

IIoT: Predictive Analytics for Efficient Product Realization and Lifecycle Services

Can IIoT get us
back to the past...?

Presented By:
Louis J Pascarella

Chief Technical Officer, Geometric Ltd.

GLOBAL PRODUCT DATA INTEROPERABILITY **SUMMIT** 2015



ELYSIUM

Darker Aerospace

NORTHROP GRUMMAN

BOEING

ELYSIUM

Darker Aerospace

NORTHROP GRUMMAN

BOEING

PLM is...

Global Product Data Interoperability Summit | 2015

**... everyone working together
to make the best decisions
every day.....**

To produce the best products...

**To Optimize Our Customers'
Experience...**

Not Difficult when Scale is Small...

... and you wear lots of hats!



Not Difficult when Scale is Small...

... and you wear lots of hats!



**....and everyone is in
the same room....**

Our Communication is.....

- **Low Risk**
- **Low Latency**
- **High Context & Error Free**

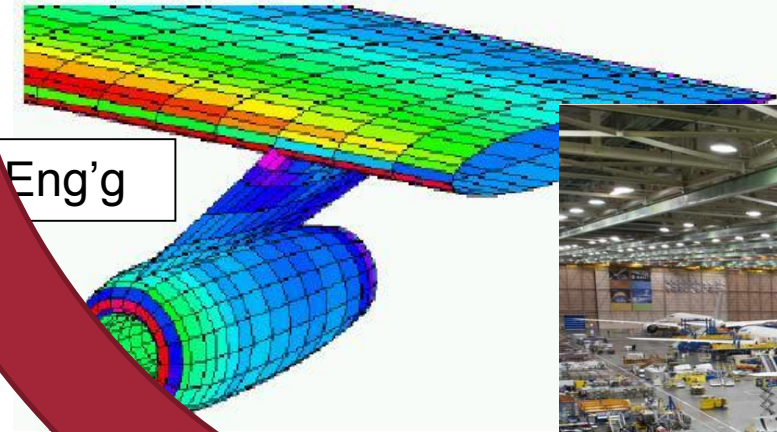
But Challenging when we... “Advance”

Global Product Data Interoperability Summit | 2015

Design



Service



Eng'g

Mfg'g



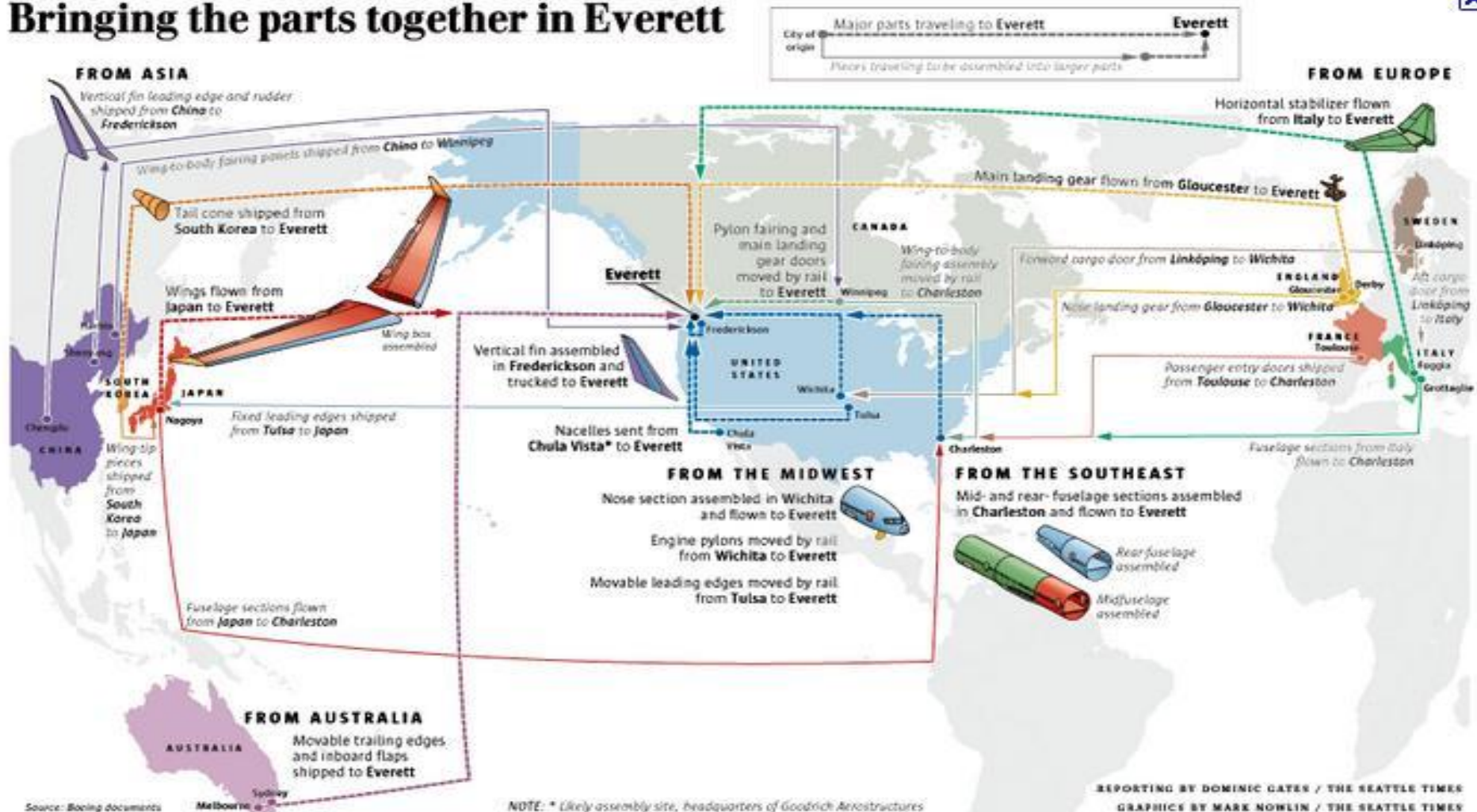
Complexity

And We grow

Global Product Data Interoperability Summit | 2015



Bringing the parts together in Everett

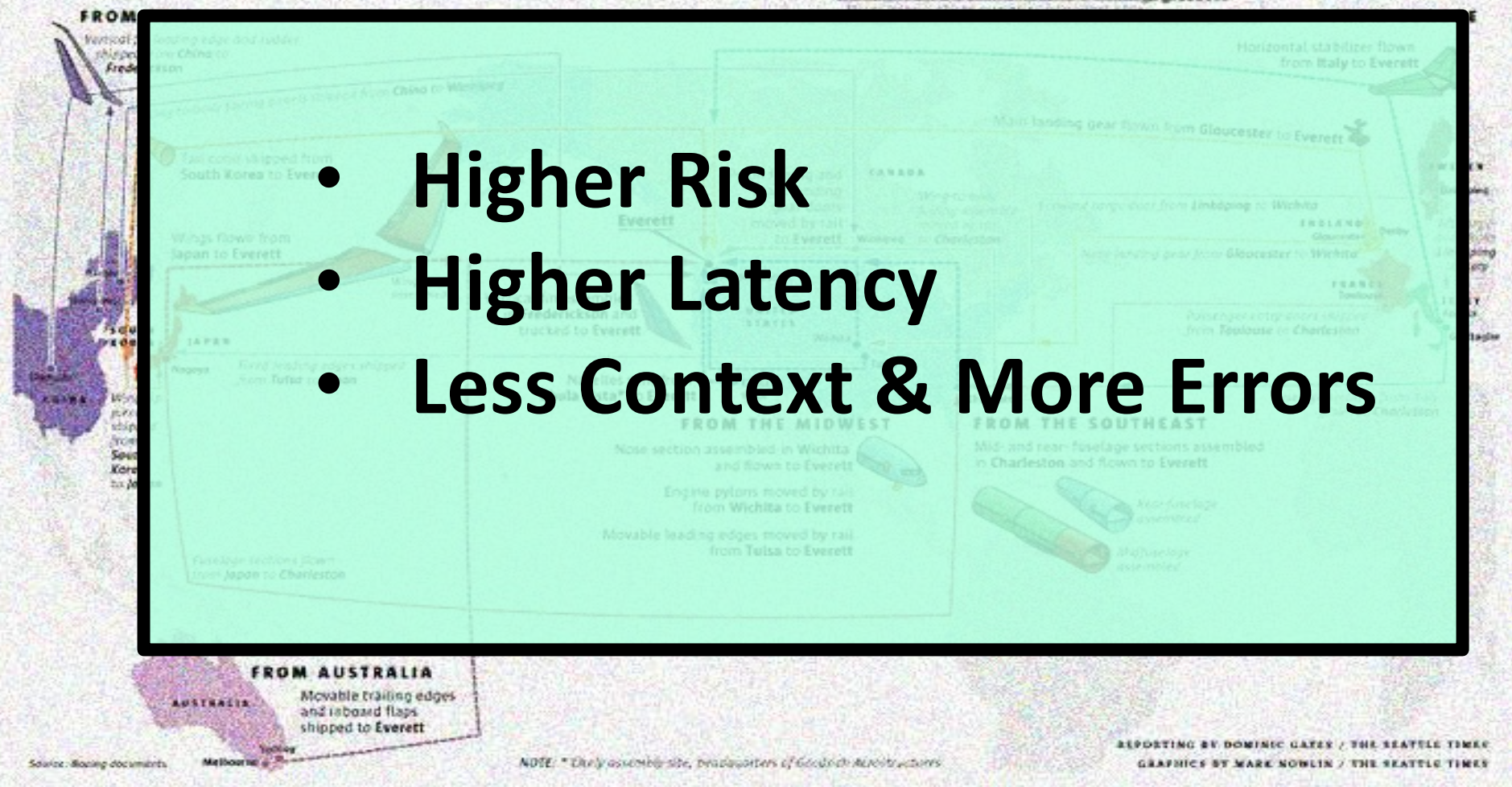


And Now Our Communication has...

Global Product Data Interoperability Summit | 2015

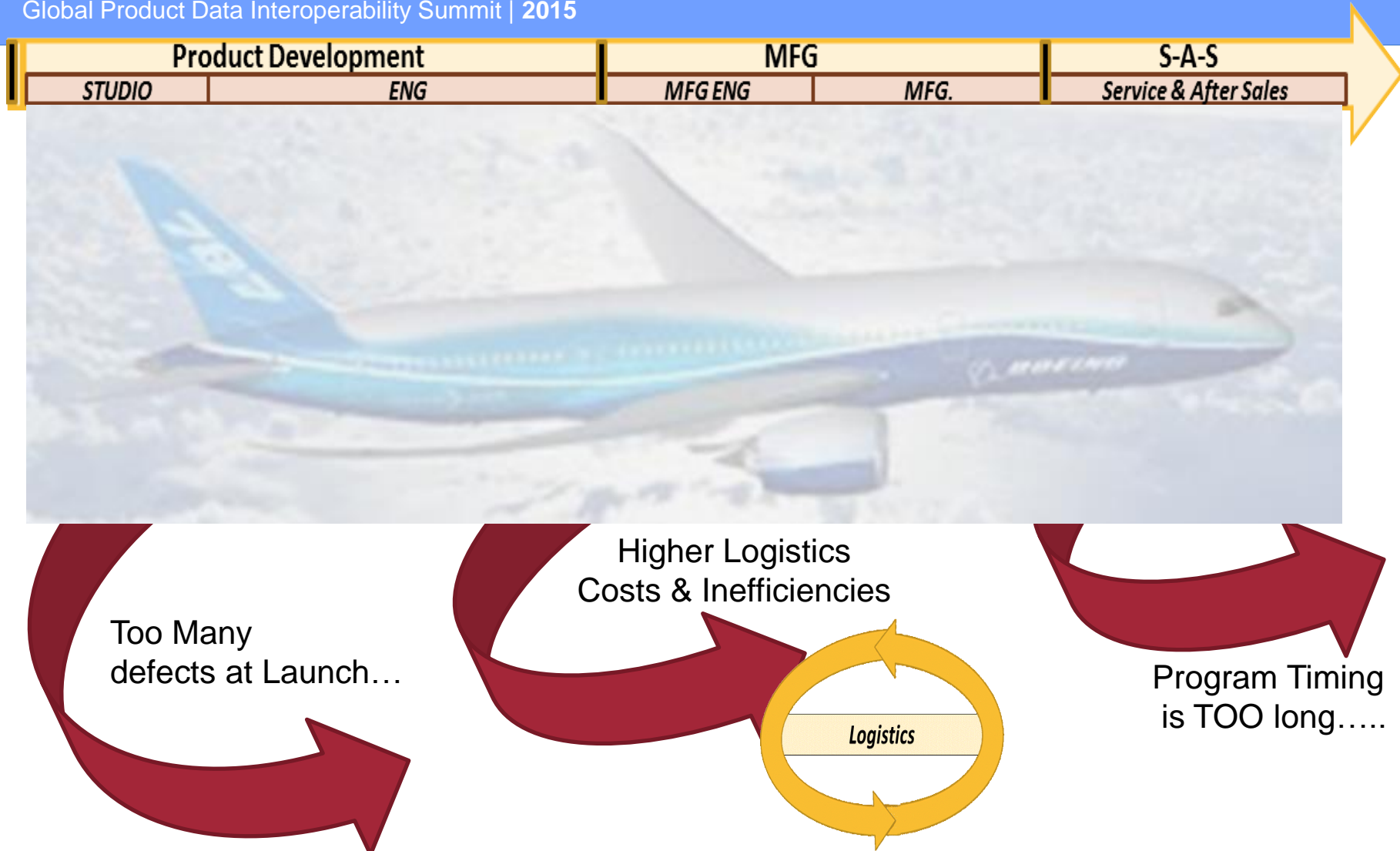


Bringing the parts together in Everett



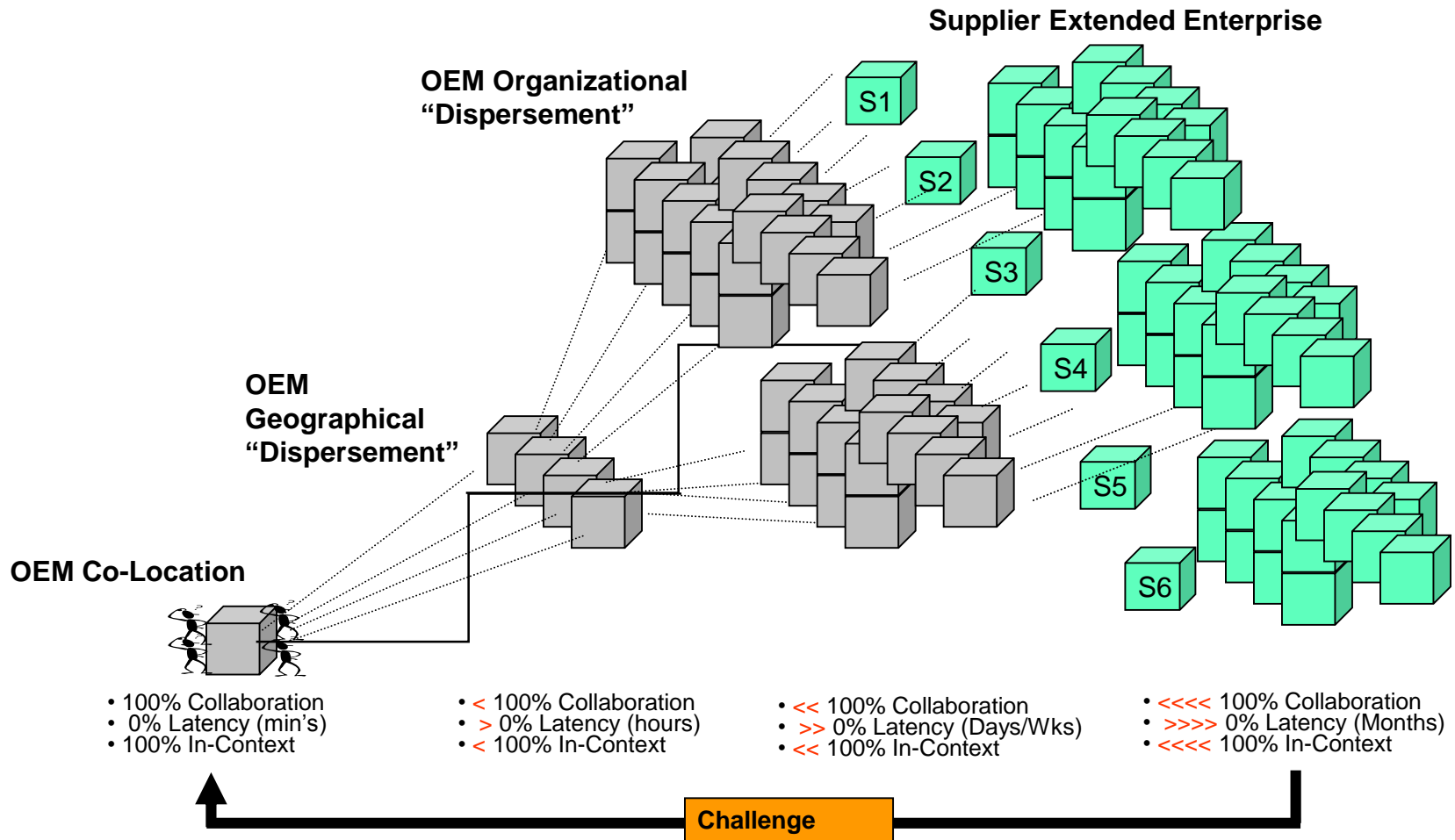
Which Causes...

Global Product Data Interoperability Summit | 2015



Growth Effects on Collaboration...

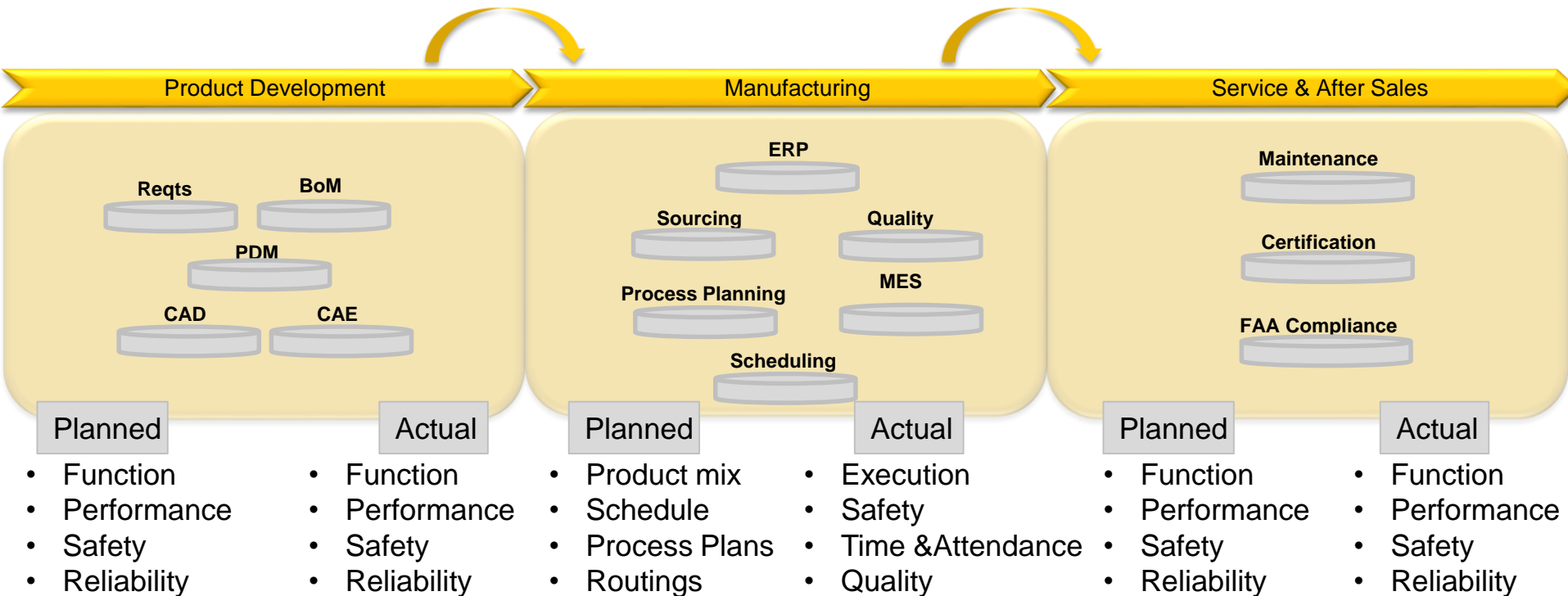
Global Product Data Interoperability Summit | 2015



The Way Forward...

Traditional Product Realization Landscape...

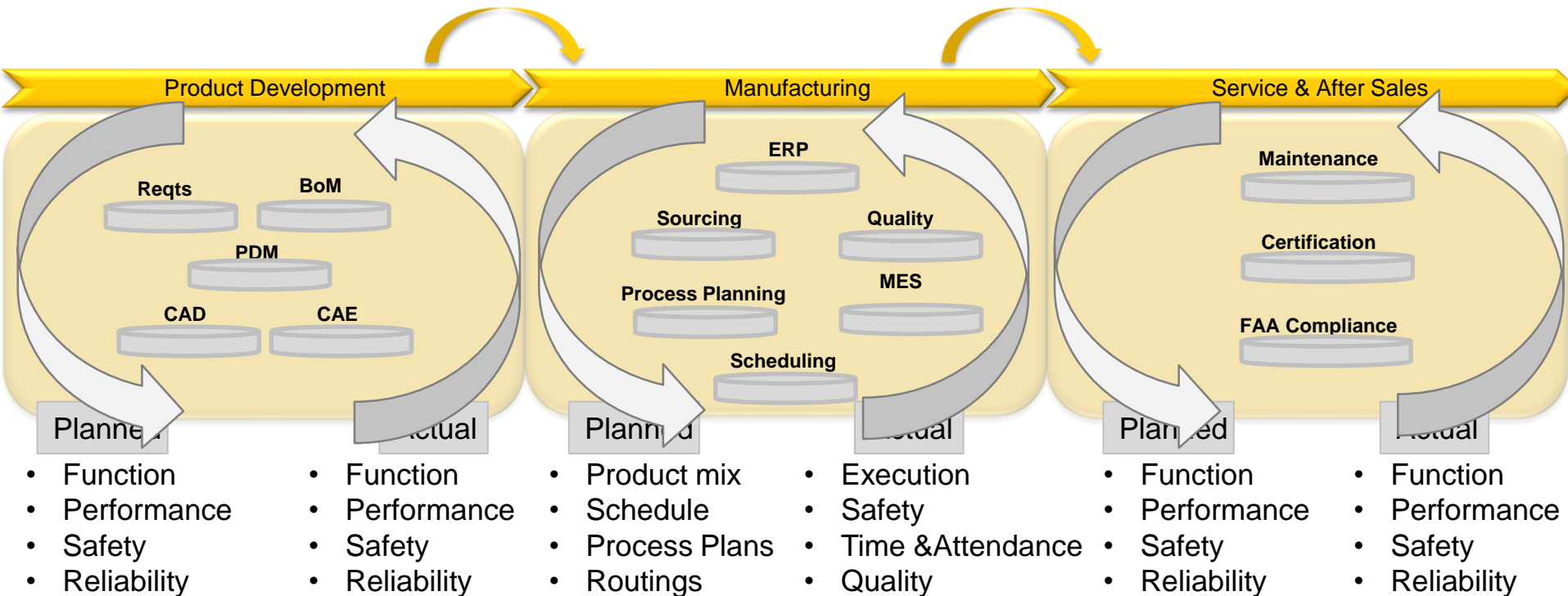
Global Product Data Interoperability Summit | 2015



Local Optimizations
By User Domains

Traditional Product Realization Landscape...

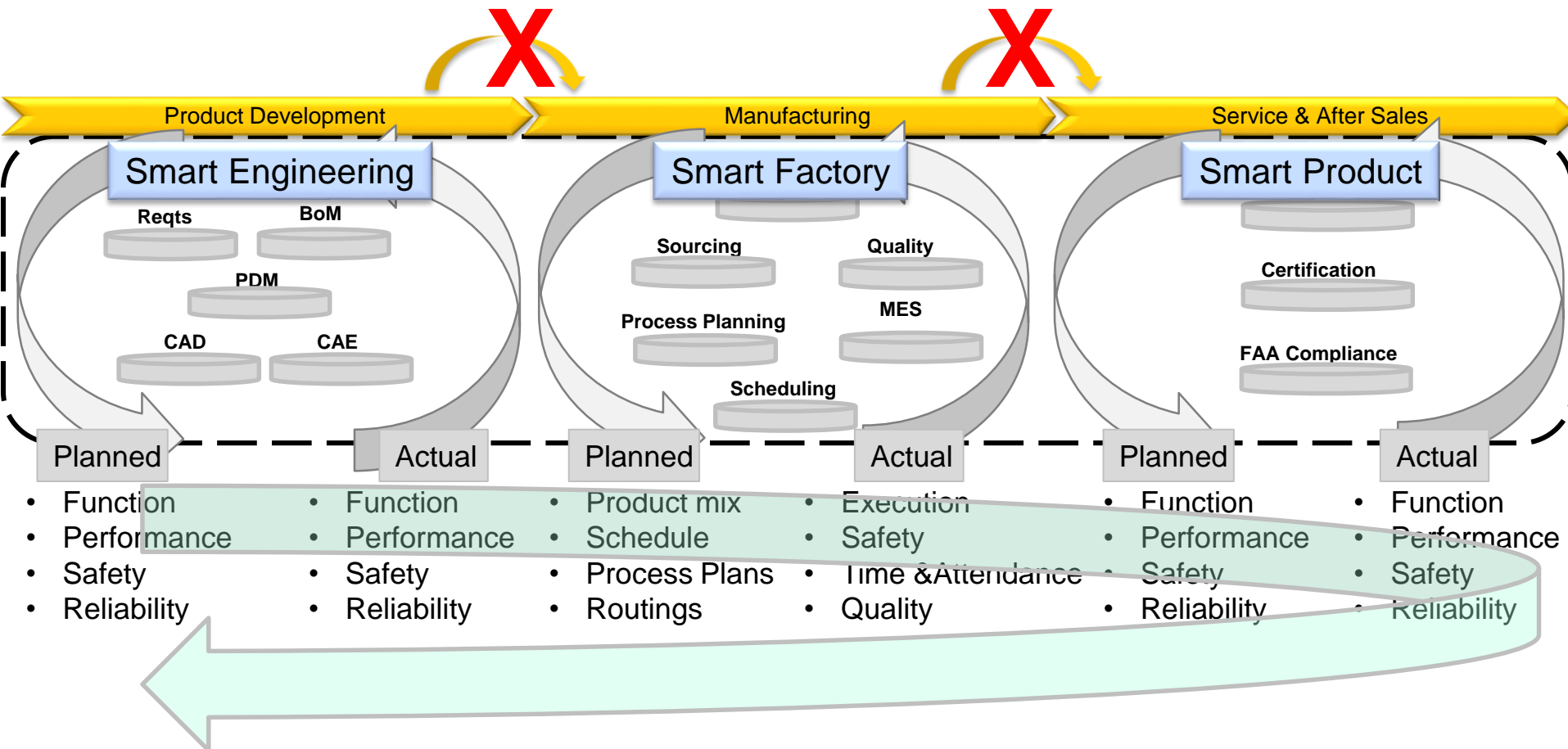
Global Product Data Interoperability Summit | 2015



Local Optimizations
By Domain

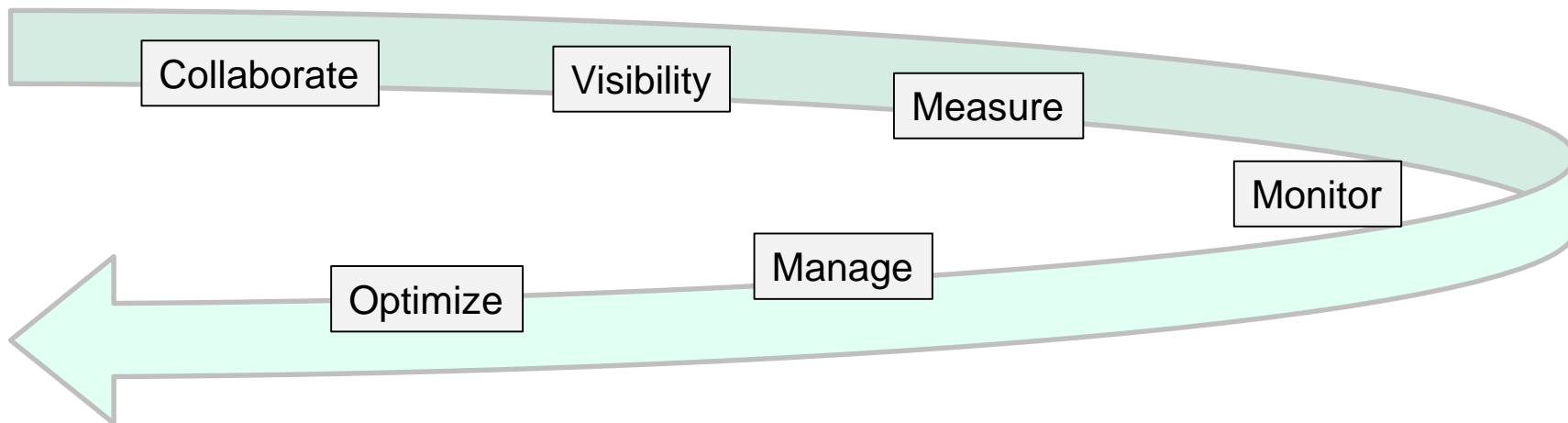
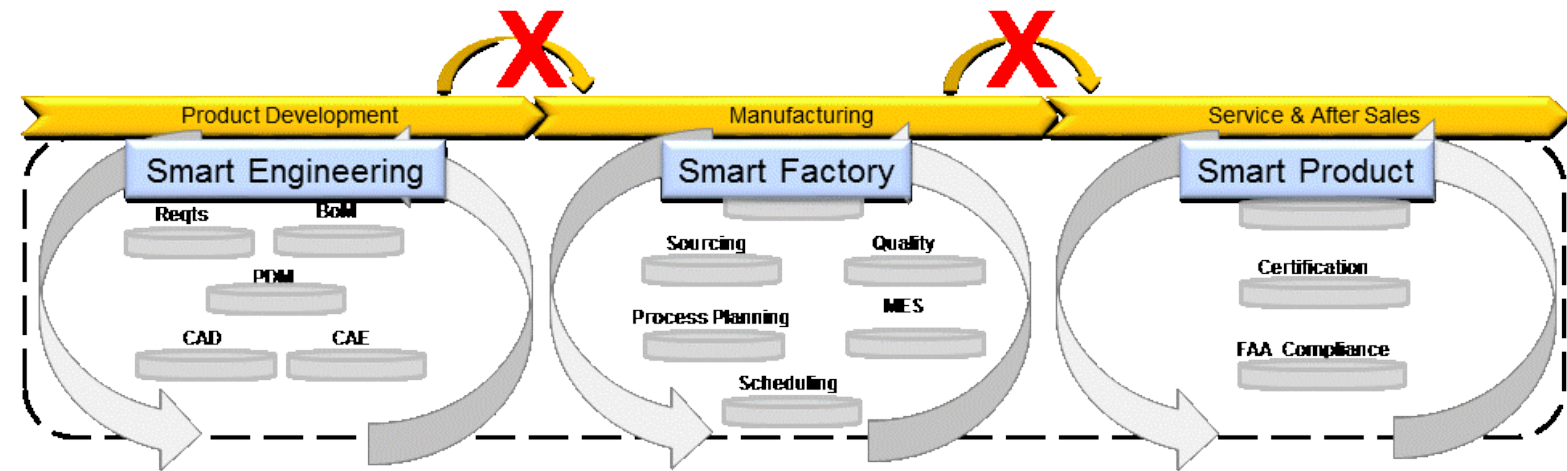
Target Product Realization Landscape...

Global Product Data Interoperability Summit | 2015



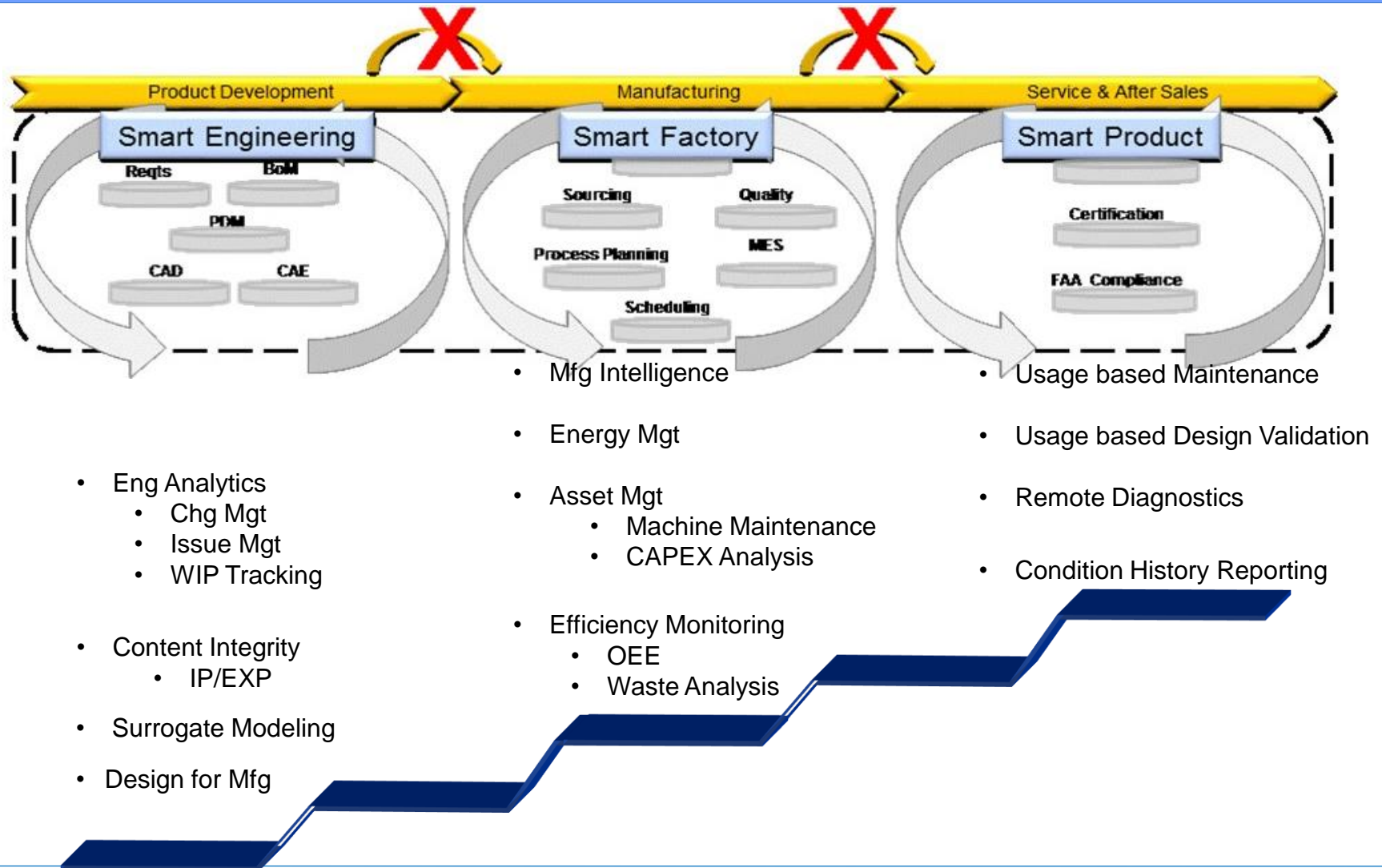
The Way Forward...

Global Product Data Interoperability Summit | 2015



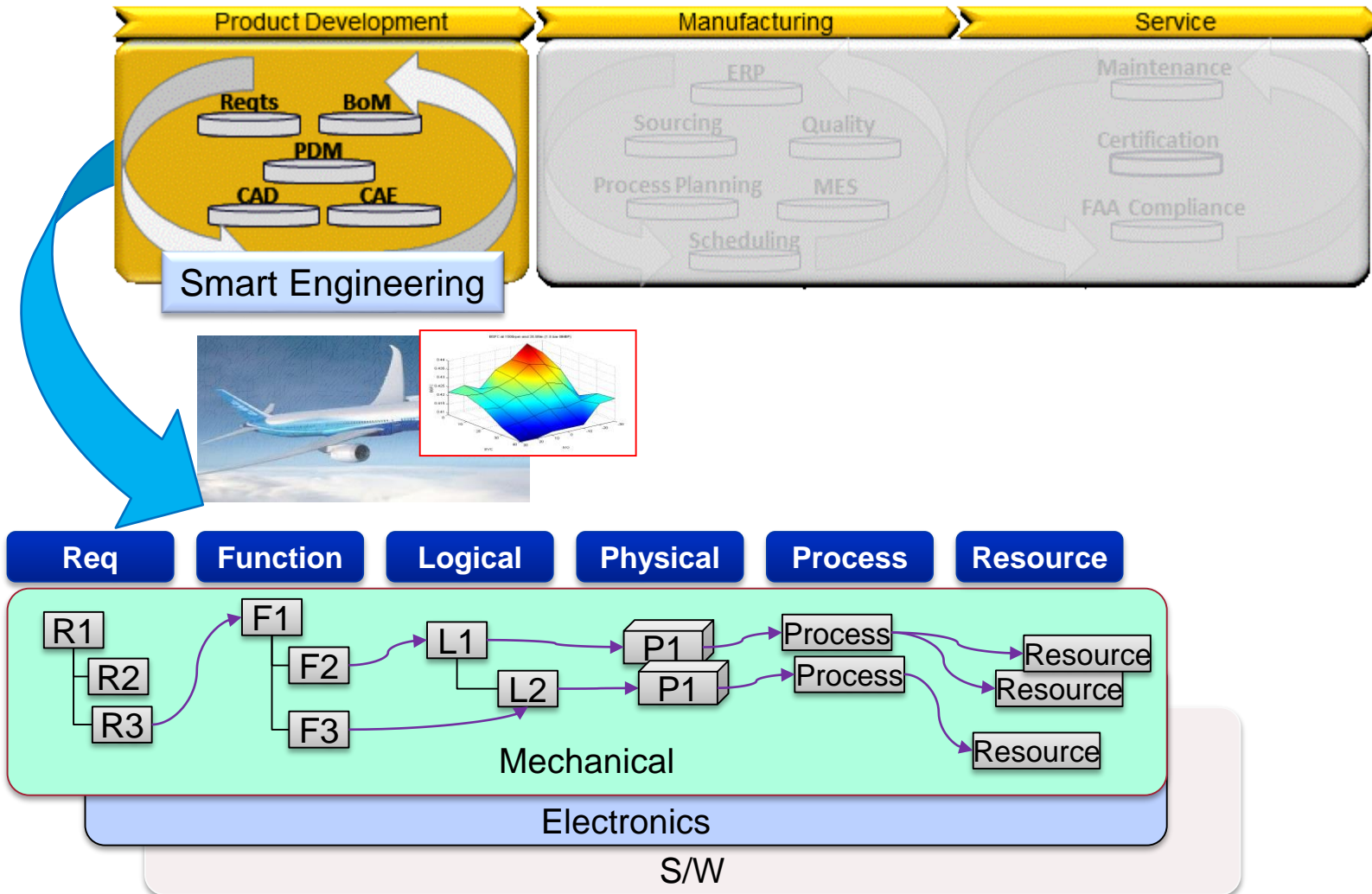
What can be done today....

Global Product Data Interoperability Summit | 2015

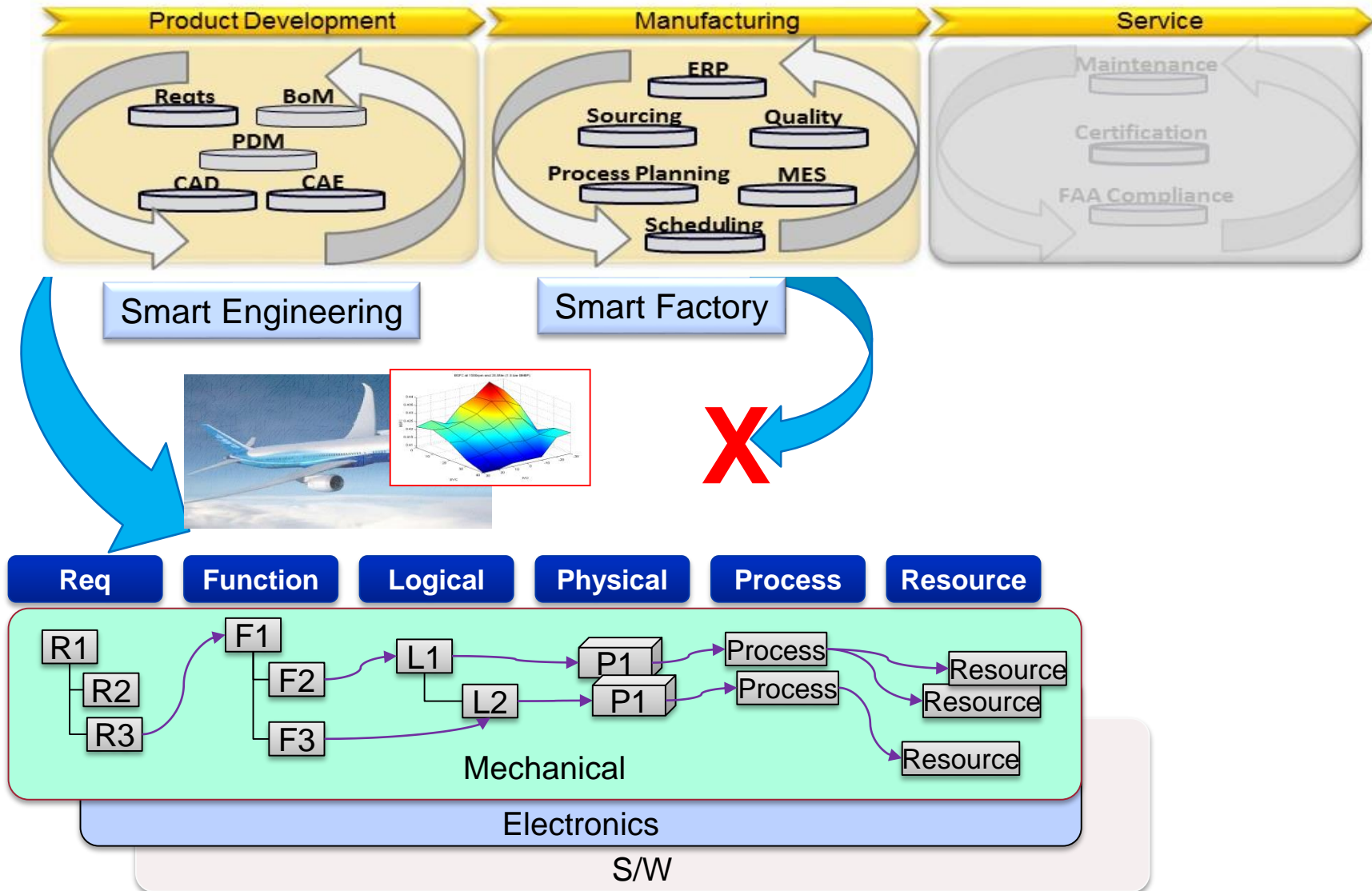


Smart Engineering → MBSE

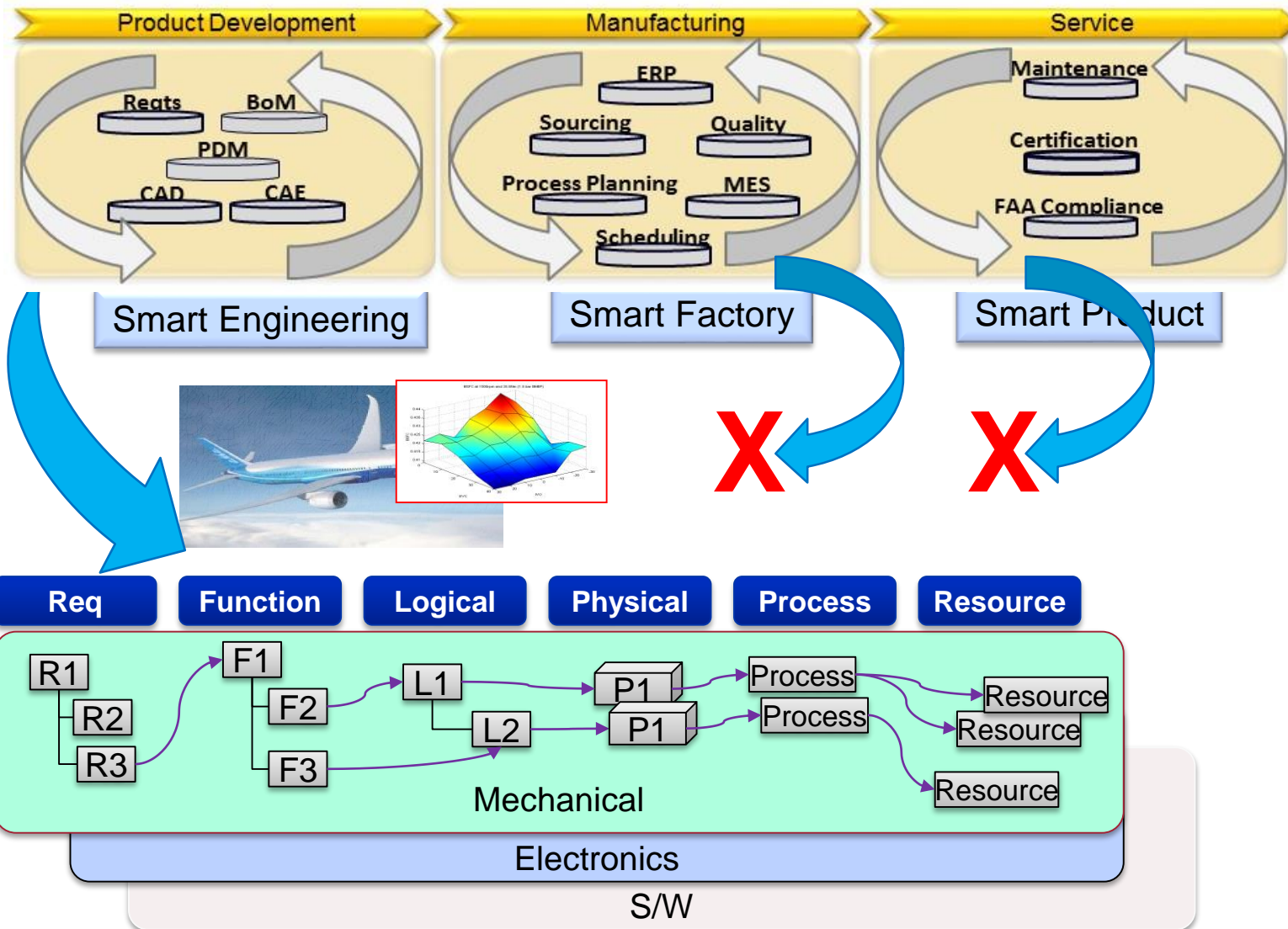
Global Product Data Interoperability Summit | 2015



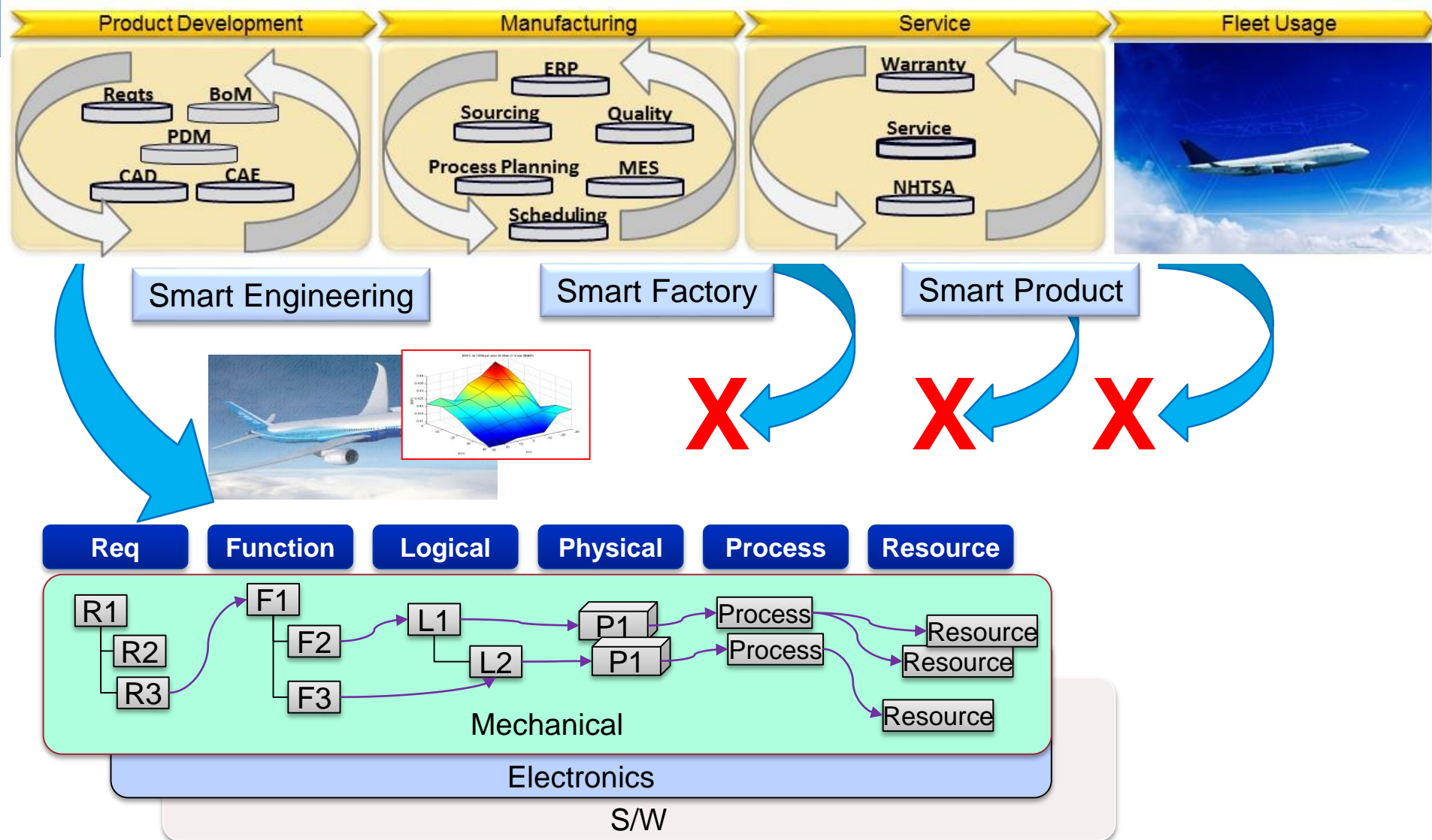
Smart Factory → Analytics Driven Optimization



Smart Product → Captured Service Experience

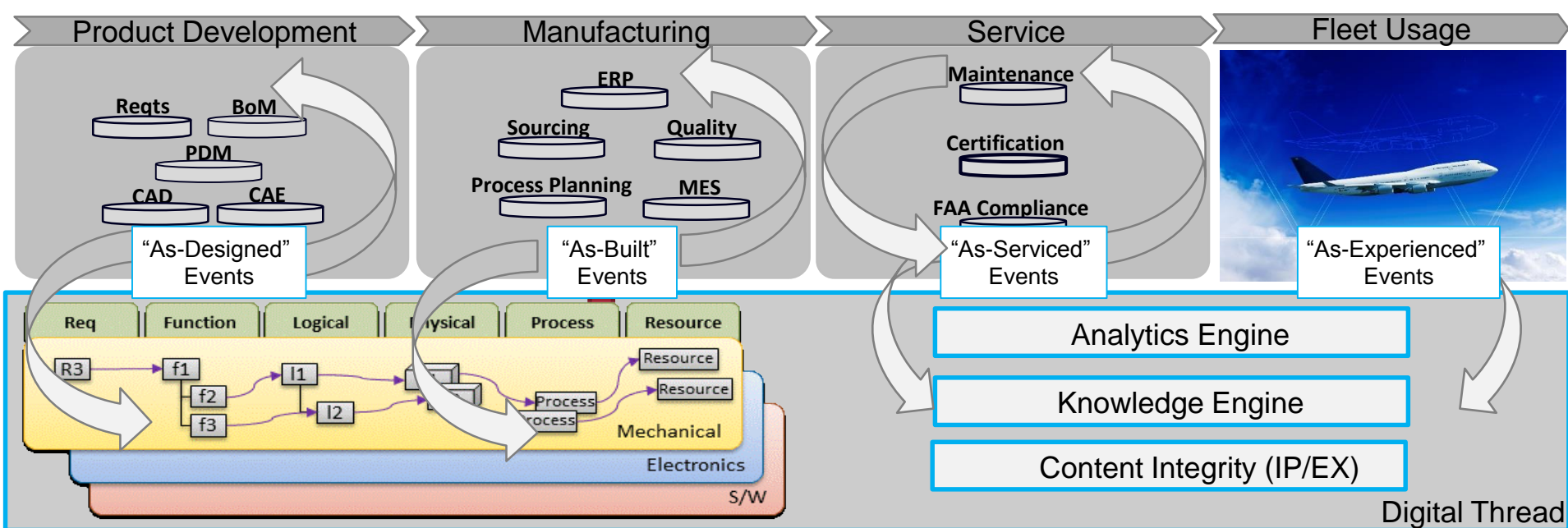


Smart Product → Captured Usage Experience



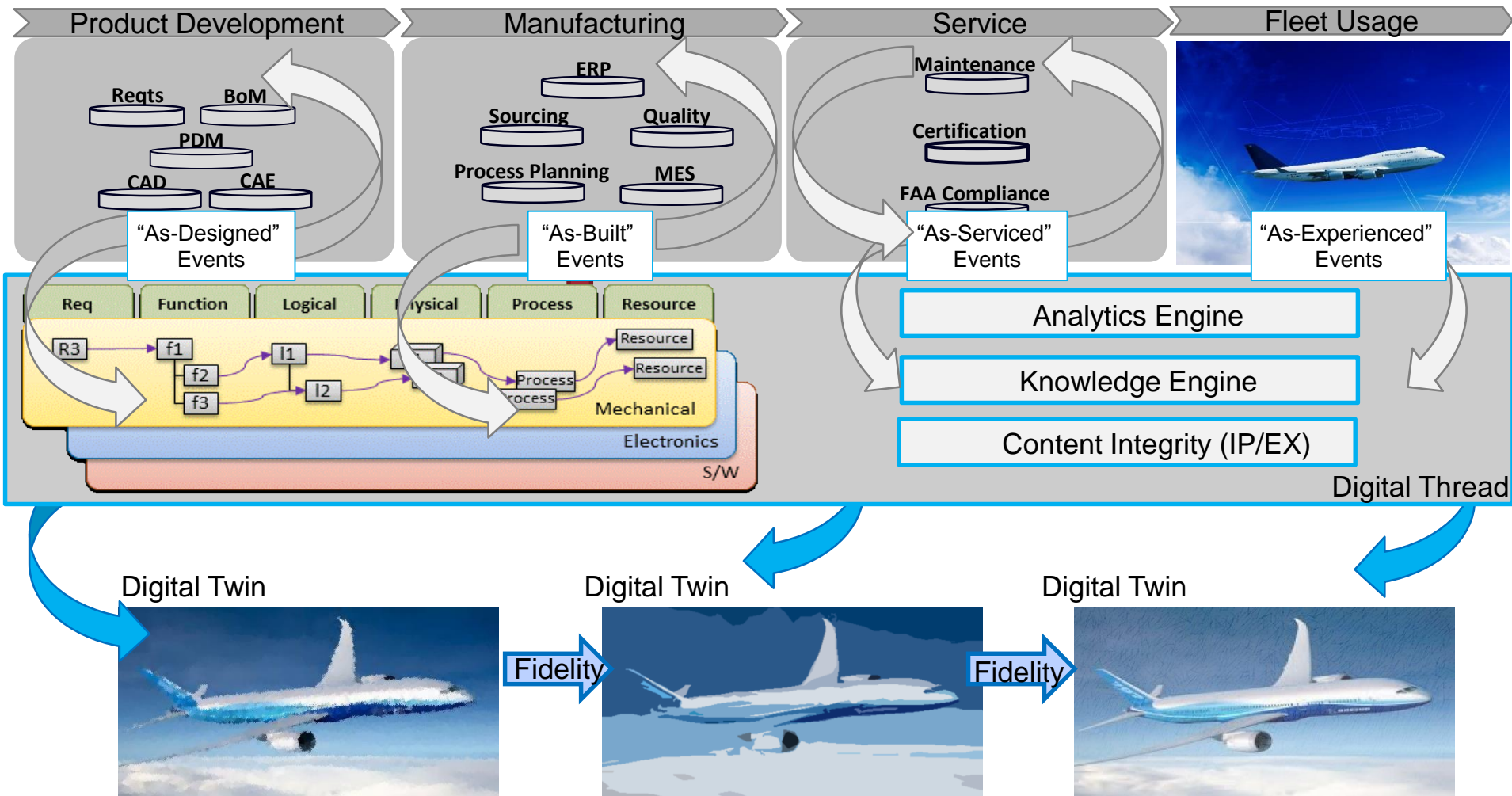
We Can now Build => Digital Thread

Global Product Data Interoperability Summit | 2015



From the Digital Thread => To The Digital Twin

Global Product Data Interoperability Summit | 2015

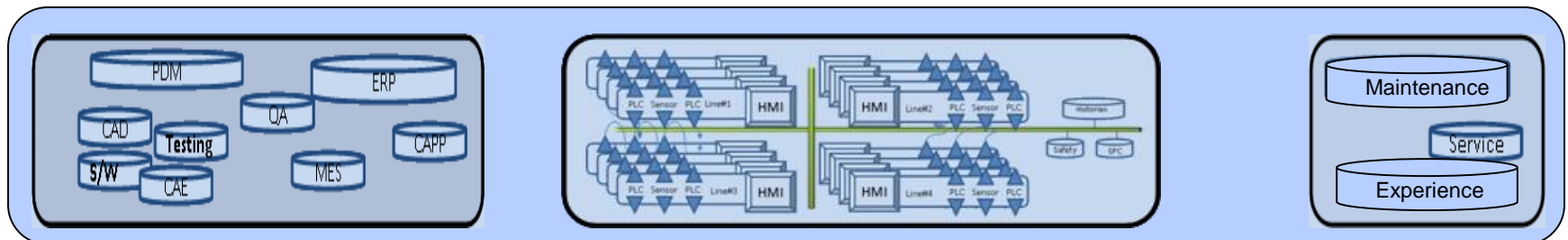
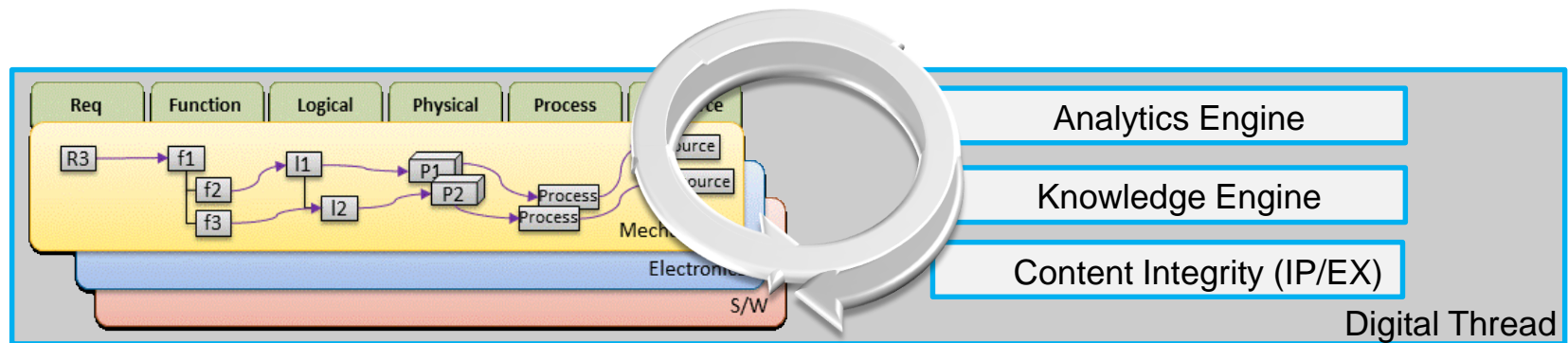


From the Digital Thread => To The Digital Twin

Global Product Data Interoperability Summit | 2015

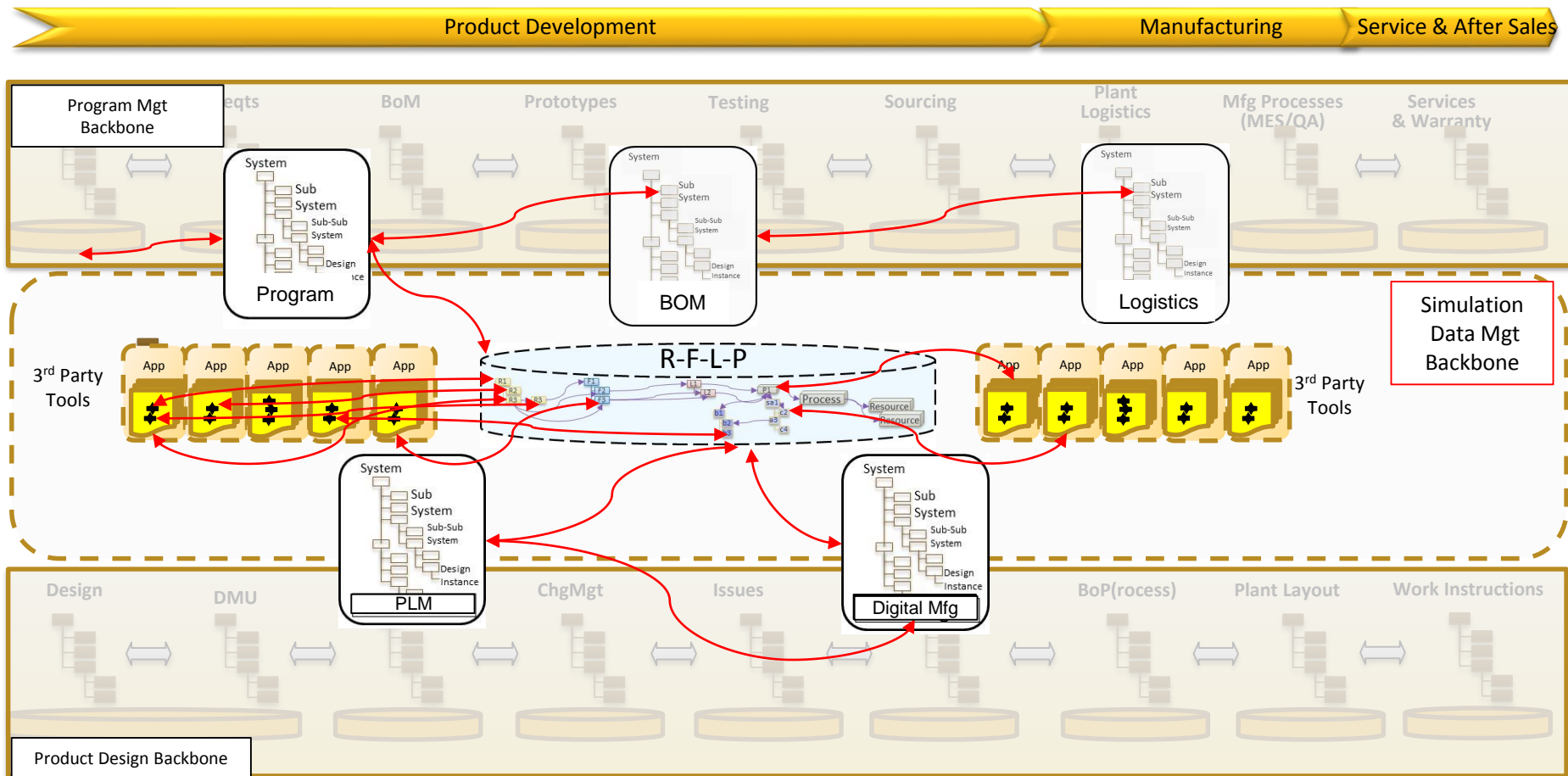
Where we are starting...

Requires a Digital Thread Platform.....



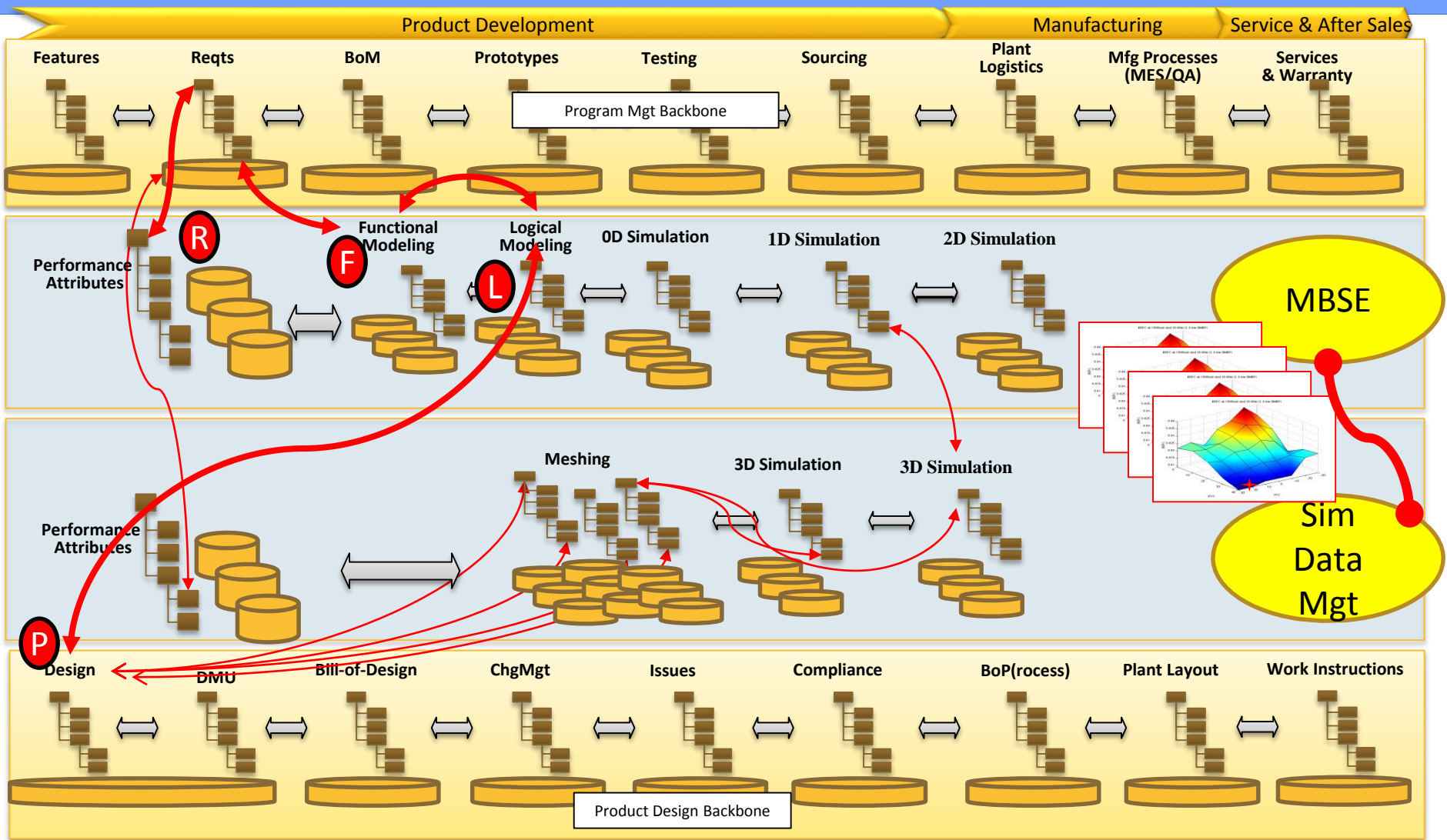
Because...The Thread Platform must manage 3rd party tools links.....

Global Product Data Interoperability Summit | 2015



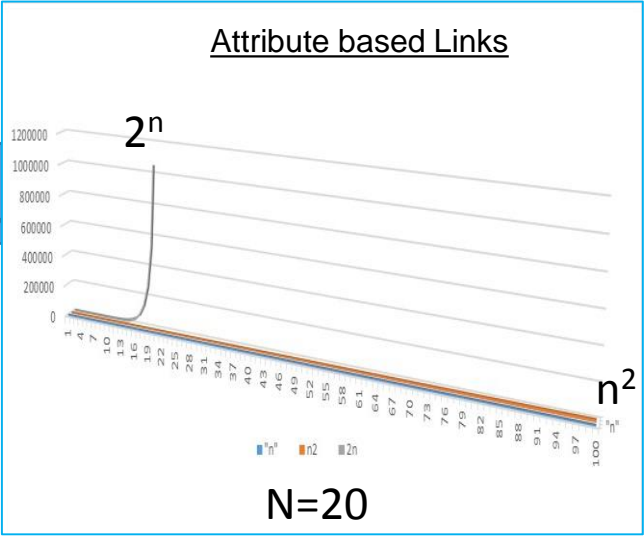
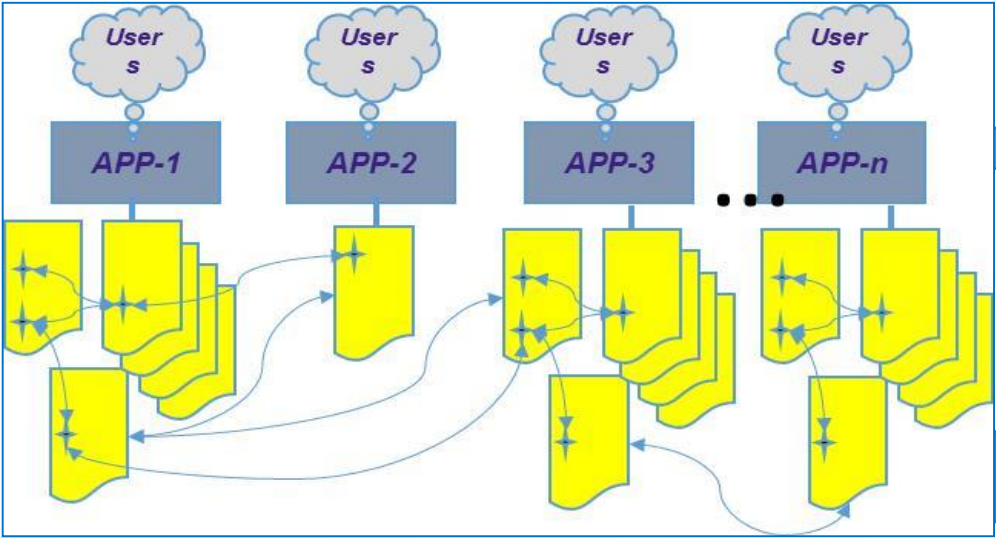
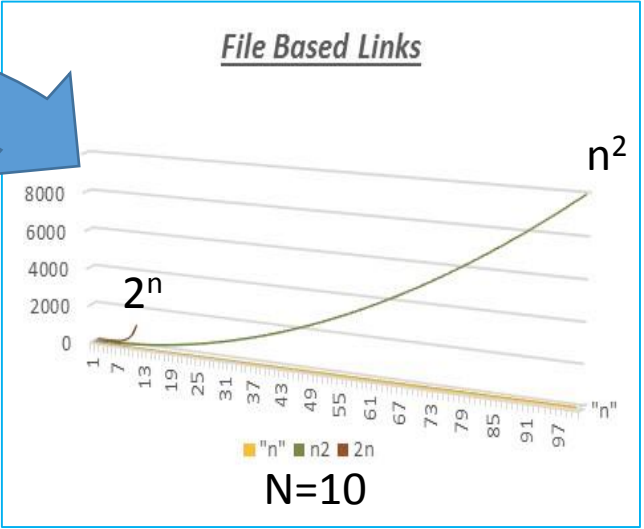
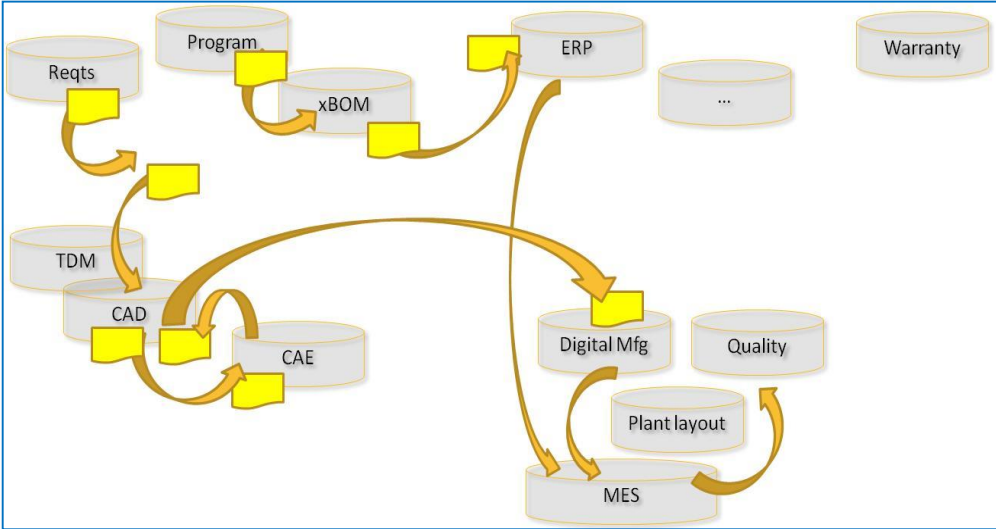
Because... The Thread Platform must manage/synthesize links.....

Global Product Data Interoperability Summit | 2015



Because... File-Based Integrations vs. Attribute Linkage Mgt (n^2 vs 2^n)

Global Product Data Interoperability Summit | 2015



Because... Shop Floor Data Collection is Heterogeneous/Granular

Global Product Data Interoperability Summit | 2015

Example Protocols and Manufacturers:

- ✓ Allen Bradley PLCs
- ✓ DNP3
- ✓ ICCP
- ✓ GE Fanuc PLCs
- ✓ Mitsubishi PLCs
- ✓ Modbus Devices
- ✓ Modicon PLCs
- ✓ OMRON PLCs
- ✓ ROC/ROC+
- ✓ Siemens S7 PLCs
- ✓ ABB AC450, AC460 and AC410
- ✓ APACS
- ✓ Bailey DCS
- ✓ Fisher Provox
- ✓ Foxboro
- ✓ Honeywell TPS (TDC 3000)
- ✓ RS3 RNI
- ✓ Triconex
- ✓ Yokogawa
- + *others*



Example Historians and Databases

- OSI PI
- AspenTech InfoPlus 21
- GE-Fanuc Automation Proficiency (iHistorian)
- Wonderware Historian (InSQL)
- MatrikonOPC Desktop Historian
- Honeywell PHD
- InStep eDNA
- Microsoft SQL Server
- All OPC-HDA Compliant Historian

Because... In-Flight Data Collection is Massive

Global Product Data Interoperability Summit | 2015



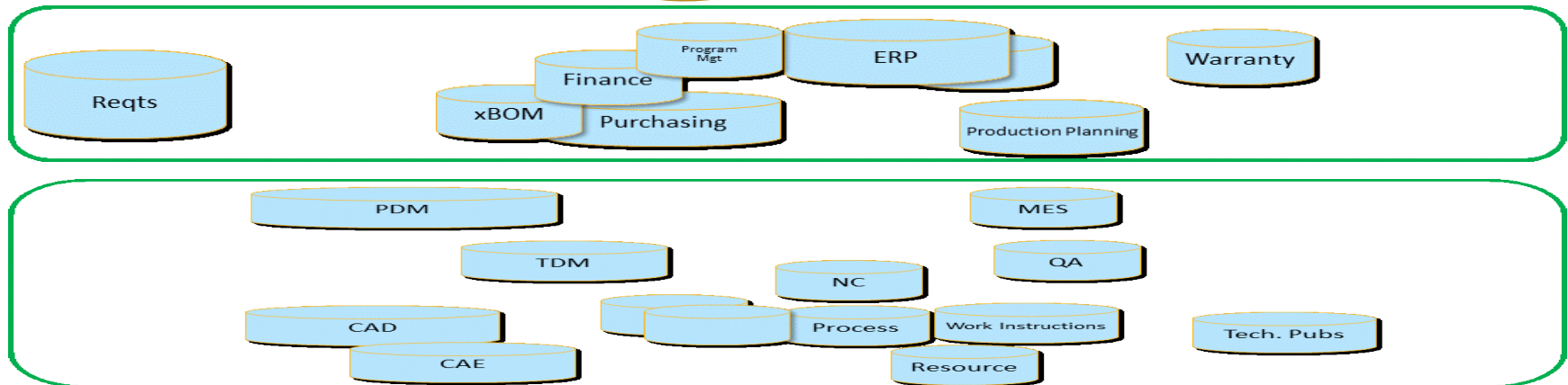
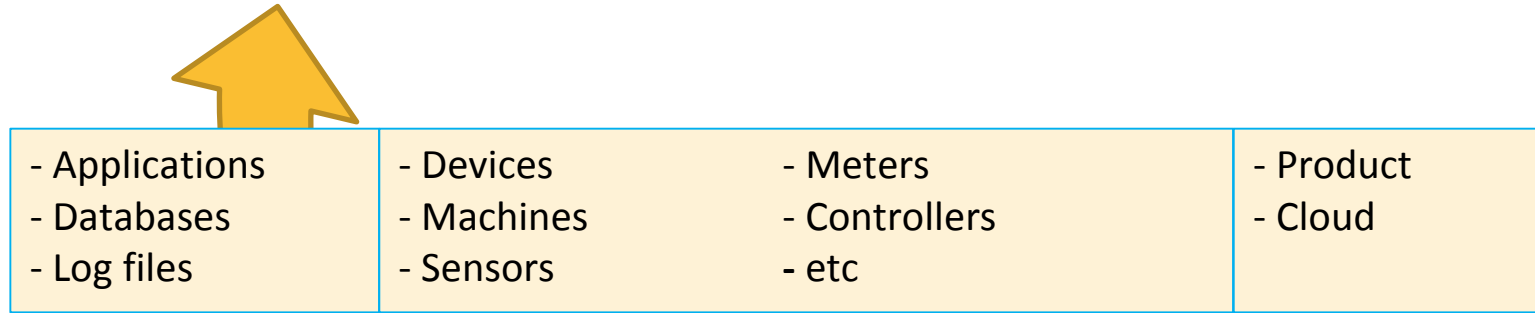
- ~ 20GB per hour
- 8000 parameter/tests

The Digital Thread Platform must.....

Global Product Data Interoperability Summit | 2015



Data Collection....

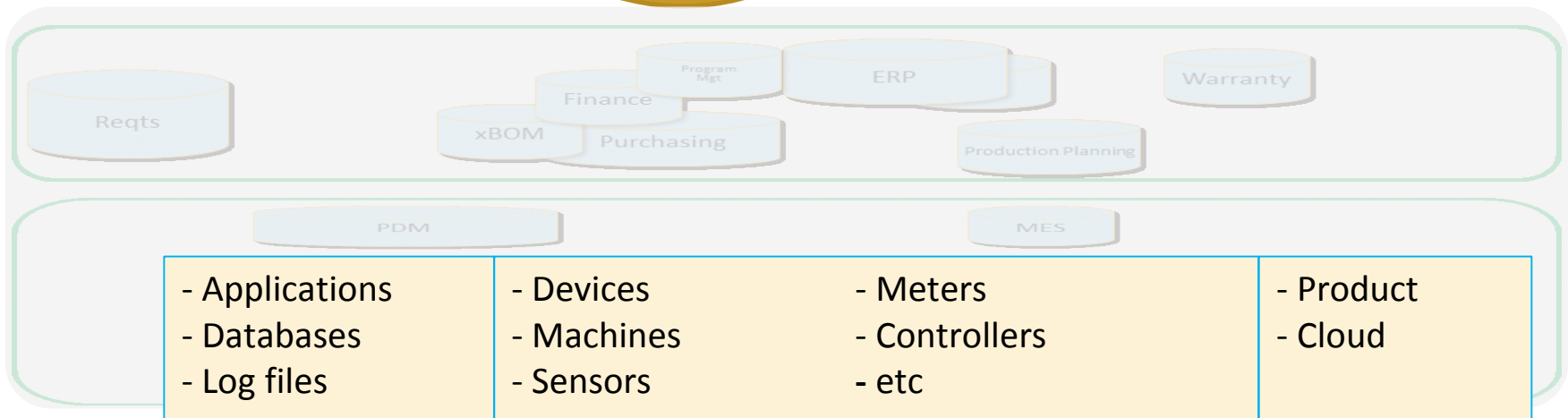
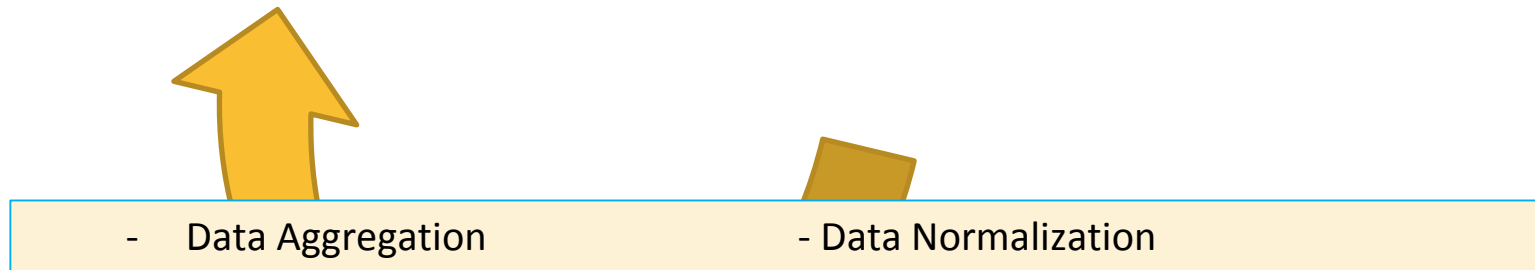


The Digital Thread Platform must.....

Global Product Data Interoperability Summit | 2015



Add

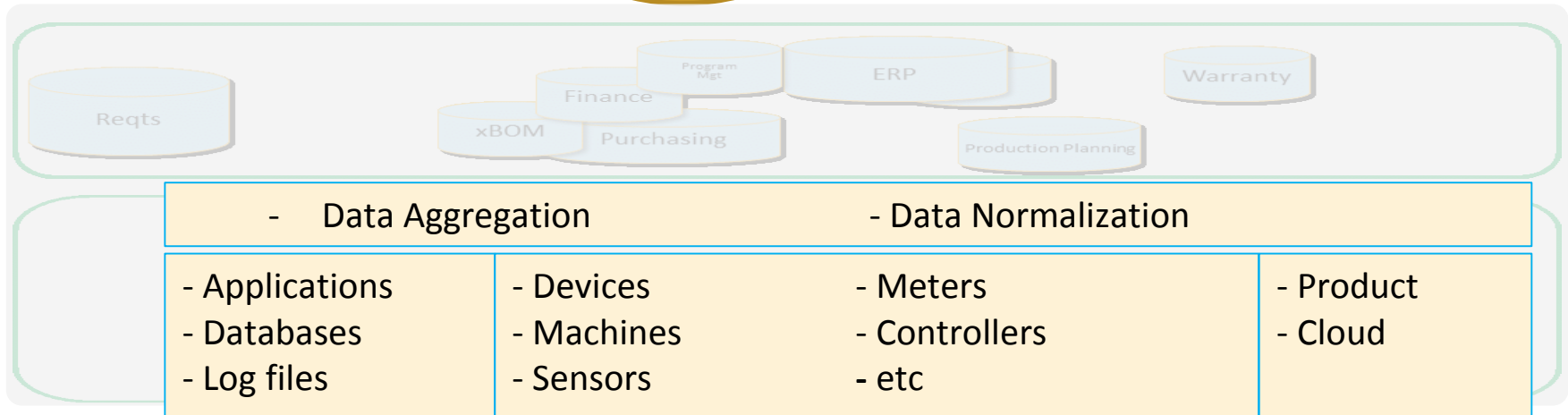
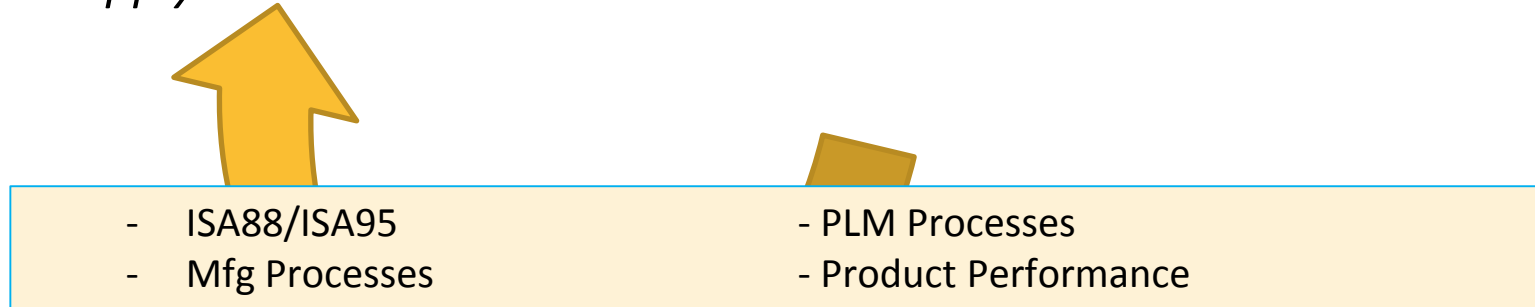


The Digital Thread Platform must.....

Global Product Data Interoperability Summit | 2015



Apply Context....



The Digital Thread Platform must.....

Global Product Data Interoperability Summit | 2015

Product Development

Manufacturing

Service & After Sales

Define Measurements, Domains, Ranges, Formulae...

- Metrics
- Targets

- KPIs
- Alerts

- ISA88/ISA95
- Mfg Processes

- PLM Processes
- Product Performance

- Data Aggregation

- Data Normalization

- Applications
- Databases
- Log files

- Devices
- Machines
- Sensors

- Meters
- Controllers
- etc

- Product
- Cloud

The Digital Thread Platform must.....

Global Product Data Interoperability Summit | 2015

Product Development

PLM Efficiency Mgt



Manufacturing

Mfg Operations Mgt



Service & After Sales

Service/Maintenance Mgt



Monitor & Manage
Dashboards, Scorecards, Reports

- Metrics
- Targets

- KPIs
- Alerts

- ISA88/ISA95
- Mfg Processes

- PLM Processes
- Product Performance

- Data Aggregation

- Data Normalization

- Applications
- Databases
- Log files

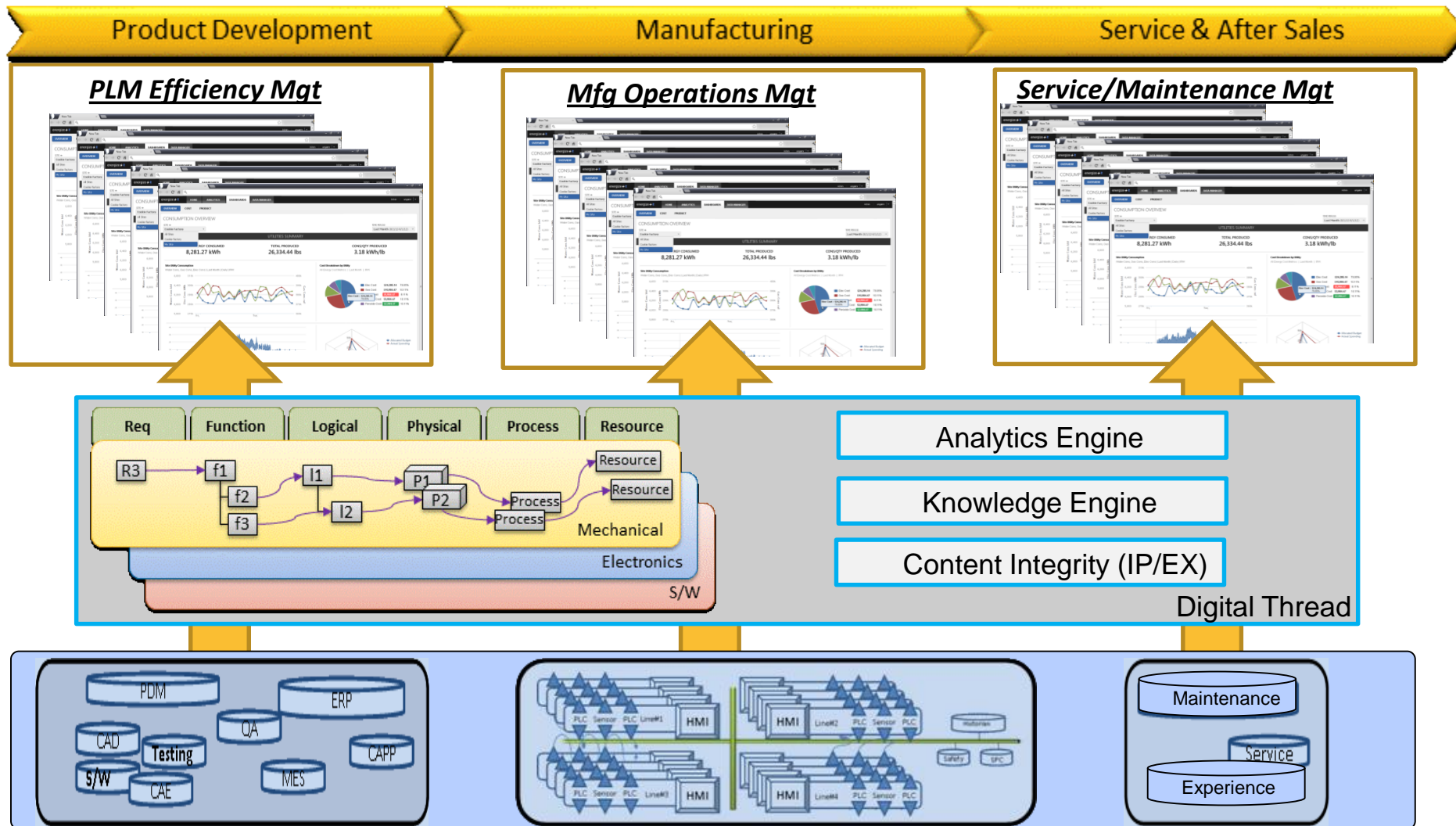
- Devices
- Machines
- Sensors

- Meters
- Controllers
- etc

- Product
- Cloud

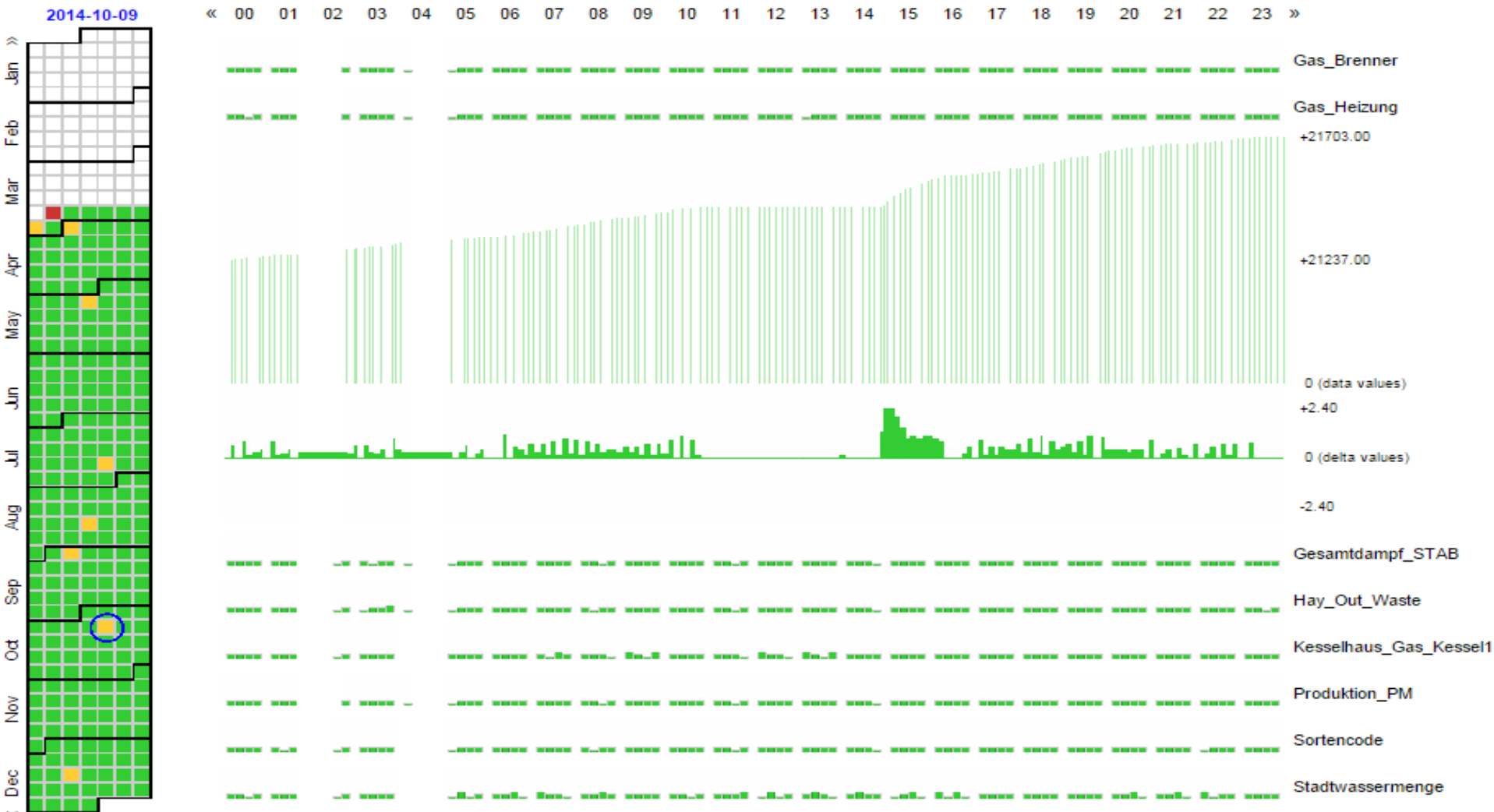
The Digital Thread Platform must.....

Global Product Data Interoperability Summit | 2015



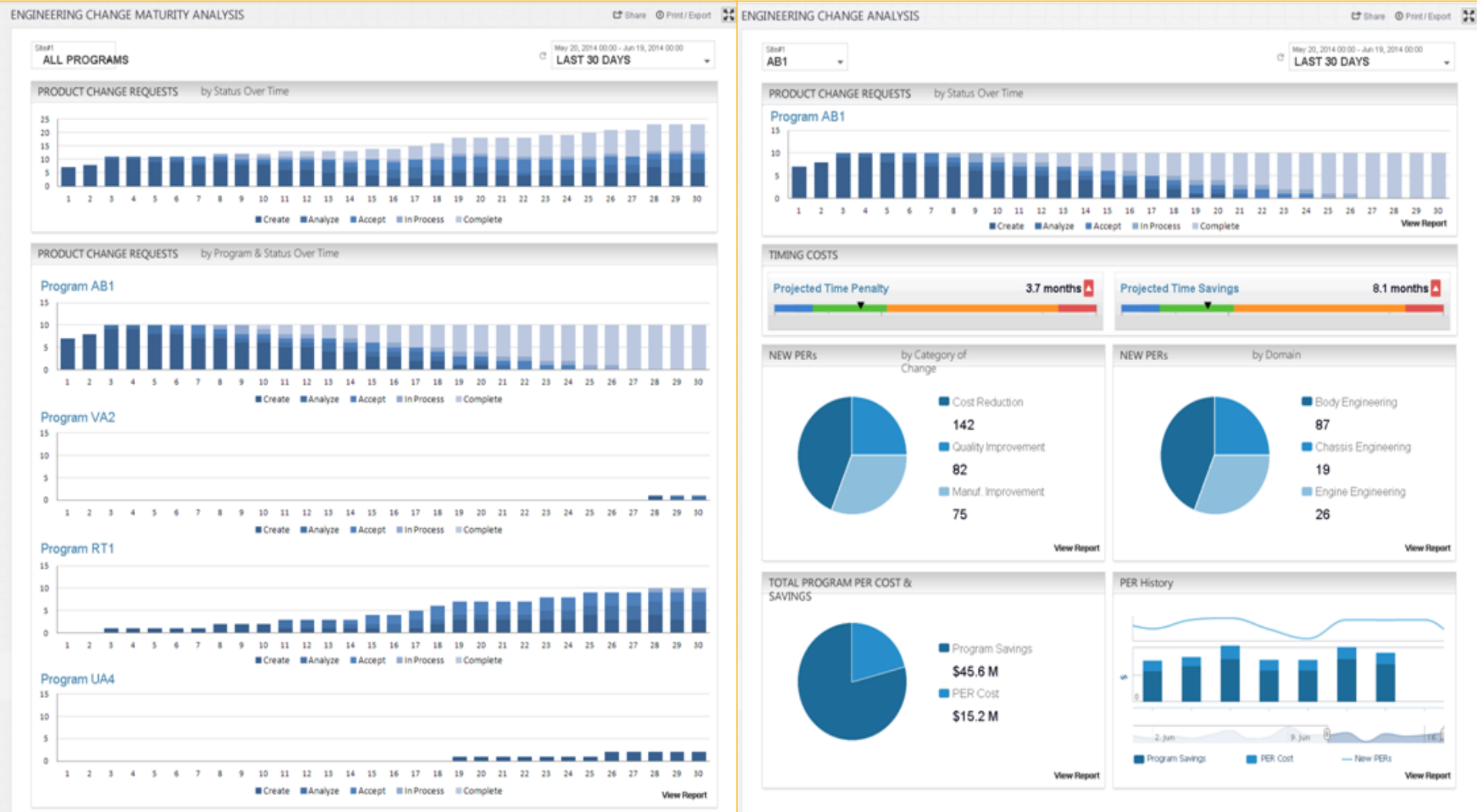
And then we can..... Have visibility on instrumented H/W & S/W

Global Product Data Interoperability Summit | 2015



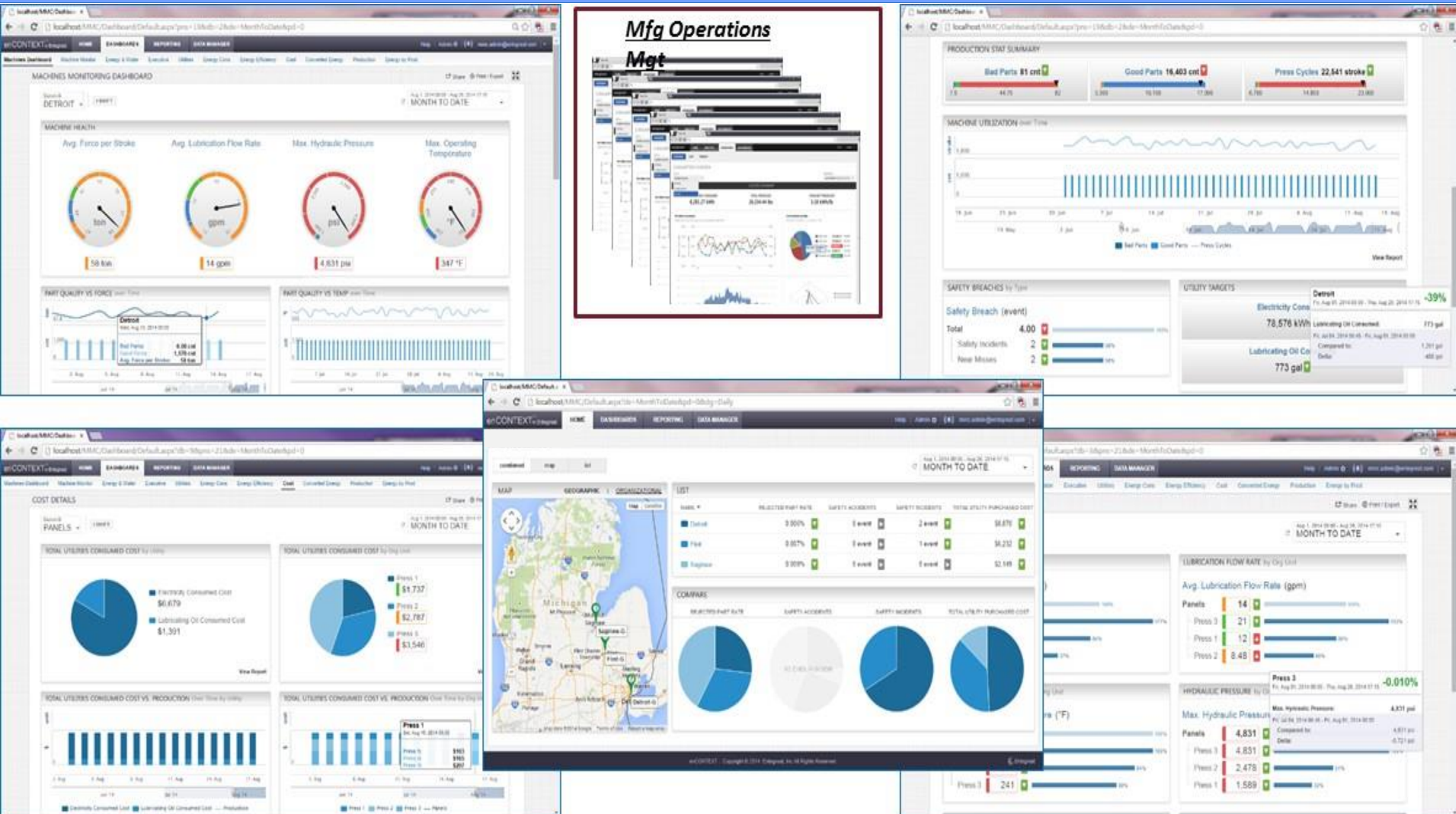
And then we can..... Monitor Program Progress & Analytics

Global Product Data Interoperability Summit | 2015



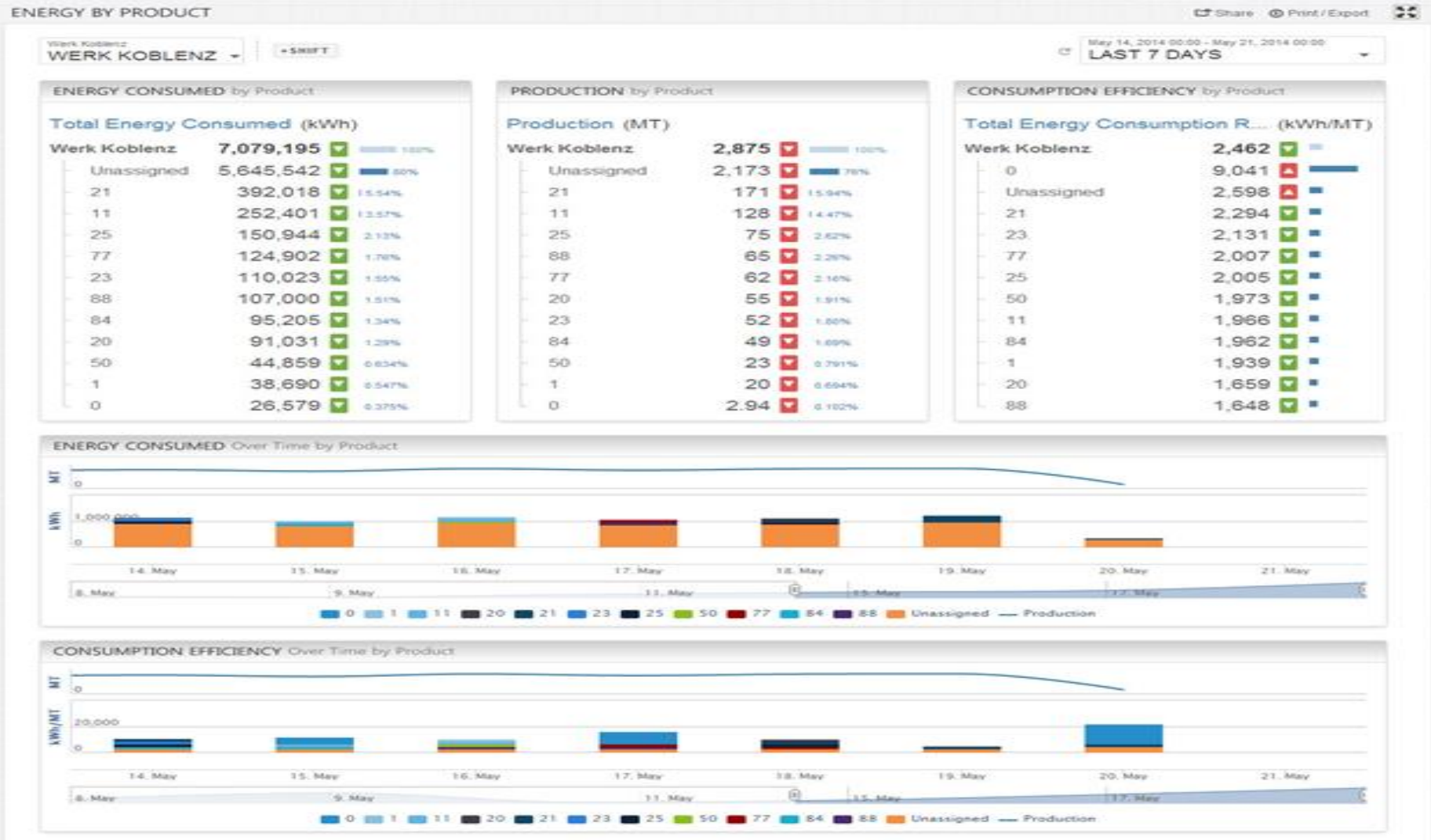
And then we can.... Monitor Production Efficiencies

Global Product Data Interoperability Summit | 2015



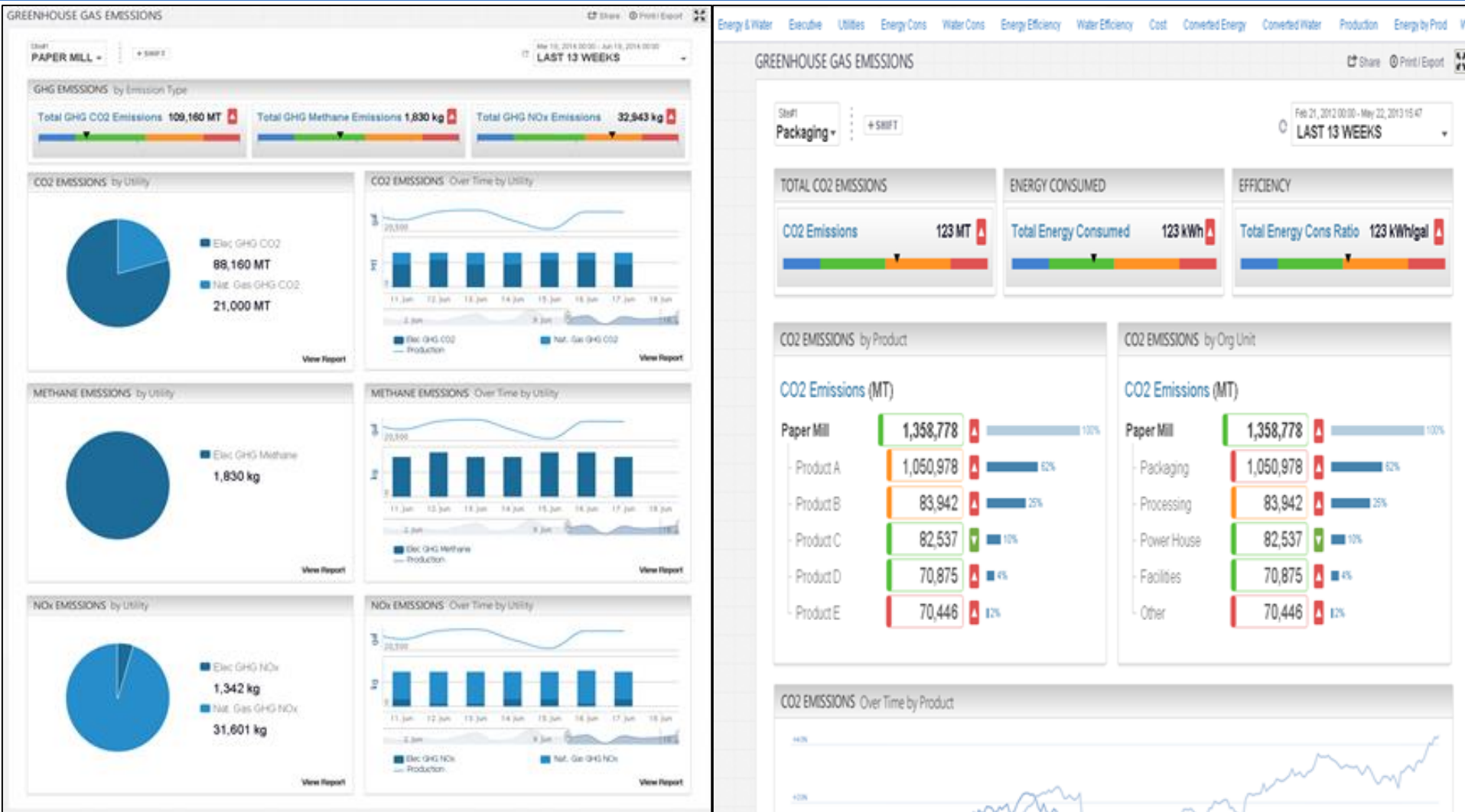
And then we can...Monitor Production Efficiencies → Energy per Product

Global Product Data Interoperability Summit | 2015



And then we can..... Monitor Green House Gas Emissions By Product, By Geo, By Mfg Node....

Global Product Data Interoperability Summit | 2015



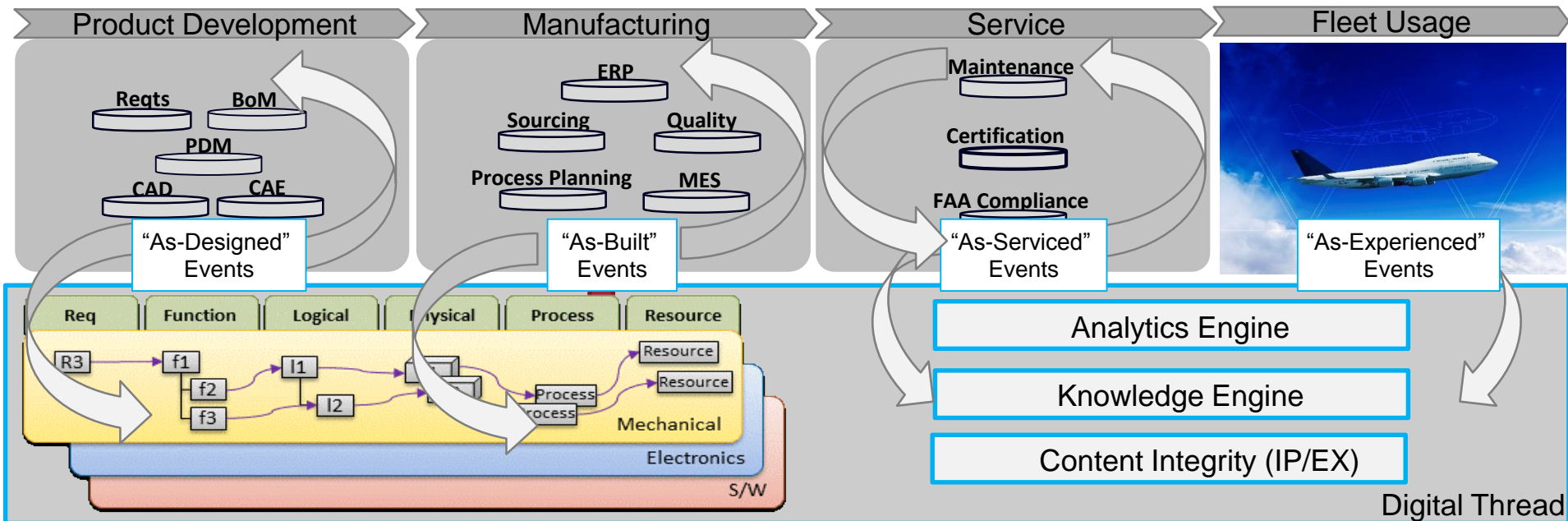
And then we can..... Monitor In-Use Products

Global Product Data Interoperability Summit | 2015



From the Digital Thread → To The Digital Twin → and Back...

Global Product Data Interoperability Summit | 2015



Thank You.....