Industrial Internet Consortium
Overview & Testbed Update
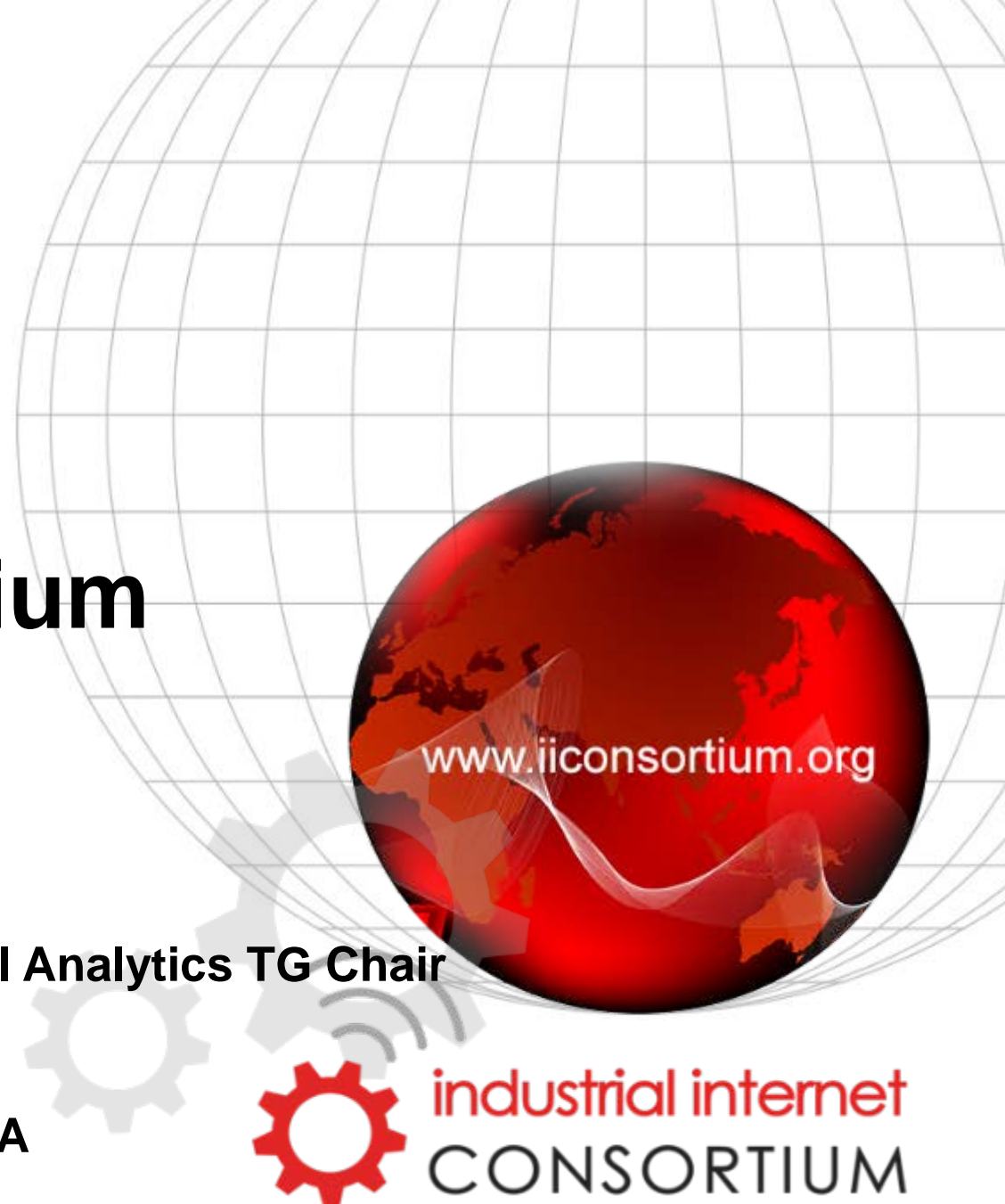
Wael William Diab
IIC Liaison WG Chair, Technology WG Chair, Industrial Analytics TG Chair
IIC SC Member (Alternate)
Senior Director, Huawei
oneM2M Industry Day, 12 July 2017, Memphis, TN, USA

www.iiconsortium.org

Agenda

Overview and Motivation

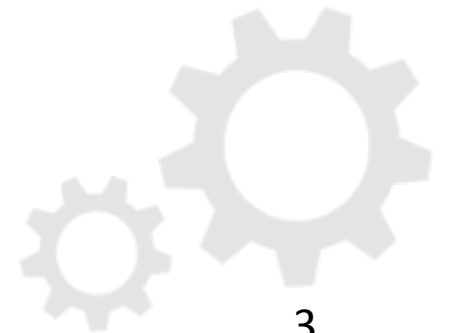Organization, Working Groups and Deliverables

Testbed Overview

Concluding Remarks

"A fundamental new rule for business is that the Internet changes everything."

-Bill Gates, 1999
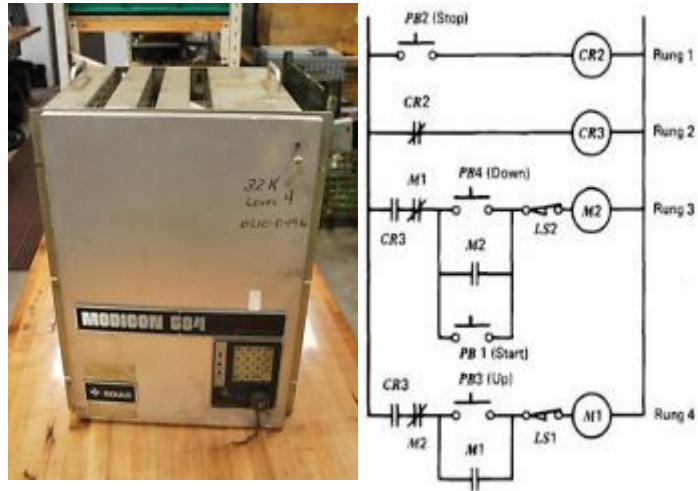
Or has it?

Discrete Manufacturing

1980

Debugging a Modicon 584
Programmable Controller

2014

Debugging a Modicon 584
Programmable Controller
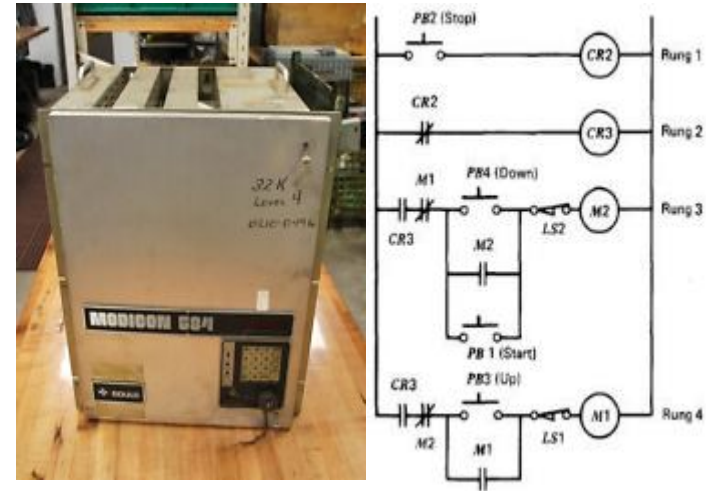
Energy Management

1950

Energy grids delivered power, not information
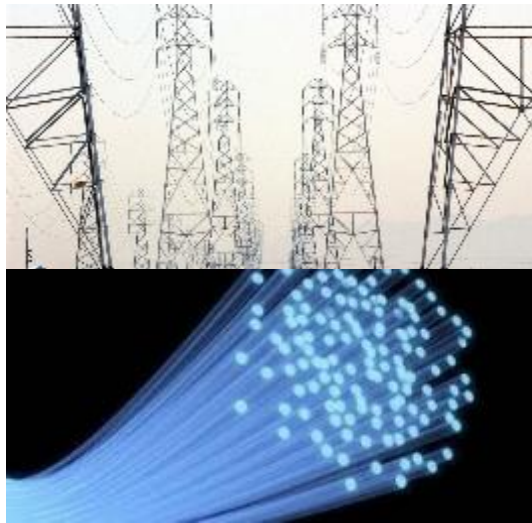
2014

Energy grids deliver power, not (much) information
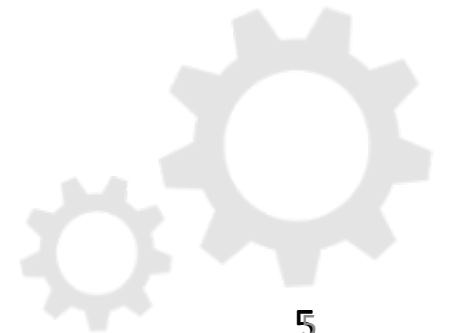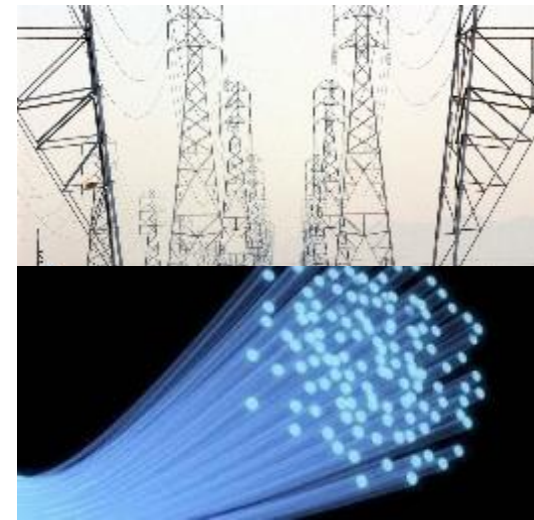
Aviation

1960

Jet performance data is downloaded by hand
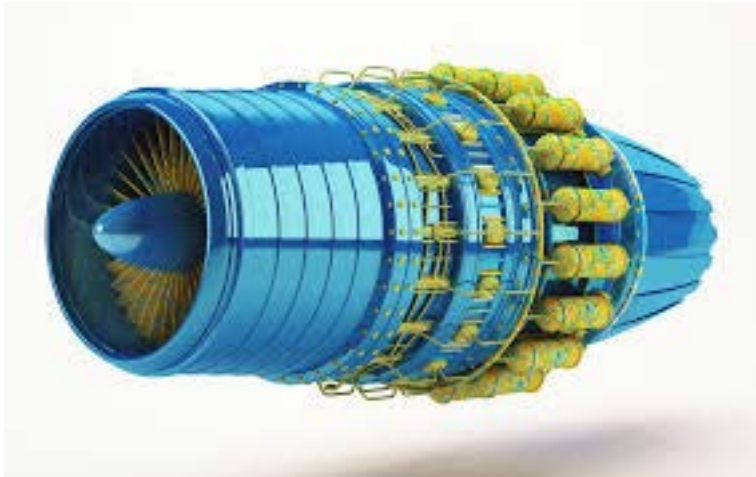
2014

Jet performance data is downloaded by hand

Yes, there are efficiencies and new integration points.

But we have a long way to go.

The Industrial Internet is leading the next economic revolution
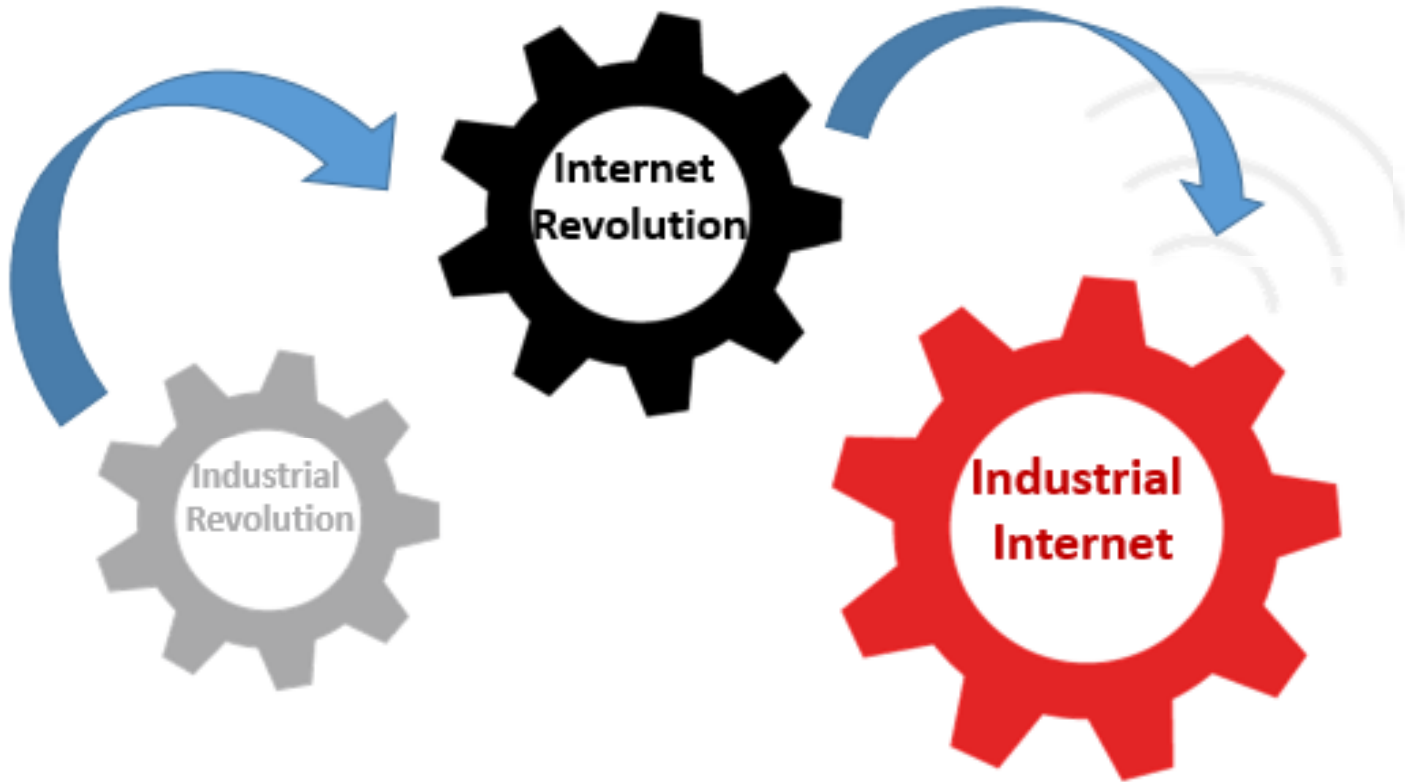
Global GDP Per Capita
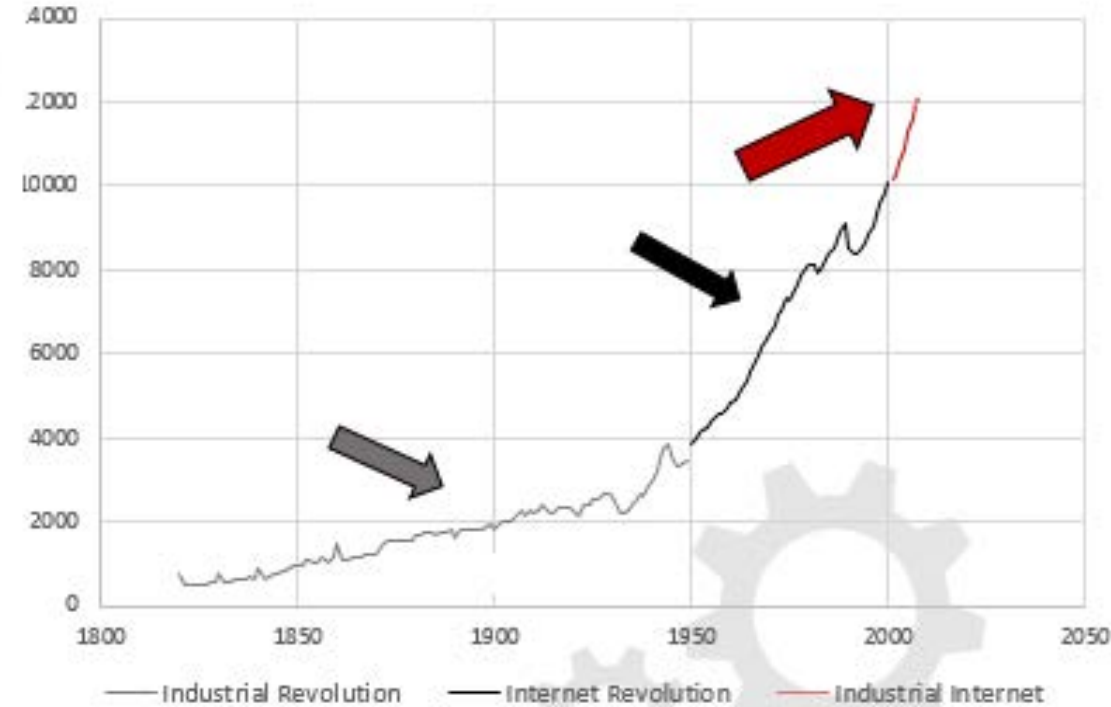
There are key differences between the Industrial Internet and Consumer IoT
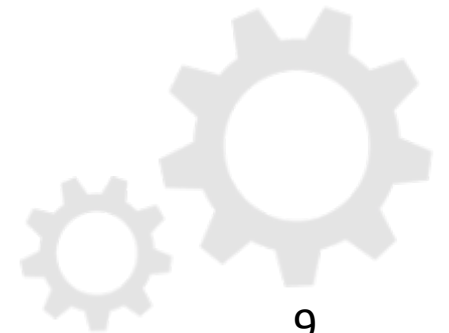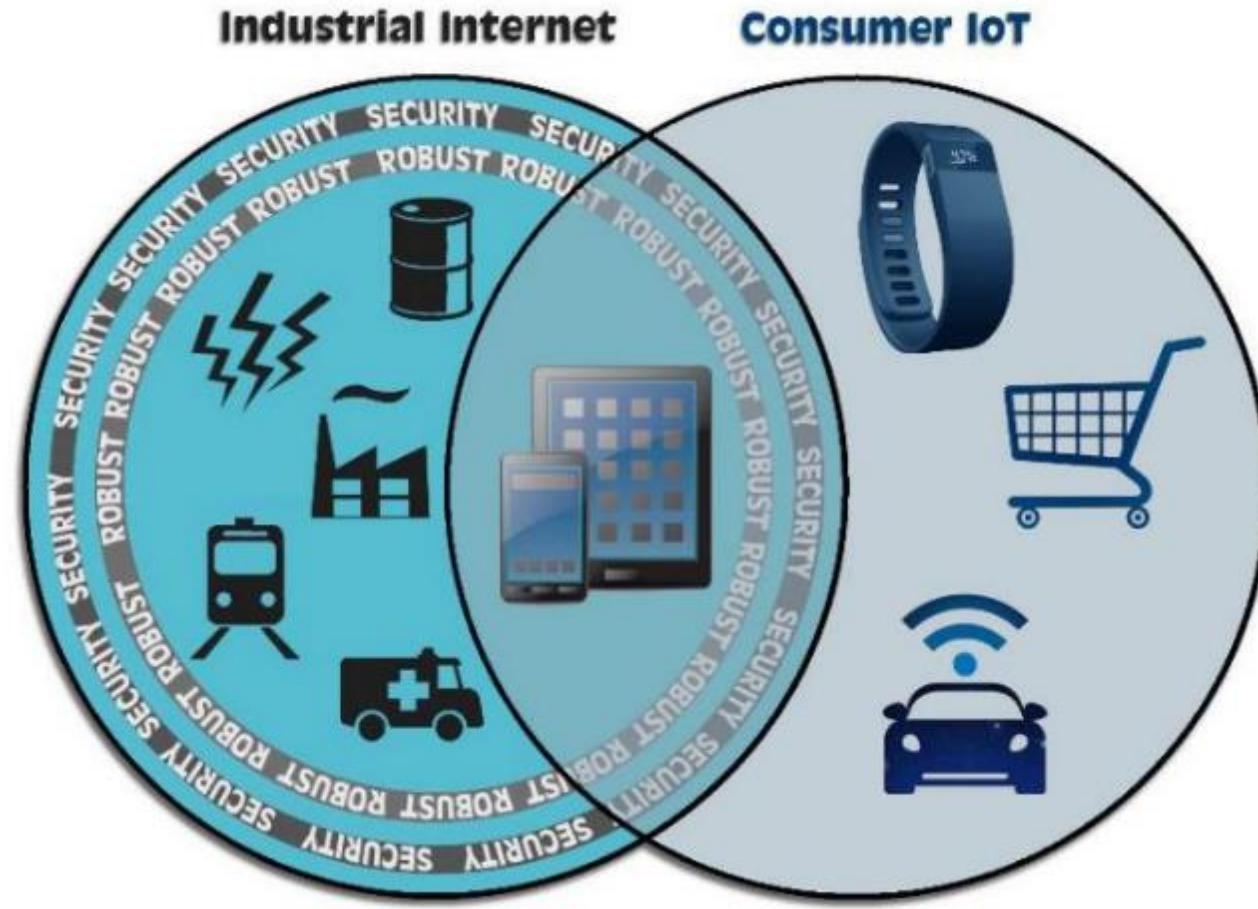
Opportunities across every industry

$30B

fuel cost saving in aviation industry

92M

vehicles with Internet connectivity on the road by 2016

$63B

productivity improvement in healthcare

Beyond the numbers, the Industrial Internet is changing *how things work.*

$66B

fuel cost saving in gas powered fleets

68%

decrease in crime rates with video surveillance

$90B

reduction in Cap X in oil & gas exploration and development

Source: Industrial Internet: Pushing the Boundaries (2012, Evans & Annuziata)
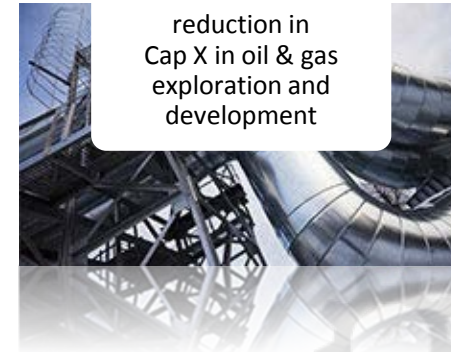
Making Sense of the Numbers

Revenue Generation

- Revolutionary new products & services → Creating new markets → Changing the way the world works

New Operational Efficiencies Drive Down Costs

- Workforce productivity gains → digitization of tasks, better deployment of resources
- Reduced maintenance costs → predictive maintenance
- Material, energy savings → reduced need for product over-engineering
- Reduced waste → Precision monitoring to predict and control machines

Improved Customer Satisfaction

- Improved service levels → fewer unplanned disruptions

Yet there are current roadblocks to widespread adoption

59% of IT Pros Say They **Have Not Started Preparing** for Expected Data Increase

73% of Companies Have **Not** Made **Concrete Plans** for the Industrial Internet

3% of IoT Professionals Say **Connectivity** is the Biggest Challenge

Many Countries Have **Insufficient Conditions** to Support **Widespread Adoption**

Data Standards are Largely **Proprietary**, **Works-in-Progress**, or **Non-Existent**

The Industrial Internet: A $32 trillion opportunity

14% of IoT Professionals Say **Security** is the Biggest Challenge

70% of IoT Professionals Say **Interoperability** is the Biggest Challenge

36% of Executives Say **System Barriers** Between Departments **Prevent Collection** and Correlation of Data

Research into the Industrial Internet has **Only Existed** in the **Past 3 Years**

Urgent Need to **Refocus Education** to Prepare for the **Upcoming Digital Workplace**

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The IIC Global Ecosystem of Stakeholders:

Things are coming together
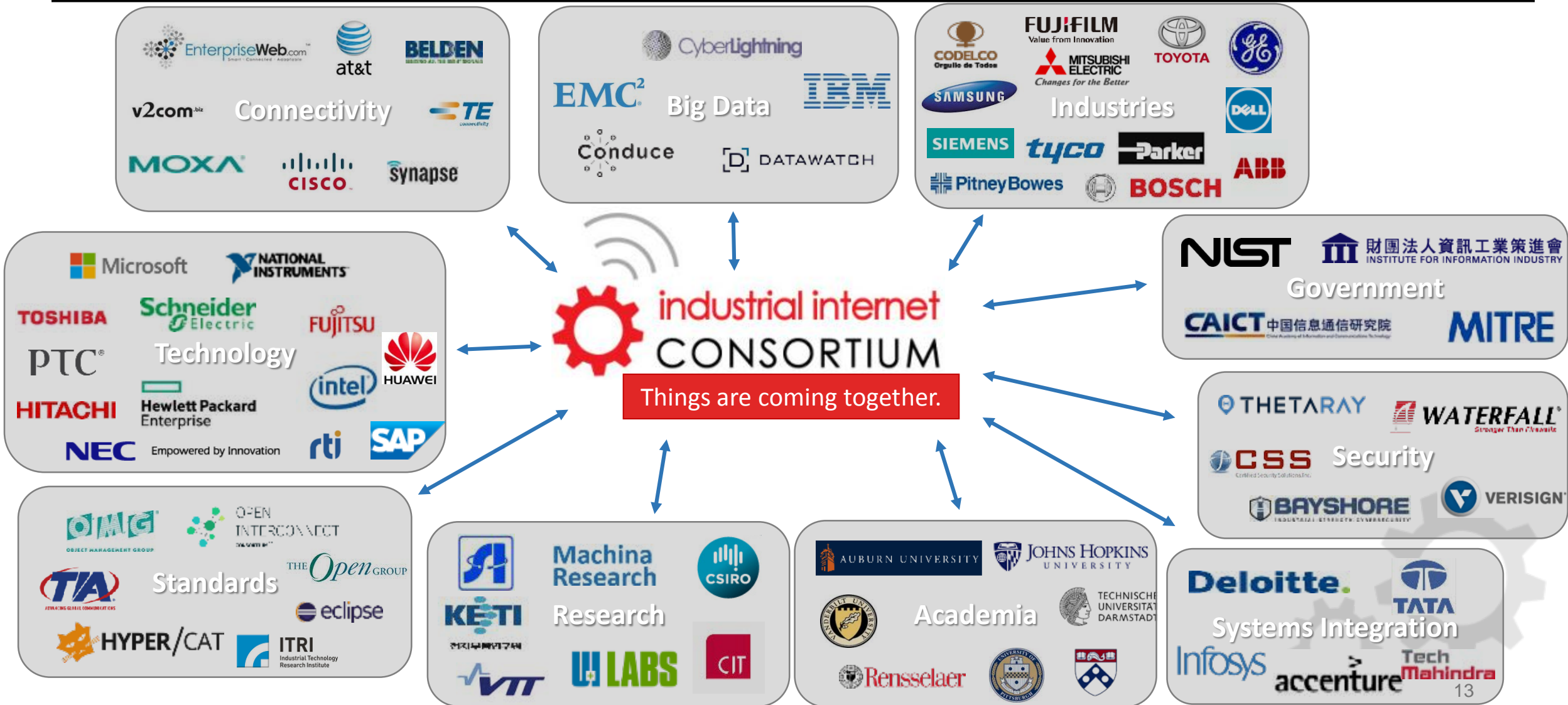
Industrial Internet Consortium Vision & Mission

Vision *: The Industrial Internet Consortium (IIC) is the world's leading organization transforming business and society by accelerating the Industrial Internet of Things (IIoT).*

Mission *: Our mission is to deliver a trustworthy Industrial Internet of Things (IIoT) in which the world's systems and devices are securely connected and controlled to deliver transformational outcomes.*

An open, neutral "sandbox" where the IIoT Ecosystem of global industry, academia and government meet to collaborate, innovate and enable.

- More than 250 organizations from more than 30 countries and growing
- 27 active testbeds all over the world from more than a dozen different segments
- Numerous publications including Reference Architecture; Security Framework; Analytics WP

The IIC is an open, neutral "sandbox" where industry, academia and government meet to collaborate, innovate and enable.

IIC Founders, Contributing Members, & Large Industry Members

ABB ERICSSON at&t

OLYMPUS TOSHIBA Hewlett Packard Enterprise Itron HCL accenture DELL

KUKA Rostelecom BOEING TOYOTA TÜV SÜD MITSUBISHI HEAVY INDUSTRIES Schindler

MICHELIN SAMSUNG HITACHI B&R HARTING iot INSTITUTE

infineon

ORACLE pitney bowes Haier KONICA MINOLTA FUJITSU Microsoft

CISCO NEC Tech Mahindra Infosys Micron NATIONAL INSTRUMENTS Munich RE

ptc MITSUBISHI ELECTRIC Changes for the Better EQUINIX XILINX ALL PROGRAMMABLE 3M Science. Applied to Life.™ GENPACT TATA

IIC Founders, Contributing Members, & Large Industry Members

Savigent SOFTWARE

pwc

WIPRO Applying Thought

SICK Sensor Intelligence.

FLUKE.

L&T Infotech

SIEMENS

DENSO

azbil

Pega

RICOH imagine. change.

THALES e-Security

BELDEN SENDING ALL THE RIGHT SIGNALS

MOXA

Deloitte.

FUJIFILM Value from Innovation

中国电信 CHINA TELECOM 世界触手可及

KASPERSKY lab

Fuji Electric

Parker

NOKIA

ANALOG DEVICES

KEYSIGHT TECHNOLOGIES

QUALCOMM

TE connectivity

RENESAS

Schlumberger

Plethora IIoT

redhat

Rockwell Automation

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IIC Small Industry Members

IIC Small Industry Members

IIC Nonprofit, Academic, & Government Members

Agenda

Overview and Motivation

Organization, Working Groups and Deliverables

Testbed Overview

Concluding Remarks

Why now?

Driving the OT – IT Convergence:

Low cost, powerful technology

- Cheap sensors & devices
- Low-cost processing power, data storage

Connected everything

- By 2020, the number of things connected to the internet will be approximately 7x the number of people on earth today.[1]

Big Data

- Collecting, storing and analyzing data is now more cost effective

Smarter Machines

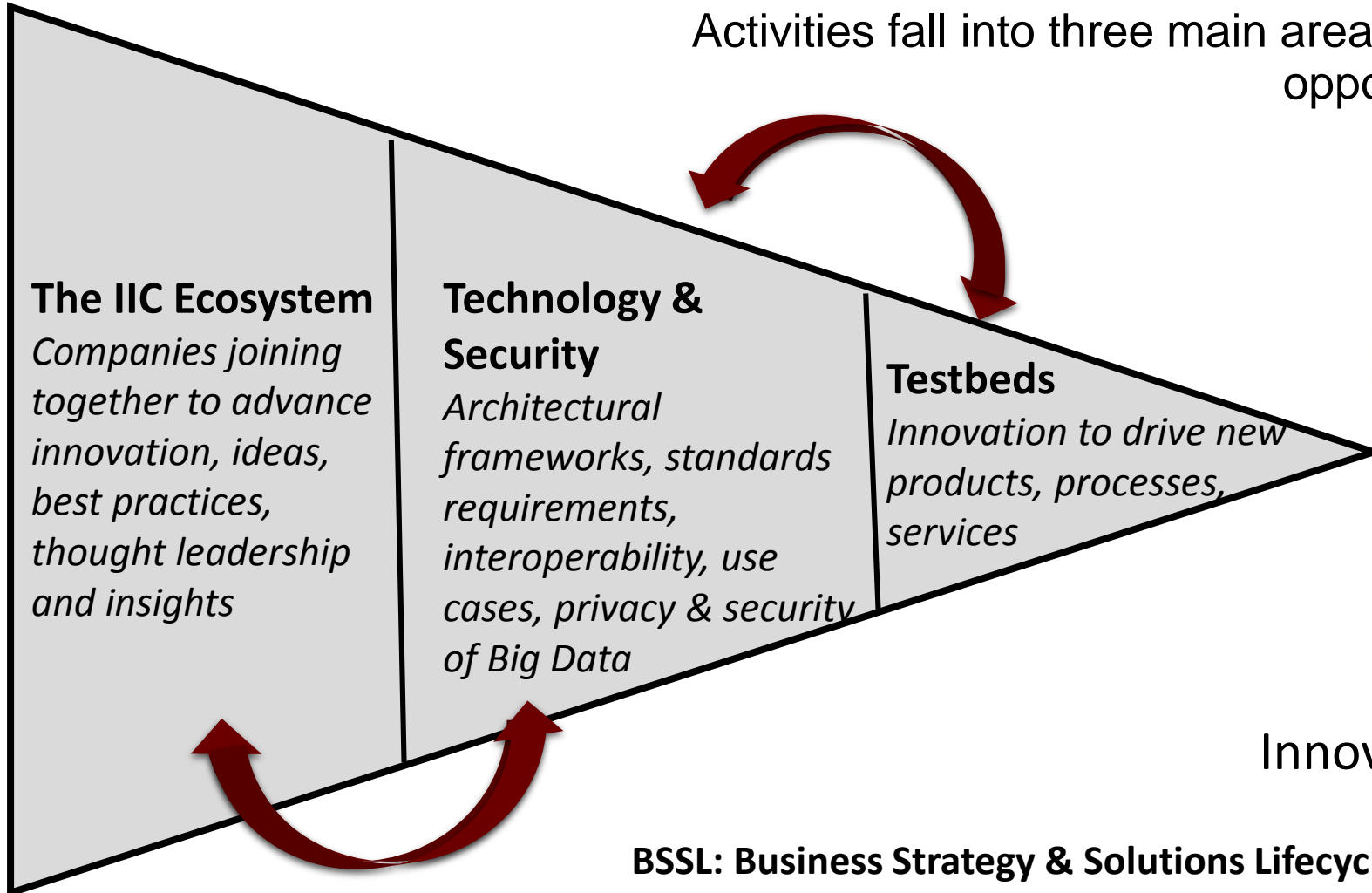- Equipment is increasingly embedded with sensors & software

[1]Source: Cisco Systems

IIC Core Focus Areas

Activities fall into three main areas that ultimately drive new opportunities for IIC members:

The IIC Ecosystem
Companies joining together to advance innovation, ideas, best practices, thought leadership and insights

Technology & Security
Architectural frameworks, standards requirements, interoperability, use cases, privacy & security of Big Data

Testbeds
Innovation to drive new products, processes, services
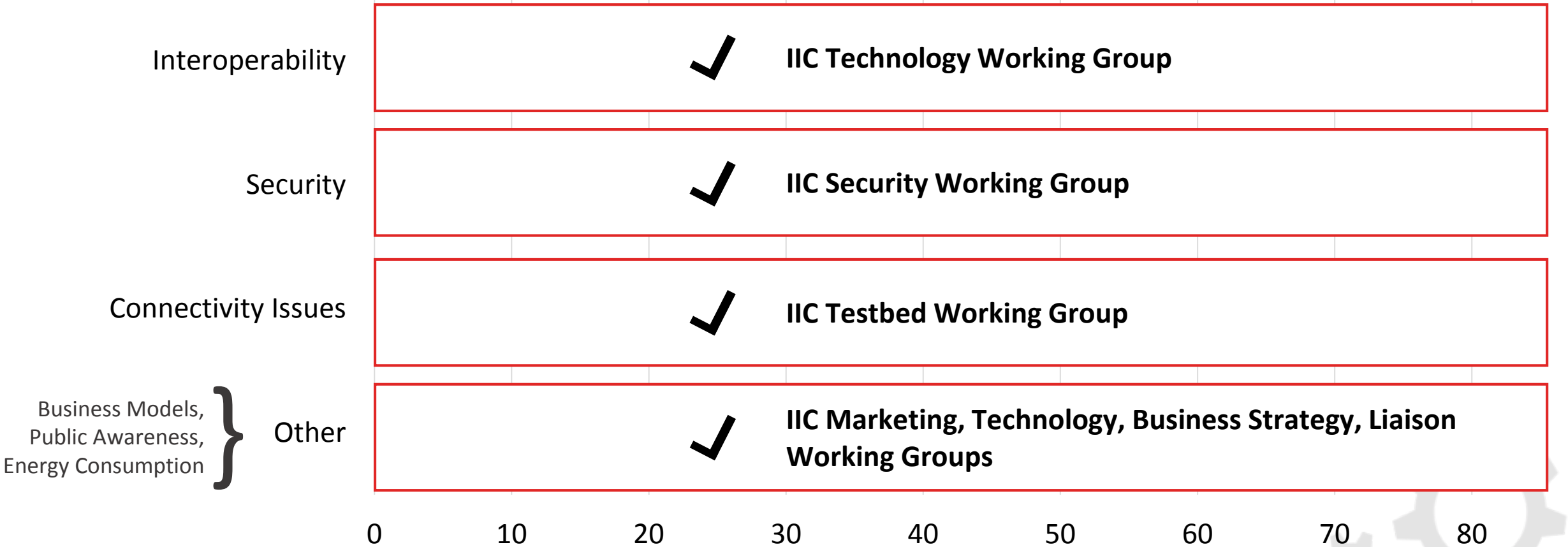
Innovative products!

BSSL: Business Strategy & Solutions Lifecycle

What is the Biggest Challenge Facing the Industrial Internet?

Interoperability — ✓ **IIC Technology Working Group**

Security — ✓ **IIC Security Working Group**

Connectivity Issues — ✓ **IIC Testbed Working Group**

Business Models, Public Awareness, Energy Consumption } Other — ✓ **IIC Marketing, Technology, Business Strategy, Liaison Working Groups**

0   10   20   30   40   50   60   70   80
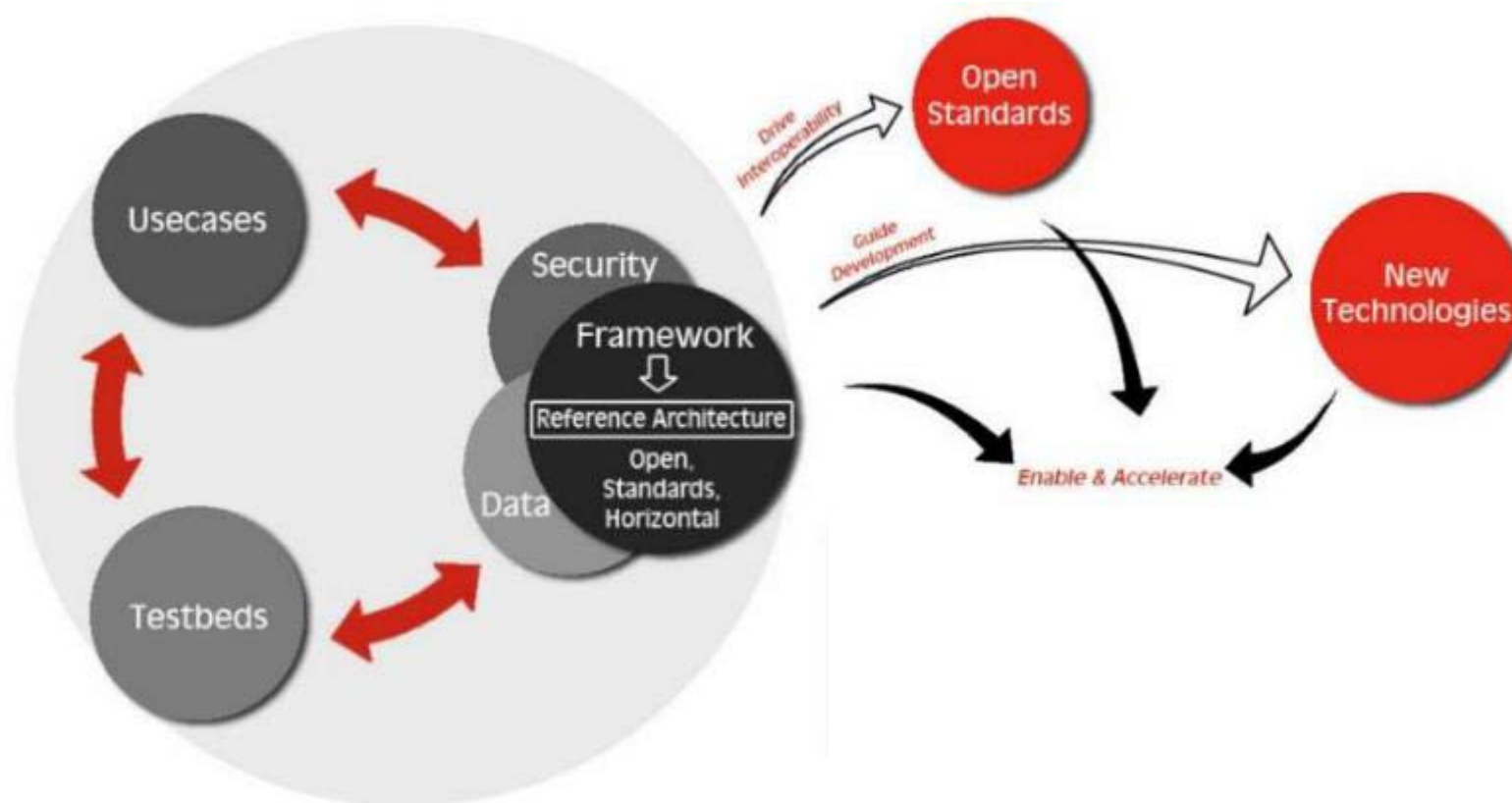
Organizational Structure of the Industrial Internet Consortium
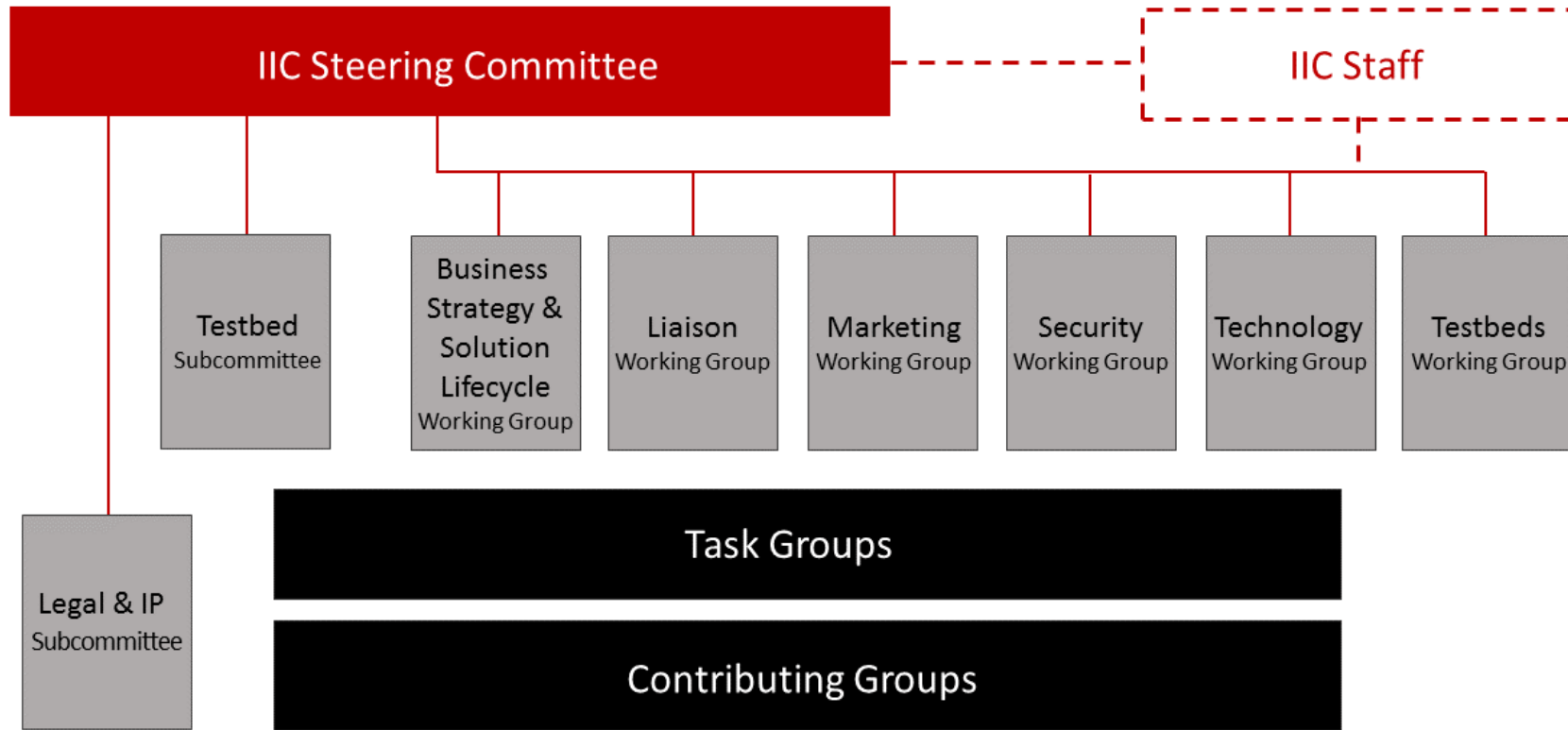
Collaboration within the Industrial Internet Consortium

IIC Working Groups have individual charters, inter-related outcomes both within the Working Groups and with external organizations.

Business Strategy and Solution Lifecycle

Business Strategy

Solution Lifecycle
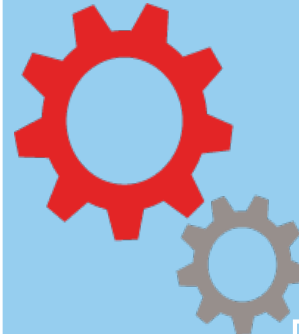
Project Toolkit

IIRA

Security Framework

Requirements for Standards

Topics and Themes

Business Model, Project Mgmt, Practices

Project Specifications & Reports

Architecture &Design

Testbeds & Projects

IIC
General IIoT Ecosystem

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Technology Working Group

Charter: To define and develop common architectures, by selecting from standards available to all, from open, neutral, international, consensus organizations and reviewing relevant technologies that comprise the ecosystems that will make the industrial internet work.

The Technology WG presently has 12 teams:

- Architecture Task Group
- Reference Architecture Editing Contributing Group
- Connectivity Task Group
- Distributed Data Interoperability & Management Task Group
- Industrial Analytics Task Group
- Edge Computing Task Group

- Innovation Task Group
- IT & OT Task Group
- Interoperability Task Group
- Safety Task Group
- Verticals Taxonomy
- Vocabulary Task Group

IIoT Technologies

IIRA

Released 2015-06

Security Framework

Requirements for Standards

Topics and Themes

Architecture Description for IIC
Built on Top of ISO/IEC/IEEE 42010:2011

Stakeholders

Biz decision makers
System Engineers
Product Managers

System Engineers
Product Managers
System Architects

Architects
Engineers
Developers
Integrators
Deployment
Operations

Why

Verb

What

Noun

How

biz values, objectives & capabilities
Business Viewpoint

Usage activities
Usage Viewpoint

Functional decomposition & structure
Interfaces & interactions
Functional Viewpoint

Activity &functional to technologies mapping
Implementation Viewpoint
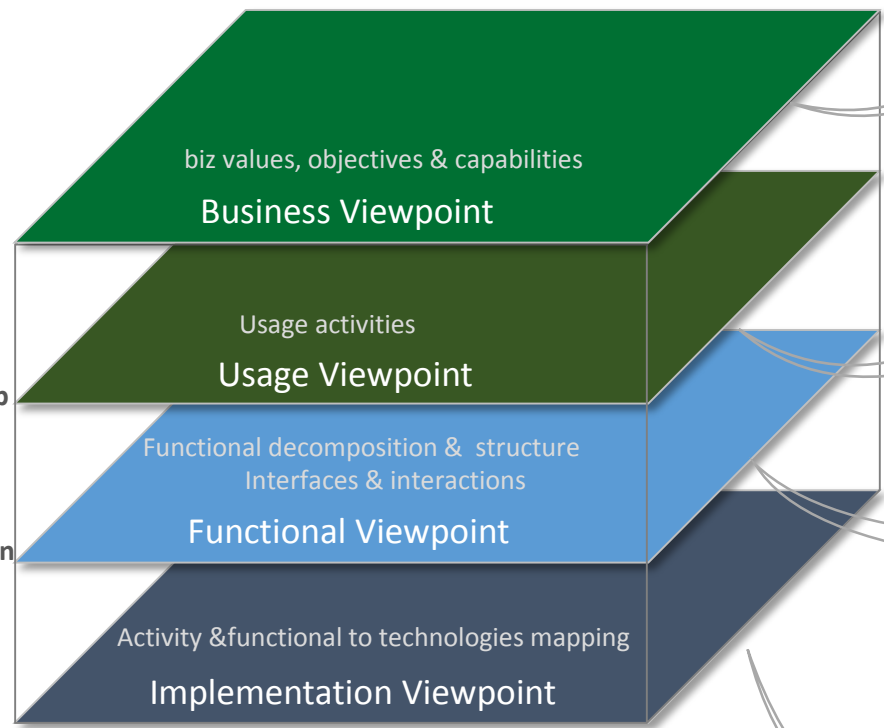
Biz View

Usage View

Functional View

Implementation View

Functional Viewpoint – System decomposition
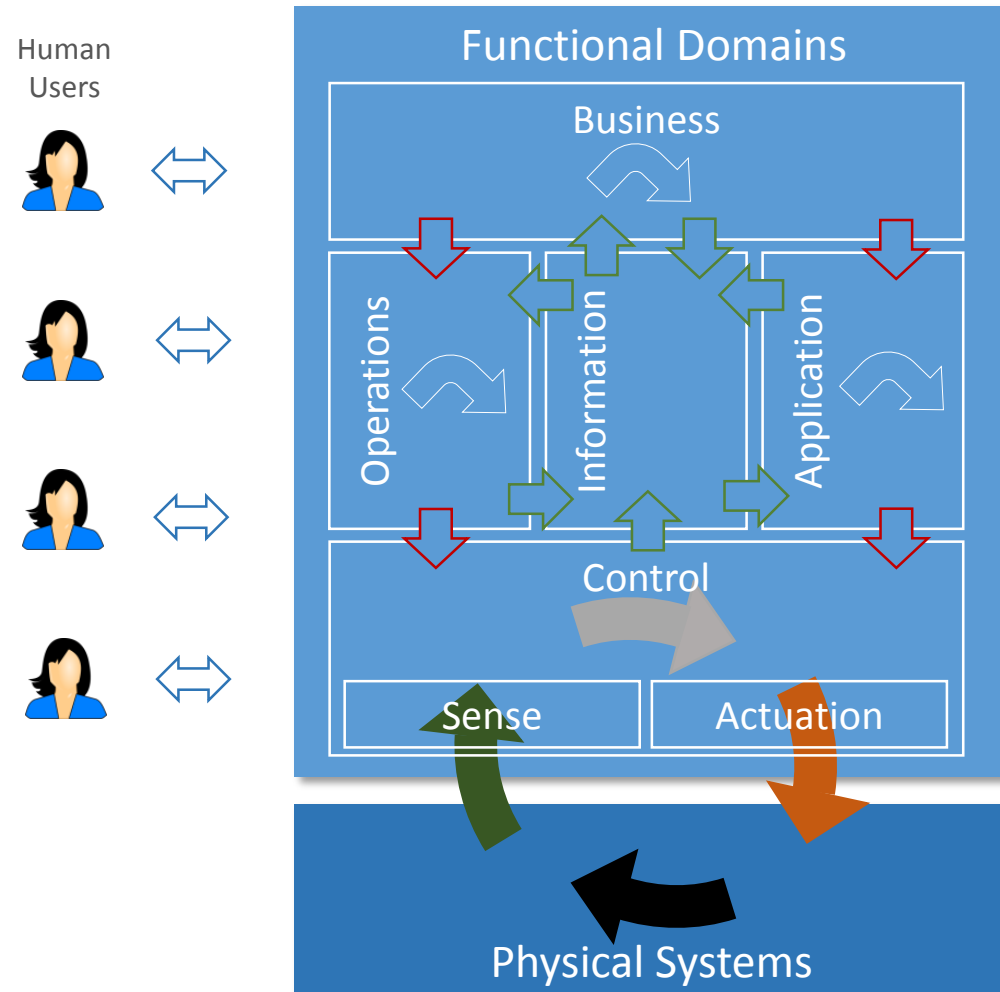
Green Arrows: Data/Information Flows; Grey/White Arrows: Decision Flows; Red Arrows: Command/Request Flows

IIoT Technologies

IIRA — Released 2015-06

Security Framework — Released 2016-09

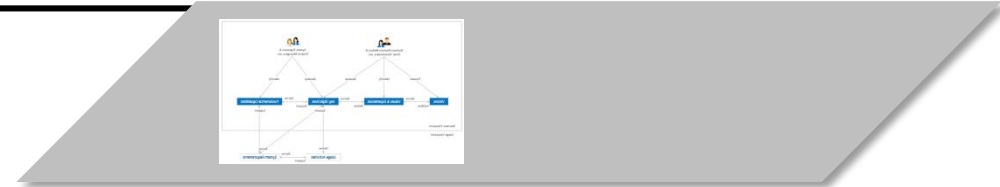Requirements for Standards

Topics and Themes
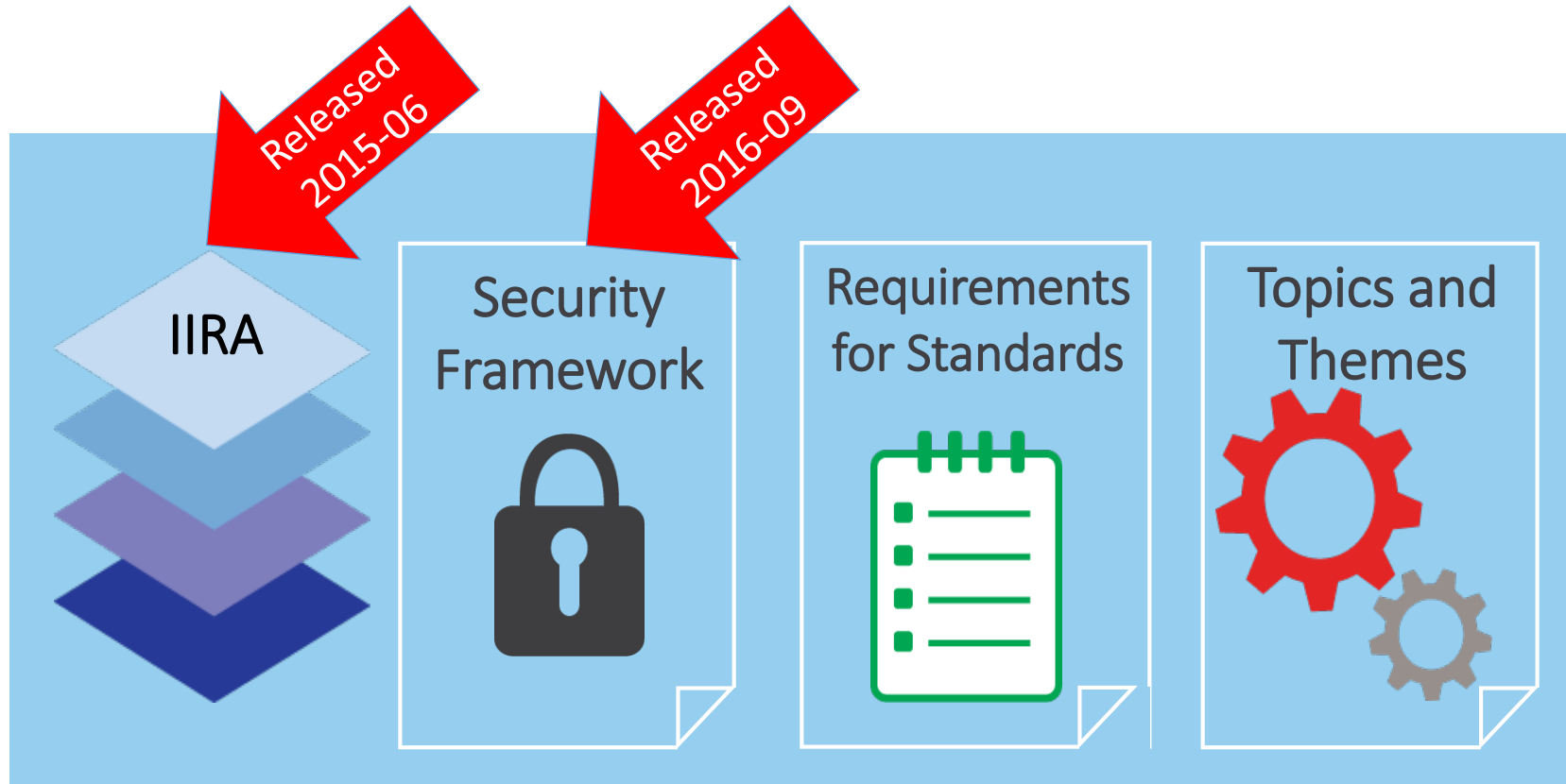
Security Working Group

Charter: To define a security and privacy framework to be applied to technology adopted by the IIC. The framework will establish best practices and be used to identify security gaps in existing technologies.

Current Priorities:

- Build End-to-End Security Use Cases
- Apply Security Use Cases to each of the Use Case Groups
- Derive requirements from each Use Case

Identify what is common (architectural)

Identify what is one-off (application-specific)

- Design Secure Integration Framework based on combined use cases (with Technology Team) - II Security Framework v1.0 Published September 2016
- Build testbeds - Testbed Evaluation Documentation

IIoT Security Application
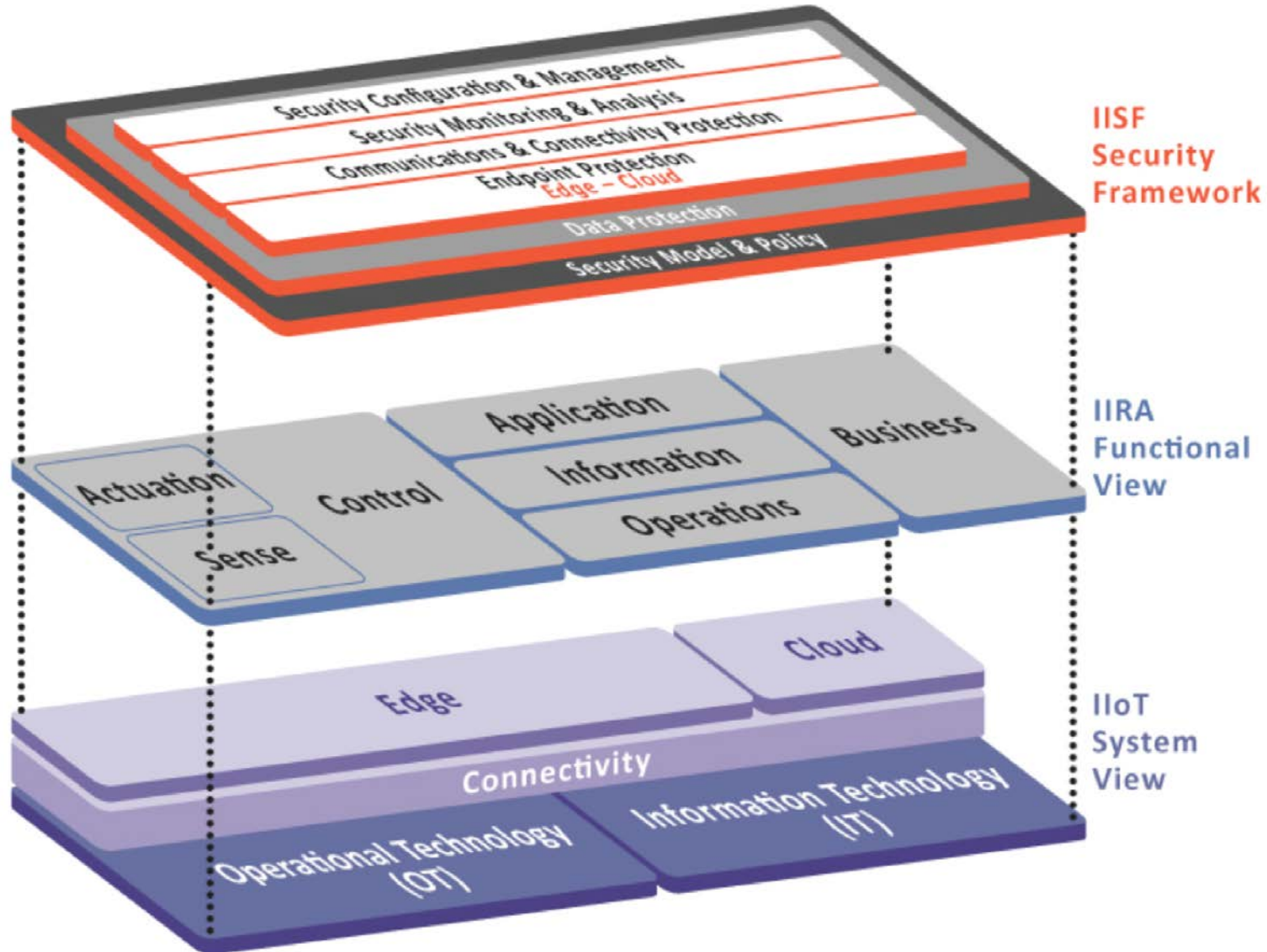
IIoT Security Building Blocks and Techniques
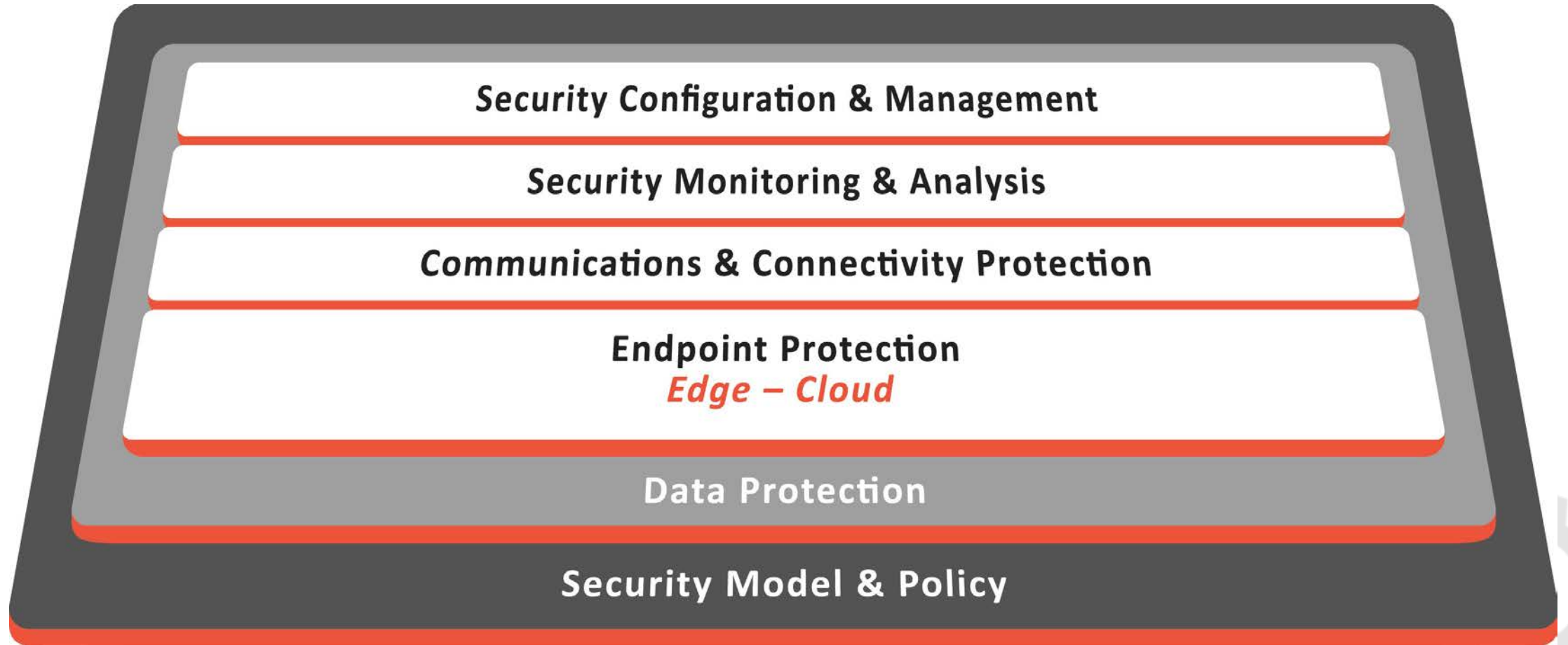
Business Strategy & Solution Lifecycle (BSSL) Working Group

Charter: To provide guidance and best practices for all aspects of developing and operating an Industrial Internet solution: business-case creation, architecture design, technology selection, implementation, testing, rollout and operations.

Goals:

- Help companies leverage the potential of the Industrial Internet

- Increase return on investment, manage project risks more efficiently, and establish a foundation for evaluating solutions and their compliance.

- Provide a foundation for defining Industrial Internet Systems certification and compliance programs, to be shared within and outside of the Industrial Internet Consortium.

- Business Strategy for Industrial Internet of Things Task Group

- Use Cases Task Group, Ecosystem Task Group

The IIoT Ecosystem: Criticality of Liaisons

IIC has more than 24 existing liaisons and currently has 36 more in flight!
**   That's impressive for an organization that had its 3rd birthday on March 27th, 2017!**
Below is a sample of the ecosystem that IIC is creating in the industry

Building Coalitions to Address the IoT Ecosystem

IIC Vision: The Industrial Internet Consortium (IIC) is the world's leading organization ***transforming business and society*** *by* ***accelerating*** *the Industrial Internet of Things (IIoT).*

IIC Mission: Our mission is to deliver a trustworthy Industrial Internet of Things (IIoT) in which ***the world's*** *systems and devices are securely connected and controlled to deliver* ***transformational outcomes****.*

LWG Mission: The IIC Liaison Working Group

- *Facilitates* ***external*** *interactions with the goal of* ***building relationships*** *for IIC*
- *Coordinates internal* ***stakeholder*** *requests and interest with external organizations*

Building Coalitions to Address the IoT Ecosystem

Liaison Working Group *Strategic* Objectives

- **Build** and coordinate **collaborative**, working relationships inclusive of **government** organizations, formal **standards** development organizations and **open source industry** organizations
- Working with peer working groups, identify gaps in the **portfolio** of IIC and create then leverage relationships for IIC
- Make **strategic recommendations** to IIC Steering Committee to grow ecosystem

Example areas of *collaboration*

- **Joint workshops** conducted with partners
  - E.g. IIC:IVI (Japan), IIC:CAICT (China) , IIC:I4.0 (Germany)
- **Technical workshops** e.g. recent technology and security workshop with NIST
- Liaison partnerships with organizations focusing on **verticals**
- Liaison partnerships with global **SDOs focused on IoT technologies**
  - E.g. ISO/IEC JTC 1/WG 10 (IoT), IEEE P2413 and 802.24 etc.
- Liaison partnerships with global **SDOs focused on related areas**
  - JTC 1/WG 9 (Big Data)

Building Coalitions to Address the IoT Ecosystem

Liaison Working Group Coordination Objectives
- Coordinate and work with internal stakeholder groups
- Coordinate with the IIC Marketing Working Group on press coverage related to liaison agreements
- Coordinate with the IIC Steering Committee Legal Sub-Committee and IIC council for review of agreements when needed

Liaison Working Group Operational Objectives
- Act as the central point within IIC for communicating with partner organizations
- Evaluate benefits to the IIC of a proposed liaison
- Identify internal stakeholder groups (e.g. IIC task groups and/or working groups) that would benefit for a proposed liaison
- Draft liaison agreements with candidate partner organizations. The Agreements developed by the Liaison Working Group may
  - Enable IIC and its liaison partner pursue related and mutually beneficial goals (e.g., exchange of information, definitions, testbeds, use cases, demonstration projects, technical specifications, standards and harmonize architectures)
  - List collaboration areas
  - Document the commitments from both organizations
- Make recommendations for approval to the IIC Steering Committee on proposed liaison agreements
- Direct both internal and external communications regarding the focus of the liaison

The IIC and standards organizations

The IIC is _**not**_ a standards organization.

The IIC will:

- establish a **reference architecture**

- **evaluate** existing standards against it

- **identify requirements**, and

- **propose** these requirements to standards organizations

Requirements are different for the Industrial Internet compared to consumer IoT.

Marketing Working Group

Charter: To establish the Industrial Internet Consortium as a community that champions innovation in connected intelligent machines and processes.

Current Priorities:

- Ensure that the strategy of the IIC is carried out
- Increase market awareness of the Industrial Internet and the IIC
- Create compelling new content around innovation that is happening/innovation to come
- Focus on thought leadership and vertical markets

The Industrial Internet in Action

Norfolk Southern Railroad

Challenge
- Increase capacity by increasing speed and efficiency

Solution
- **GE Transportation's** Movement Planner System, the railroad equivalent of an air-traffic control system

Results
- Enable more locomotives to run on the same railroad at faster speeds and with greater efficiency — without laying new track
- Increase velocity by approximately 10%
- Save millions of dollars: each mph faster, saves up to $200 million/year in capital and expenses
- Improve railroad crew management availability

www.iiconsortium.org/case-studies
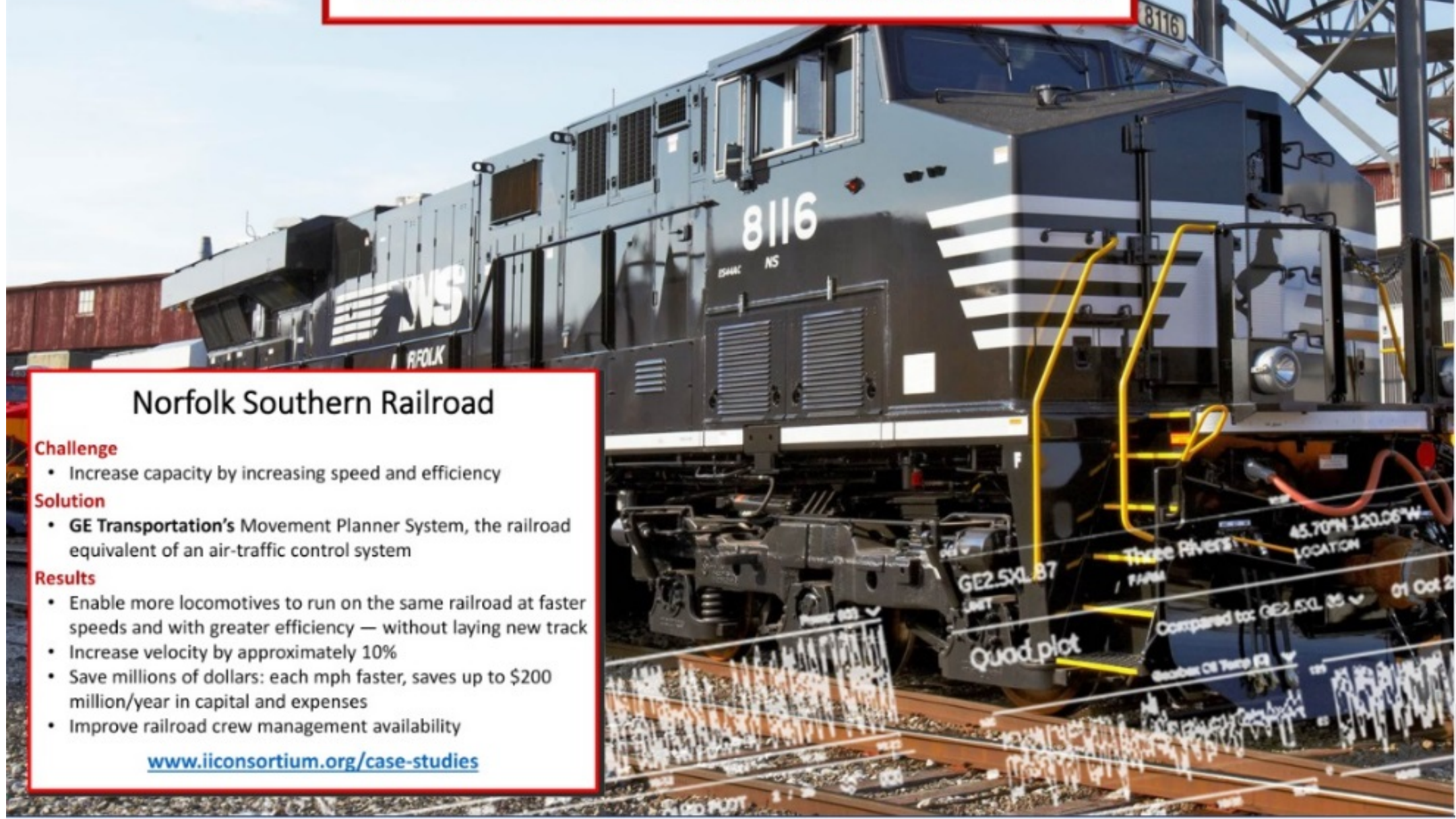
The Industrial Internet in Action

BK Medical

Challenge
- Scale large distributed ultrasound systems while maintaining or enhancing performance and reliability
- Provide greater integration into the patient care systems for improved decision making for medical staff
- Deliver architectural approach that meets both system and developer needs

Solution
- **RTI**'s Connext® DDS - foundation for the BK Medical Global Data Bus
- Data-centric design approach that includes management tools for performance, reliability and other system attributes
- Solution that ensures loose-coupling between system elements

Results
- Implement plug and play, and assess proprietary and commercial hardware architectures
- Provide real-time response and action in a distributed system
- Integrate real-time communications with IT infrastructure
- Add RTI Connext Secure easily to any legacy system

www.iiconsortium.org/case-studies

The Industrial Internet in Action

Marathon Petroleum Company

Challenge
- Reinforce safe work practices and support employee safety

Solution
- **Accenture** Life Safety Solution tracks employees' location in a plant, warns the individual and the plant operators of any potential nearby danger including abnormal gas levels. It can also detect employees' lack of motion ("man down") and trigger the appropriate safety protocol.
- Automatically record any safety incident to allow the plant to continuously improve their safety operational process, and in the case of evacuation, identify any missing individual in a timely manner.

Results
- 24/7 safety monitoring and timely responses to gas leaks
- Greater and more accurate safety incident reporting
- Improved compliance through personnel location monitoring

www.iiconsortium.org/case-studies

The Industrial Internet in Action

Secure Access to Robots

Challenge
- Eliminate VPN access to ensure more secure troubleshooting of factory automation equipment
- Maintain high standards of access control

Solution
- Joint **Bayshore Networks-Cisco** solution enabling secure "line of sight" access for remote users

Results
- Uninterrupted enforcement of secure IT/OT operations and safety policies
- Faster execution of diagnostics and maintenance, without travel
- Zero downtime and higher availability of production zone operations

www.iiconsortium.org/case-studies

The Industrial Internet in Action

Intermodal Container Tracking

Challenge
- Improve inventory management of intermodal containers moving around the globe
- Improve capacity planning

Solution
- **AT&T** GPS location monitoring tracks shipments as they move from major ports worldwide

Results
- Improved theft prevention
- Risk management and mitigation
- Efficient auditing

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The Industrial Internet in Action

Intel Manufacturing

Challenge
- Increase operational efficiency and reduce maintenance costs in an Intel factory
- Extract value from a wide variety of manufacturing data

Solution
- With industry collaboration from Cloudera, Dell, Mitsubishi Electric, and Revolution Analytics, **Intel** manufacturing developed and deployed an IoT and big data analytics solution

Results
- Save millions of dollars annually
- Improve yields by addressing manufacturing tool issues in advance
- Boost efficiency, including a one-tenth reduction in test times
- Reduce downtime by identifying worn tool parts prior to planned maintenance

www.iiconsortium.org/case-studies

Testbed Working Group

Charter: To accelerate the creation of testbeds for the Industrial Internet.

Testbed Lifecycle Phases

Task:	What? Why?	How? How Much?	Create	Experiment
Phase:	Concept	Feasibility	Development	Operation
Goal:	Approval	Planned/Resourced	Operational	Results
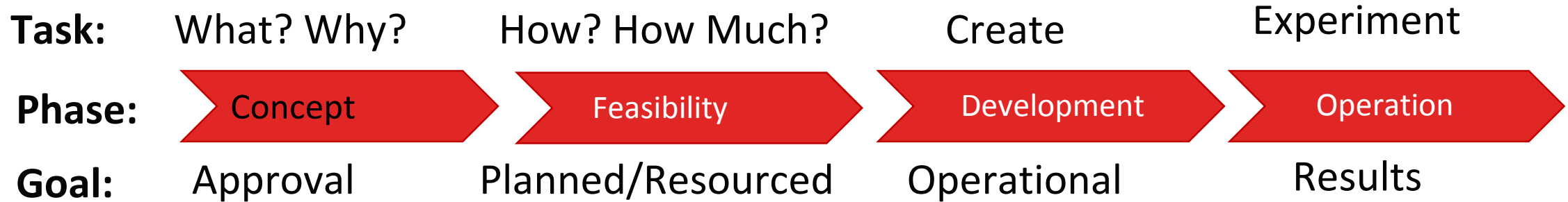
Current Priorities:

- Assist members in identifying, defining and gaining approval for their testbeds
- Identify and communicate funding resources for IIC testbeds
- Provide processes and infrastructure for efficient & effective operations

Current Publicly Announced Testbeds

Asset Efficiency Testbed

Condition Monitoring Testbed

Connected Care Testbed

Connected Vehicle UTM Testbed

Edge Intelligence Testbed

FA PaaS Testbed

FOVI Testbed

High-Speed Network Testbed

Industrial Digital Thread Testbed

INFINITE Testbed

Intelligent Urban Water Supply

Microgrid Testbed

Precision Crop Management Testbed

Security Claims Evaluation Testbed

Smart Airline Baggage Management

Smart Energy Management Testbed

Smart Factory Web Testbed

Smart Manufacturing Connectivity

Smart Water Management Testbed

Time-Sensitive Networks Testbed

Track and Trace Testbed

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What is an IIC Testbed?

CONTROLLED EXPERIMENTATION PLATFORM

~conforming to an <u>IIC technical references</u>, where solutions can be deployed and tested in environments resembling <u>real-world</u> conditions

Explore untested technologies or existing technologies working together in an untested manner

Create innovative new products, services, and business practices

Generate requirements and priorities for standards organizations

Business Model, Project Mgmt, Practices

Project Specifications & Reports

Architecture &Design
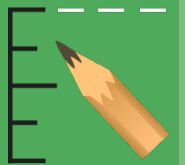
Testbeds & Projects

Testbed Results

Innovation
- What innovations have been realized? Any industry impact?
- What best practices have been learned

Standards
- What noteworthy standards does the testbed employ? Their purpose?
- What noteworthy standards is the testbed influencing? Which SDOs?
- What gaps have been identified that should become a future standard?

Technical References
- What changes would you like to see in IIC Technical References?
- What influence has the testbed had on IIC Technical References?

Agenda

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Organization, Working Groups and Deliverables

Testbed Overview

Concluding Remarks

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Sample Approved IIC Testbeds
Further Details

July 2017

Track & Trace

Collaborators:

- Bosch, Cisco, SAP SE, Tech Mahindra

Market Segment

- Industrial Manufacturing
- Use Case 1: Power Tool Fleet Management
- Use Case 2: Forklift Tracking

Goal

Ensure proper usage and minimize failures of handheld power tools and forklifts improving the overall manufacturing process by accurately tracking and tracing these assets, collecting usage and status data in industrial factory, maintenance, and logistics environments

Features & Commercial Benefits

- Asset Management, Work Management
- Integration with Factory Manufacturing Systems
- Improved Safety and Operational Performance
- Monitor/Control Quality

Communication and Control for Microgrid Applications

Collaborators:

- Leads: Cisco, RTI, National Instruments
- With: CPS Energy (San Antonio), Duke Energy, SEPA

Market Segment:

- Energy Industry

Goals:

- Prove the viability of a real-time, secure databus and distributed control architecture in managing a real-world smart "microgrid" power system.

- Efficiently utilize distributed, dynamic generation capabilities such as those provided by local solar panels and wind turbines.

Features & Commercial Benefits:

- Enable efficient integration of solar and wind into the grid
- Create a dynamic, open marketplace for smart grid vendors
- Prove the viability of a real-time, secure databus distributed-control architecture in real-world grids

Solar Wind

Field Network

Local load control

Neighborhood MicroGrid
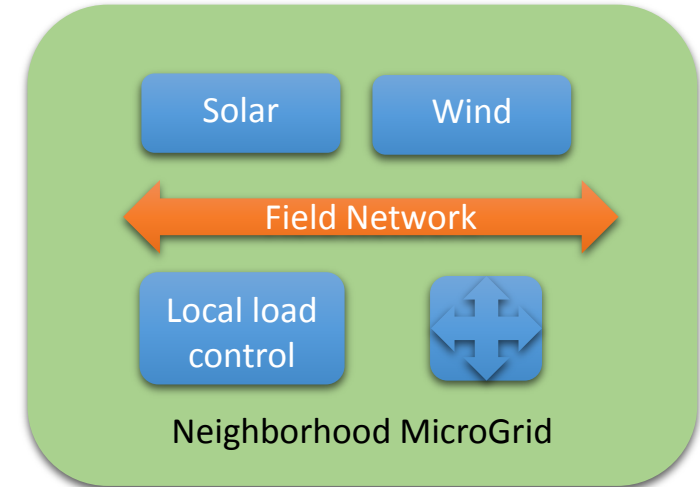
Time Sensitive Networking Testbed

Testbed Showcase Winner — Q1 2017 — Industrial Internet Consortium

Collaborators:

- Members: Analog Devices, Belden/Hirschmann, Bosch Rexroth, B&R Industrial Automation, Cisco, Intel, Hilscher, Kalycito, KUKA, National Instruments, Renesas Electronics, Schneider Electric, SICK AG, TTTech, Xilinx
- With: Avnu, Calnex, ISW, Ixia, OPC Foundation, Phoenix Contact

Market Segment:

- Manufacturing – with a vision to be useful in a wide range of applications, including Utilities, Transportation and Oil and Gas.

Goals:

- To support real-time control and synchronization of high performance machines over a single, standard Ethernet network, supporting multi-vendor interoperability and integration.

Features & Commercial Benefits:

- TSN will open up critical control applications such as robot control, drive control and vision systems to the Industrial Internet.
- This connectivity then enables customers, suppliers and vendors to more readily access data from these systems and to apply preventative maintenance and optimization routines to these systems.

Smart Factory Web Testbed

www.smartfactoryweb.com

Collaborators:

- Fraunhofer IOSB, Korea Electronics Technology Institute (KETI)

Market Segment:

- Manufacturing: industrial automation

Goals:

- Form a network of smart factories with flexible adaptation of production capabilities and sharing of resources and assets to improve order fulfillment.

- Factory-to-factory interoperability and Plug & Work of machines with the industrial standards OPC UA and AutomationML

Commercial Benefits:

- Create and validate new business models with flexible assignment of production resources across factory locations.

- Create new opportunities for SMEs, allowing them to respond flexibly to manufacturing orders.

- Faster engineering and ramp-up time of modules, machines and IT systems

Smart Manufacturing Connectivity for Brownfield Sensors Testbed

Collaborators:

- Members: TE Connectivity, SAP SE

- With: ifm, OPC Foundation

Market Segment:

- Discrete Manufacturing

Goals:

- Make available all cyclic (process and status) data and acyclic data (e.g. events and device data) delivered by smart IO-Link sensors at the platform tier

- Provide a retrofit-able factory floor hardware to facilitate the easy physical integration in brown-field installations with low effort and low cost (re-use of existing cabling, no PLC re-programming)

- Define a consistent conversion from the IO-Link device description (IODD) to OPC UA and thus, providing a common semantics to allow for the quick integration with IT systems

Commercial Benefits:

- Retrofit-able hardware solution reduces the costs of the physical installation

- Definition and implementation of common device model enables the easy integration with IT systems

- Input to the development of an IO-Link/OPC UA Companion Standard drives the adoption of IO-Link gateways equipped with OT/IT communication capabilities

- Easy access to a high volume of sensor data enables the improvement of current analytics and the development of innovative applications.

Interconnecting Regional Efforts

- Collaboration announced in February with German Plattform Industrie 4.0
  - First three meetings (November 2015, May 2016, September 2016) are producing proposals for consideration by both Steering Committees
  - Real collaboration happening in architecture & testbeds especially
- Collaboration announced in April with Japanese Industrial Valuechain Initiative
- Collaboration announced in September with Japanese IoT Acceleration Consortium
- The Consortium is also developing ties with other regional efforts
  - France: Alliance Industrie du Futur
  - China: Internet+ and China 2025
  - United States: Cyber-Physical Systems
  - Japan: Robot Revolution Initiative
  - Chile: Industrial Internet Centers of Excellence
  - Russia: National Association of Industrial Internet

Collaborating on Platform Interoperability
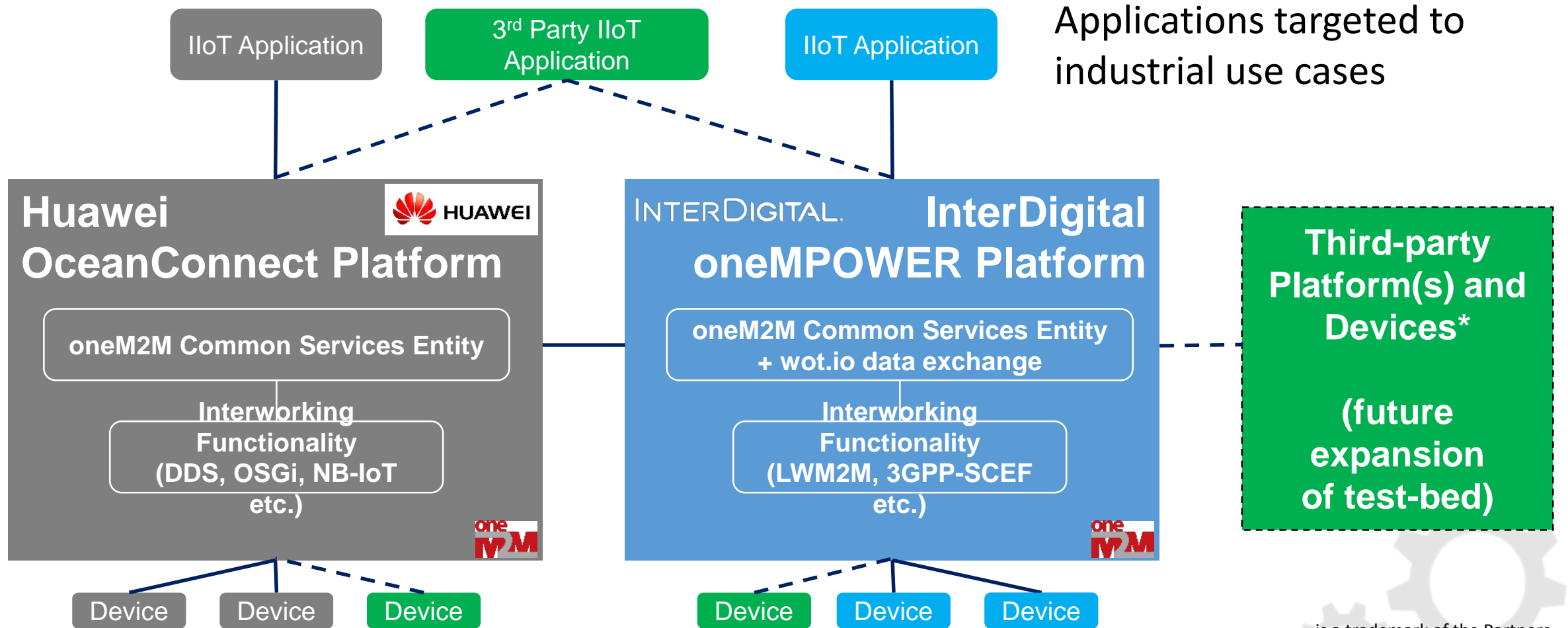
Project Context

Within the IIC's Testbed WG, demonstrate cross-vendor interoperability between Huawei OceanConnect and InterDigital oneMPOWER IoT platforms that are based on oneM2M standard.

- platform-to-platform,
- device-to-application, across application silos etc.
- extend to third-party components and modules

Collaborating on Platform Interoperability

IIoT Application

3rd Party IIoT Application

IIoT Application

Applications targeted to industrial use cases

Huawei OceanConnect Platform

HUAWEI

oneM2M Common Services Entity

Interworking Functionality (DDS, OSGi, NB-IoT etc.)

InterDigital oneMPOWER Platform

INTERDIGITAL.

oneM2M Common Services Entity + wot.io data exchange

Interworking Functionality (LWM2M, 3GPP-SCEF etc.)

Third-party Platform(s) and Devices*

(future expansion of test-bed)

Device   Device   Device

Device   Device   Device

is a trademark of the Partners Type 1 of oneM2M.

Discussions are underway with third-parties providing IIoT platform services and standalone actuators/devices/sensors

Agenda

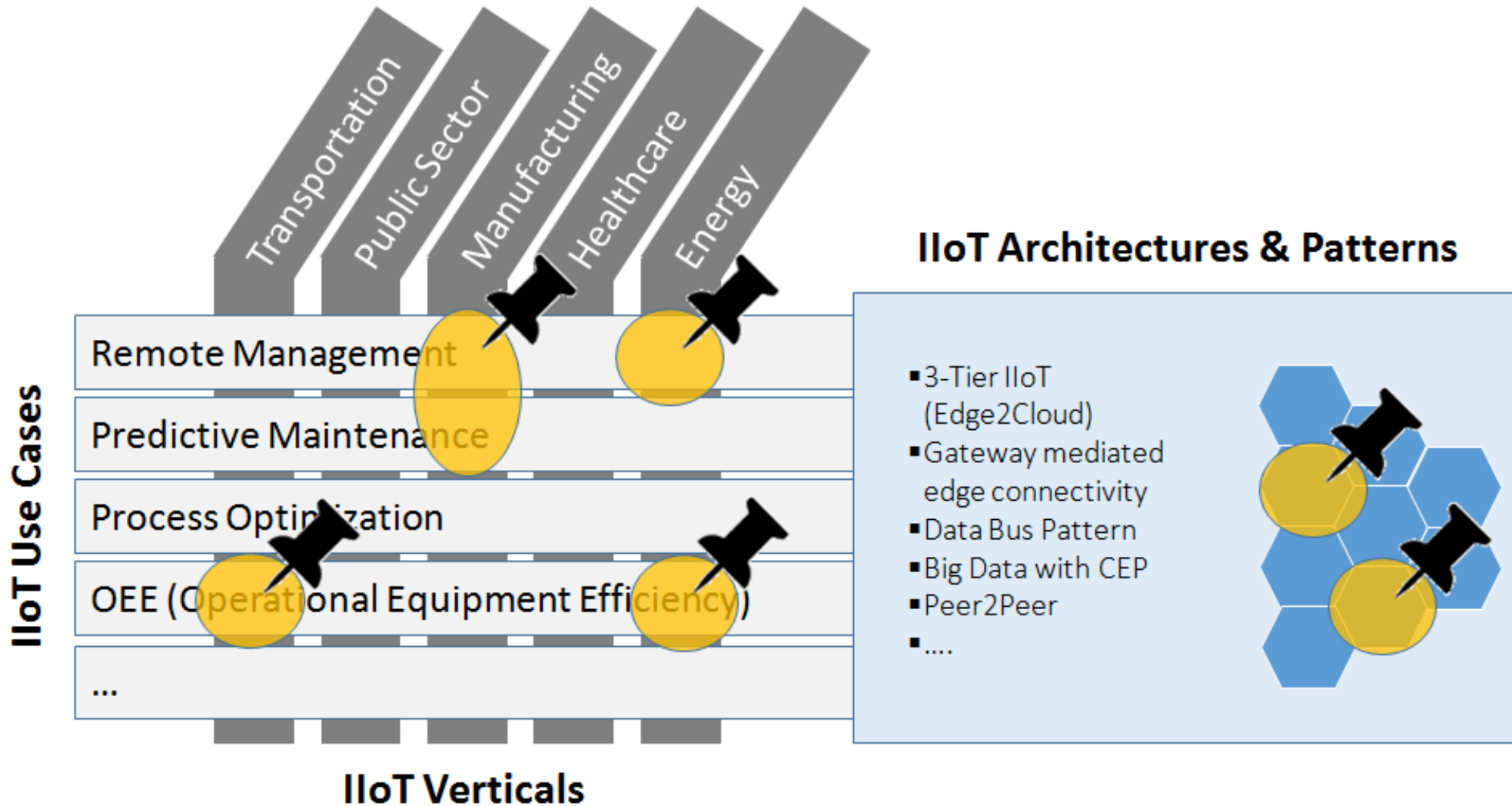Overview and Motivation

Organization, Working Groups and Deliverables

Testbed Overview

Concluding Remarks

Industrial Internet Interoperability Coalition (I3C)

IIoT Verticals: Transportation, Public Sector, Manufacturing, Healthcare, Energy

IIoT Use Cases:
- Remote Management
- Predictive Maintenance
- Process Optimization
- OEE (Operational Equipment Efficiency)
- ...

IIoT Architectures & Patterns

- 3-Tier IIoT (Edge2Cloud)
- Gateway mediated edge connectivity
- Data Bus Pattern
- Big Data with CEP
- Peer2Peer
- ....

The Future

How will we reduce jet engine failure & maintenance costs?

How will we reduce waste of natural resources?

How will we save lives through better patient care?

Things are coming together.

How will we reduce passenger fatalities?

How will we minimize unplanned factory downtime?

Why Participate in the Industrial Internet Consortium?

- Collaborate and network with like-minded leaders of the Industrial Internet: Small and large technology innovators, vertical market leaders, researchers, universities, and governments

- Drive innovation and grow your business by creating new industry use cases and testbeds for real-world applications

- Join with industry innovators in setting the technology and security direction and requirements for the Industrial Internet
    - Define and develop the reference architecture, frameworks, and security necessary for interoperability
    - Influence the global development standards process for internet and industrial systems

- Participate in the sharing and exchange of real-world ideas, practices, lessons, and insights

Summary: The Industrial Internet Consortium Today

- More than **260 organizations** from more than 30 countries and growing
- **26 running testbeds** all over the world
  - More than 20 coming through the approval process and in design
  - Expanding into **new verticals** (agriculture, security, etc.)
- **Reference Architecture** second version published in January
- **Security Framework** published in September
- **Business Strategy & Solutions Lifecycle** a year+ old
- **Connectivity Framework** published in February
- Strategy for influencing standardization on track
- Much more breadth in Steering Committee

Community. Collaboration. Convergence.

Things are coming together.

www.iiconsortium.org

July 2017