

IIoT, AI and the Digital Thread for Aerospace Manufacturing Optimization

GE Aviation MRAS Case Study

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PLATAINE[®]
people-smart automation

About Plataine

IoT-based Optimization and Automation Software for Advanced Manufacturing

- A software intelligence layer over ERP, PLM and the shop-floor
- Our solutions leverage factory floor sensors and AI-based analytics providing real-time recommendations & decisions
- Unique data structure to manage the Digital Thread in the factory and across the supply chain
- Top-tier partners: **GE Digital, McKinsey, AMRC (UK), CTC GmbH (Airbus)**

Key Applications:

- Process Automation: Material, WIP & parts traceability
- Material Yield Optimization
- Tool Utilization Optimization
- Digital Thread & Part Traceability
- Supply Chain Collaboration

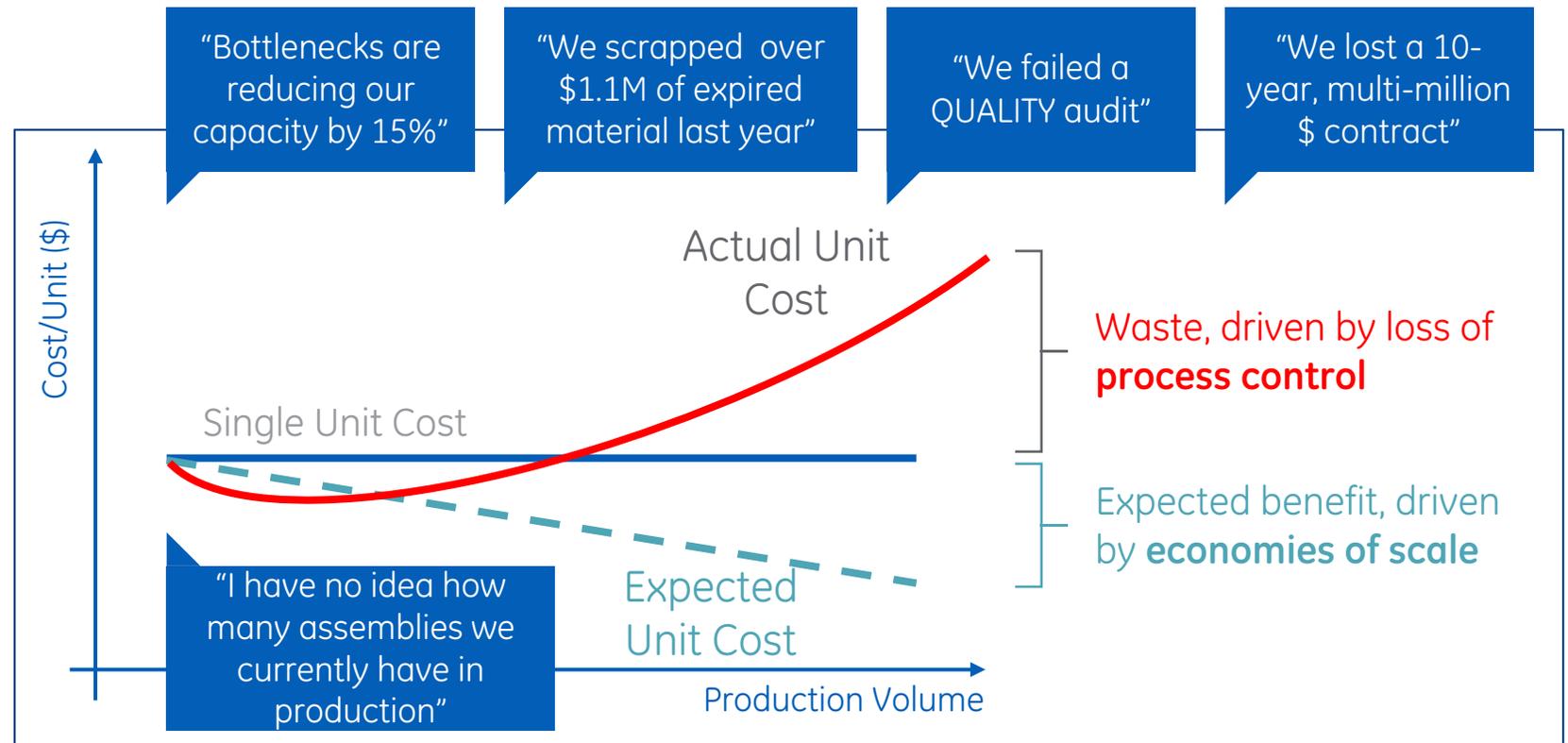


The Problem we solve

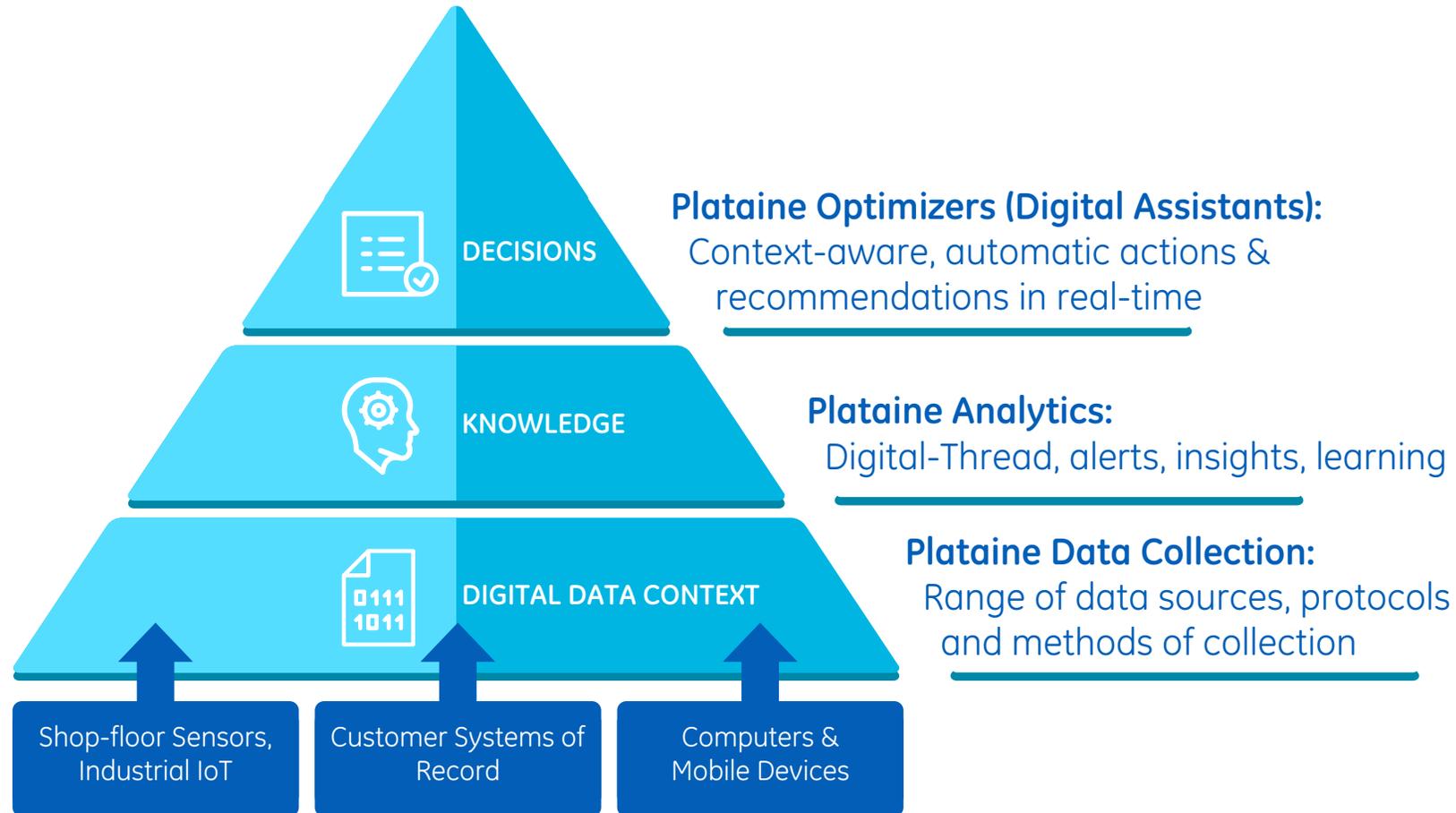
- Current systems & processes are challenged to address growing production volumes & complexity, while under strict quality constraints

- The Result:

- Inflexible Production Plans
- Lack of Visibility
- High rework & waste
- Reduced capacity
- High Cost of Poor Quality (CoPQ)



Plataine's IIoT Apps for Manufacturing Optimization



About GE Aviation MRAS (Middle River Aircraft Systems)

- 870K sq. ft. facility located in Baltimore, MD
- Designs, develops and manufactures:
 - Nacelle and Thrust Reverser Systems
 - Complex Composite and Metallic Structures
 - Global Services and Support
- The specific program designs, builds and services composites nacelle systems for the CFM LEAP powered A320NEO



MRAS Business Challenges (high-rate program)

- Lack of visibility over kits and tools led to inefficiencies and waste
- Manual tracking of kits' location, expiration date (bond by date) and exposure time resulted in late processing, quality issues, excessive lab testing, and in some cases disqualification and scrap
- 'Time-based' tool maintenance (not 'duty-cycle-based'), leading to quality issues: often found late in the process
- Challenges projected to increase with rapid volume growth into 2018

The Solution: Plataine's Industrial IoT Software for Manufacturing Optimization

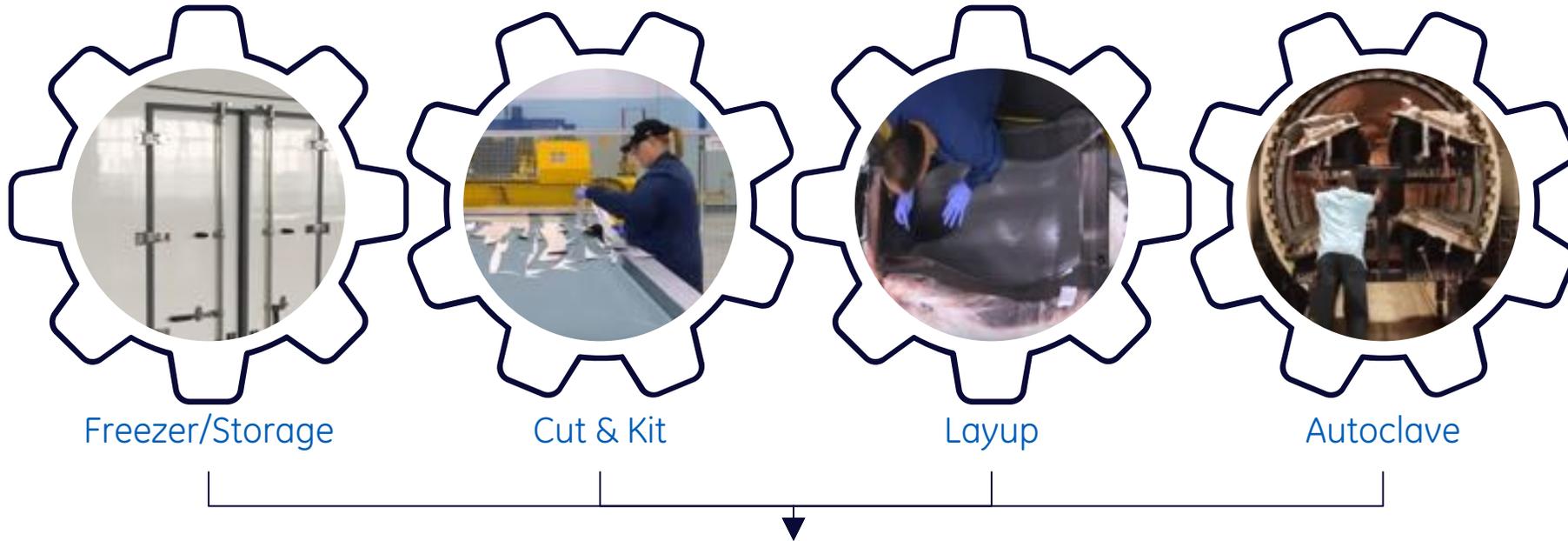
- Automate tracking of **work orders progress and assets' location & condition** (Material, kits, parts, tools)
- Automatic management of **time-sensitive material & kits** (composites)
 - Expiration date & exposure time (bond by date)
 - **Real time alerts** to materials & resulting parts (inheritance)
- Automatic **tool cycle tracking & maintenance alerts** (from 'time-based' to 'duty-cycle-based')
- Create digital assets to obtain **100% part traceability** and the Digital Thread
- First **link into supply chain integration** (kits externally supplied by pre-tagged and tracked)
- **Integration with MRAS Enterprise systems landscape**

Program Scope

- Hundreds of active materials & [multi-material] kits tracked at any given time (2000 archived kits to date)
- Approximately 100 tools are tracked at a given time
- Over 30 stations tracked:
 - 2 Freezers including kit staging area
 - 22 Layup stations
 - 9 Autoclaves including area outside of autoclaves
 - Teardown area
- Volume projected to grow as the program's rate grows

Material & Asset Tracking

Work Orders Progress, Status & Location



- Site map displays kits and parts location and status
- Bottlenecks and congestions



- Outcome:**
- Increased throughput
 - Improved 'on-time delivery' ratio

Material Optimization

Optimized Management of Time-sensitive Materials



Key	MRAS Part #	MRAS WO #	Exp. Date	Out Time Left
6005	612C4118-023KT	1187362	5/12/2018	332:28
6708	612C4118-023KT	1187384	5/12/2018	332:38
6711	612C4118-023KT	1187383	5/12/2018	332:38
6712	612C4118-023KT	1187384	5/12/2018	336:54
6728	612C4118-023KT	1187385	5/12/2018	336:54
6867	612C4103-079KT	1186027	5/13/2018	320:28
6896	612C4103-079KT	1186028	5/13/2018	320:28
6421	612C4103-089KT	1184581	5/13/2018	515:57
6515	612C4103-089KT	1184583	5/13/2018	320:28
6463	612C4102-138KT	1184776	5/19/2018	368:00
6467	612C4102-138KT	1184774	5/19/2018	367:41
6890	612C4103-089KT	1186012	5/19/2018	334:28

Complete automation

- 'In & out of freezer' times
- Expiration date & exposure time
- Material allocation suggestions

Outcome:

- Savings in raw material
- Reduced rework

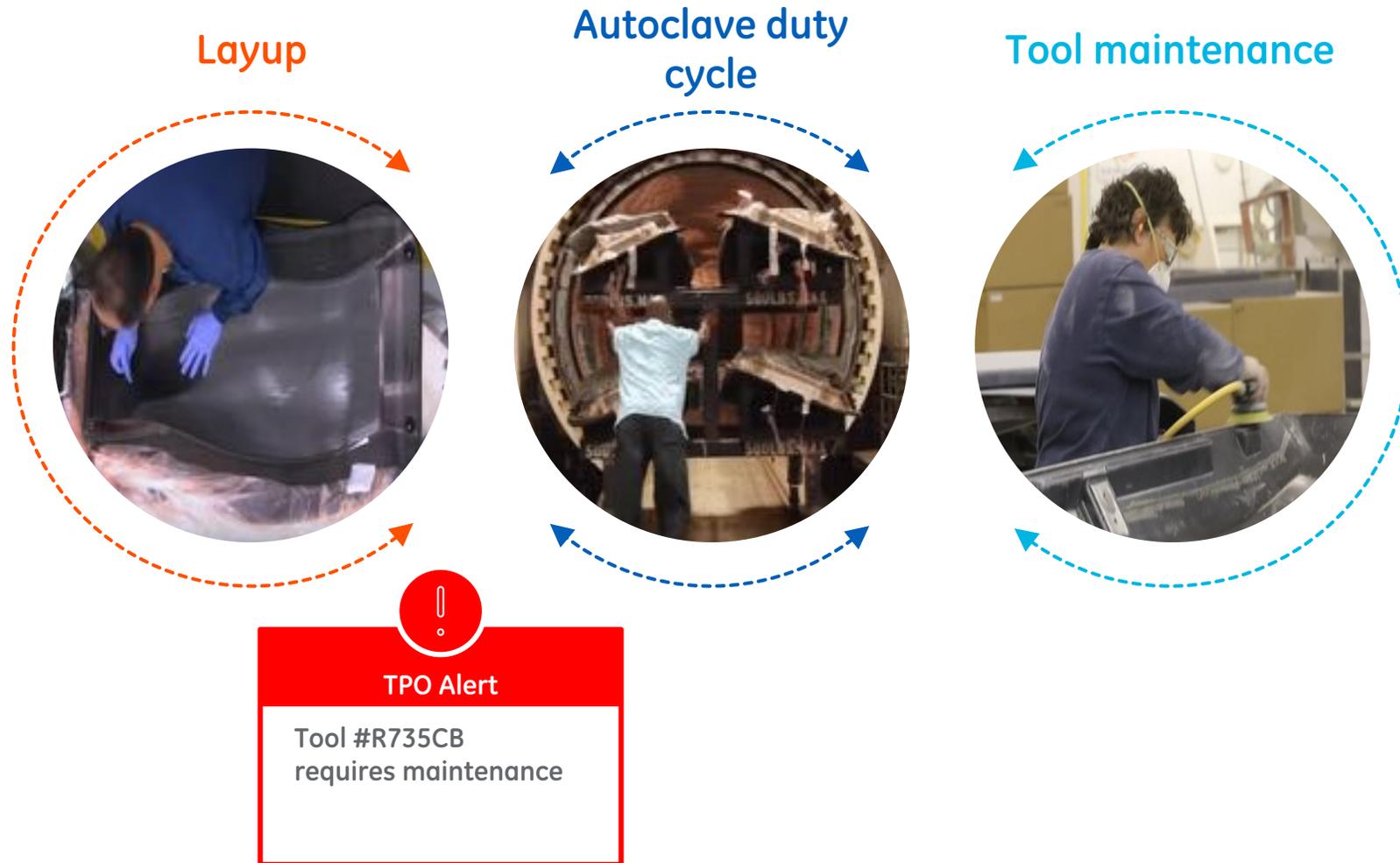


TPO Alert

Kit #4698
Remaining Shelf Life:
20 hrs

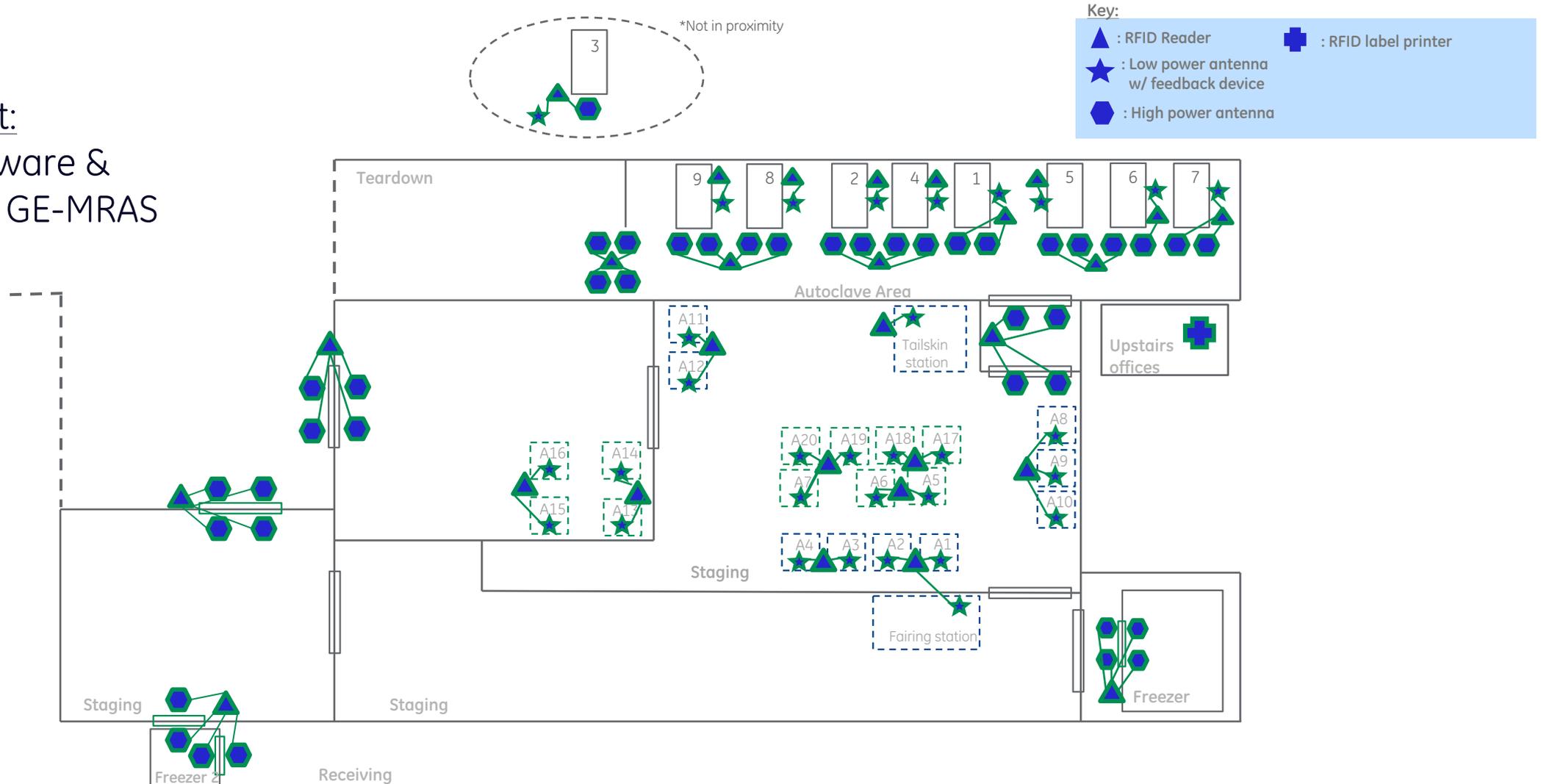
Tool Management

Optimize tool maintenance cycles

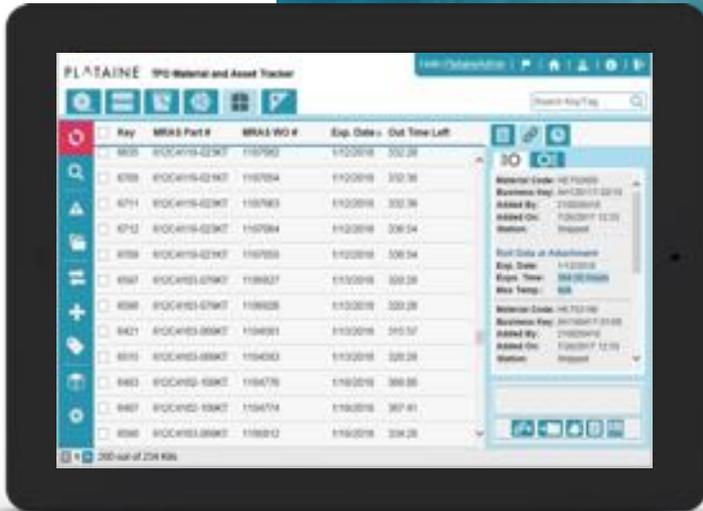
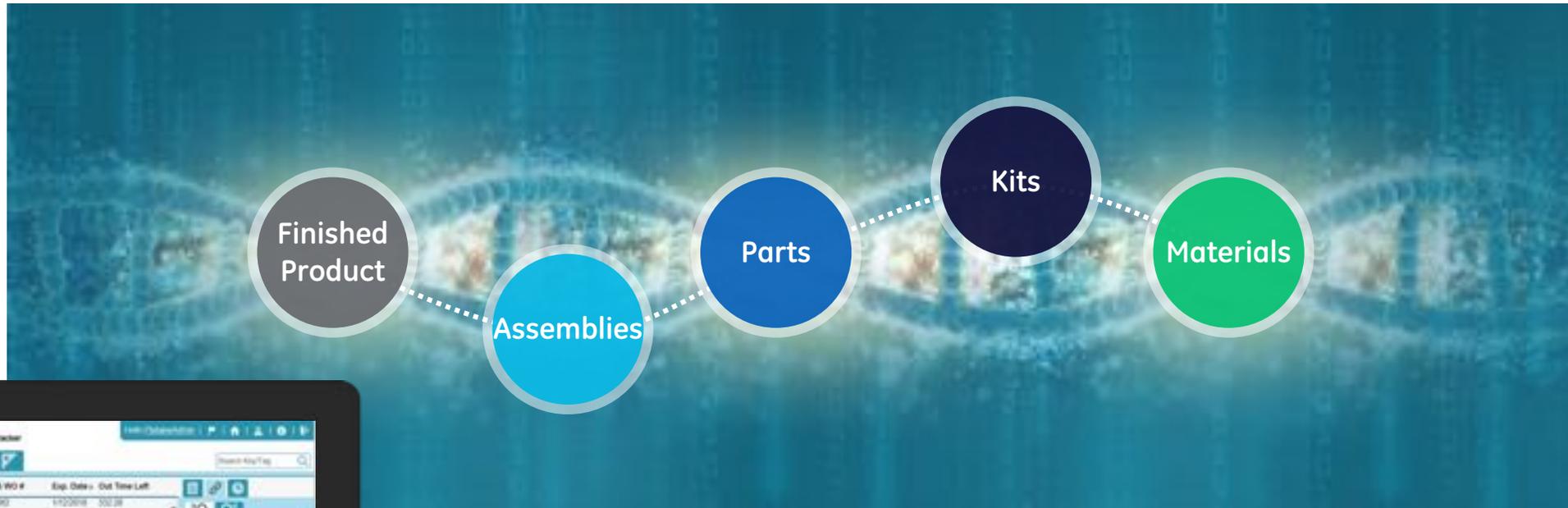


RFID sensors serve as application enabler

Site Layout:
RFID Hardware &
Devices at GE-MRAS



Digital Thread: from raw material to finished part, allowing full traceability and auditability



✓ Full Digital Traceability

✓ Assets genealogy back to the raw material

✓ Quality analyses

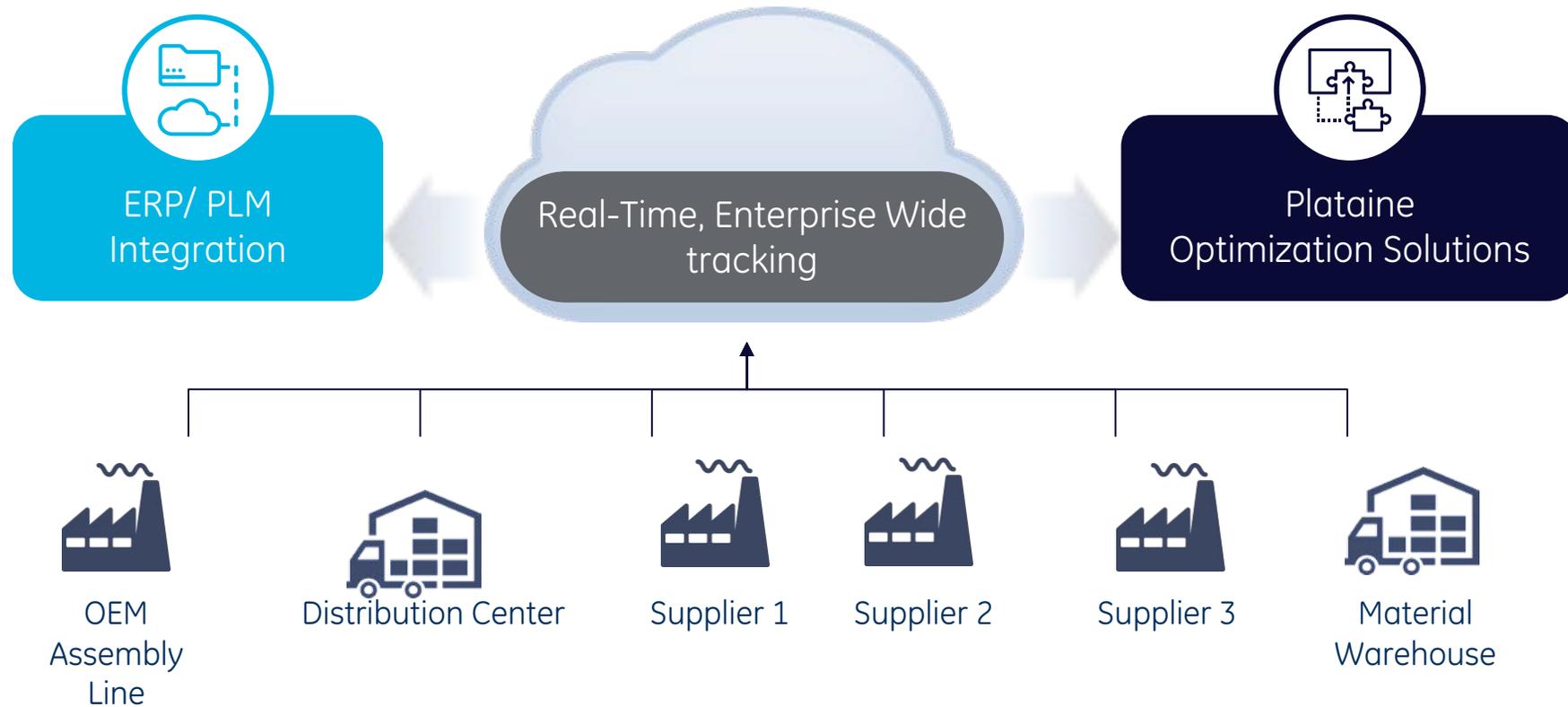
✓ Audit ready data

Integrated Dashboards and Reports

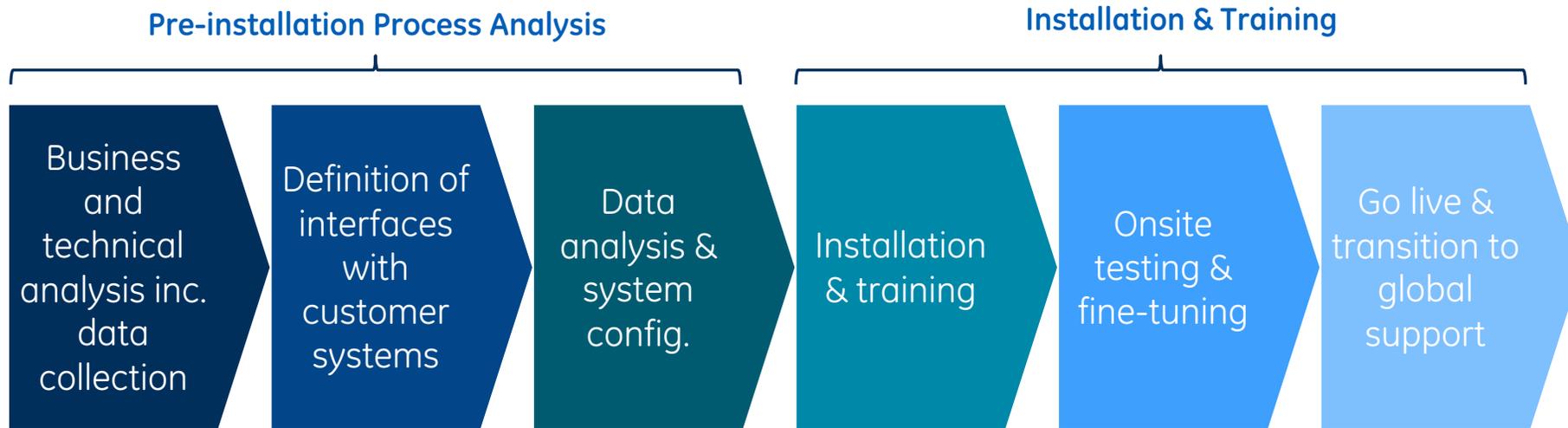
- Spotfire Dashboards
 - Map actual part location on shop floor
 - Track Estimated Time Left (ETL)
 - Flag work orders past ETL thresholds
 - Provide order in which to pull kits from freezer based on expiration date
- Reports displayed on shop floor monitors and available via iPhones and iPads
- Real-time intelligence for real-time action



Scaling Up Beyond The Factory Level - Complimenting GE's Digital Thread Across the Supply Chain



Deployment Methodology & Key Milestones



- June 2016: Proof-of-Concept (POC) Pilot, performed onsite
- August 2016: Onsite RFID Mapping
- Dec 2016: PO issued
- March 2017: Go Live UAT for Phase 1; Ramp up through May 1st
- June 2017: Phase 2 deployment

Benefits and Outcomes

- Reduction of non-conformance, due to missed bond-by dates and over-aged material
 - Cost of processing kits, including lab testing
 - Impact on schedule due to parts held up by kits
 - Cost of potential part scrap
- Improved visibility - where parts are, color code of time left etc.
- Shifting maintenance of bond tools from 'time-based' to 'duty-cycle-based'
- More efficient autoclave utilization – maximize parts per autoclave run
- 100% digital traceability, integrated with GE MRAS systems

Next Phases

- Expanding system scope for part tracking in downstream stations
- Continuous learning of data collected for more precise and relevant alerts & recommendations:
 - Composites shelf-life management and allocation based on historical process data and real-time production situation
 - Tool Maintenance Alerts based on historical process & quality data ensures optimal maintenance cycles (not too early, not too late)

Summary: Make Automation Your Top Priority

- **Collect** data in real-time that covers the entire manufacturing processes from:
 - Factory-floor sensors & machines
 - Enterprise systems (ERP, CAD/PLM, MES)
 - Digital devices
- **Analyze** data to get insights and alerts
- **Optimize** manufacturing using AI-based Digital Assistants that empower your staff

Thank You

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