IOT - Connecting

Assets and much, much more!

*The Art of the Possible*

Maj Gen (Ret) H. Brent Baker, Sr.
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Maj Gen H. Brent Baker - Bio

Global Product Data Interoperability Summit | 2016

- Maj Gen H. Brent Baker, Sr., 37 year AF Career
- Life-Time Logistician with experience across all loggie disciplines
- Proudest Moments: Stood up AF Global Logistics Supply Center and 7X commander
- Last two jobs: Commander, AFMC, and Commander Hill AFB Depot Complex
- Passion…Alabama Football, Roll Tide Roll
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
This was the conversation 5 years ago
NEW REALITY: integrating digital and physical worlds
'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.
Academics and industry are taking note

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

Think tank recommendations for DoD IoT adoption...

- Condition-Based Maintenance
- Real-Time Fleet Management
- Inventory Management
- Base Management/Energy Efficiency

CSIS Whitepaper
9/2015

“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

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
Think tanks are weighing in also - CSIS Whitepaper 9/2015

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
The "end game" scenario for IoT based maintenance

Integrating Systems to Life Management Processes

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

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

Asset Restored
7) Service is performed, restoring asset to proper condition
Supply Chain Operations Ref Model (SCOR)
How SCOR relates to IoT

Plan

Return

IoT
Applications for smart, connected products

Source

Deliver

Make

IoT now links smart, connected products and all SCOR processes
How the OODA Loop can apply to the IoT

Col John Boyd, USAF

- 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)
Third Offset - operational components relating to IoT

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

"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

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.

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

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

Source: DoD (Dep SECDEF Bob Work, at Center for a New American Security12/14/2015)
Service is the Leading Use Case for IoT Technology

Smart, Connected Products Drive Two Levels of Accelerated Service Transformation

**Breakthroughs in Operational Effectiveness**
- Reactive → Proactive
- On Site → Remote
- Blind → Data Driven
- Historic → Present & Future

**Strategic Differentiation**
- 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
Example Pilot Programs

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Predictive maintenance

Using AR for servicing fielded equipment. CAT estimates 30% of a technician’s time is spent looking for information. Using IoT technologies to layer CAD models over service information to accomplish tasks like real-time support and predictive maintenance.

BENEFITS:

- Quick knowledge transfer from experienced to novice technicians.
- Leverages existing technology investments...CAD data, sensors.
Remote software updates

Diebold is a $2.9B provider of integrated self-service delivery and security systems, including ATMs. IoT technology is Diebold’s mechanism for ATM service connectivity.

**BENEFITS:**

- Average problem resolution time reduced from 3 hours to minutes.
- 17% of total issues resolved remotely without a field service visit.
- Overall ATM downtime reduced by 15%.
Example Pilot Programs

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Smart repair

Leveraging IoT technology to enable AR for servicing motorcycles. The service technician app has all open repair tickets and enables live diagnostics, visualizes 3D CAD data of any malfunctioning parts with simple ‘show me’ function that even a novice technician can use. The system conducts diagnosis then displays animated repair procedures in AR.

BENEFITS:

- Fast diagnostics and remediation based on AR.
- Lowers expertise level threshold of technicians who are unfamiliar with a particular equipment platform but can still conduct complex maintenance activity.
Questions
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