Roadmap from Meridium to Unified APM

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Introduction to GE Digital
Advancing the horizontal and vertical
GED Business Strategy

Industry leading apps for asset management & field services

Comprehensive ecosystem

Agnostic platform; flexibility in architecture & deployment

Technology investments speed time to value & differentiate
APM Portfolio Strategy

APM Value Drivers

**APM value focused on Availability, Risk, & Cost**

- Comprehensive solution for asset strategy, risk management, monitoring, diagnosis, and reliability management for asset and process intensive industries.
- Value to customers bottom line with less unplanned downtime, more predictable operations, and matching maintenance to budget; and lower TCO of APM Solution
- Ability to manage data once, but serve it up multiple analytics, KPIs, and other views.
- Cost effective solution from an IT spend perspective. APM is an end to end solution that will cut costs through landscape simplification compared to fragmented alternatives
BHGE Digital Product Portfolio Architecture

Asset Performance Management (APM)
- Reliability Management
- Compliance and Integrity Management
- Asset Strategy Optimization

Machine and Equipment Health

BHGE Oil and Gas Digital Products
- IntelliStream™
- Predictive Corrosion Management (PCM)
- BHGE Digital Other Products* (LNG, Refinery, etc)

APM Shared Components
Case Mgmt, Knowledge Mgmt, Alarm, Asset Mgmt, Condition Monitoring, SmartSignal, Visualization, and More

Digital Twin Framework
PREDIX

*SaaS Applications
OT Sys, PLM Sys, ERP Sys

Cost ↑ Output ↓ Response Time

* New products under development by BHGE Digital
GE Digital APM solution map

Reliability Management

- Achieve less unplanned downtime by predicting equipment issues before they occur.
- Predictive diagnostics
- Case and collaboration management
- Knowledge management
- Root cause analysis
- Reliability analysis

Compliance & Integrity Management

- Ensure asset integrity and compliance by monitoring changing risk conditions.
- Hazard analysis
- Safety lifecycle management
- Risk based inspection
- Inspection management
- Thickness monitoring
- Management of change

Asset Strategy Optimization

- Optimize across availability, reliability, risk, and costs through intelligent asset strategies.
- Reliability centered maintenance
- Failure mode and effects analysis
- Strategy management
- Strategy library
- Lifecycle cost analysis
- Financial and risk simulation

Machine & Equipment Health

- Anytime, anywhere, unified view of your assets’ current state and health.
- Connectivity
- Data management
- EAM integration

- Condition monitoring
- Data analysis and visualization
- Criticality analysis

- Event management
- Recommendation management
- Reliability benchmarking
GE APM – Continuous Improvement Framework
Continuous Improvement through integration

- Strategy
  - Criticality
  - Failure Modes
  - Damage Mechanisms

- Risk
  - Re-evaluate Risk

- Analytics + Action
  - Drive Work (repair)

- Operations & Maintenance
  - Connect / Collect
    - Sensor Data / Alerts / Events
    - Inspection / Work History Events

- Optimize Plan
  - Change Strategy (Interval)
Business benefits

GE is the only APM solution providing end-to-end value

- **5-10%**: Inventory cost reduction
- **2-6%**: Increased availability
- **10-40%**: Reduction in reactive maintenance
- **3-40%**: HSE incident reduction
- **5-25%**: Gain in employee productivity
- **5-25%**: Reduction in IT total cost of ownership
Journey to Unified APM
## Heritage Meridium Solution Detail

### APM Answers
- Performance Benchmarking
- Bad Actor Detection
- Manufacturer Comparison
- Data Quality Management

### APM Strategy
- Reliability Centered Maintenance
- Failure Modes and Effects Analysis
- Asset Strategy Management & Library
- Asset Strategy Optimization
- Life Cycle Cost Analysis

### APM Mechanical Integrity
- Risk-Based Inspection (API 580/581)
- Inspection Management
- Thickness Monitoring
- Mobile Inspections

### APM Failure Elimination
- Production Loss Analysis
- Generation Availability Analysis
- Root Cause Analysis
- Reliability Analytics

### APM Health
- Asset Health Manager
- Rounds
- Emerson AMS Analytics
- GE Analytics

### APM Safety
- Hazard Analysis
- SIS Management
- Calibration
- Mobile Proof Tests

### APM Foundation
- Asset Criticality Analysis
- APM Metrics
- APM Designer
- APM Maps
- Language Options

### APM Connect
- APM Connect Plus and Studio
- EAM Adaptors (SAP, Maximo, Oracle)
- Online Adaptors (OPC, OSI PI, Aspentech IP21, PhD)
- GE Predix Adaptor

### Cognitive Analytics
- Failure Pattern Insights
- Machine Learning Framework

### APM Connect
- Language Options
2016 PREDIX APM Solution Map

Machine & Equipment Health

The first step of APM
- Connectivity
- Data Management
- Condition Monitoring
- Data Analysis
- Configurable Dashboards

Reliability Management

Machine & Equipment Health Plus:
- Analytics Orchestration
- Analytics Catalog & SmartSignal
- Configurable Workflows
- Event Management
- Case & Collaboration Management
- Knowledge Management

Maintenance Optimization

Reliability Management Plus:
- Performance Benchmarking
- Asset Maintenance Strategy/Scenarios
- Financially Optimized Asset Strategy
- Work Scoping, Prioritization, and Scheduler
- Inventory Optimization

Accelerated with Meridium
Source: Meridium Conference 2016
Merging Capabilities

Machine & Equipment Health
- Connectivity
- Data Management
- Condition Monitoring
- Data Analytics
- Configurable Dashboards

Reliability Management
- Analytics Orchestration
- Analytics Catalog & SmartSpending
- Configurable Workflows
- Event Management
- Case & Collaboration Management
- Knowledge Management

Maintenance Optimization

Reliability Management Plus:
- Performance benchmarking
- Asset Maintenance Strategy/Scenarios
- Financially Optimized Asset Strategy
- Work Scheduling, Prioritization, and Scheduling
- Inventory Optimization

Presentation Title
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GE Digital APM Solution Map

Reliability Management
- Achieve less unplanned downtime by predicting equipment issues before they occur.

• APM Failure Elimination
• SmartSignal
• Cognitive Analytics

Compliance & Integrity Management
- Ensure asset integrity and compliance by monitoring changing risk conditions.

• APM Mechanical Integrity
• APM Safety

Asset Strategy Optimization
- Optimize across availability, reliability, risk, and costs through intelligent asset strategies.

• APM Strategy

Machine & Equipment Health
Anytime, anywhere, unified view of your assets’ current state and health.

• Historian
• CSense Runtime Ed.
• APM Connect
• APM Health
• Bit Stew MIx Core
• Asset Answers
• APM Analytics
• APM Foundation

Increase asset reliability and availability while reducing cost and risk in operations.
Unified APM DEMO
Unified APM – Strategy and Roadmap
Unified Roadmap – Tenets

Tenets for joint Product Management teams on product strategy and roadmap

• “Do no harm”
  (does not mean “do not change”)

• Keep Customer Commitments

• Accelerate Unified Solution to Market

• Identify Synergies and Platform Dependencies
Strategic APM Product Initiatives

- Strategic
- APM
  - Unified 1.0 (GE APM + Meridium APM)
  - APM-P & APM-M
    - M&D & 4.3 Commitments
- Unified 2.0
  - Meridium
  - SmartSignal
  - Asset Answers
  - Predix - APM
  - Unified APM 1.0
- Digital Twin Blueprints
  - Asset Strategies
  - Failure Modes / Deg Mech
  - Lifecycle Costs
  - Analytics
  - Health Indicators
Unified APM Timeline

2017 Q4
APM
- Unified 1.0.2
- ServiceMax Integration
- Maximo Integration
- SmartSignal – for early adopters and IPRC

Unified 2.0 BETA
- Lift/Shift V4 to Predix
- All Meridium modules functional
- Backend Changes
- Rewrite Windows Services
- PostgreSQL
- .Net Core
- Product Rationalization
Limited Availability for stakeholder review and feedback

2018 Q1
APM
Single code-base (Unified 2.0 GA)
- All “Unified 1.x” Capabilities
- All Meridium modules Parity GA release – net new customers
- SmartSignal additional cloud capability

2018 Q2
APM
Incremental module enhancements
- APM Now and Unified 1.0 customer migration support
- SmartSignal Parity GA release
- On-prem Migration tools (APM-M/SmartSignal)

2018 Q3
APM
Enhancements per roadmap
- V3 / V4 Customer migration support
- SmartSignal on-premise customer migration support

Predix Cloud
Unified APM 1.x
Full GA APM functionality
Limited on-prem APM functionality
Predix Private Cloud
On-prem APM M&EH, RM, CIM, and ASO functionality

V4.3.x Meridium Support Releases (quarterly)
V6.3.x SmartSignal Support Releases (as-needed)

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On-premise Meridium APM Support

FAQ

Q: Will on-premise Meridium APM Version 4 continue to be supported?

A: YES! Rest assured that Meridium APM Version 4 will continue to be supported for the foreseeable future.

We just completed a significant investment in a major release of Meridium APM version 4.3 delivered in Q2 of 2017.

Beyond Meridium APM version 4.3, legacy-Meridium functionality will reside within and be branded under GE Digital’s APM solution.