AGENDA

1. The evolving conversation
2. The 'Things' side of the IoT
3. Academic, industry, govt and think tank reaction
4. Recent trending in DoD
5. The 'end game' for IoT based maintenance
6. How SCOR, OODA and the Third Offset apply to IoT
7. IoT enabled service use case types and examples
8. Questions
Core Capabilities of an Integrated Service Information Solution
"THINGS' ARE CHANGING

The changing nature of products is disrupting value chains, forcing companies to rethink and retool nearly everything they do internally."
CHANGE IS EVERYWHERE

Smart, Connected Products
Remote Service, Ops & Analytics

Smart, Connected Operations
Brilliant Factory/Industry 4.0

Smart, Connected Systems
Smart Farms, Smart Cities, etc.
Smart, connected products are transforming how companies design, manufacture, operate and service products, and ultimately, how they organize to create and capture value.

– October 2015

Technically, we’re going to be one of the players that’s both offering an operating system, in the case of Predix, and also applications, in an open setting. So you have a macroeconomic story: Here’s what the Industrial Internet means, but then you have a technical story that says GE’s going to be one of the players that’s driving both horizontal platforms and vertical applications.

– September 2015
FEDERAL GOVERNMENT REACTION

Congress

- Depot Caucus
- IoT Caucus
- DIGIT Act
- Committees asking DoD

DoD

- Spending on SLM vs. PLM
- Augmented reality
- Additive manufacturing
- Third Offset Strategy
WHAT WE ARE HEARING

“We live in a very dynamic time. Our Air Force is being asked to shift focus and do different things very quickly. And we need to respond and be very creative and innovative in how we do that.”

Lt Gen Ellen Palikowski, AFMC Commander 8/2015

Think tank recommendations for DoD IoT adoption...
- Condition-Based Maintenance
- Real-Time Fleet Management
- Inventory Management
- Base Management /Energy Efficiency

CSIS Whitepaper 9/2015

Ideas for IoT Adoption in USAF...
- Base Facilities Management - Traffic management, Energy conservation,
- Vehicle Management (truck, airplane) - Maintenance prediction, location tracking
- Base Facilities Maintenance - Trash pickup, food replenishment

Frank Konieczny – USAF CTO 11/2014
Recommendations for DoD's IoT adoption
• Condition-Based Maintenance
• Real-Time Fleet Management
• Inventory Management
• Base Management /Energy Efficiency
TRENDS IN DOD THAT WE ARE TRACKING WITH YOU

• Third Off-Set Strategy to save dollars and make leap in technology
• “Center for Strategic Studies” supports “Smart-Connected” products
• Readiness Rates are troubling to say the least, some at all time lows
• Modernization efforts are growing but directly competing with legacy systems
  – Every $$ saved in legacy support goes towards modernization
  – Expect additional pressures to drive down cost of legacy maintenance
• Cyber Security is biggest concern now although we have to keep discussion on target
• DoD very interested in Digital Twin/Thread, Cloud Services, Augmented Reality, Augmented Training, Machine Learning, Smart depots/buildings, etc., but struggle on defining requirements
Integrating Systems to Life Management Processes

**Alerting**
2) ThingWorx application monitors sensor data and confirms that problem or other conditions exist that trigger maintenance

**Data Capture**
1) Sensor data gathered from connected asset inside depot

**Diagnostics**
3) Diagnostics rules and maintenance schedules are used to identify or predict maintenance needs

**Supply, Provisioning**
4) Required parts are identified or ordered via optimal supply location, owner, utilization, condition.

**Work-order Automation**
5) Work Order generated in the maintenance systems with parts status for technician scheduling

**Technical Data Integration**
6) Required technical data and instructions are located and attached to work order

**Asset Restored**
7) Service is performed, restoring asset to proper condition
Dr. David Bertreau, OSD/LMR—"it took us a while to get here but SCOR is our model."
IoT now links smart, connected products and all SCOR processes.
HOW THE OODA LOOP CAN APPLY TO THE IOT

- Collection of data by 'means of the senses'
- Time is the dominant parameter - must complete the OODA cycle quicker than enemy
- Decision-making changes on the fly based on introduction of new and quickly changing data
- Can apply tactically to battlespace or strategically (i.e. Third Offset Strategy)
At the middle of all of this is data coming from signals, sensors, machines, or other humans. So the IoT will play a central role.

- **"Cyber hardened" semi autonomous**
  - Weapons that survive cyber threats
    - Ex. - Small diameter bomb still operating without GPS

- **Autonomous "Deep Learning"**
  - Automated analysis with no human
    - Ex. - NSA algorithm makes a threat profile based on ISIS posts to social media

- **Assisted Human Operations**
  - Machines help human operate better
    - Ex. - Parking assist or the ‘Iron Man’ exoskeleton

- **Human-Machine Combat Teaming**
  - Humans and unmanned operating together
    - Ex. - P8 and Triton unmanned system or swarms of unmanned systems

- **Human-Machine Collaboration**
  - Machines help humans w/ decisions
    - Ex. - F-35 Helmet using data from multiple systems into one layout for pilot

Source: DoD (Dep SECDEF Bob Work, at Center for a New American Security 12/14/2015)
SERVICE IS THE LEADING USE CASE FOR IOT TECHNOLOGY

Smart, Connected Products Drive Two Levels of Accelerated Service Transformation

Breakthroughs in Operational Effectiveness vs. Strategic Differentiation

- Reactive → Proactive
- On Site → Remote
- Blind → Data Driven
- Historic → Present & Future

New Product Sales → Products as a Service
Break Fix → Performance Based
Equipment Uptime → Operation Optimization
Product Value Chain → Customer Value Chain

“Remote data, which can track performance, failure reasons, and potential fixes, provides service technicians with the answers to solve customer problems faster.”

Aly Pinder Jr.
Senior Research Analyst, Service Management
Aberdeen Group
March 2015
NEW AUTOMATED SERVICE PROCESS

1. Service Insights
   Aggregate view of relevant data for service from multiple enterprise systems and connected products

2. Remote Monitoring & Anomaly Detection
   Real-time monitoring and analysis of sensor data that triggers alerts from business rules and machine learning techniques to initiate further action

3. Predictive Service
   Machine learning analytics detect changes in sensor data and correlate service history to predict failures and enable condition-based maintenance

4. Remote Service
   Service response conducted remotely with ability for remote access, calibration, diagnostics, software & file distribution, and customer self-service

5. Connected Field Service
   Field Service ticket is automatically opened and a technician with parts, skill set, and knowledge to complete job is scheduled/delivered

6. Connected Parts Mgmt
   Parts forecasting optimization & planning informed in real-time by asset location, owner, utilization, condition

7. Interactive Equipment Service
   Required service information is attached to service order for technician including sensor, alert details, warranty, procedure, and parts—all enabled with an Augmented Reality experience
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