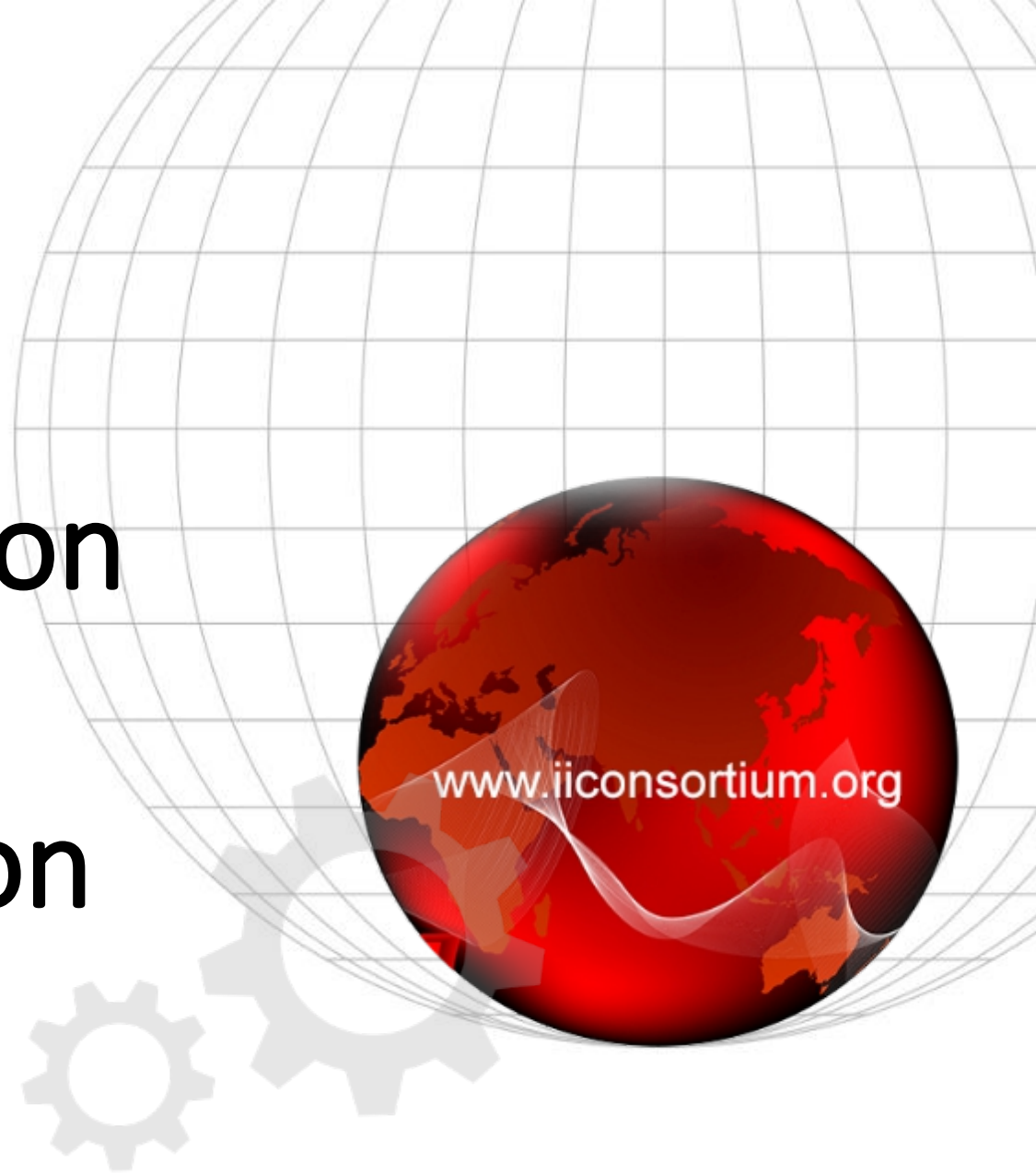




The Industrial Revolution Meets The Internet Revolution

17 April 2015





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

-Bill Gates, 1999

Or has it?





Where We've Been

	15 Years ago	Today
Listening to music		
Watching a movie		
Contacting people		
Reading the news		
Making music		

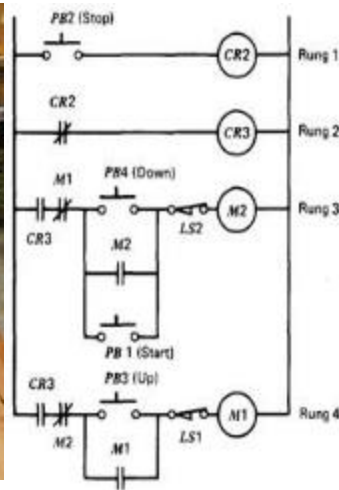




Discrete Manufacturing

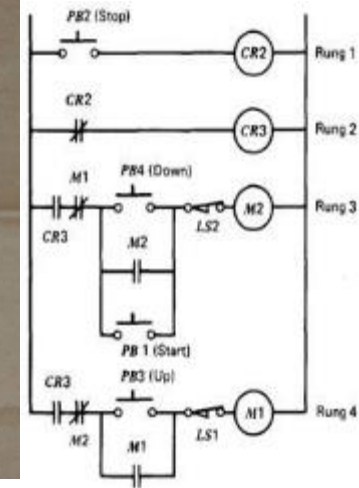
1980

Programming a 584
Programmable Controller



2015

Programming a 984
Programmable Controller

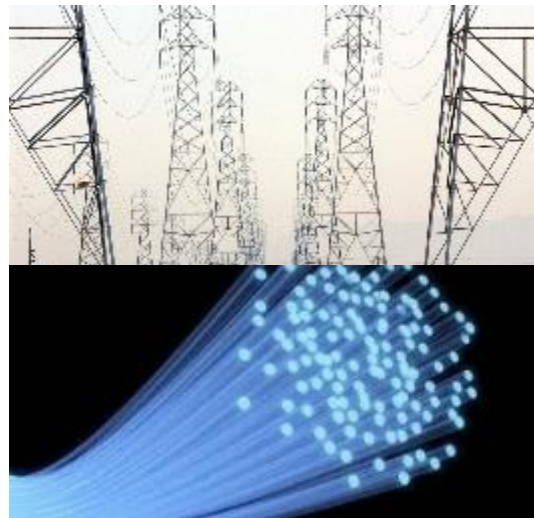




Energy Management

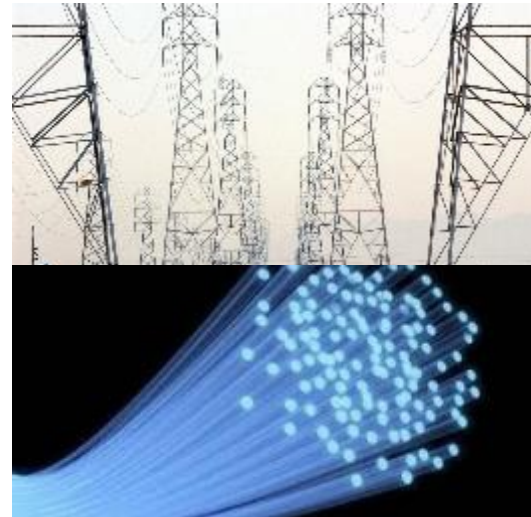
1950

Energy grids delivered power (not information) from small number of plants to millions of businesses & homes



2015

Energy grids deliver power (and a little information) from small number of plants to millions of businesses & homes

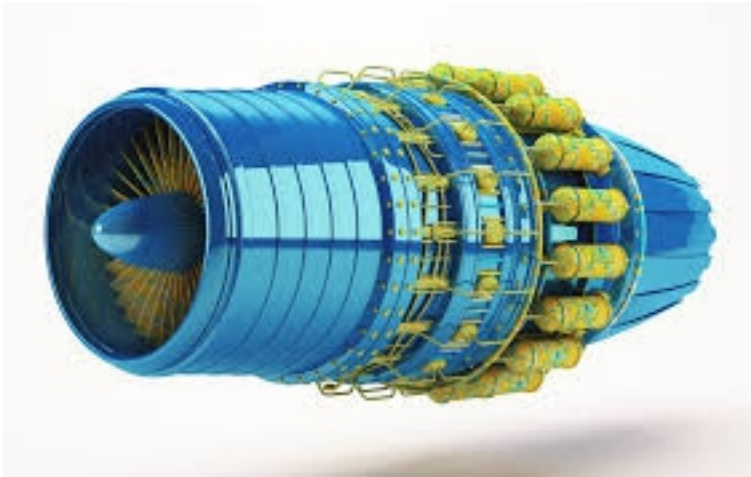




Aviation

1960

Jet performance data is downloaded
by hand



2015

Jet performance data is downloaded
by hand





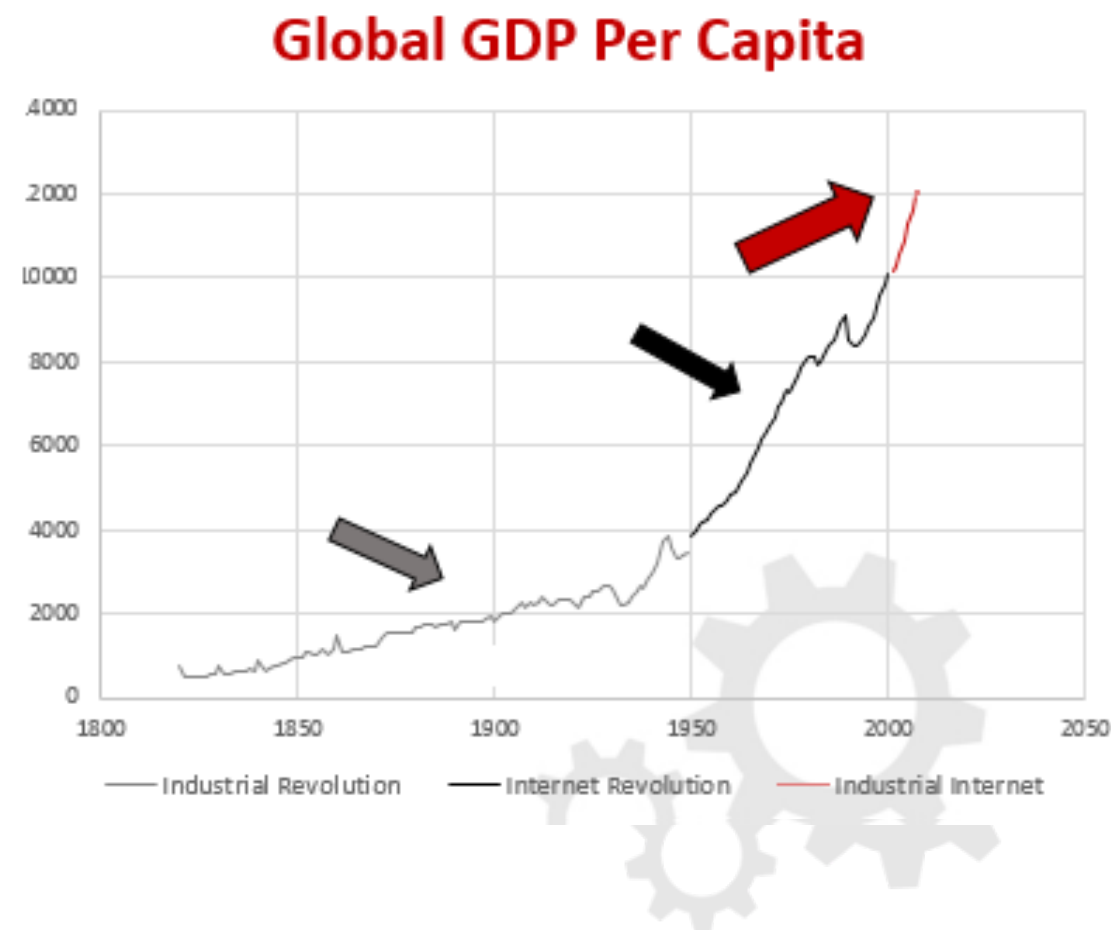
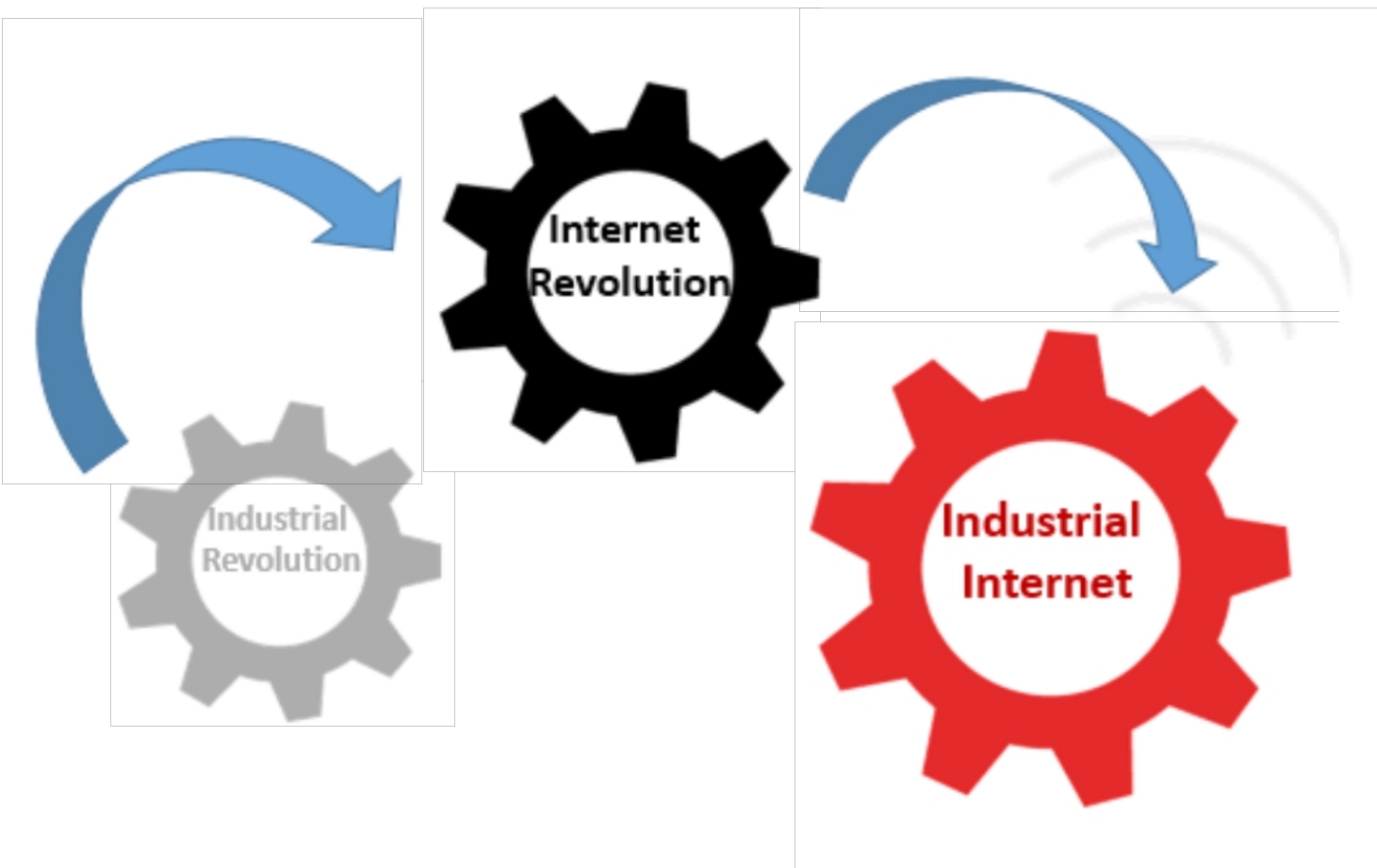
No, the Internet Didn't Change Everything

There is much more to be done:

- Oil & Gas Exploration
 - Geological data integration from multiple sensing sources
- Rail & other transportation
 - Failure sensing and automatic rerouting of multimodal systems, far more extensive than JapanRail automatic stop
- Smart homes & smart energy usage
- And on... and on... and on...
- *“Internet Thinking” is key to Smart Manufacturing, Smart Connected Products, and Smart Product Data*

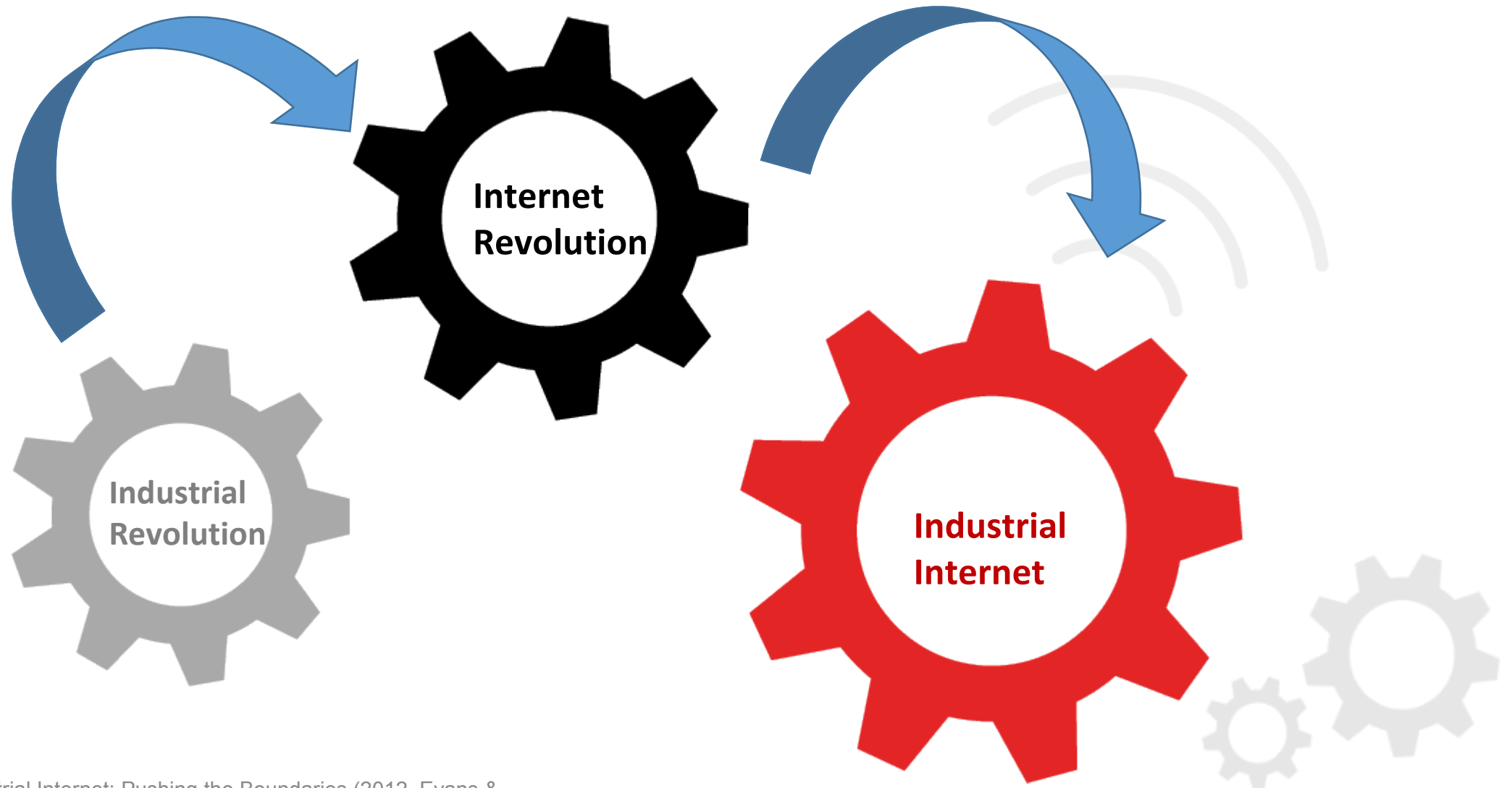


The Industrial Internet is leading the next economic revolution



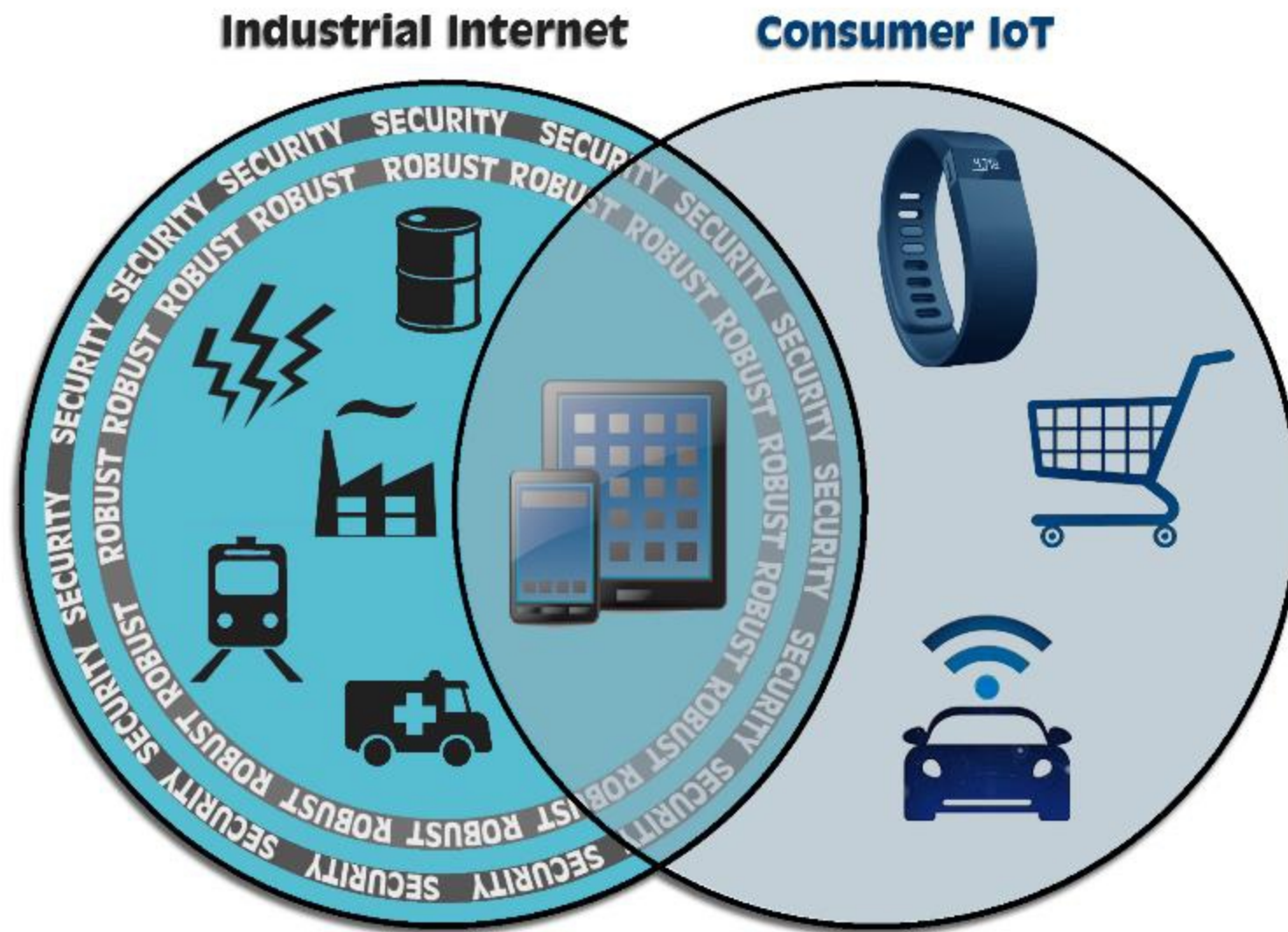


Disruptive Technologies lead to Transformational Change





There are key differences between the Industrial Internet and Consumer IoT





The Measurable Outcome will be in the Trillions of Dollars

GE: **\$32.3 trillion opportunity** representing 46% share of GDP today.

Cisco: Internet of Things (IoT) will **increase private sector profits 21%** and add \$19 trillion to the global economy by 2020

Gartner: IoT product and service suppliers will generate **incremental revenue exceeding \$300 billion** in 2020.

McKinsey Global Institute: **\$36 trillion operating costs** of key affected industries could be impacted by IoT

The convergence of *Internet of Things, Industrie 4.0, Cyber-Physical Systems* presents an enormous opportunity.





Making Sense of the Numbers

Revenue Generation

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

New Operational Efficiencies that 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

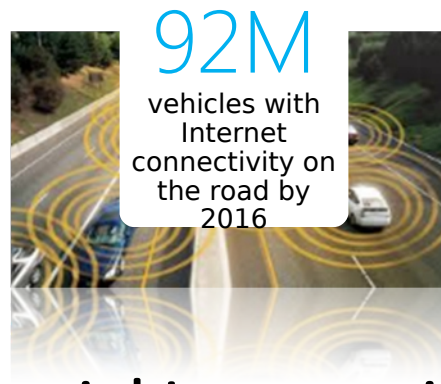
Improved Customer Satisfaction

- Improved service levels → fewer unplanned disruptions





Opportunities across every industry: GE's 15-year outlook



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

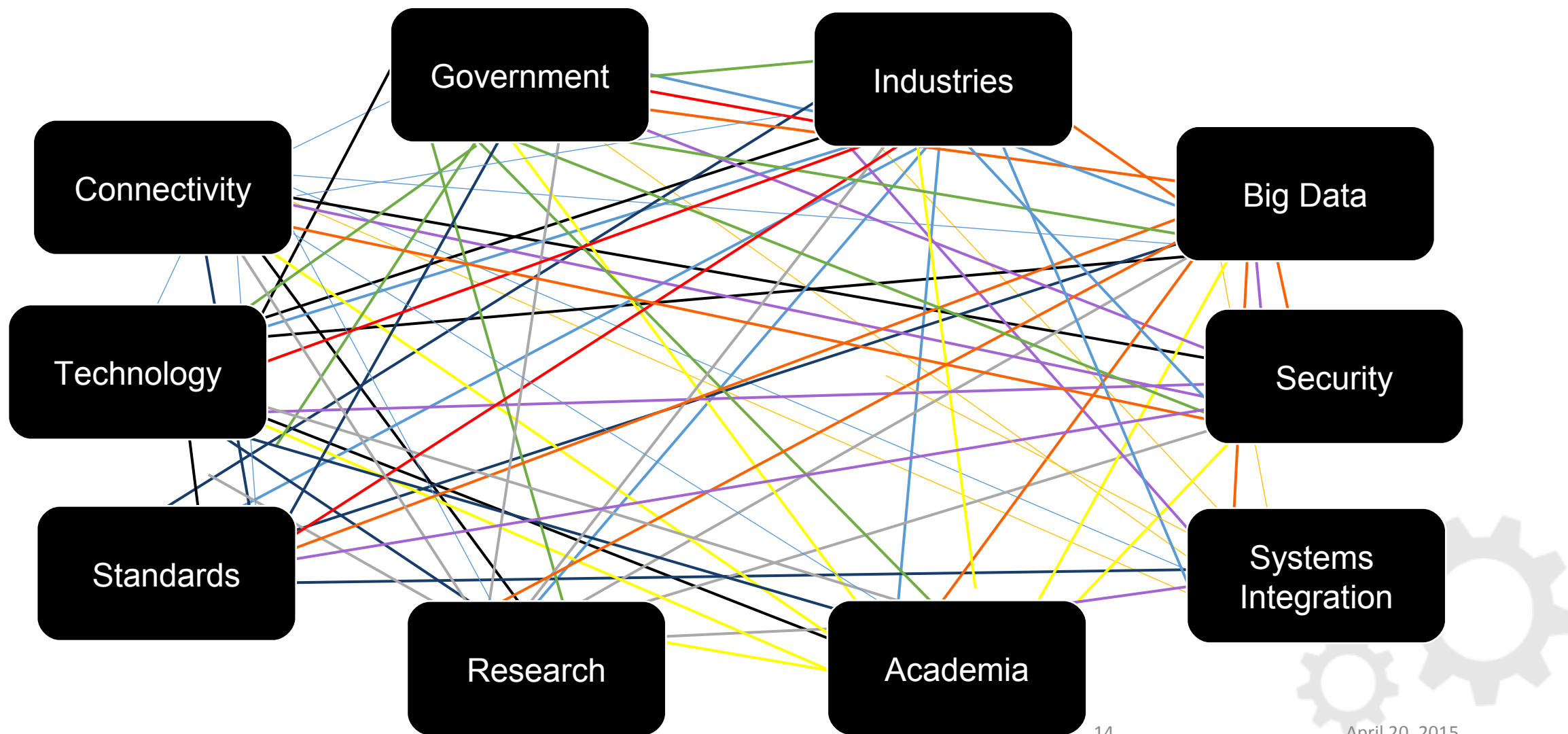


Source: Industrial Internet: Pushing the Boundaries (2012, Evans & Annuziata)

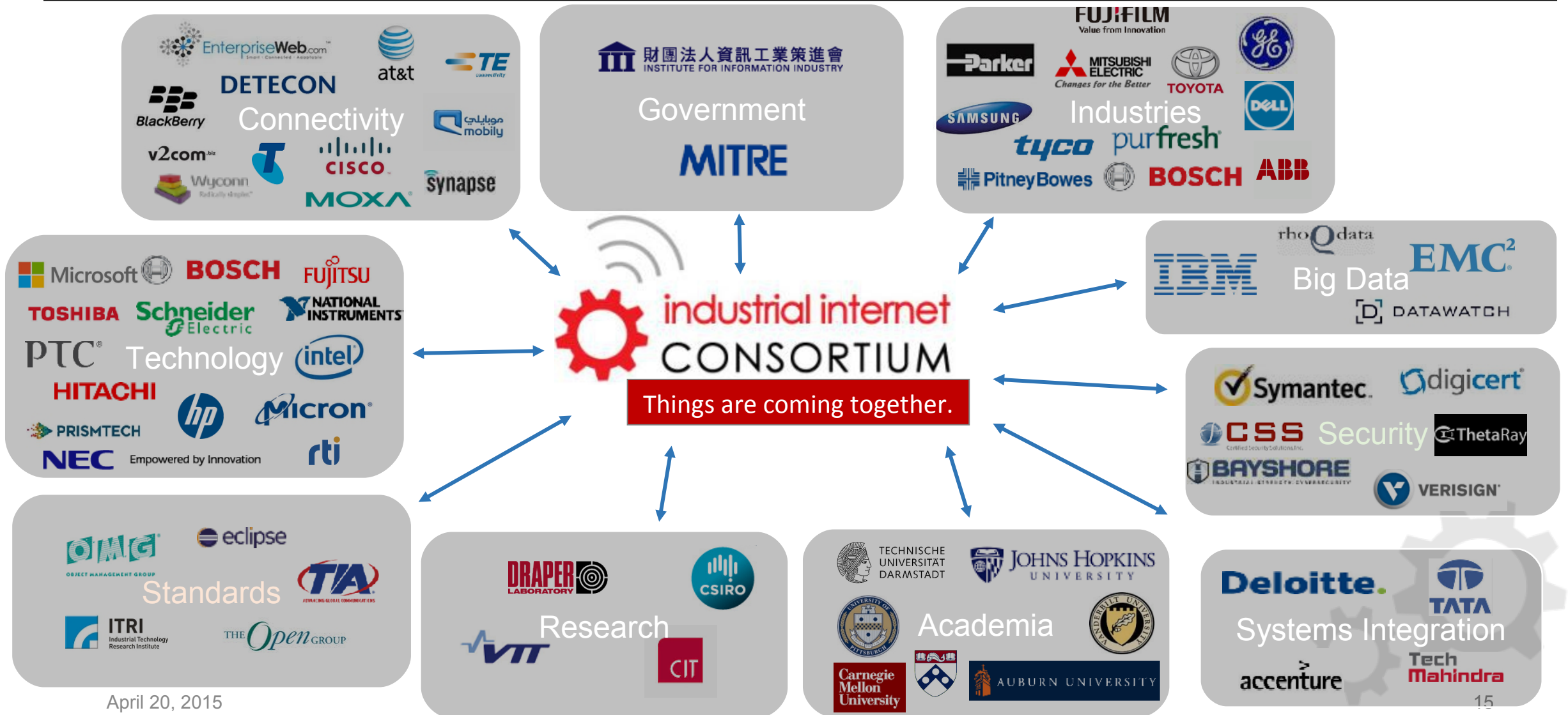




Yet there are current roadblocks to widespread adoption



The IIC: Things are coming together



Mission

To **accelerate growth** of the Industrial Internet by **coordinating ecosystem** initiatives to connect and integrate objects with **people, processes and data** using common architectures, interoperability and open standards that lead to **transformational business outcomes**.

Launched in March 2014 by five founding members:



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



IIC Founders/Large Industry Members





IIC Small Industry Members

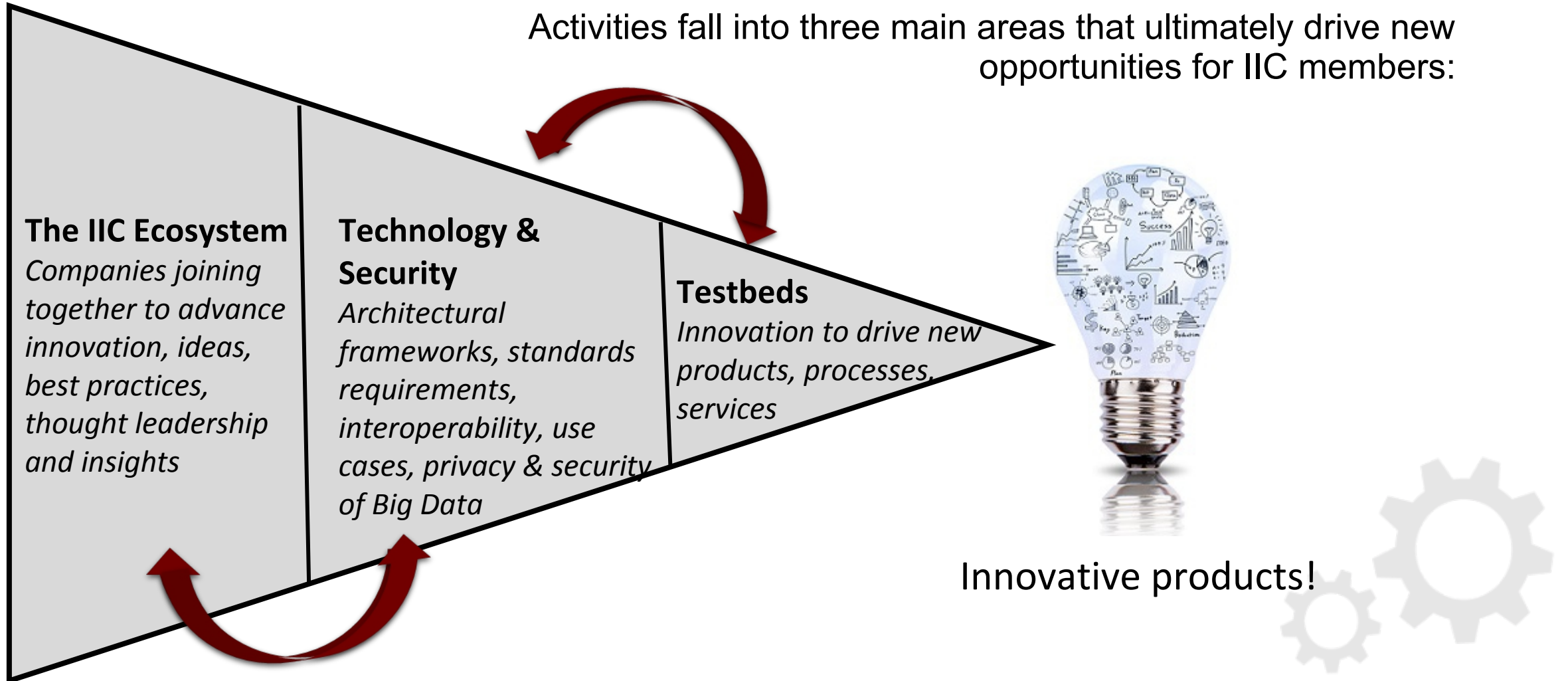


IIC Nonprofit/Academic Members





IIC Core Focus Areas



IIC Track & Trace Testbed



BOSCH

**Tech
Mahindra**


CISCO™



Source: Bosch

IIC Testbed: Track & Trace

Industrial Internet Consortium Member participants:

- Bosch, TechMahindra, Cisco, National Instruments

Market Segment

- Industrial Manufacturing
- Power Tool Fleet Management

Goal

- Manage smart, hand-held tools in manufacturing, maintenance and industrial environments

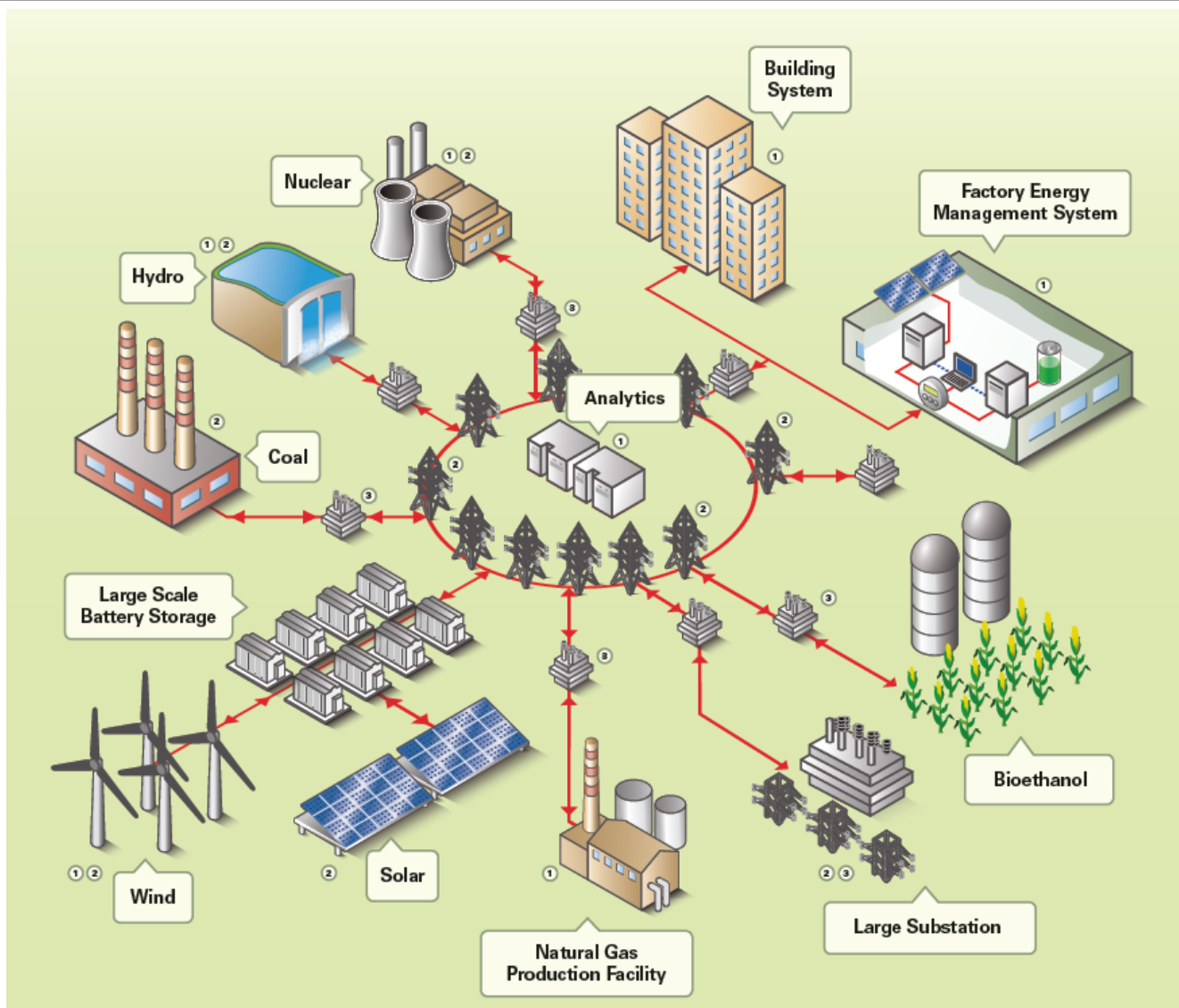
Features & Commercial Benefits

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





IIC Testbed: Communication and Control





IIC Testbed: Communication and Control for Microgrid Applications

Goals

- Enable efficient integration of solar, wind, & EVs
- Create a dynamic, open marketplace for smartgrid vendors
- Prove the viability of a real-time, secure DataBus distributed-control architecture in real-world grids

Collaborators

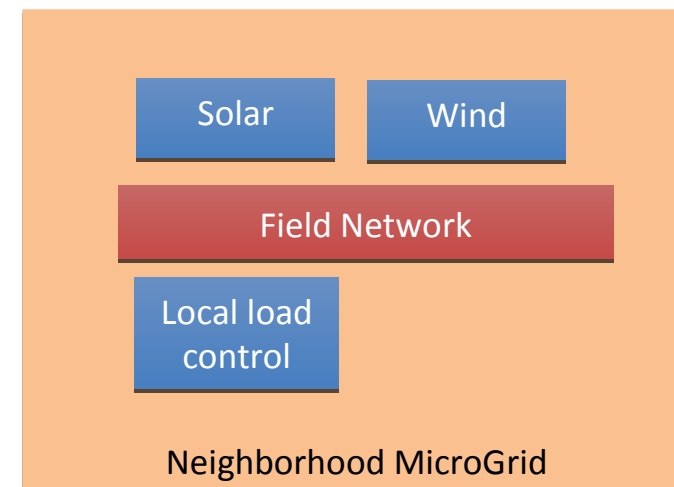
- Leads: RTI, National Instruments, Cisco
- With: CPS Energy (San Antonio), Southern Cal Edison, Duke Energy, SGIP

Leads

- RTI: DDS middleware and system integration
- NI: Engineering software and cost-effective hardware
- Cisco: Grid communications

Phases

1. Proof of Concept at National Instruments
2. Realistic simulation at Southern Cal Edison
3. Live test at CPS Energy San Antonio Grid of the Future



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 sensor & software



¹Source: Cisco Systems
20 de abril de 2015



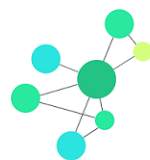


What about Standards? And Open Source?

Already plenty of standards at the communications level (e.g., OMG DDS)

Semantic standards are going to be critical in all verticals

IIC is a *source* for standards requirements & priorities



OPEN
INTERCONNECT
CONSORTIUMSM



THE *Open* GROUP



The Future

How will we reduce jet engine failure & maintenance costs?



How will we minimize unplanned factory downtime?

How will we save lives through better patient care?



How will we reduce passenger fatalities?



How will we reduce waste of natural resources?



Things are coming together.





Community. Collaboration. Convergence.

Things are coming together.

www.iiconsortium.org





For More Information

Dr. Richard Mark Soley
Executive Director
Industrial Internet Consortium
tel: +1-781-444 0404
fax: +1-781-444 0320
email: soley@omg.org
<http://www.iiconsortium.org>

