





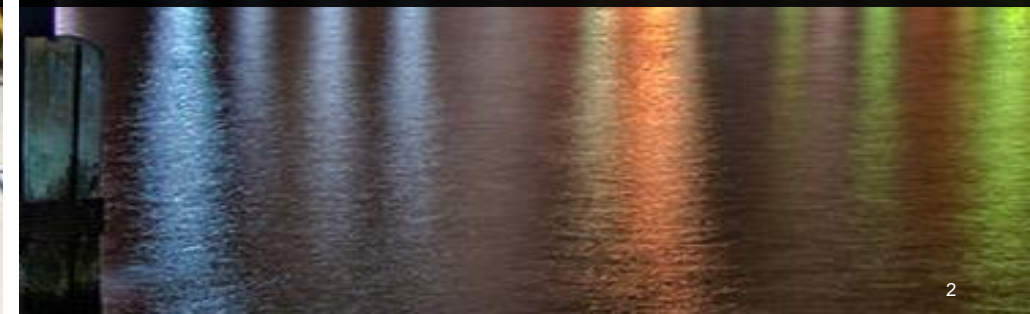
**Smart, Connected Products**  
Remote Service, Ops & Analytics



**Smart, Connected Operations**  
Smart Manufacturing / Industry 4.0

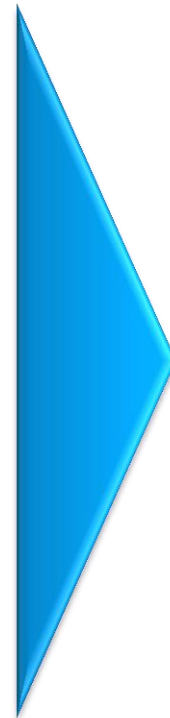


**Smart Connected Systems**  
Smart Farms, Smart Cities, etc.





**Smart, Connected  
Operations**



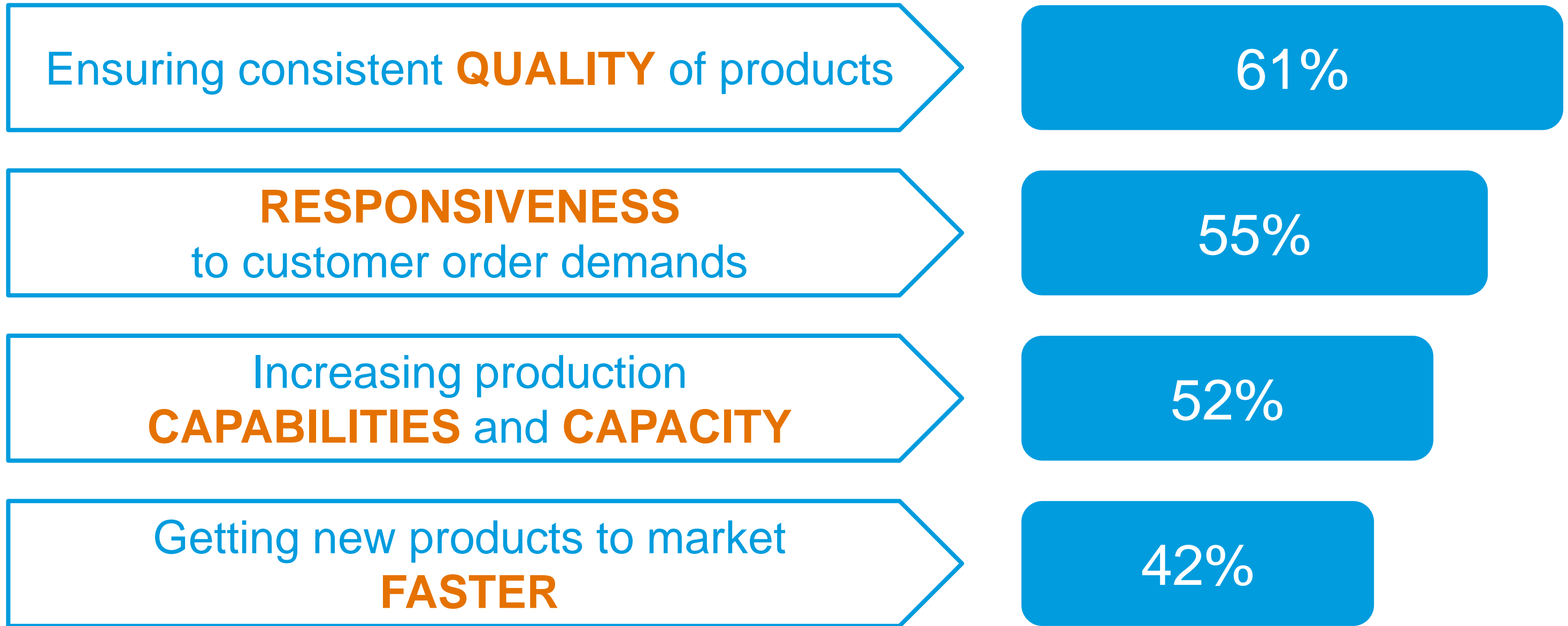
## **Similar Industry Terms:**

- Industry 4.0
- Smart Manufacturing
- Factory of the Future
- Brilliant Factory
- The Factory of the Future

# Operations Include Your Supply Chain

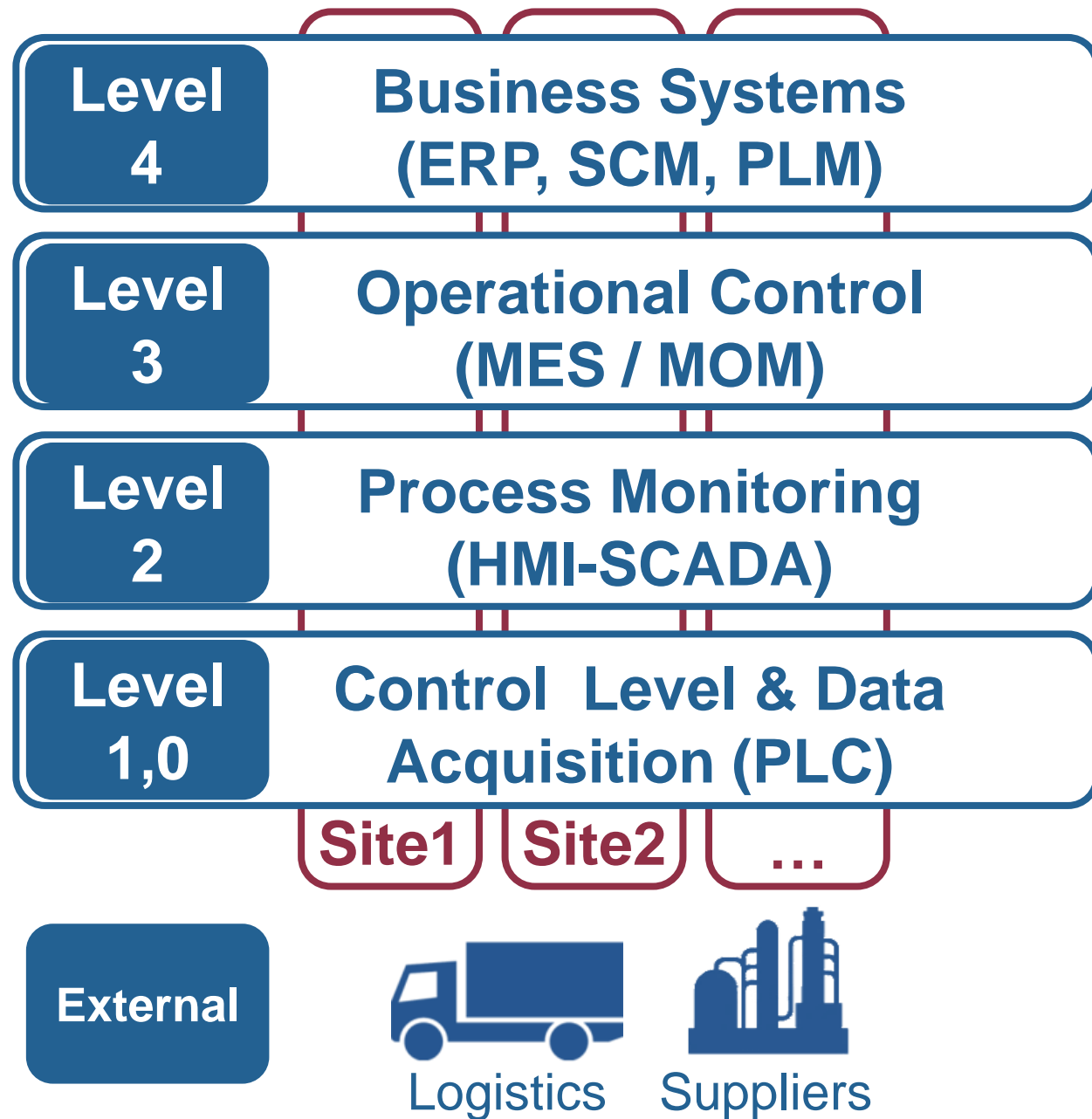


# Top Strategic Objectives Have Remained the Same for Years



Source: LNS Research, 2015: Top Operational Objectives for Manufacturing Executives

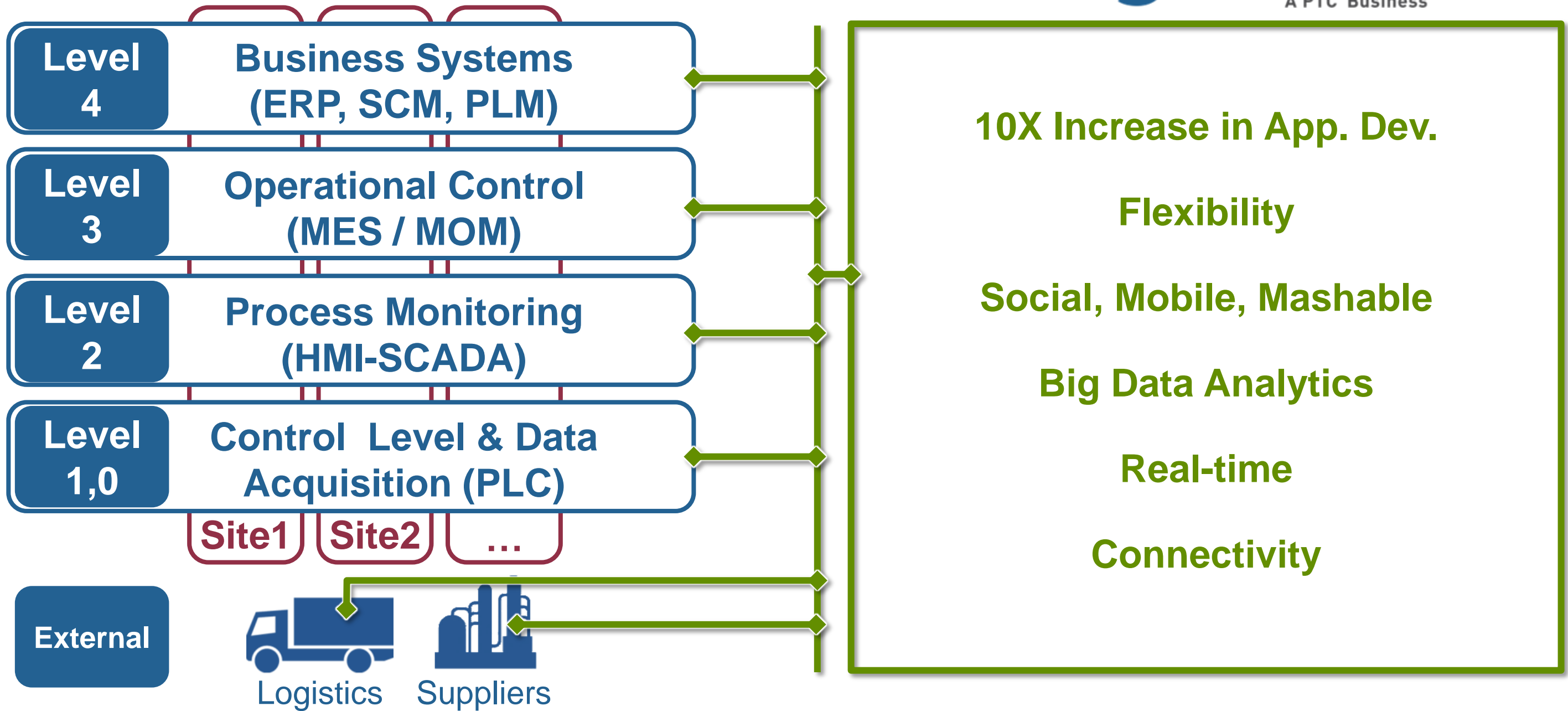
## Traditional Mfg System Landscape

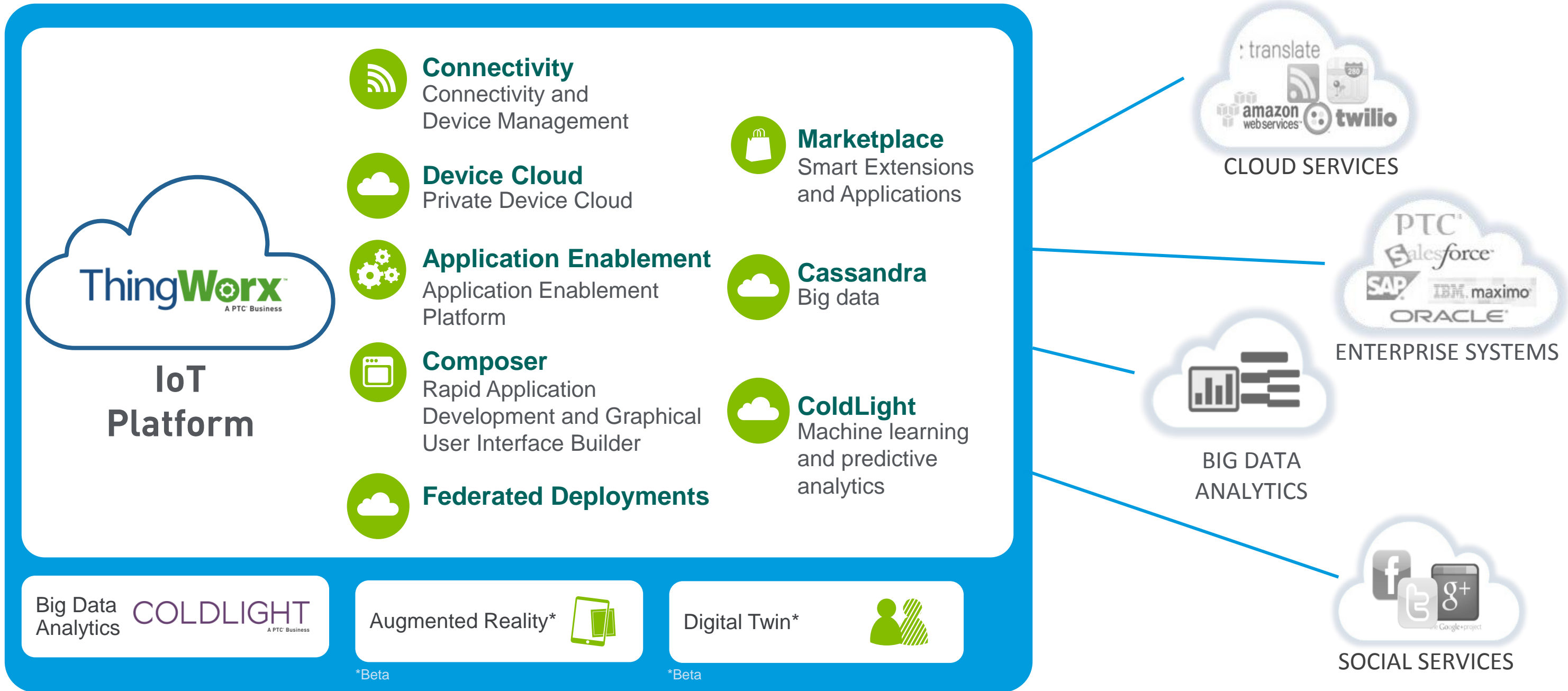


## Challenges

- Different equipment
- Different systems maturity
- Limited interoperability
- Proprietary protocols
- Limited visibility
- Lack of flexibility

## Traditional Mfg System Landscape







The 1st Online Marketplace for the Internet of Things

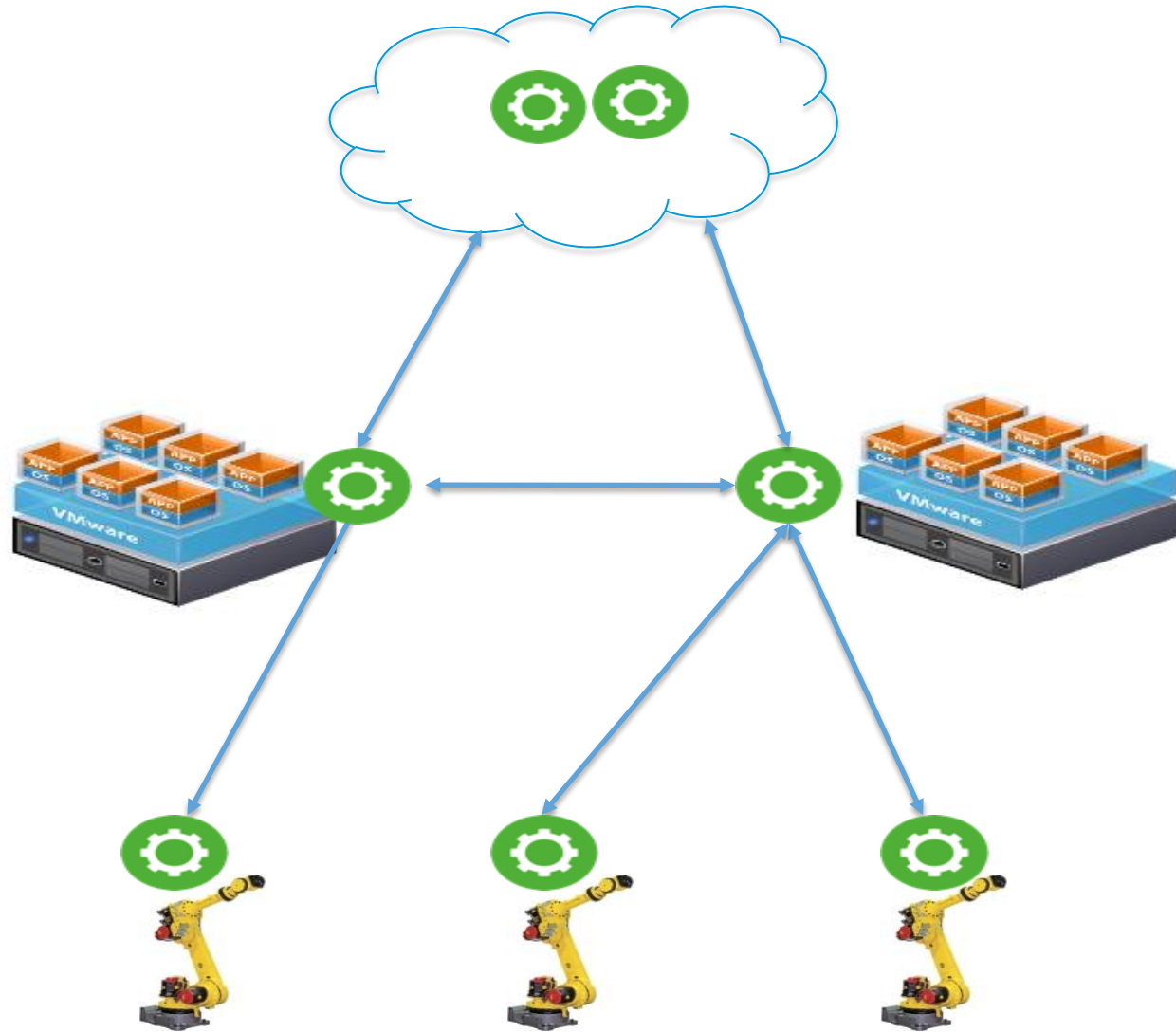


- ✓ Ecosystem extends ThingWorx capabilities and enhances your competitive advantage
- ✓ Improves IoT solution time-to-market through application “assembly”
- ✓ Accelerates IoT/M2M adoption through global sharing of IP



Leverage an ever-increasing catalog of ready-to-use extensions to continuously improve your own IoT offering

Federated Architecture with unified end-to-end security and management

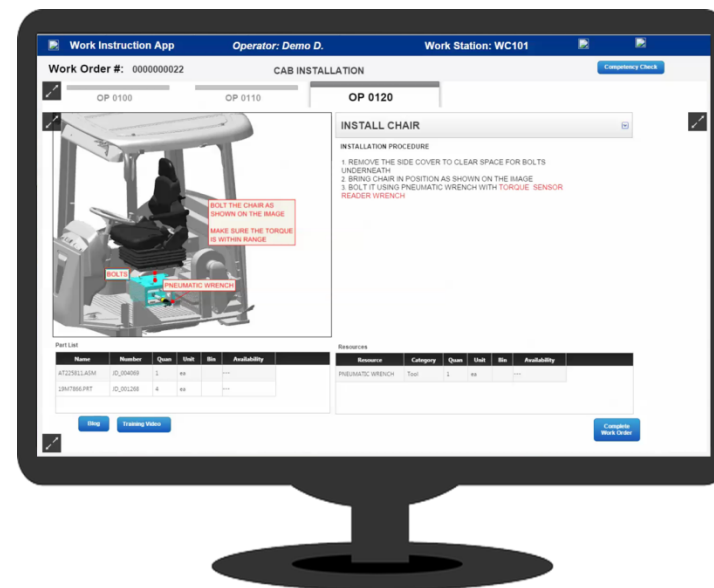


**Cloud Scale Apps** - Big Data, Analytics and Corporate applications run centrally

**Regional / Factory Level Apps** - each facility runs autonomously and manages its own fleet of equipment. Shares data with peer facilities and corporate

**Embedded / On Device** - the ThingWorx stack enables autonomous operation, local UX, performant operation while being part of the overall security infrastructure

- Next-Gen. Operational Intelligence
  - Unified visibility
  - Drill-down & root cause analysis
- Paperless Shop Floor
- Smart, Connected Tools
- Remote Supplier Quality
- Asset Tracking
- Manufacturing Big Data Analytics
  - Predictive analytics
- Equipment Health and Monitoring
  - Condition-based maintenance
  - Predictive maintenance
  - Remote service from machine builder
- Augmented Reality / Digital Twin



Confidential and Proprietary - Not for Distribution





Leading CPG manufacturer with over 350 beverage and snacks plants globally

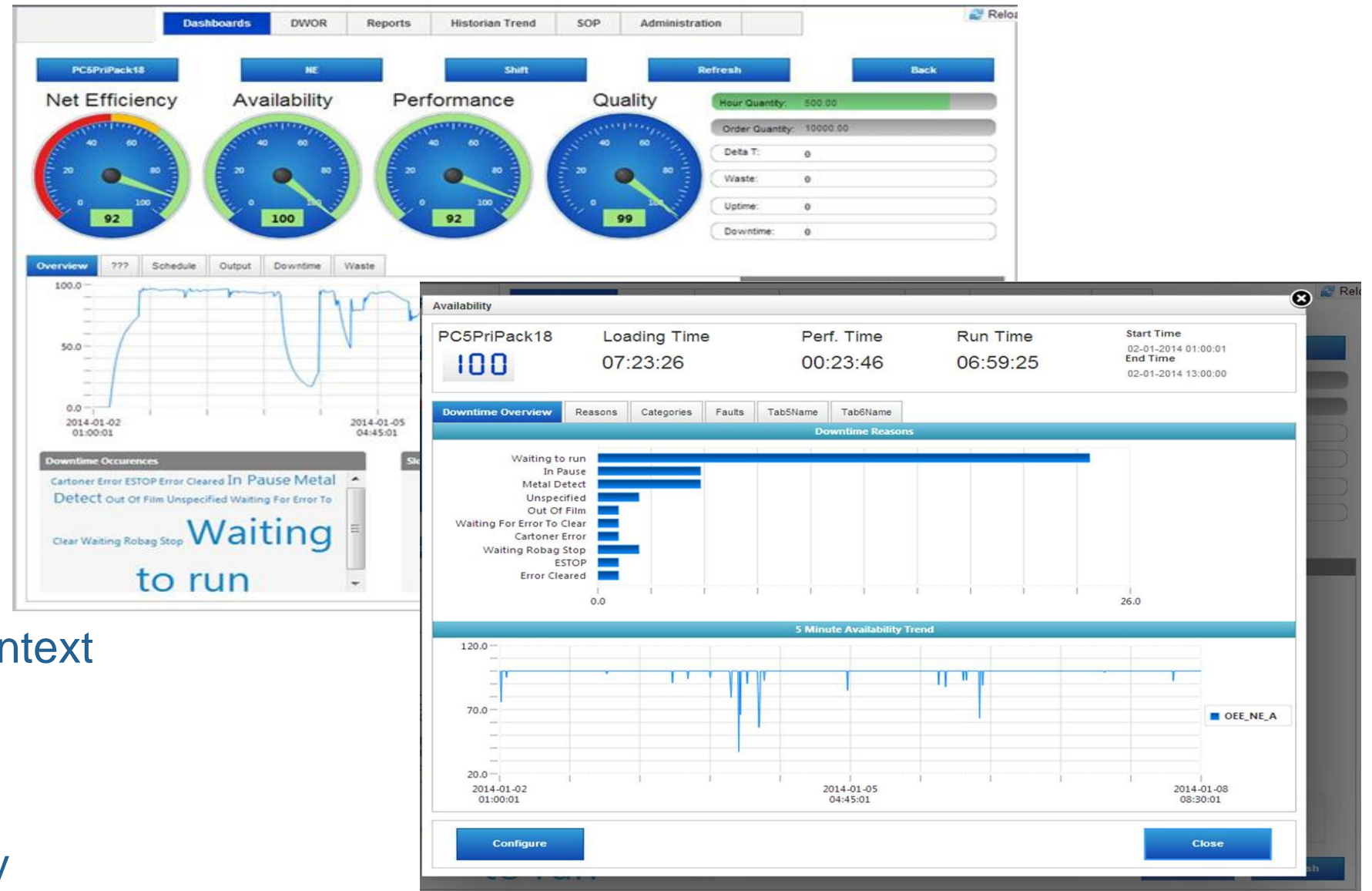
## Problem:

- Heterogeneous landscape
- Siloed applications
- Non-standard KPI's
- Non-actionable information
- Lack of line coordination
- Zero collaboration

## ThingWorx solution:

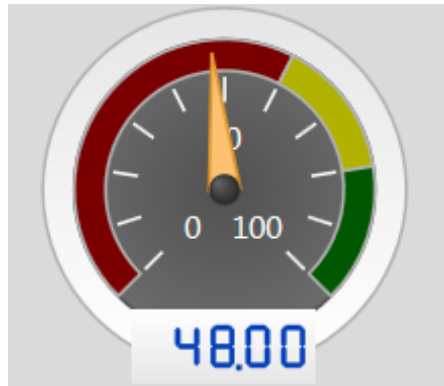
- 360 degrees view of operations
- Empowering operations with data in context
- Coordination of entire process
- Actionable & collaborative

**Results:** 5% to 8% increase in productivity



Empowering operations with data in context, and building community of experts

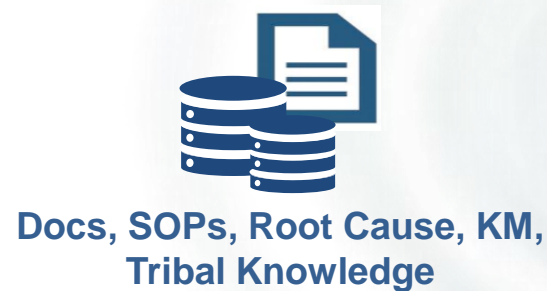
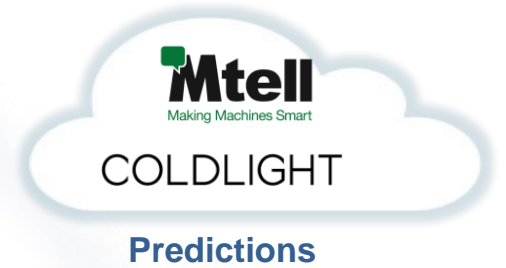
## The traditional approach: Disconnected KPIs

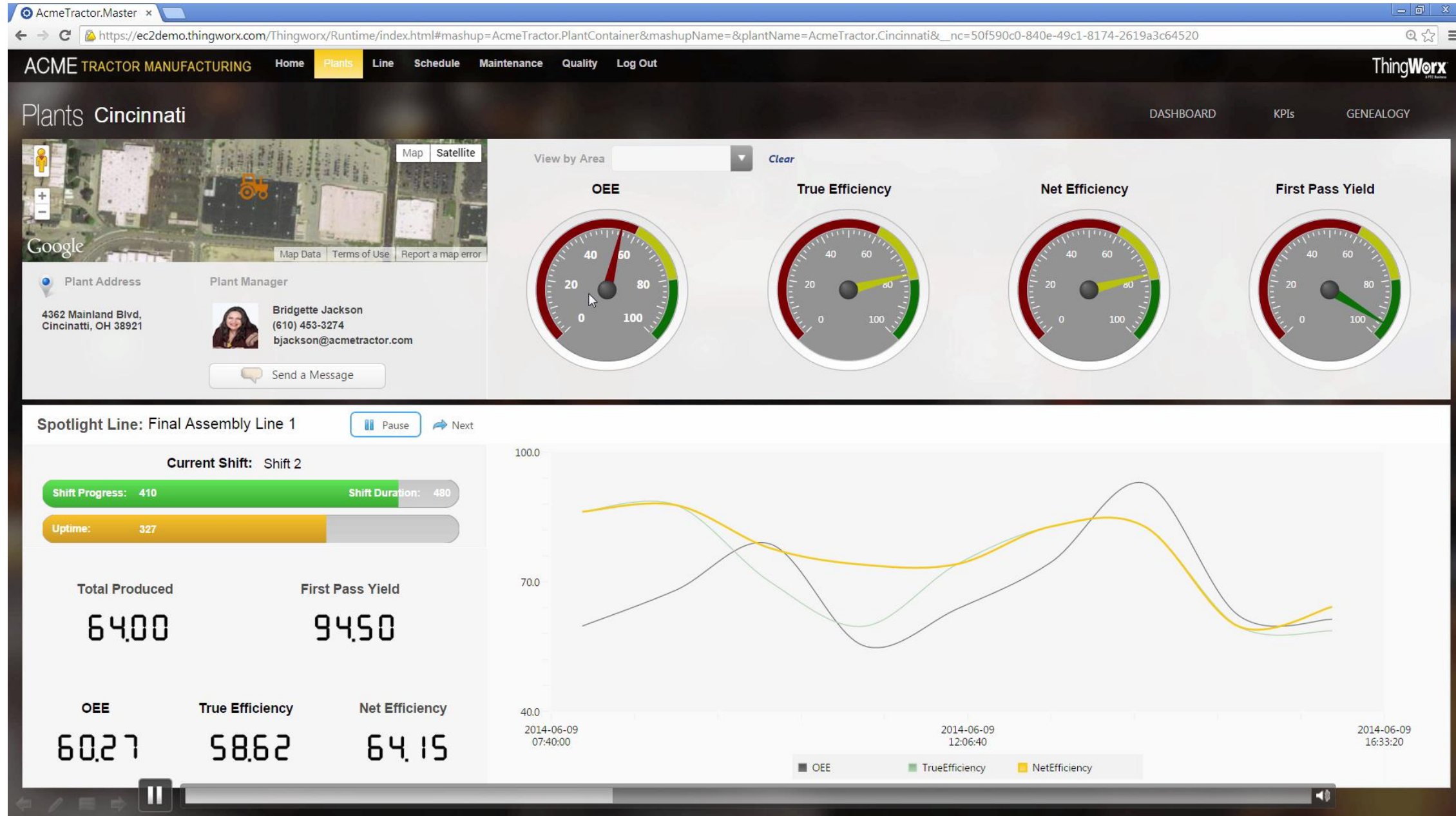


# ThingWorx™

A PTC® Business

## Solve problems more quickly Get to root cause more frequently





The screenshot displays the ThingWorx Rapid Application Enablement (RAE) interface. At the top, there is a menu bar (File, Edit, View, Favorites, Tools, Help) and a toolbar with various application icons. Below the toolbar is the ThingWorx logo and a search bar. The main workspace is titled "New Mashup" and contains several panels:

- Left Panel:** A "Widgets" panel with a "Category" dropdown set to "All" and a search box containing "ga". Below this are "Gauge" and "Navigation" sections, with "Progress Gauge" selected.
- Center Panel:** A "Preview" area showing a map of Mexico and Central America. Below the map is a table with columns: Avatar, BillOfLading, BillOfLadingItems, Cargo, CurrentSpeed, Description, and DriverName. Two "Gauge" widgets are positioned above the table.
- Right Panel:** A "Data" panel showing a list of data sources and fields. The "Selected Row(s)" section is expanded, showing fields like OutsideGeoFence, VIN, Cargo, StateCode, EngineRunTime, BillOfLadingItems, TrailerHumidity, description, name, EquipmentFault, DriverPhoneNumber, and homeMashup.
- Bottom Panel:** A "Connections" panel showing a flow diagram. It includes a "ThingTemplates\_Refrigera..." widget, a "GetImplementingThings..." widget, a "Selected Row(s)" widget, and a "# CurrentSpeed" widget. A blue arrow points from the "Selected Row(s)" widget to the "# Data" widget, which is connected to the "Gauge-16" widget.

At the bottom left, a "Gauge-16" properties panel is visible, showing a table of properties:

Name	Value
-T- Id	Gauge-16
-T- Type	Gauge
-T- DisplayName	Gauge-16
-T- Description	
# Data	
# MinValue	0
# MaxValue	100
ValueFormatter	State Formatting
FormatNeedle	<input checked="" type="checkbox"/>

Home Plants Line Schedule Maintenance Quality **Delivery Tracking** LogOut

0 of 12 Active Filter(s) Add Filter

OrderID	CustomerID	CustomerName	ItemID	ItemDesc	Status
100001	100	Office Supply Inc.	823418	STORAGE - LOW, DWR/SLD, 17X48X24, RIGHT	Complete
100002	100	Office Supply Inc.	823419	STORAGE - LOW, DWR/SLD, 17X48X24, LEFT	Complete
100003	102	123 Furniture Co.	823418	STORAGE - LOW, DWR/SLD, 17X48X24, RIGHT	Complete
		123 Furniture Co.	823419	STORAGE - LOW, DWR/SLD, 17X48X24, LEFT	Complete
		Office Supply Inc.	823418	STORAGE - LOW, DWR/SLD, 17X48X24, RIGHT	In Product
		Office Supply Inc.	823419	STORAGE - LOW, DWR/SLD, 17X48X24, LEFT	In Product
100005	102	123 Furniture Co.	823418	STORAGE - LOW, DWR/SLD, 17X48X24, RIGHT	In Transit
100006	102	123 Furniture Co.	823419	STORAGE - LOW, DWR/SLD, 17X48X24, LEFT	In Transit

Order ID: 100002, Item ID: 823419, Item Description: STORAGE - LOW, DWR/SLD, 17X48X24, LEFT, Qty: 4, Due Date: 2015-01-15 00:00:00

Customer: 100

Contact Driver

External Data Feed (GPS data)

Trucking Route (Historical data)

Customer Order (from ERP)

Order Delivery & Driver Contract Information

External Data Feed (GPS data)

Trucking Route (Historical data)



## Bi-directional connection to:

## Connected - Tailored - Actionable



### People (operator):

- Single sign-on
- Role-based



### Mfg systems (ERP/MES):

- Work orders
- Operations, parts, resources
- Competencies check



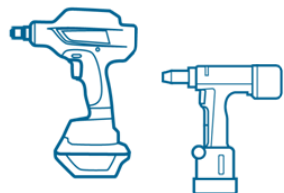
### PLM / MPM / CAD:

- 2D / 3D
- Part and process plan details
- Standard operating procedures



### Quality / data capture:

- Traceability, genealogy
- Operator feedback



### Industrial tools:

- Torque, angle, battery life, ...
- Position and orientation

**Work Instruction App** Operator: Demo D. Work Station: WC101

Work Order #: 000000022 CAB INSTALLATION

OP 0100 OP 0110 OP 0120

**INSTALL CHAIR**

INSTALLATION PROCEDURE

1. REMOVE THE SIDE COVER TO CLEAR SPACE FOR BOLTS UNDERNEATH
2. BRING CHAIR IN POSITION AS SHOWN ON THE IMAGE
3. BOLT IT USING PNEUMATIC WRENCH WITH TORQUE SENSOR READER WRENCH

BOLT THE CHAIR AS SHOWN ON THE IMAGE  
MAKE SURE THE TORQUE IS WITHIN RANGE

**Part List**

Name	Number	Quan	Unit	Bin	Availability
AT225811.ASM	JD_004069	1	ea	---	---
19M7866.PRT	JD_001268	4	ea	---	---

**Resources**

Resource	Category	Quan	Unit	Bin	Availability
PNEUMATIC WRENCH	Tool	1	ea	---	---

Wrench Torque

Torque Value

Issue Description

Log FRACAS Incident

# Windchill MPMLink Demo: Digital Process Plan Design

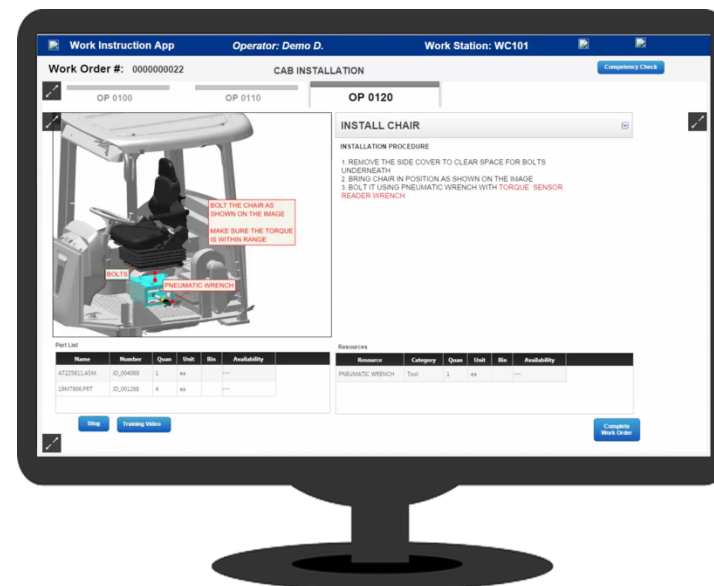
The screenshot displays the PTC Windchill software interface for a digital process plan design. The browser address bar shows the URL: `jnyonkuru011.ptcnet.ptc.com/Windchill/app/#ptc1/tcomp/infoPage?oid=OR%3Acom.ptc.windchill.mpml.processplan.MPMProcessPlan%3A264156&u8=1`. The main title is "Process Plan - 000000022, A.7 (Manufacturing) (Production) (CAB INSTALLATION)".

The interface is divided into several panes:

- Left Pane:** A tree view showing the structure of the process plan. The selected item is "JD\_004319, AT308471\_CP.ASM, A.3 (Manufacturing) (Related Part)". Below the tree is a "Find in Structure" search box and a list of objects (21 objects).
- Top Center Pane:** A toolbar with various actions such as "Insert Existing", "Remove", "Check Out", "Undo Checkout", "Check In", "My Checkouts", "Views", "Display", "New", "Add to", "Filter", "Current Filter", "Saved Filters", "Tree Picker", "Open Related Part", "Open Tree Picker", "Open Selected", "Related Assembly Filter", "Current Filter", "Edit Filter", "Saved Filters", and "Tools".
- Right Pane:** A list of tasks for the "CAB INSTALLATION, 000000022, A.7 (Manufacturing) : Current Filter(Latest : Manufacturing...)". The tasks are sorted by identity and include:
  - 0010, SECURE FRAME ON STATION, A.4 (Manufacturing), 0000000032
  - ELECTIC WRENCH, A.1 (Manufacturing) (Tool), 0000000041
  - JD\_003284, AT309725.ASM, A.2 (Design)
  - LIFTING POINT, A.1 (Manufacturing) (Tool), 0000000042
  - WC101, A.1 (Manufacturing) (Work Unit), 0000000023
  - 0020, INSTALL TOP, A.5 (Manufacturing), 0000000033
  - ELECTIC WRENCH, A.1 (Manufacturing) (Tool), 0000000041
  - JD\_003163, AT223312.ASM, A.1 (Design)
  - WC101, A.1 (Manufacturing) (Work Unit), 0000000023
  - 0030, INSTALL BOTTOM PLATE, A.5 (Manufacturing), 0000000028
  - 0040, INSTALL BOTTOM SYSTEMS, A.5 (Manufacturing), 0000000030
  - 0050, INSTALL FLOOR, A.6 (Manufacturing), 0000000026
  - 0060, INSTALL AC SYSTEM, A.6 (Manufacturing), 0000000031
  - 0070, STEERING WHEEL, A.6 (Manufacturing), 0000000024
  - 0080, INSTALL DASH BOARD, A.6 (Manufacturing), 0000000029
  - 0090, INSTALL CEILING, A.6 (Manufacturing), 0000000034
  - 0100, INSTALL DOOR & WINDOW, A.6 (Manufacturing), 0000000025
  - 0110, INSTALL WINDSHIELD, A.5 (Manufacturing), 0000000027
  - 0120, INSTALL CHAIR, A.6 (Manufacturing), 0000000035
- Bottom Left Pane:** A 3D visualization of the assembly structure, showing a white frame with various components attached. It includes a "Find in Structure" search box and a list of objects (20 objects).
- Bottom Right Pane:** A 3D visualization of the final assembly, a yellow and black cabinet. It includes a "Find in Structure" search box and a list of objects (20 objects). The visualization is in a "Middle=Spin Right=Fly" view.

The screenshot shows a web browser window displaying the 'Work Instruction App'. The browser address bar shows the URL: `jnionkuru011.ptcnet.ptc.com:8181/Thingworx/Runtime/index.html#mashup=Connected%20Work%20Instructions&__fromBuilder=e498129b-3309-4272-89f6-54b23`. The app header includes 'Work Instruction App', 'Operator: Demo D.', and 'Work Station: WC101'. Below the header, the 'Work Order #: 000000022' and 'CAB INSTALLATION' are displayed, along with a 'Competency Check' button. The main content area is divided into three operation steps: 'OP 0100', 'OP 0110', and 'OP 0120'. The 'OP 0120' step is active and titled 'INSTALL CHAIR'. It contains an 'INSTALLATION PROCEDURE' with three steps: 1. REMOVE THE SIDE COVER TO CLEAR SPACE FOR BOLTS UNDERNEATH; 2. BRING CHAIR IN POSITION AS SHOWN ON THE IMAGE; 3. BOLT IT USING PNEUMATIC WRENCH WITH TORQUE SENSOR READER WRENCH. To the left of the procedure is a 3D CAD model of a machine seat assembly. A red callout box points to the seat with the text: 'BOLT THE CHAIR AS SHOWN ON THE IMAGE MAKE SURE THE TORQUE IS WITHIN RANGE'. Labels 'BOLTS' and 'PNEUMATIC WRENCH' are placed on the model. Below the model is a 'Wrench Torque' gauge showing a needle pointing to approximately 100. To the right of the gauge is a 'Torque Value' line graph with data points for the time intervals 2015-06-08 22:31:04, 2015-06-08 22:31:11, and 2015-06-08 22:31:18. The graph shows torque values fluctuating between approximately 88.0 and 122.0. Further right is a progress bar showing 0 out of 32, and an 'Issue Description' text input field with a 'Log FRACAS Incident' button below it.

- Next-Gen. Operational Intelligence
  - Unified visibility
  - Drill-down & root cause analysis
- Paperless Shop Floor
- Smart, Connected Tools
- Remote Supplier Quality
- Asset Tracking
- Manufacturing Big Data Analytics
  - Predictive analytics
- Equipment Health and Monitoring
  - Condition-based maintenance
  - Predictive maintenance
  - Remote service from machine builder
- Augmented Reality / Digital Twin



Confidential and Proprietary - Not for Distribution



# PTC<sup>®</sup> Live Global