

The Role of Standardization in IIoT

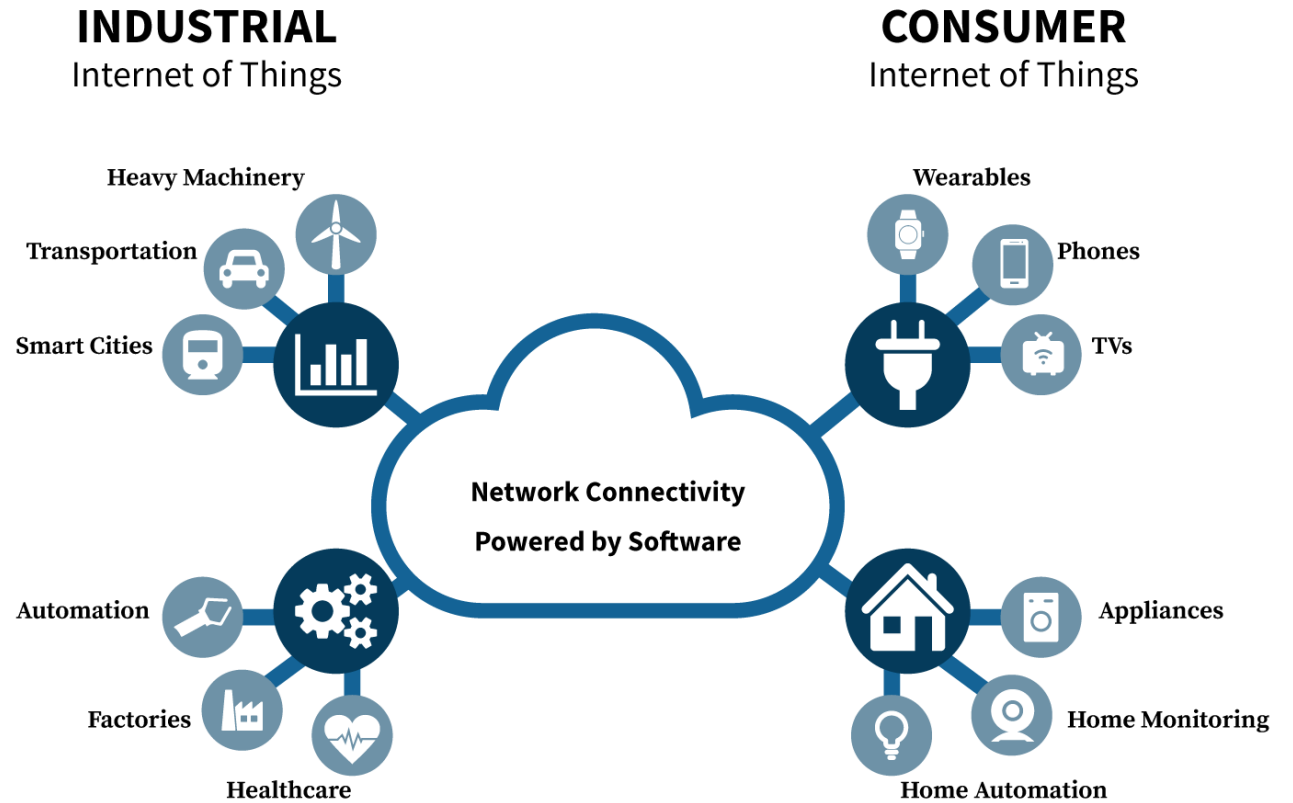
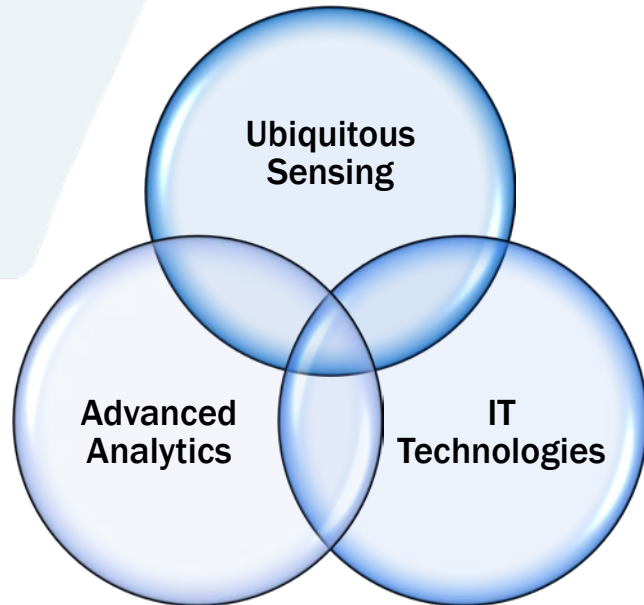
Embedded Tech Trends, January, 2018

Jessica Isquith



PICMG – Industrial Internet of Things (IIoT)

- Current Role
- Logical Evolution
- New Role as Standards Body and advocate



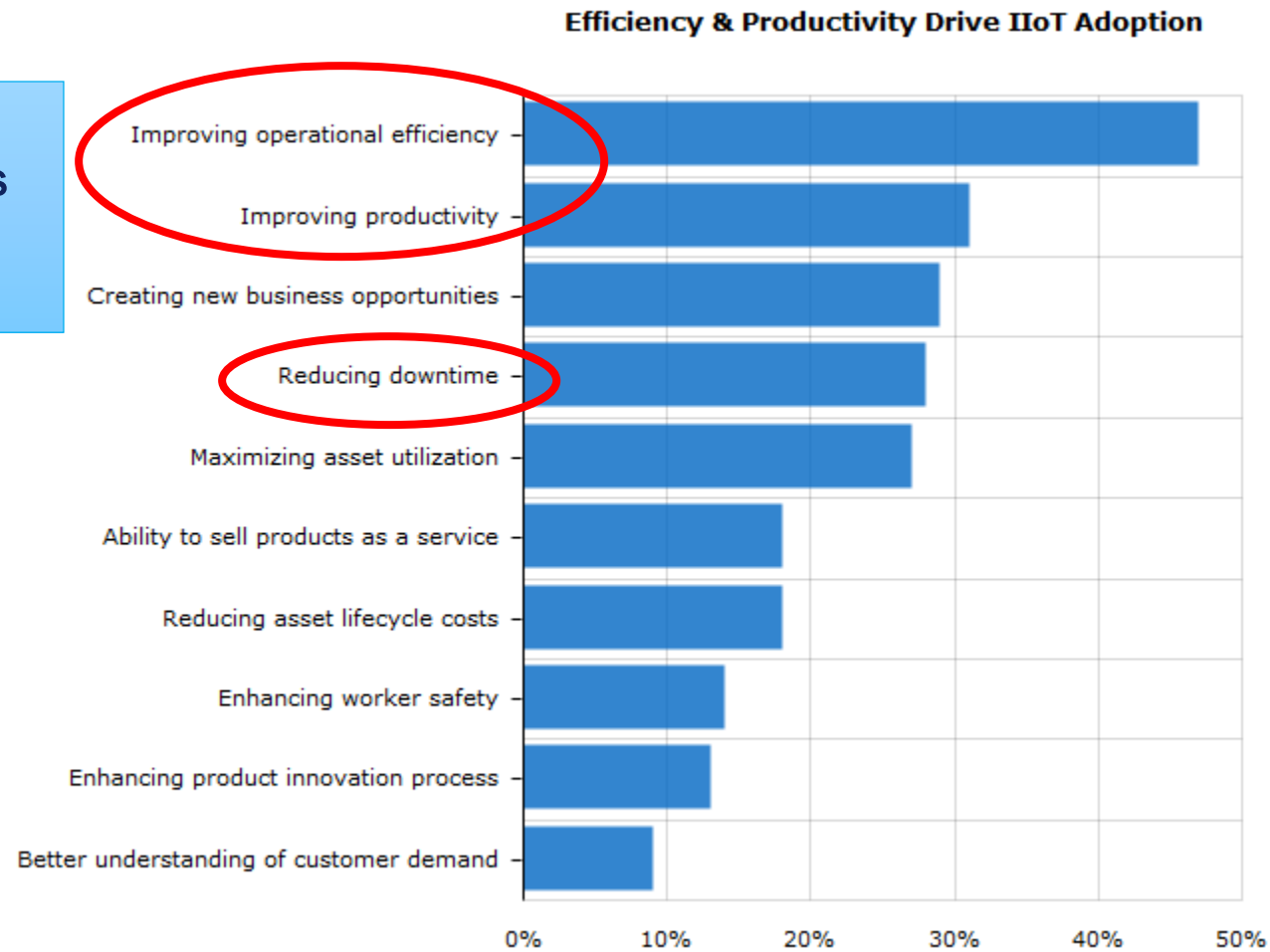
Market View from Analysts

- “The industrial sector is broadly expected to be the largest beneficiary of the broader Internet of Things development,” – Nigel Coe (Morgan Stanley)
- “Global IoT in Manufacturing Market ... is projected to be the fastest growing in the market 2017-2024.” – Databridge Market Research
- “The global IoT in manufacturing market accounted for USD 6.23 billion in 2016 growing at a CAGR of 28.01% during the forecast period of 2017 to 2024.”
– Databridge market research
- According to Markets and Markets, “Manufacturers will spend \$74.8 billion per year on smart factory technology by 2022.”
- McKinsey & Company estimates that by 2025, the total economic impact of smart factories could reach \$3.7 trillion per year.

IIoT Manufacturing Market is the fastest growing segment and aligns well with PICMG’s background and skills

What IIoT Operators are Looking For

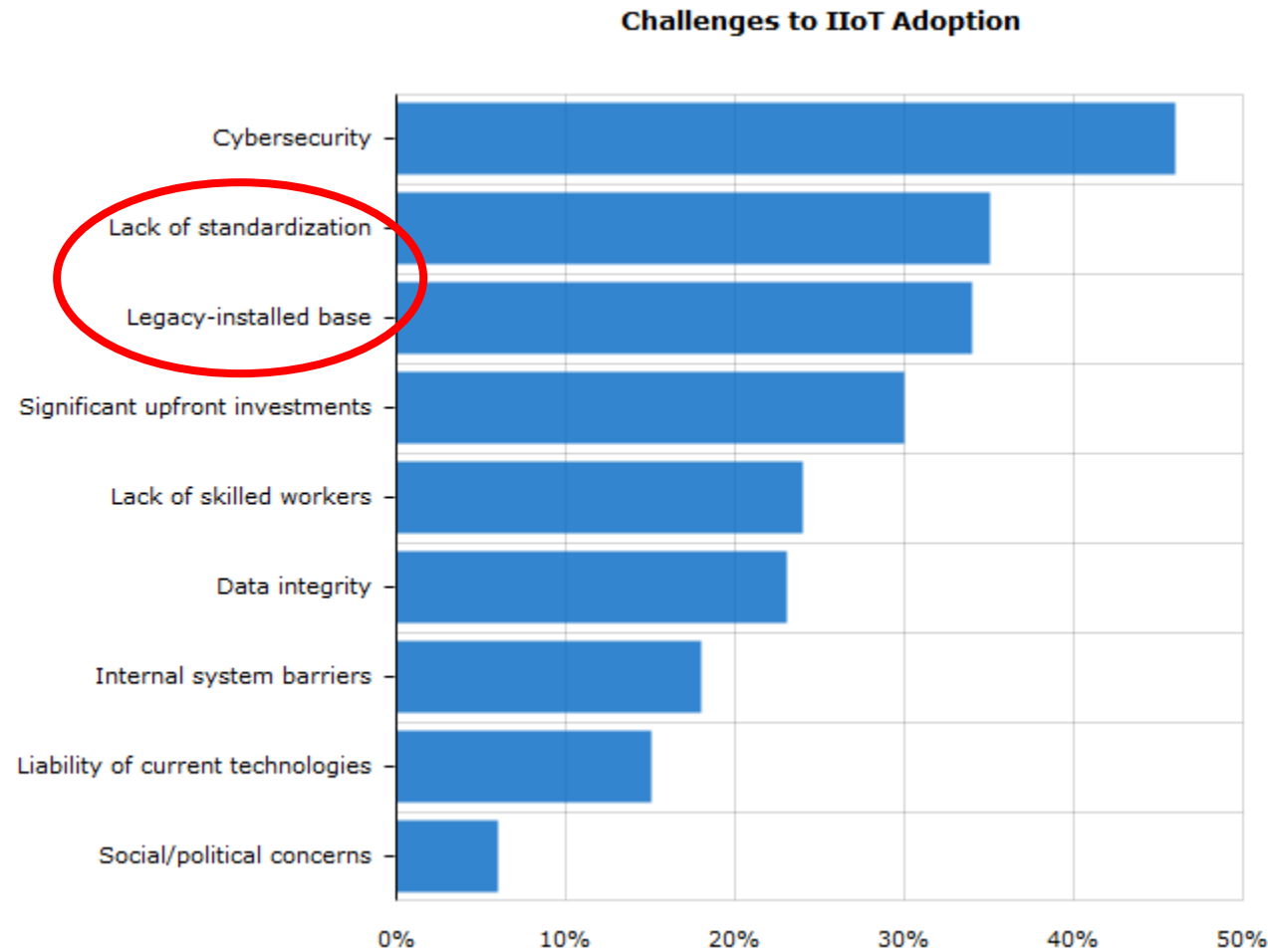
Aligns well with PICMG member's demonstrated capabilities



Sources: Morgan Stanley-Automation World Industrial Automation Survey, AlphaWise

What are the Primary Challenges to IIoT Adoption

Lack of standards is a key need. PICMG STRENGTH



Sources: Morgan Stanley-Automation World Industrial Automation Survey, AlphaWise

State of Standards in IIoT



- Excellent work being done
- Collaboration is key
- Gaps exist

AIOTI

AllSeen Alliance

DMTF

ETSI

IEC 62443/ISA99

IEEE (including P2413)

IERC

Internet Engineering Task Force (IETF)

Internet Governance Internet of Things Consortium IoT Security Foundation (IoTSF)

IP for Smart Objects (IPSO) Alliance

ISO/IECJTC-1

MAPI Foundation

OASIS

oneM2M

Online Trust Alliance

Open Connectivity Foundation (OCF)

The Open Management Group –

Open Web Application Security Project – OWASP

Smart Grid Interoperability Panel

Thread Group –

Industrial Internet Consortium

ETSI Multi-Access Edge Computing (Formerly Mobile Edge Computing)

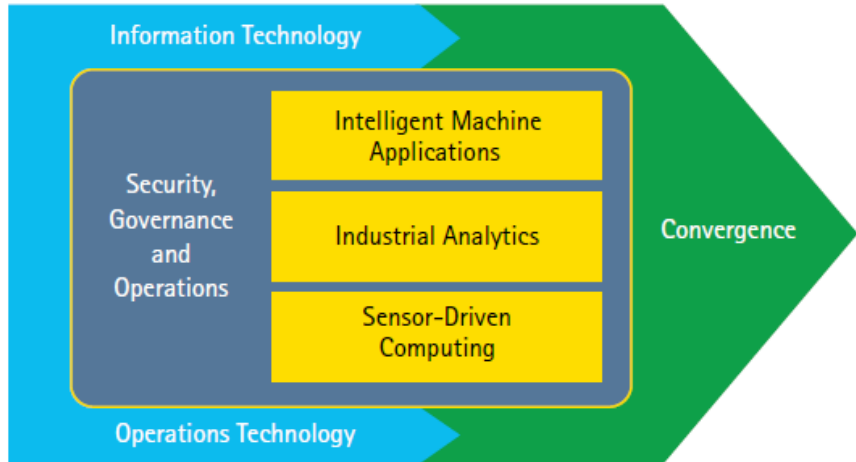
The OpenFog Consortium

EdgeXFoundary

CORD (Central Office Re-architected as a Datacenter)

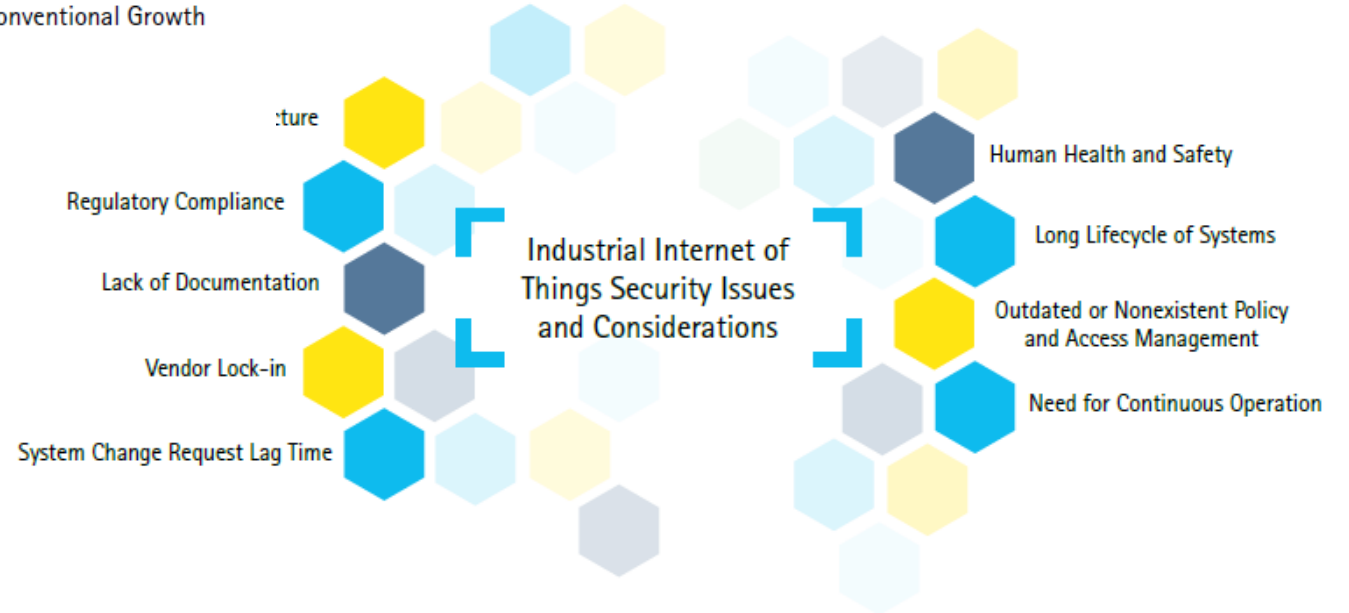
OpenEdge

IIoT: Convergence of OT and IT / Ongoing Challenges



Source: Woodside Capital Partners, 2017

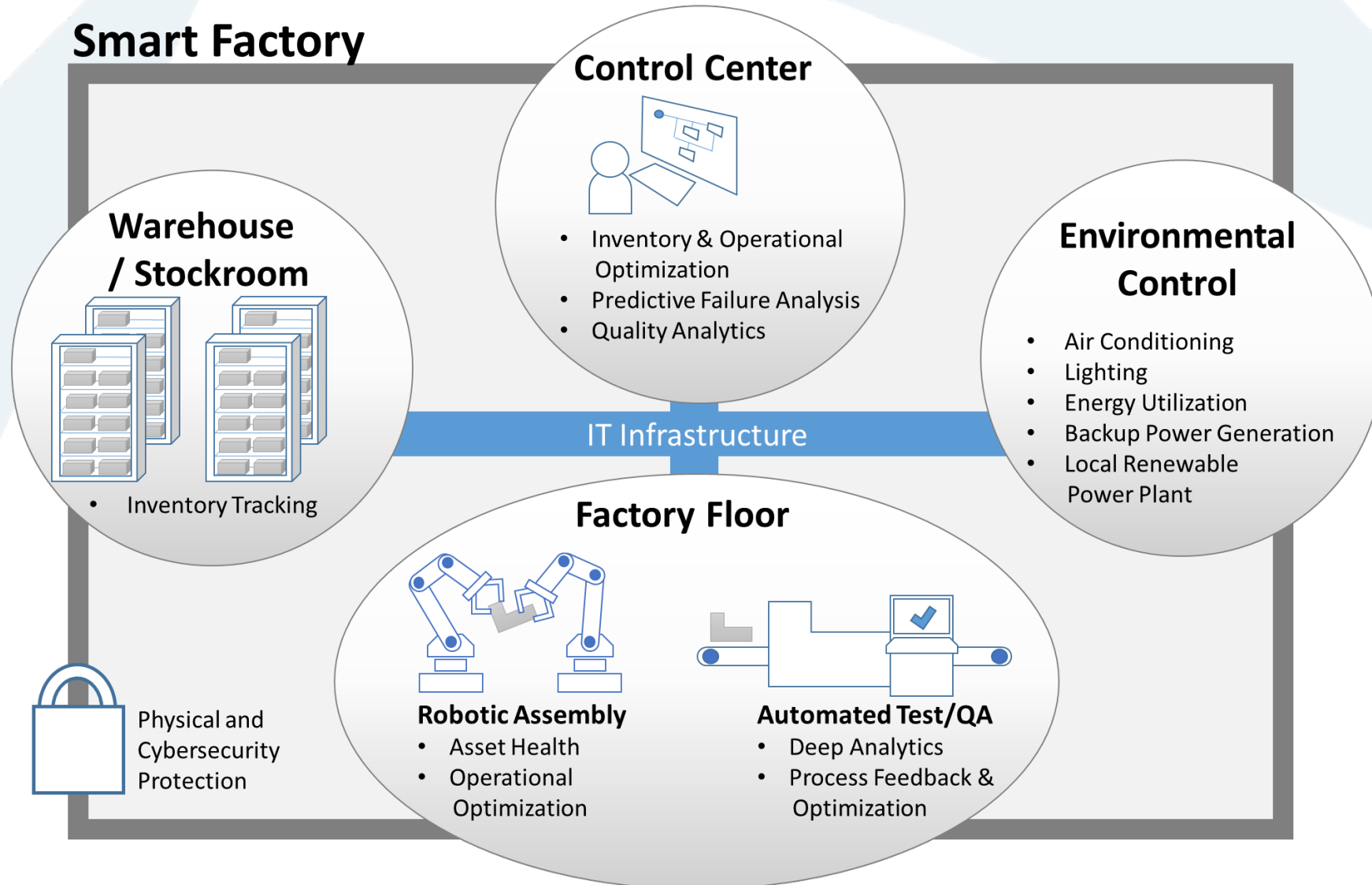
- Operational Efficiency
- New Services and Pricing Options
- Unconventional Growth



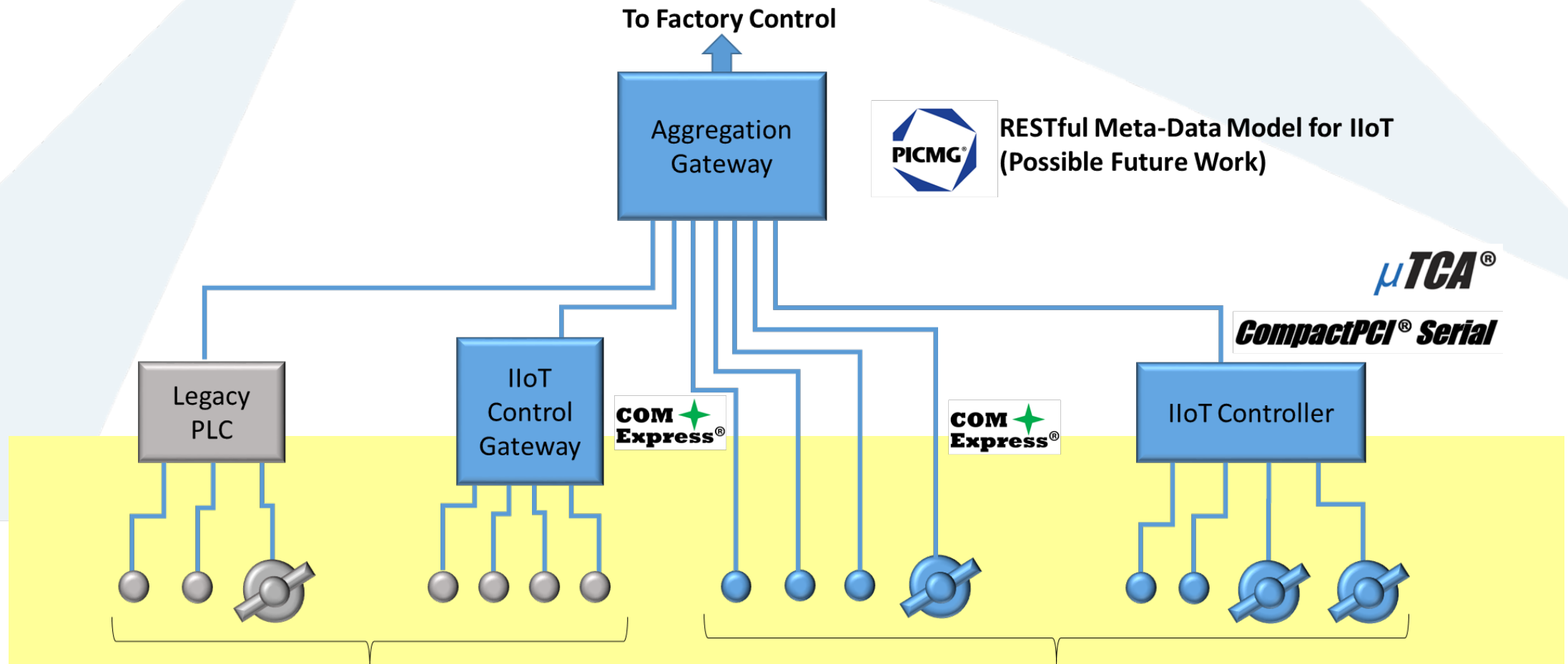
Companies, policy makers, customers and other stakeholders will have to work together to mitigate the risks of intelligent equipment connected to networks.

Source: Accenture

Smart Factory – The Heart of IIoT Manufacturing



PICMG Product Fit within IIoT



RESTful Meta-Data Model for IIoT
(Possible Future Work)

μTCA[®]

CompactPCI[®] Serial

COM Express[®]

COM Express[®]

- Legacy Sensors, Actuators & Control Points**
- I2C, Zigbee, Ethernet, CAN and other interfaces
 - Non-standard data representation

- IIoT Enabled Sensors, Actuators & Control Points**
- Standardized RESTful interfaces
 - Common Meta-data representation model



Active PICMG Standards Applicability to IIoT

COM 
Express®



CompactPCI®
Serial



μTCA®



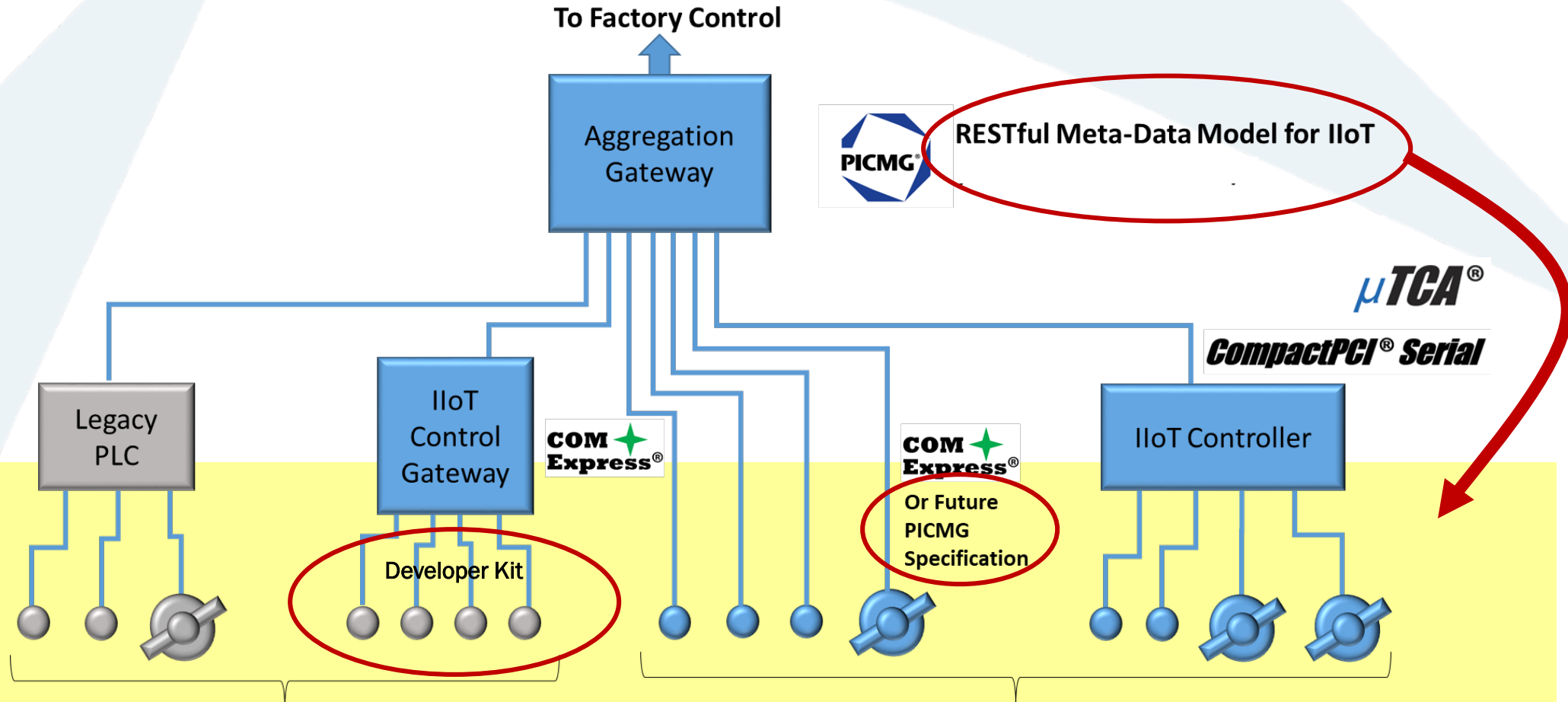
- Developed with small form-factor and machine to machine in mind
- Utilized in a wide range of industrial applications
- Designed for high performance in small footprint
 - Latest processor architectures
 - PCI Express Gen 3, up to 10GbE, SATA, USB 3.0
- Flexible I/O options through I/O base board
 - Enables easy adaptation to IIoT interfaces
- Many existing IIoT applications

- Fully modernized industrial platform standard
 - Leverages decades of PICMG experience in automation
- Rugged packaging, familiar form-factor
 - 3U or 6U Eurocard sizes
- High performance and scalable
 - Larger processor capabilities
 - PCI-Express/Ethernet
 - I/O expansion through add-in cards

IIoT relevant features

- Designed for 99.999% uptime, high availability
- Inherent shelf management and device identification/control
- Smaller form factor, modular
- JTAG Switch Module allows for easy software updates and debug remotely
- Ruggedized and conduction-cooled options

Areas of Future PICMG Work



- Legacy Sensors, Actuators & Control Points**
- I2C, Zigbee, Ethernet, CAN and other interfaces
 - Non-standard data representation

- IIoT Enabled Sensors, Actuators & Control Points**
- Standardized RESTful interfaces
 - Common Meta-data representation model

Software Opportunity – Meta-data model

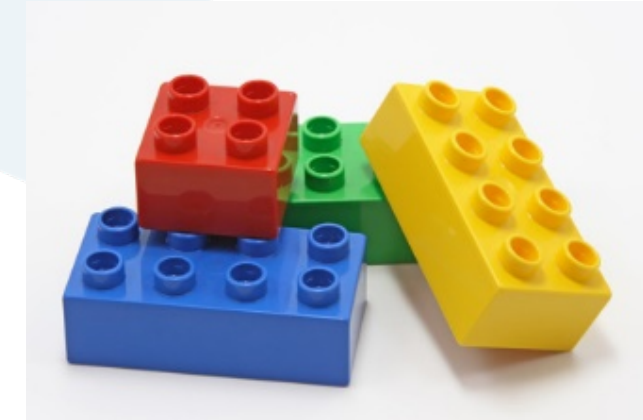
- Software is what makes IIoT work
 - Standardization in software important
- Meta-data model
 - Meta-data = Data about data
 - A model of how all the system components will present themselves and interact with one another
 - Provides common description language but allows for flexibility and future growth
- Distributed Management Task Force (DMTF) Redfish
 - Growing standard for management in IT and datacenters
 - Some leverage from datacenter model, but no schema for industrial-specific devices
 - Willing to work with other organizations (e.g. Open Compute Organization)
- PICMG has the capability and domain knowledge to create a meta-data model
 - Working through DMTF may be the fastest way forward.

An open, standardized meta-data model for IIoT would be a clear win for both the industry and PICMG

COM Express IIoT Developer Kit



- Hardware kit offered by PICMG
- Includes
 - Carrier board with IIoT I/O break-out
 - Examples of metadata models for common sensors
 - Examples of I/O interface for common sensors types
 - Compatibility with a wide variety of COM Express modules



Goal: Accelerate IIoT development and deployment of IIoT enabled sensors

Hardware opportunity – Postage Stamp

- Enables sensor vendors to quickly create smart sensors
- Key features
 - Very small form factor
 - “Just enough” I/O
 - Lower processing capabilities – microcontroller
- Low power features
 - Solar, long life battery, PoE
- Fully supports common meta-data (Software) model for “Plug-and-Play” configuration and discovery.



Postage Stamp form factor will allow PICMG to extend its platform support lower into the IIoT hardware stack and enable growth of smart sensors market.

Next Steps

- Cooperative relationship with DMTF for Redfish development (In Progress)
 - PICMG develops and updates schema, DMTF incorporates into Redfish
 - PICMG and DMTF publish (or cross-link) the schema on their web sites.
- Postage stamp specification investigation / kickoff
 - Market analysis & requirements gathering
- Com Express Developer Kit
- Continue to collaborate with complementary consortia
- Court Sensor Vendors for Collaboration
 - Possible formation of sensors community within PICMG

Goal: Make 2018 a year of significant success in IIoT
Commitment: PICMG Shall Continue to evolve to meet Industry Needs

IIoT Adoption is Happening Now

- Companies want to implement open standards in IIoT
- Today there are many groups working towards this goal – but many gaps remain
- Consortia and Alliances are critical to successful long term implementations
- Collaboration between organizations is best for the industry
- Participate!

**It is time to act and turn disruption into opportunity
through collaborative Open Standards**

**Thank you,
Jessica Isquith
jess@picmg.org**