

SESSION ID: II1142B

HOW SAFRAN AERO BOOSTERS LEVERAGE INDUSTRY 4.0

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Hervé DELHALLE

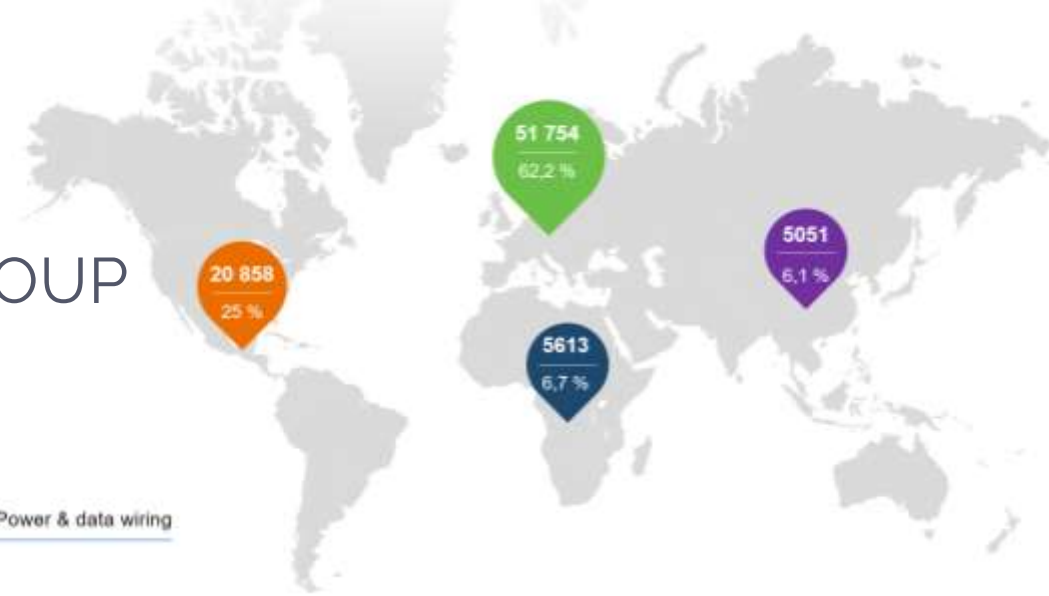
Manufacturing 4.0 Leader
SAFRAN Aero Boosters

17th May, 2023

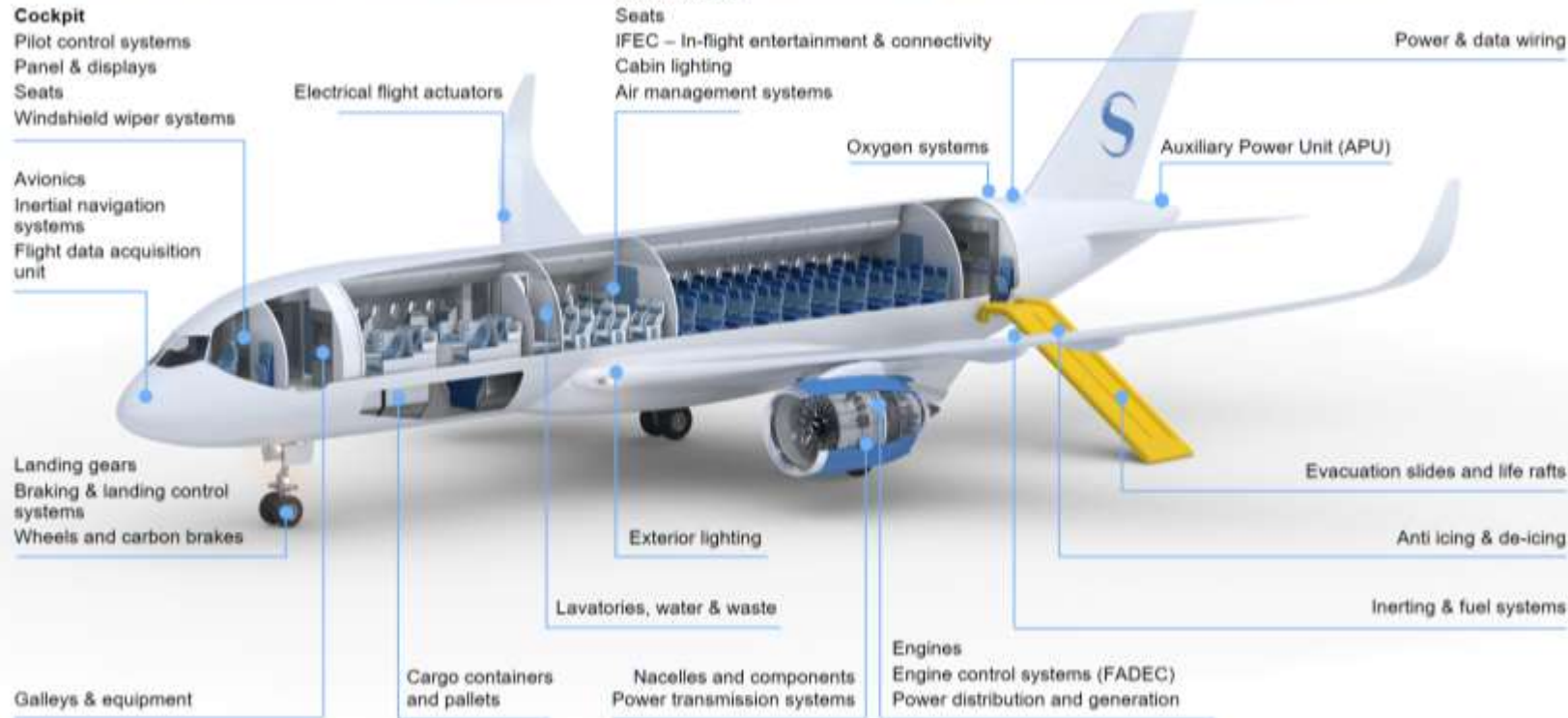
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SAFRAN

AN INTERNATIONAL HIGH-TECHNOLOGY GROUP



A COMPREHENSIVE RANGE OF AIRCRAFT PROPULSION SYSTEMS AND EQUIPMENT



WORLD'S No.3
AEROSPACE COMPANY
(excluding aircraft manufacturers)

More than **83,000 EMPLOYEES**
in **27 COUNTRIES**

- 5 CORE BUSINESSES :**
- Aircraft propulsion
 - Aircraft equipment
 - Aircraft interiors
 - Defense
 - Space



SAFRAN AERO BOOSTERS

SAFRAN Test Cells

USA | Minnesota | 100 people



Headquarters & Test Center

BELGIUM | Herstal | 1,500 people



SAFRAN Oil Systems

USA | Florida | 100 people



443 M€ (2021)
851 M€ (2019)



1,700
employees



Design &
manufacturing
on an integrated site

LEADERSHIP IN 4 ACTIVITIES

 <p>BOOSTERS</p> 	 <p>OIL SYSTEMS</p> 	 <p>TEST CELLS</p> 	 <p>SPACE VALVES</p> 
<p>WORLD LEADER FOR MEDIUM- AND LONG-HAUL AIRCRAFT</p>	<p>WORLD LEADER FOR MEDIUM-HAUL AND REGIONAL AIRCRAFT</p>	<p>1 OUT OF 3 TEST CELLS WORLDWIDE</p>	<p>EUROPEAN LEADER</p>



- ~50 customers
- Airline companies
 - Engine manufacturers
 - Maintenance centers

- ~50 customers
- Engine manufacturers
 - Maintenance centers
 - Military forces

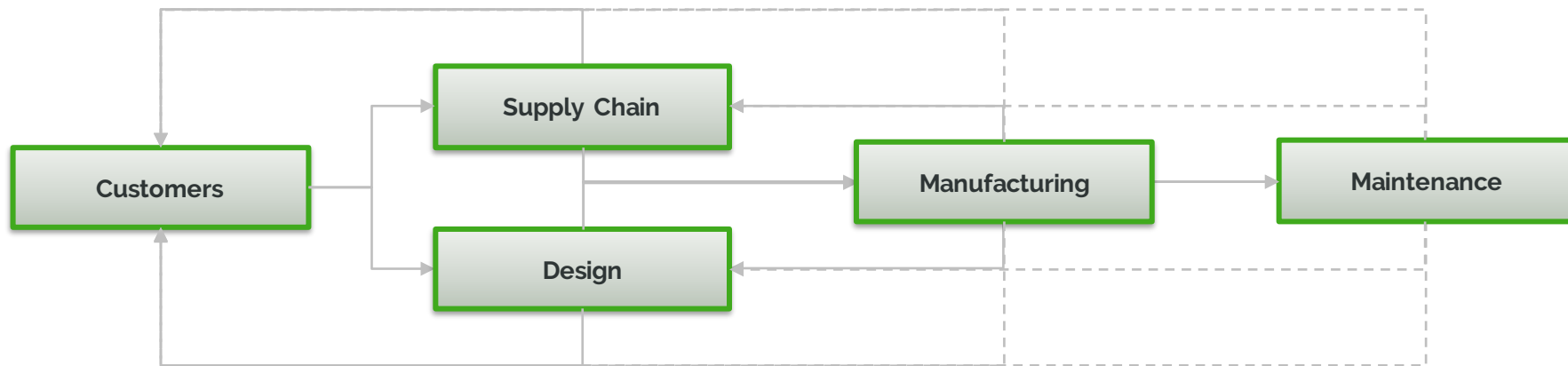


DIGITAL STRATEGY (1/2)

Enterprise Management



Product Lifecycle



Resources

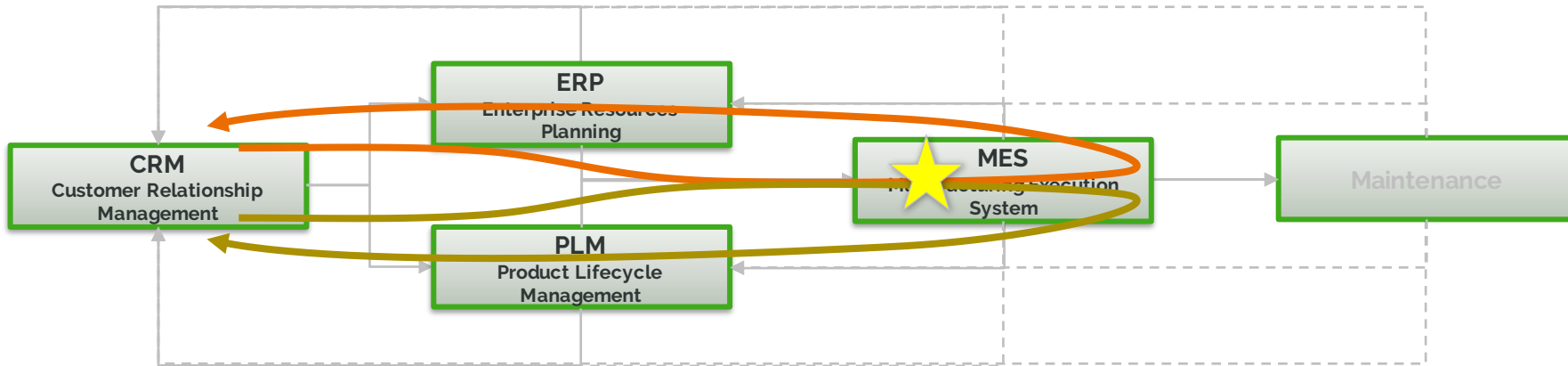


DIGITAL STRATEGY (2/2)

Enterprise Management



Product Lifecycle



Resources



The MES (Manufacturing Execution System) is the key system to close the two main loops of digital continuity

ANSI / ISA 95 STANDARD (ISO / CEI 62264)

ERP, PLM, Analytics,...

SCADA

Sensors

Process

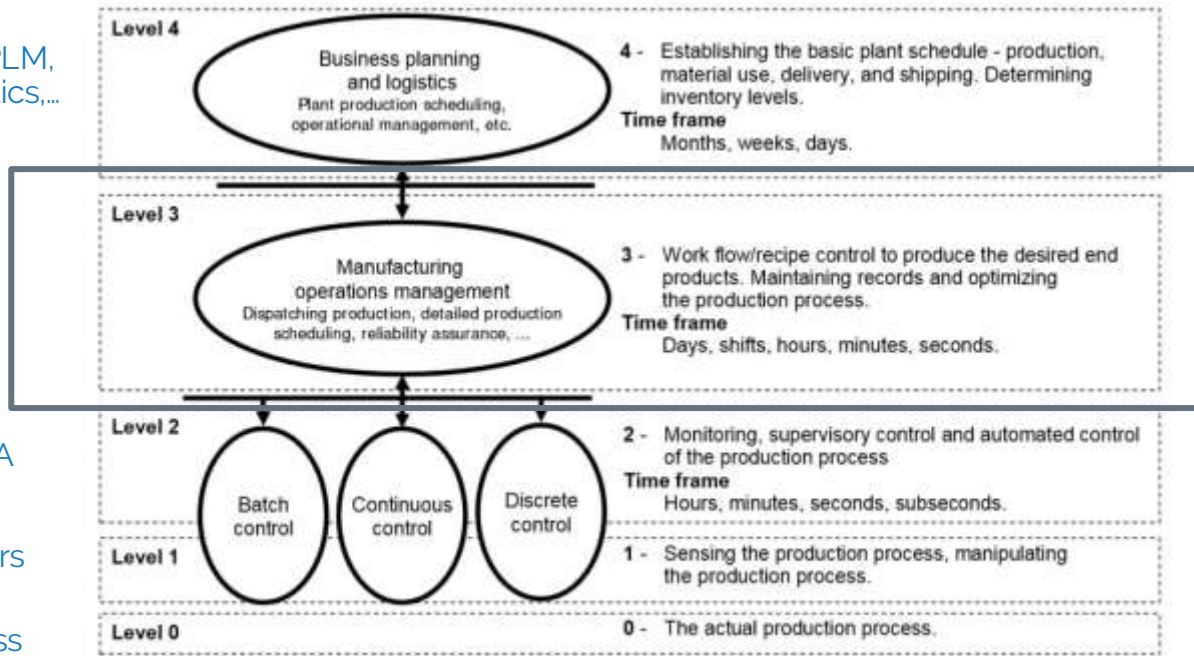
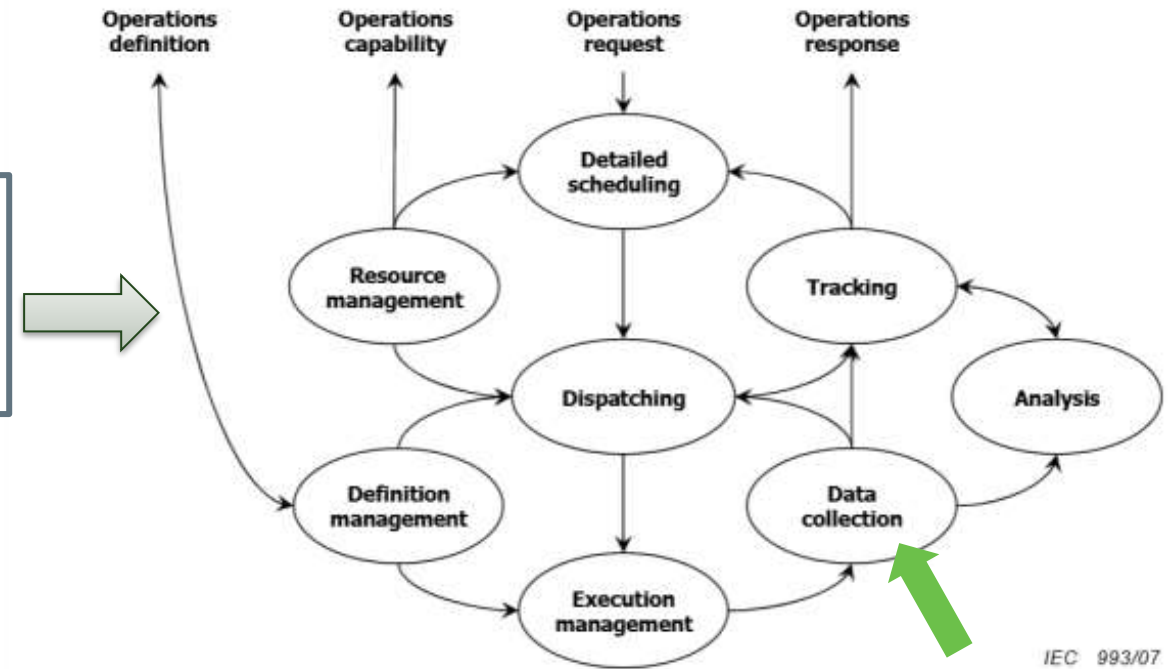


Figure 2 – Multi-level functional hierarchy of activities

IEC 993/07



IEC 993/07

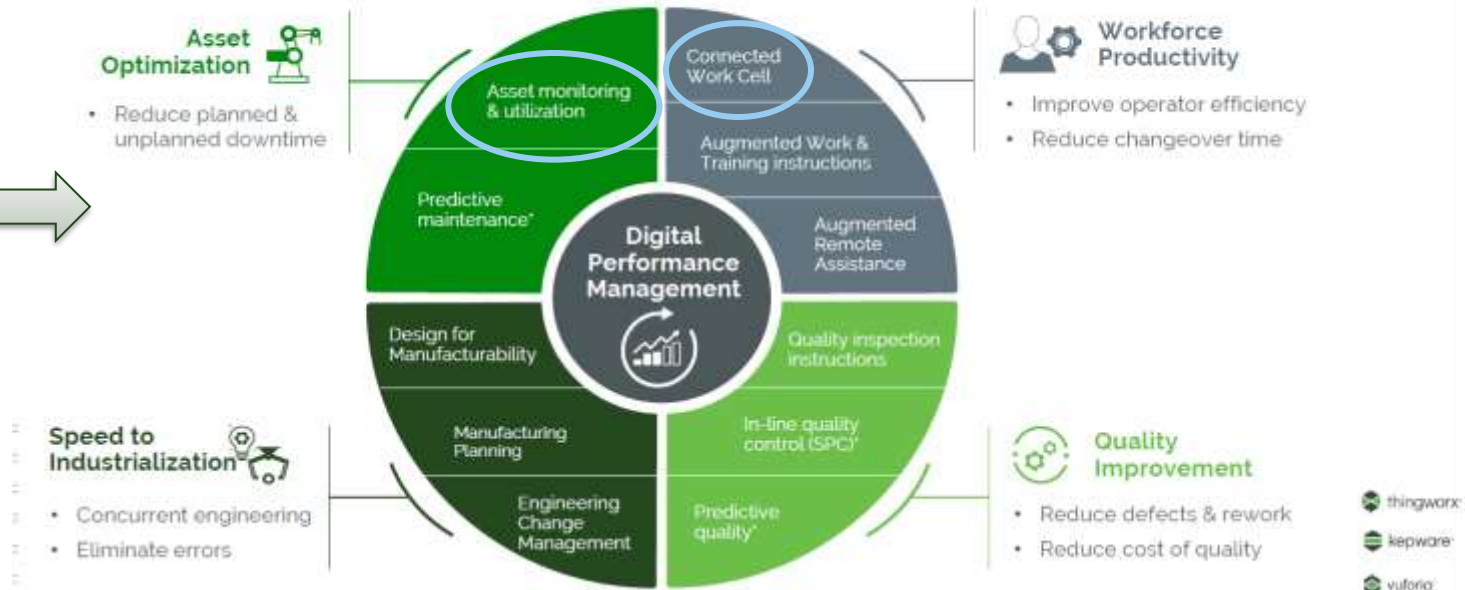


SAFRAN performed a first benchmark to identify the right technology for “Data Collection” and we selected PTC Thingworx. In search for a market solution covering the other ISA95 functionalities, SAFRAN evaluated 31 different products and tested some of them on real use cases. None was able to provide full coverage and compliance to ISA95 standard

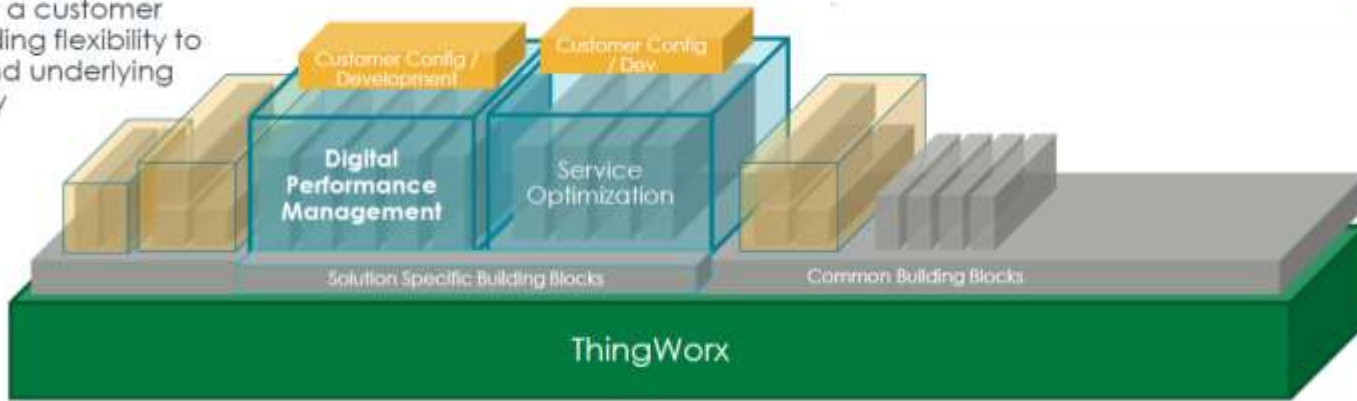
PTC BUILDING BLOCKS

PTC roadmap is aligned with SAFRAN Aero Boosters goals

PTC MFG SOLUTION SUITE



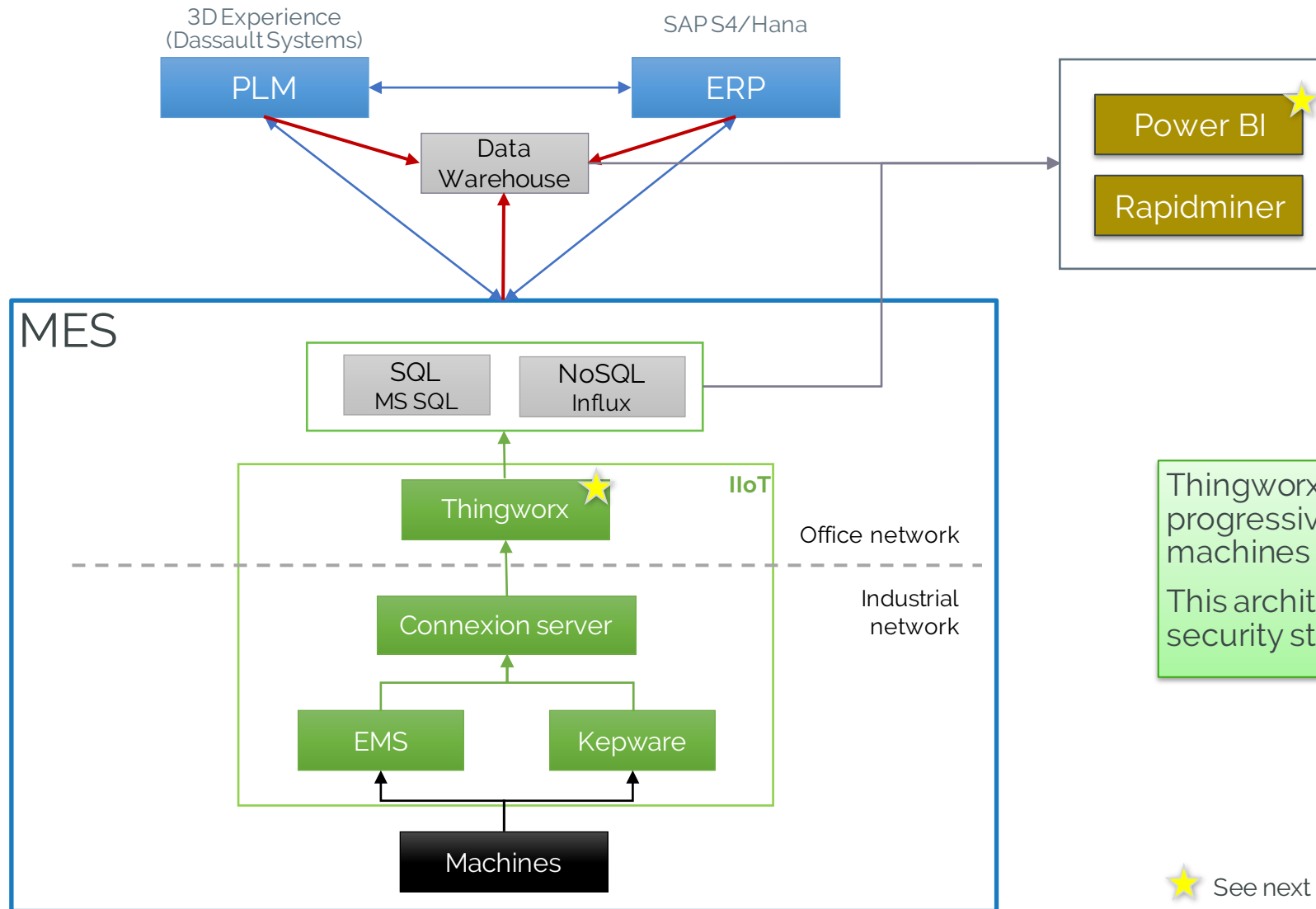
The packaging of building blocks solves a business problem for a customer while providing flexibility to reuse/extend underlying functionality



Building block layer added on top of Thingworx, compliant with ISA95 dictionary

SAFRAN Aero Boosters selected some products of PTC manufacturing suite to progressively build his MES.

ARCHITECTURE FOR DATA COLLECTION



Thingworx is fully operational and we are progressively connecting all main machines

This architecture is compliant with SAFRAN security standard

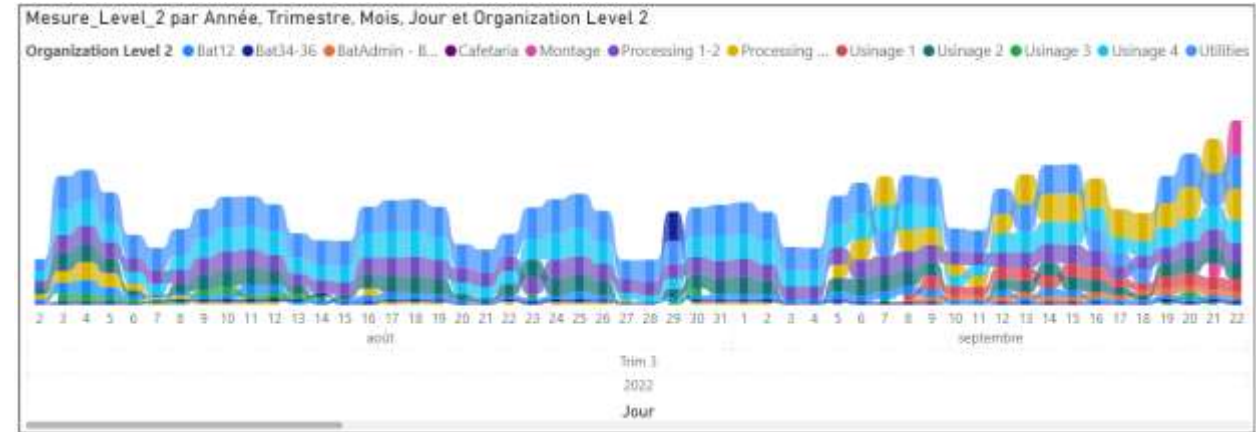
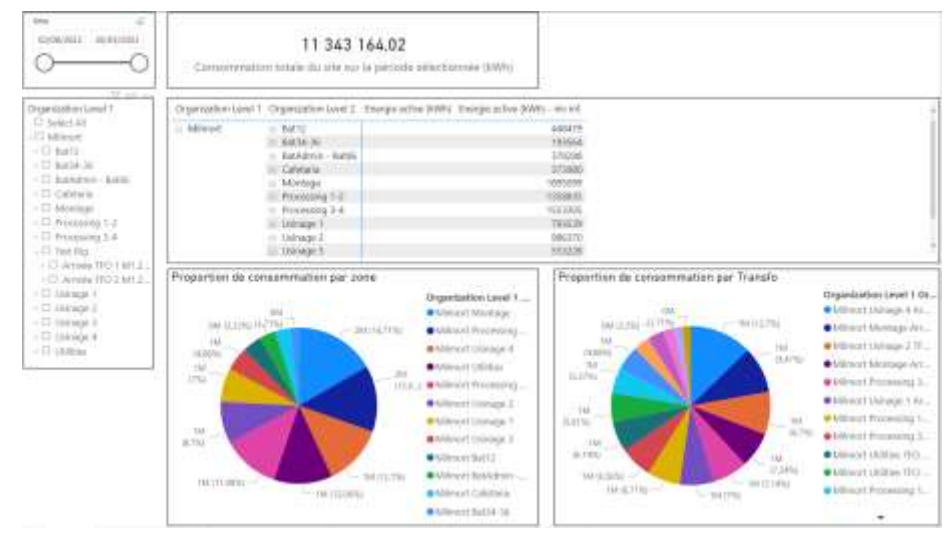
★ See next slide for two examples...

TOOLS DEVELOPED BY SAFRAN AERO BOOSTERS



Energy consumption monitoring.
Data collection with Thingworx and analyze with Power BI

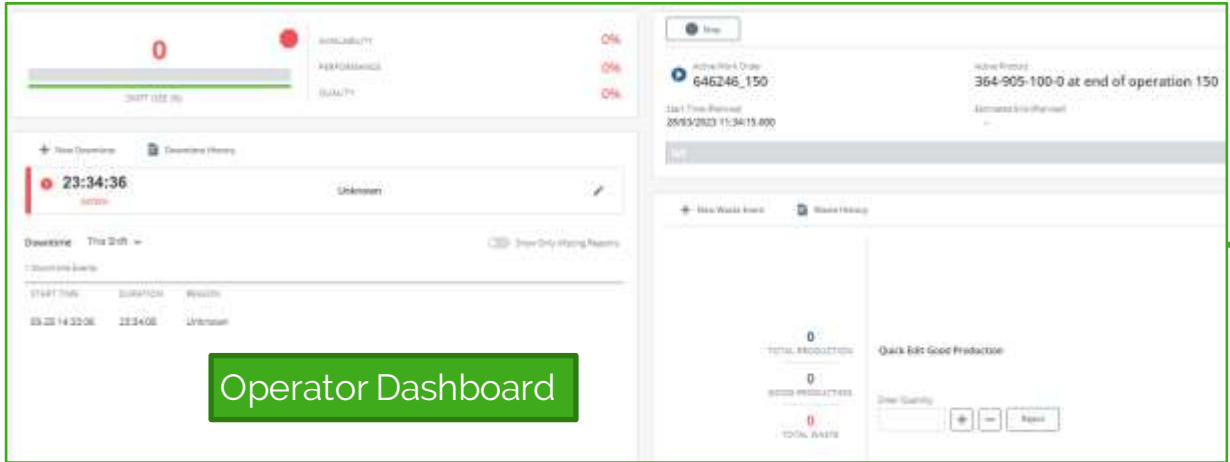
Real-time status of EMD machines + Maintenance log book
Data collection + Dashboard with Thingworx



RTPPM (REAL TIME PERFORMANCE PRODUCTION MONITORING)



Standard KPI



Operator Dashboard

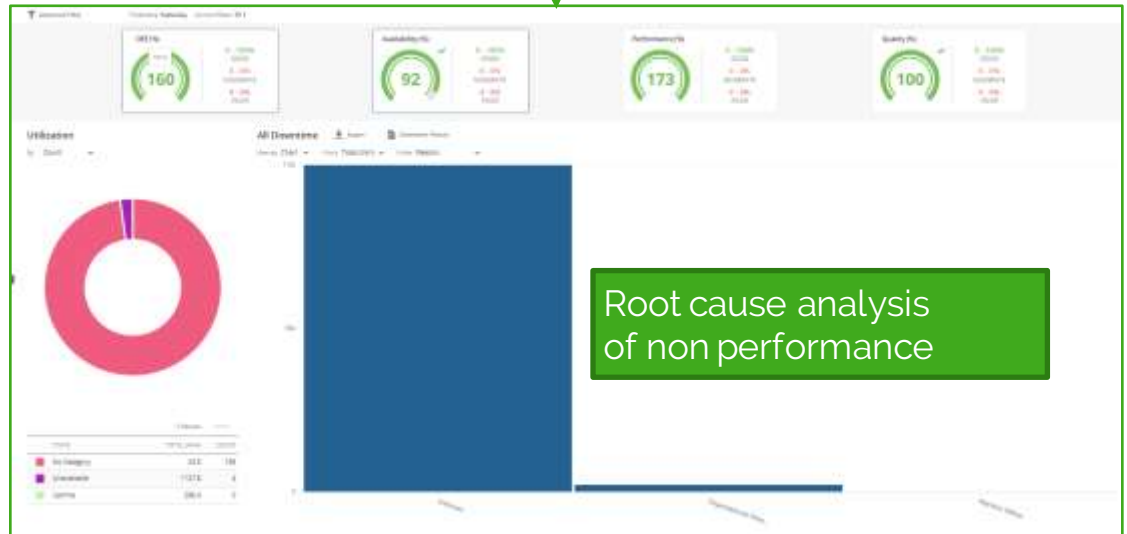
	DEL (%)	AVAILABILITY (%)	PERFORMANCE (%)	QUALITY (%)
WORK UNIT TV 1	160	92	00:23:50 DOWNTIME 173	-0 LOSSES (EACH) 100
WORK UNIT TV 2	0	0	00:02:31 DOWNTIME 0	0 LOSSES (EACH) 0
WORK UNIT TV 3	39	64	08:22:30 DOWNTIME 62	1 LOSSES (EACH) 100
WORK UNIT TV 4	90	84	01:23:04 DOWNTIME 107	-0 LOSSES (EACH) 100
WORK UNIT TV 5	126	94	00:24:14 DOWNTIME 133	-0 LOSSES (EACH) 100
WORK UNIT TV 6	130	88	00:41:32 DOWNTIME 148	-0 LOSSES (EACH) 100
WORK UNIT TV 7	0	100	00:00:00 DOWNTIME 0	0 LOSSES (EACH) 0

Goals :

- Provide machine availability directly at workplace
- Access to a cause analysis for unavailability, standardized for all assets

Test ongoing on RTPPM module developed by PTC.

- Automated collection of machine states
- Collection of manual data that are not available automatically
- Provide an analysis interface




Root cause analysis of non performance

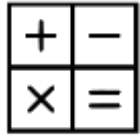
DIGITAL INSTRUCTIONS (CWC = CONNECTED WORK CELL)




ERP PLM



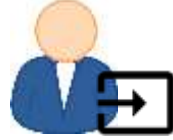
Quality record




Embedded logic




Certification



Operator inputs



Connected tools



Identification

Functionalities

Work Order: OF_Dummy_000005
Serial Number: SN_Dummy_000005
Product: GEnx-1B
Start Time: 2023-04-05 15:09
Planned End Time: 2023-04-07 19:00
Station: Dummy Station 1

Vérifier le P/N des pièces à monter

Vérifier le P/N des pièces à monter (2)

Appliquer de l'huile moteur sur les O-ring

Mettre en place les deux O-ring

Insérer les aubes suivant le listing

Mesures et contrôles - Moteur en fonction (1)

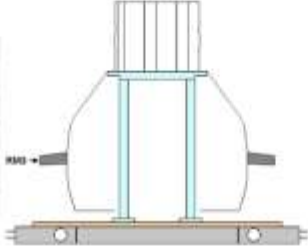

Mesures et contrôles - Moteur en fonction (2)

Mesures et contrôles - Moteur en fonction (3)

Vérifier le P/N des pièces à ...

Vérifier le P/N des pièces à monter dans la LISTE MATIÈRE SUR OF.

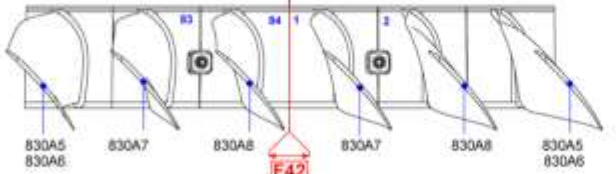
NO. DE PIÈCE	QUANTITÉ	DESIGNATION	UNITÉ	REMARQUES	DATE DE DÉPART	DATE DE RETOUR
1	1	GE0070	0.25	114.52	114.52	114.52
2	1	GE0070	0.25	114.52	114.52	114.52
3	20	GE0070	0.20	114.58	114.58	114.58
4	1	GE0070	0.20	114.70	114.70	114.70
5	13	GE0070	0.20	114.78	114.78	114.78
6	18	GE0070	0.20	114.87	114.87	114.87

Etape 3 Ouverture pour engagement des aubes

avec le Fan vers le Haut

← Chargement



Déchargement →

Chargement Nominal

FAN vers le haut

00:00:50 Target Cycle Time 00:04:00 All Steps 00/00/16

Verify Parts

PART NAME	PART NUMBER	QTY
Dummy component	Product_Dummy_000001	4 <input type="checkbox"/>

Note:

WAY FORWARD – CONCLUSIONS

- In SAFRAN digital transformation, the MES is the key system to ensure digital continuity in operations and design activity loops (ERP-PLM-MES is the golden triangle)
- SAFRAN Aero Boosters selected PTC Thingworx for machine data collection and is now building his MES with PTC building blocks and some products from PTC Manufacturing suite.
- This choice was mainly based on
 - Decision from PTC to include in Thingworx building blocks compatible with ISA95 standard
 - PTC roadmap for tool development aligned with SAFRAN Aero Booster strategy
 - Openness and Quality of Technical support
- Next challenges are
 - Development of missing ISA95 features (Traceability, Detailed Scheduling)
 - Interface with the PLM (Product Lifecycle Management) to get digital instructions and provide manufacturing data
 - Interface with the ERP (Enterprise Resources Planning) for production request and resources management, and provide production feedback in real time for Advanced Planning Scheduling
 - Interface with the QMS (Quality Management System) to manage non conformance and provide traceability
 - Interface with the HRM (Human Resources Management) for operator qualification and availability



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A NEW ERA IN PRODUCT LIFECYCLE INNOVATION

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