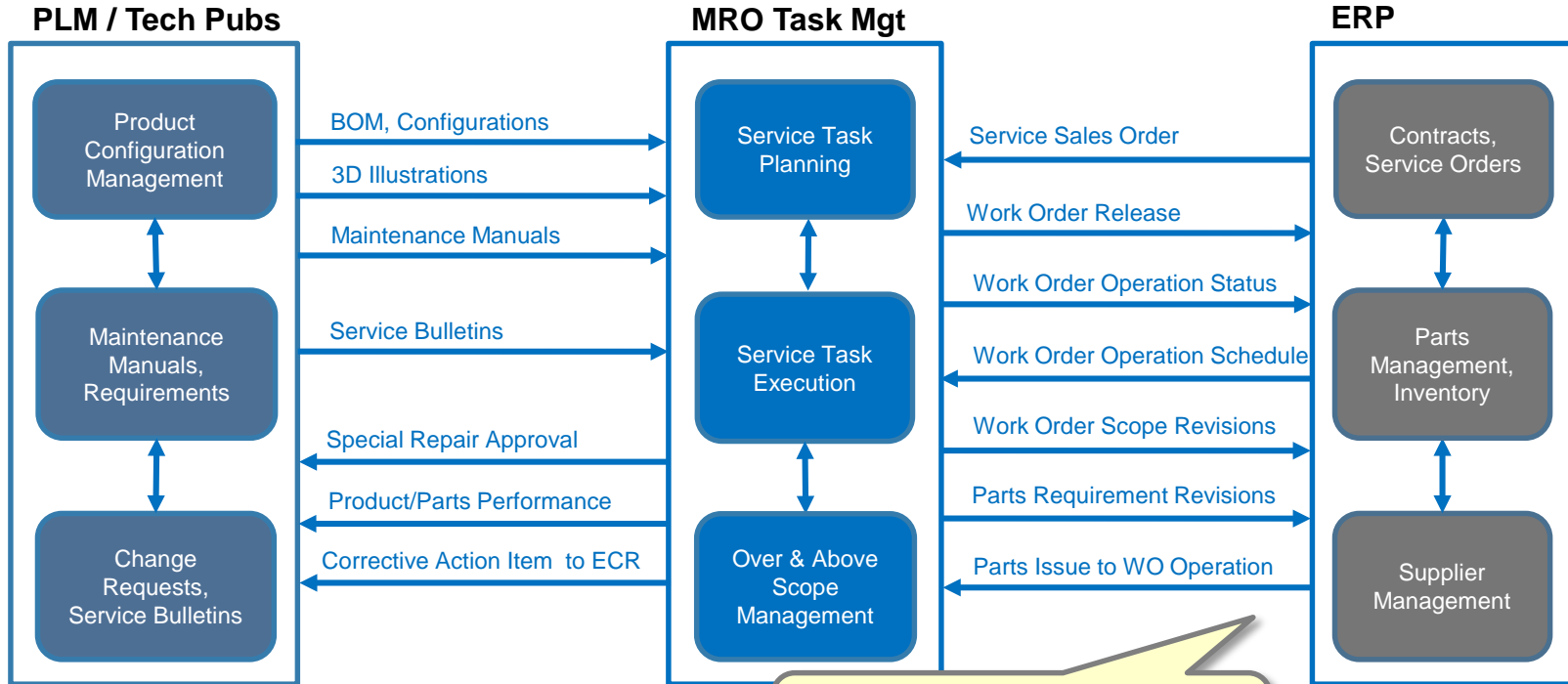


- Over & Above Scope and Special Repairs require additional approvals

Enhanced Data Flow between PLM, MRO, ERP

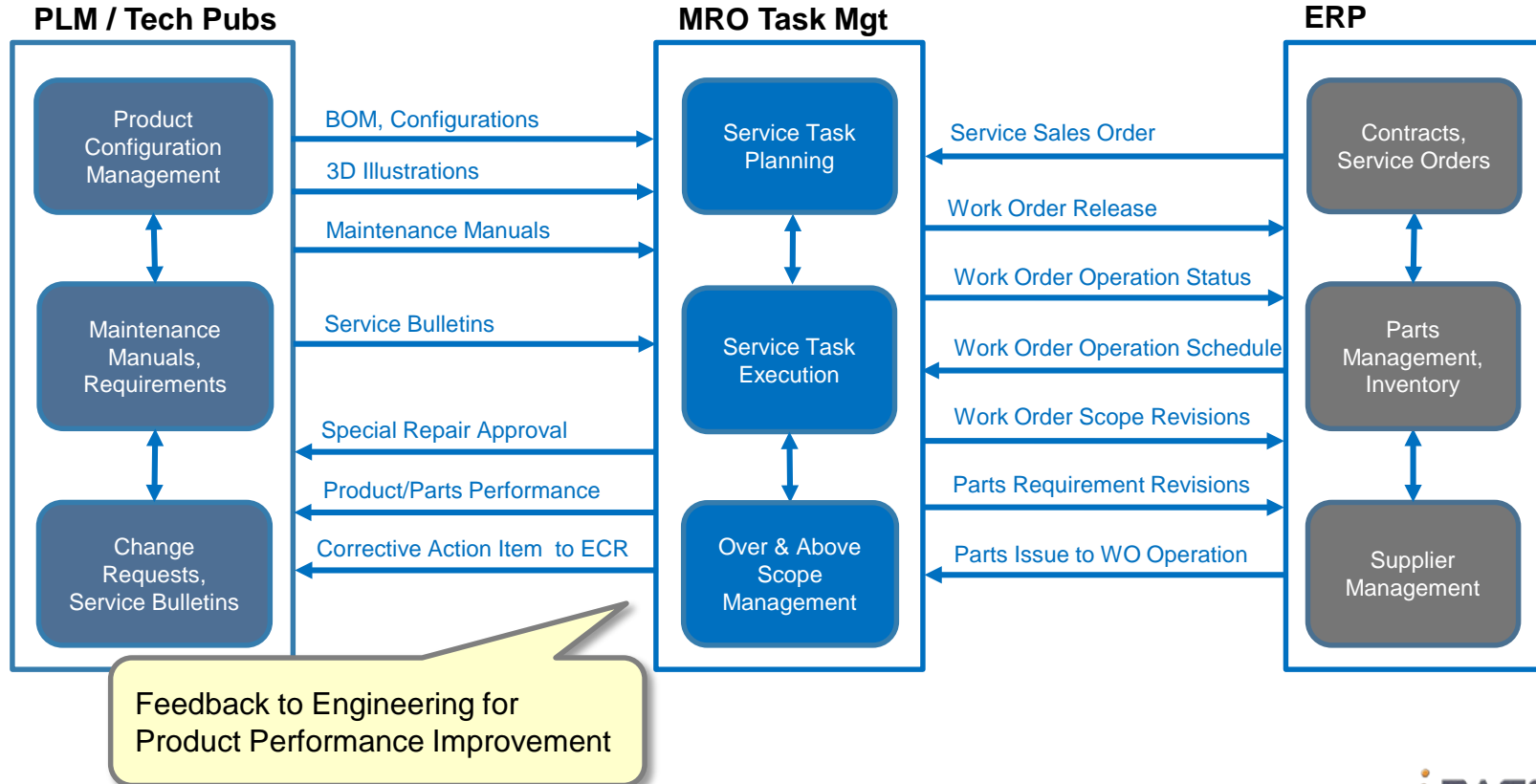


Enhanced Data Flow between PLM, MRO, ERP



Ensure parts are where needed.
Not too many, not too few.

Enhanced Data Flow between PLM, MRO, ERP



Update As-Maintained Data

The screenshot displays a web-based maintenance management system interface. The top navigation bar shows the user 'CONRAD' connected to the system. The main content area is divided into several sections:

- Production Control, Unit Information:** This section contains a table with columns for Item No, Holds Serial No, Lot No, and UD Entry Name. The table lists several items, including UA-AV11100-001-W, UA-9993456-001, UA-LQRRSK01-002, and UA-WH765-001.
- Current Condition:** This section displays a table with columns for Order No, Item No, Item Rev, Ref Des, Serial No, and Removal Action. The table shows a single entry for UA-R2914456, UA-WH765-001, with a removal action of 'REMOVE AND REPLACE SAME PART'.
- Unit Work History:** This section displays a table with columns for Part Number, Part Rev, Drawing No, Serial No, Description, Part Rev, Dwa Rev, Lot No, Required Cert, and User Name. The table shows a single entry for UA-AV11100-001-W, UA-A7575, with a required certificate of 'ACCEPT' and a user name of 'Conrad Levis'.

The interface also includes a sidebar with a tree view of the system structure and a bottom section with two images showing the removal of a rear landing gear harness.

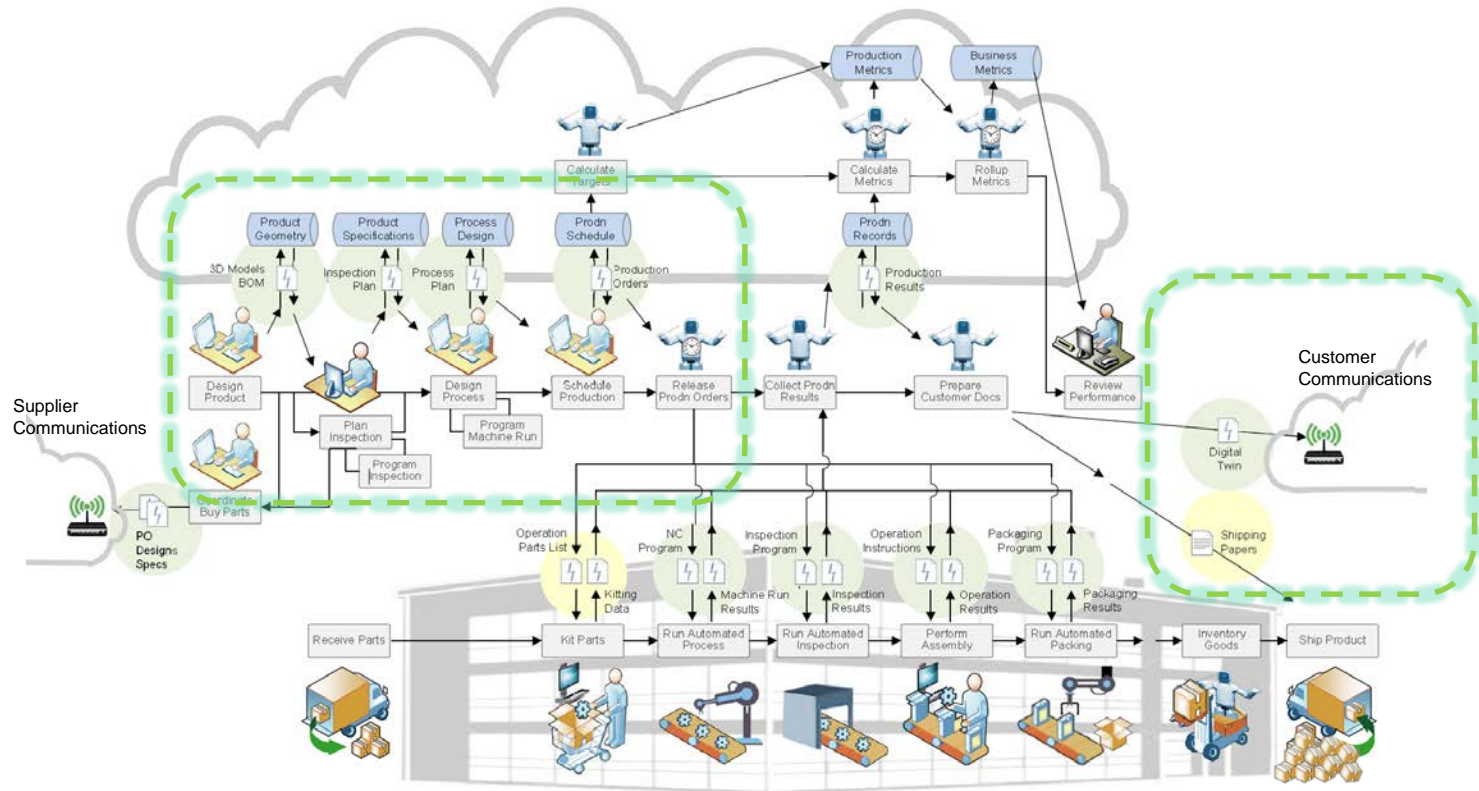
The Digital Twin / Digital Thread Enabling the SCOR Model



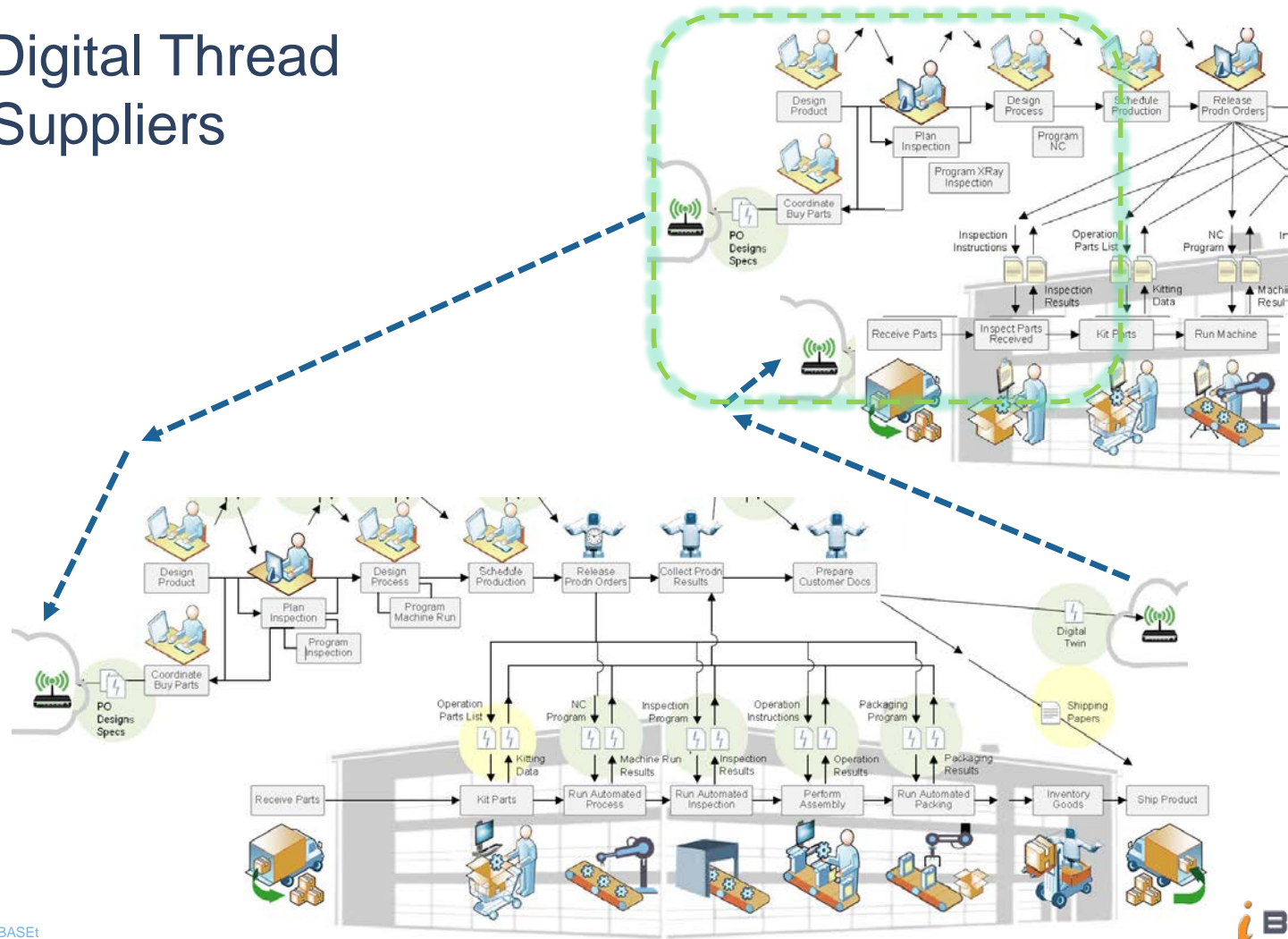
Product Lifecycle Execution

For Supply Chain Quality Management...

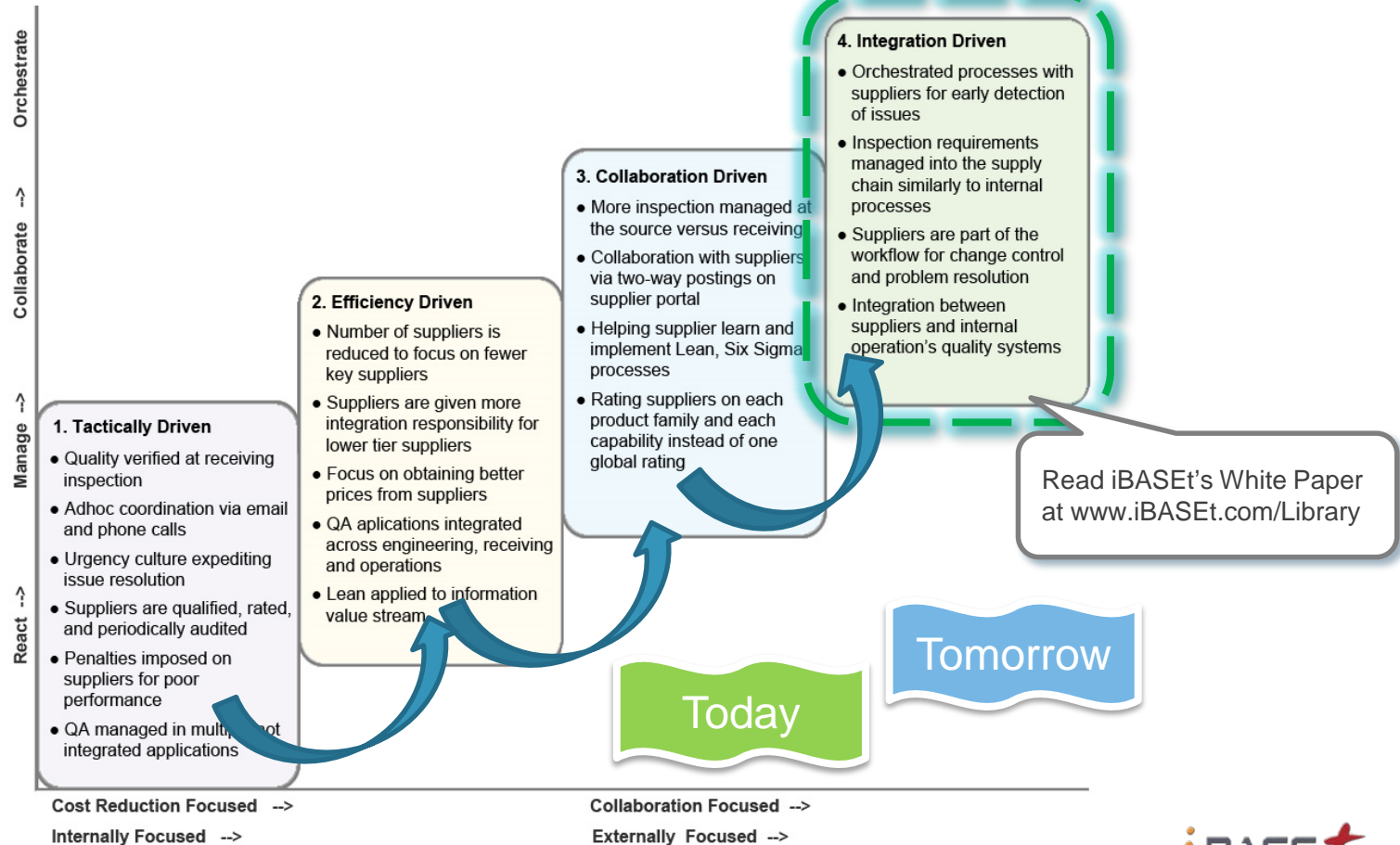
The Digital Thread from Engineering, Planning to Suppliers



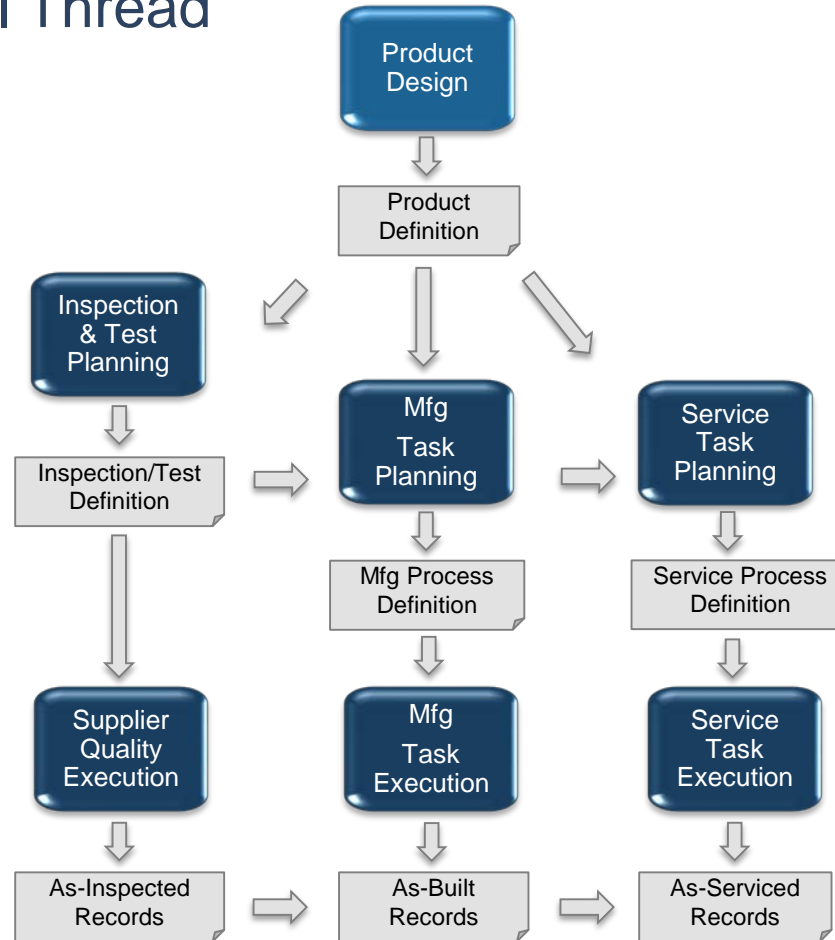
The Digital Thread with Suppliers



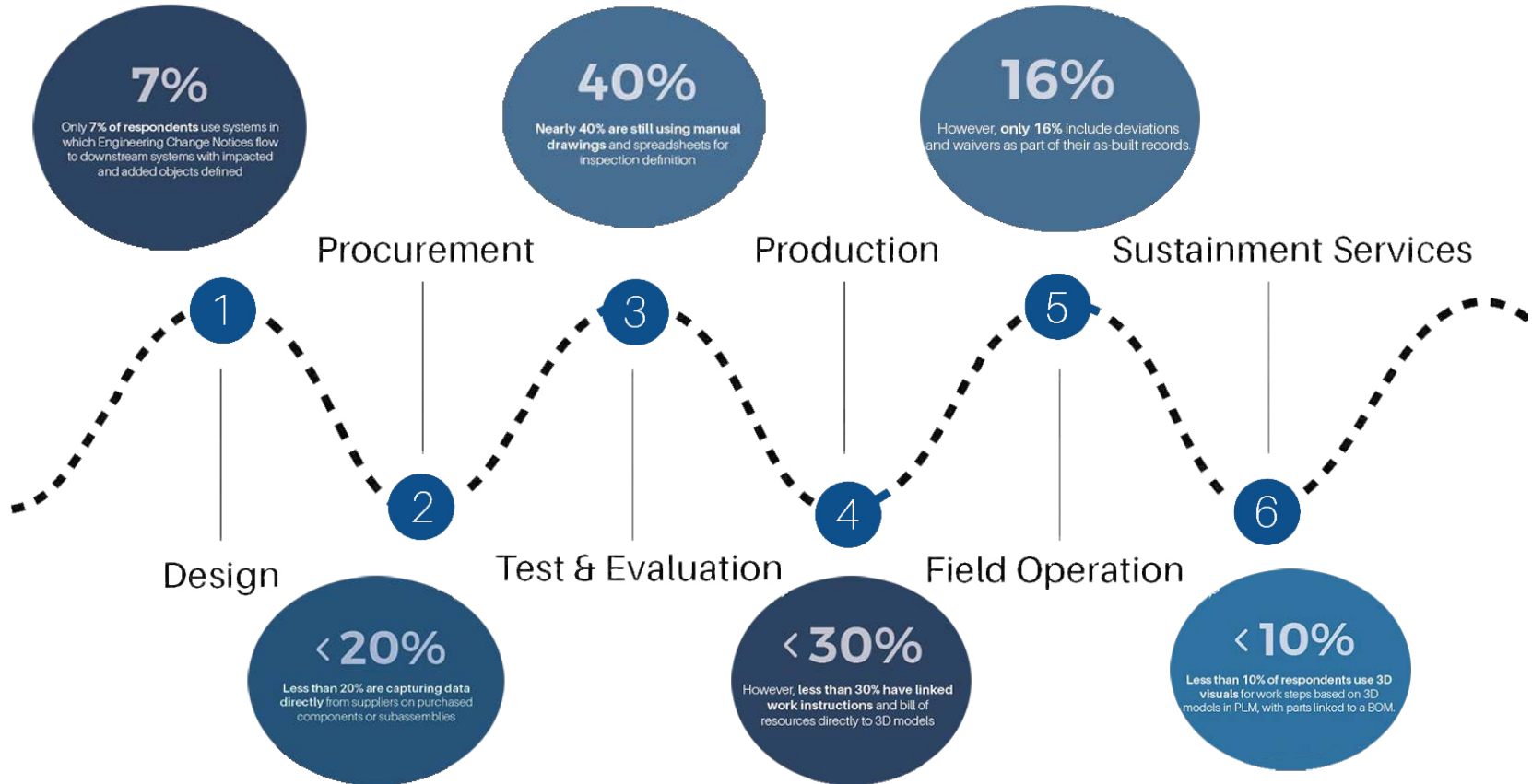
Taking Enterprise Quality Management to the Next Level...



What is Your Digital Thread Adoption Score?



Where Are We Today on the Digital Thread?



Questions?



www.iBASEt.com Resources

eBOOKS



Calculate our Digital Thread Adoption Score

Discover how well your manufacturing enterprise is performing with the adoption of new technologies by taking our quiz. Once all responses have been selected, your Digital Thread Adoption score will be instantly calculated.

Enabling the Digital Thread

Learn about unifying Design, Manufacturing and ERP in a Closed Loop Digital Thread.

WHITEPAPERS



Six Innovation Areas in MRO Leading the Path to the Model Based MRO Enterprise

In this paper, we discuss the convergence of technologies enabled by a new model-based enterprise philosophy that leverages the engineering 3D models and specifications throughout the product lifecycle including shop floor execution.


Taking Enterprise Quality Management to the Next Level of Performance

Can you remember headlines in the news related to product recalls and quality issues?



COMPLEX made SIMPLE

THANK YOU



The statements contained in this document include forward looking statements including statements regarding the Company's expected future financial position, results of operations, business strategy, budgets, projected costs, capital expenditures, products, competitive positions, growth opportunities, plans, business and product goals and objectives for future operations, as well as statements that include words such as "anticipate," "if," "believe," "plan," "estimate," "expect," "intend," "may," "could," "should," "will," and other similar expressions are forward-looking statements. These forward-looking statements are made subject to certain risks and uncertainties, which could cause actual results to differ materially from those presented. Readers are cautioned not to place undue reliance on these forward-looking statements, which speak only to the date such data was presented. The Company undertakes no obligation to publicly revise these forward-looking statements to reflect events or circumstances that arise after the posting this data in this document or presentation. Factors that may cause actual results to differ materially from those in the forward-looking statements include, without limitation, reduction in demand or as a result of current economic and market conditions; customer acceptance of pricing; delays in delivery or increases in costs, including transportation costs, of raw materials or sourced products and labor or changes in or unavailability of quality suppliers; exchange rate fluctuations, changes in foreign import tariffs and monetary policies and other changes in the regulatory climate in the foreign countries in which we operate and/or sell products; delays in manufacturing and delivery schedules; bankruptcy of or loss of major dealers, retail customers or suppliers; customer acceptance of, changes in the costs of, or delays in the development of new products; introduction of new products by, or more favorable product pricing offered by, our competitors; product liability or other litigation, warranty claims or returns of products; the effectiveness of the cost reduction programs implemented globally, including the successful implementation of procurement and sourcing initiatives; changes mandated by federal, state and other regulation, including health, safety or environmental legislation; and other risks. Many of these factors are outside of the Company's control.