ee392b
Industrial IoT: Applications
Overview

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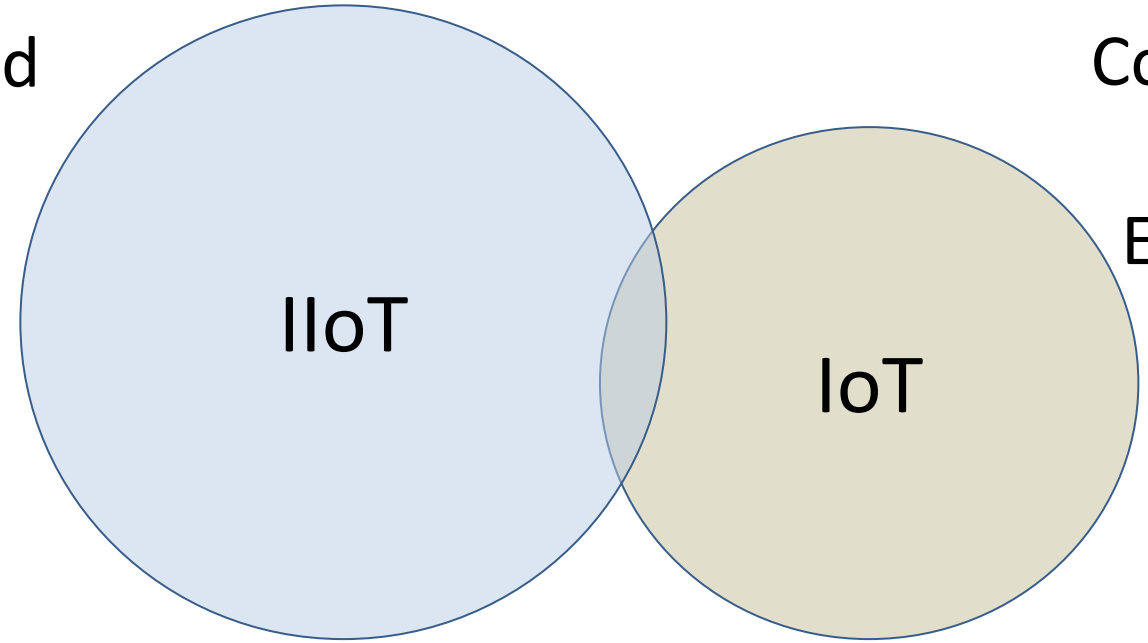
IIoT Class Overview

WHAT IS INDUSTRIAL IOT?

IIoT and IoT

IIoT ≠ IoT

Connected
Industrial
High-cost
Assets



Connected
Low-cost
End-point
Devices

Enterprise IoT (EIoT)

Consumer IoT (CIoT)

IIoT Analytics

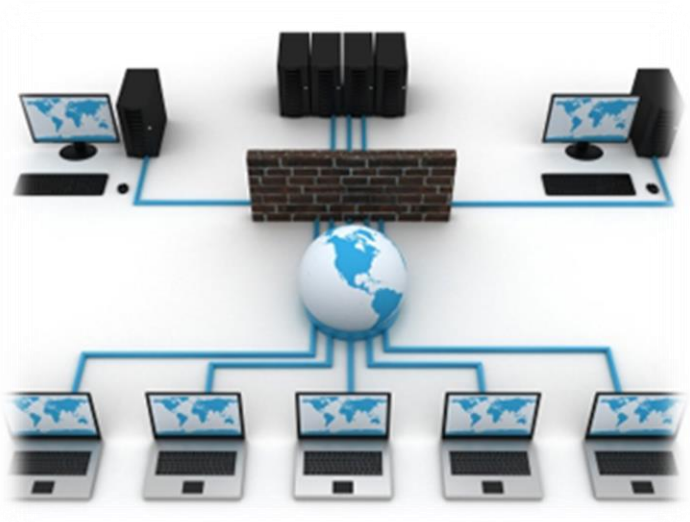
INDUSTRIAL REVOLUTION

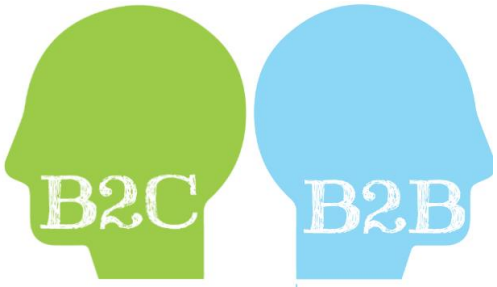
Digital Revolution

- Software is eating the world

  (Marc Andreessen, 2011)

- Internet Revolution





New Industrial Revolution

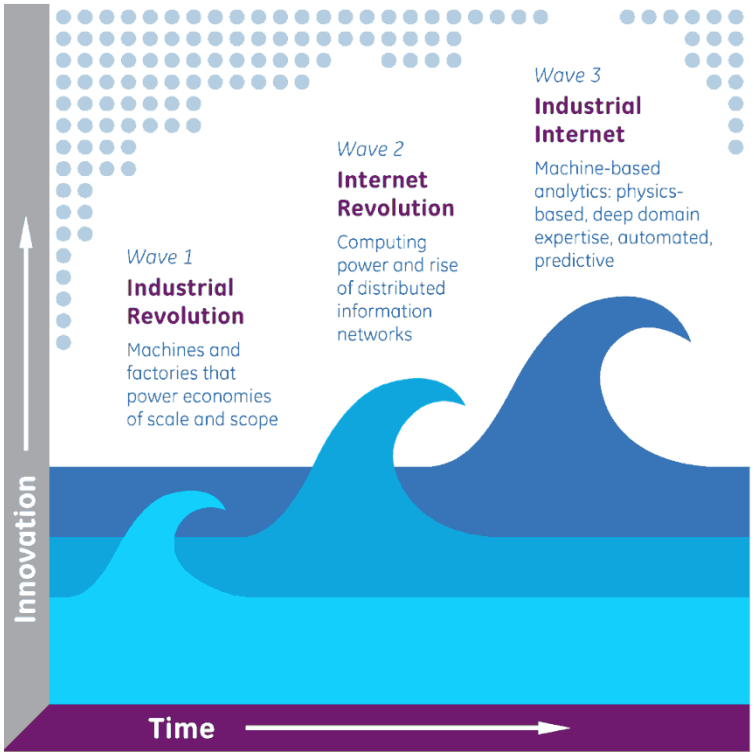
- Digital revolution: connected people
  - 10-15% of the economy
- Industrial IoT revolution: connected machines
  - 80% of the economy

M2M

Industrial Revolutions

1. The 1st Industrial Revolution
   - Mechanized production; water and steam power
2. The 2nd Industrial Revolution
   - Mass production; electric power
3. Internet Revolution
   - Automation; electronics and information technology
4. Industrial Internet (IIoT)
   - Digital integration

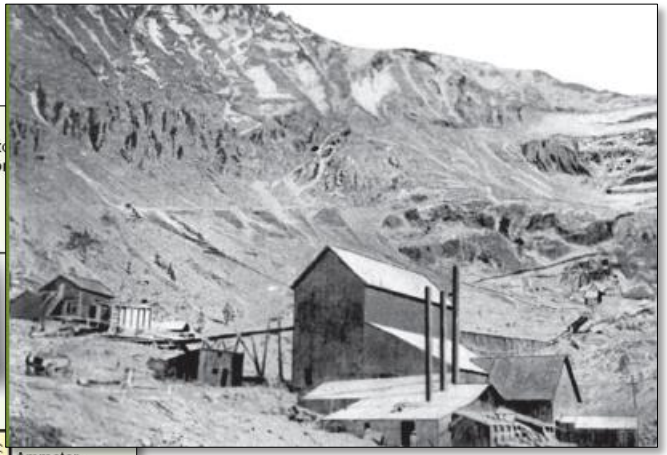
GE, 2012



2nd Industrial Revolution

- Electric power integration
  - Transmission and distribution

Westinghouse Project
Telluride, CO, 1881



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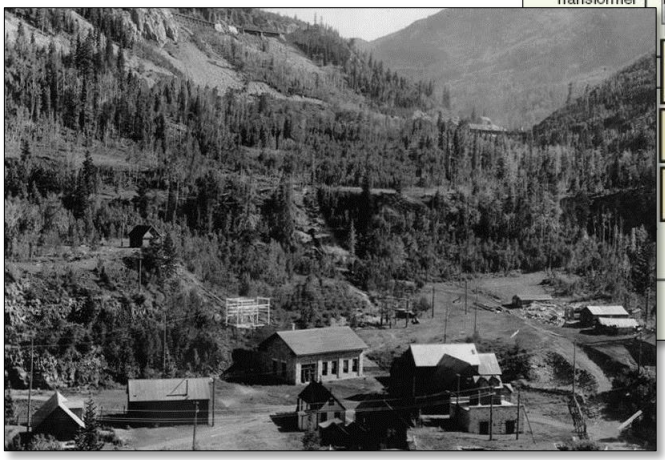
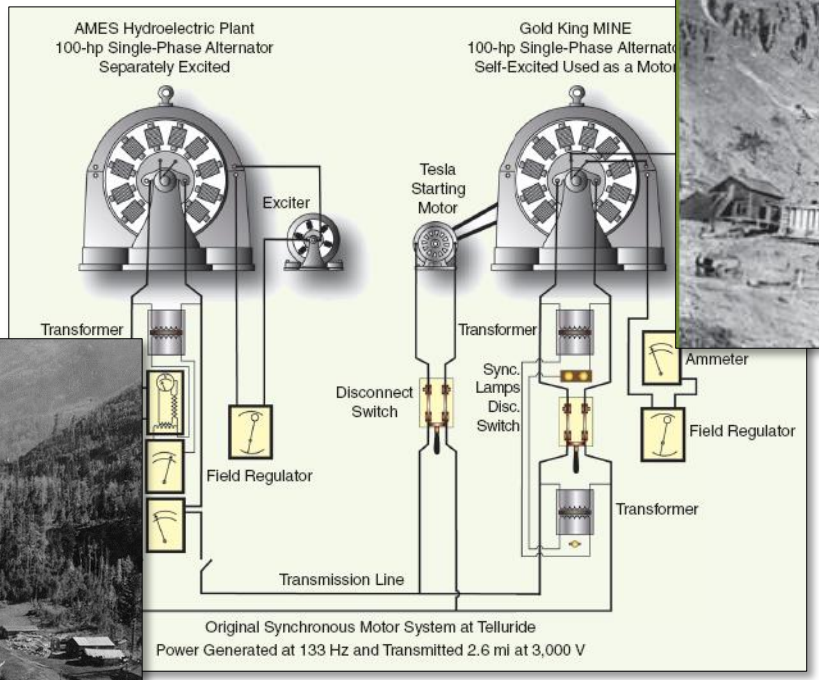
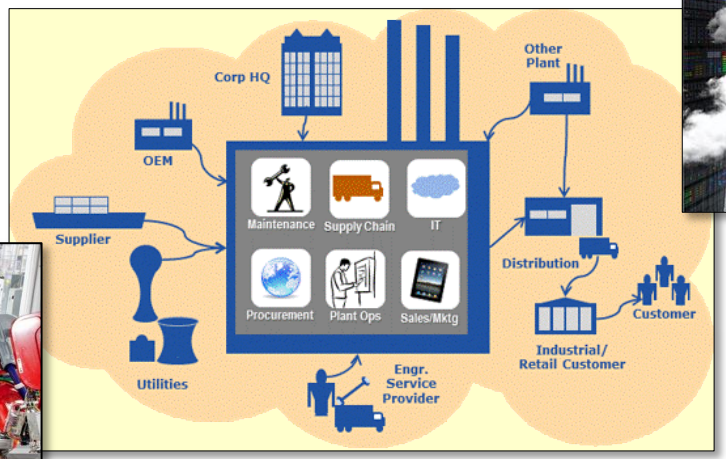




IIoT: 2nd Internet Revolution

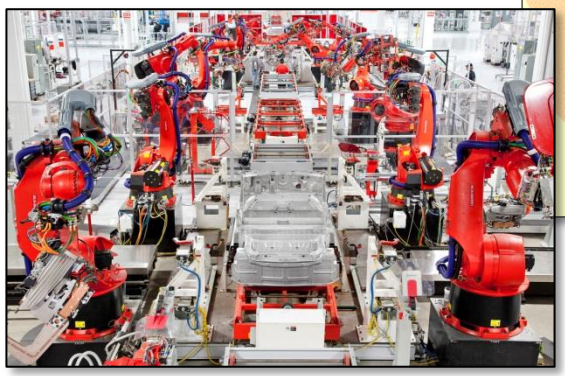
- Computing power integration
  - Data transmission and distribution
  - Digital integration

Cloud



Industry 4.0

Tesla



IIoT Analytics

ECONOMIC IMPACT

Business Value Estimates

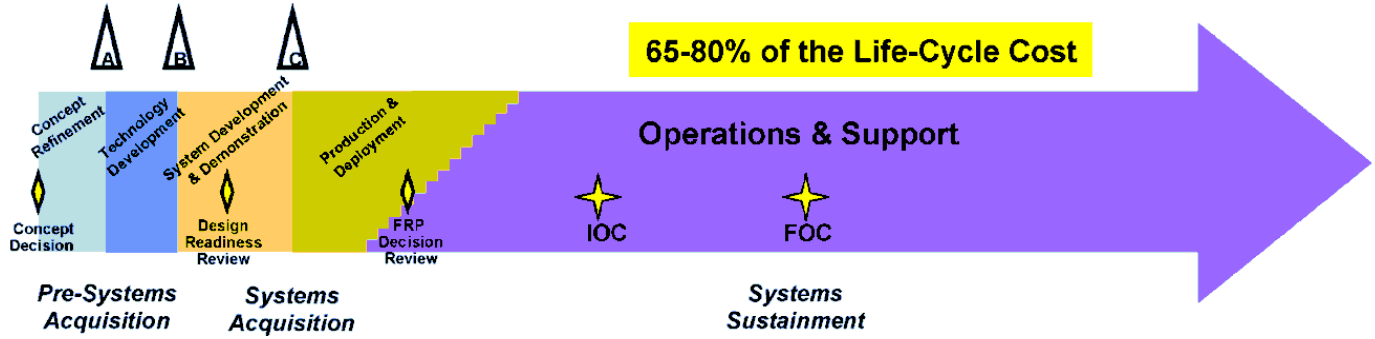
- Analyses of the IIoT economic impact

	Value	Date	Comment
GE	$10-15 Trillion	2014	IIoT
Accenture	$14 Trillion	2015	IIoT
McKinsey	$11 Trillion	2015	IIoT
Industrie 4.0	$4 Trillion	2014	Manufacturing
Gartner	$2 Trillion	2015	Consumer IoT
Cisco	$17 Trillion	2015	IoE ≈ IIoT+CIoT

Operations and Support

- Development and manufacturing
  - 15-20% of the lifecycle cost
- The IIoT will also change operations and support
  - 65-80% of the lifecycle cost

Value chain for industrial goods (PWC, 2015)



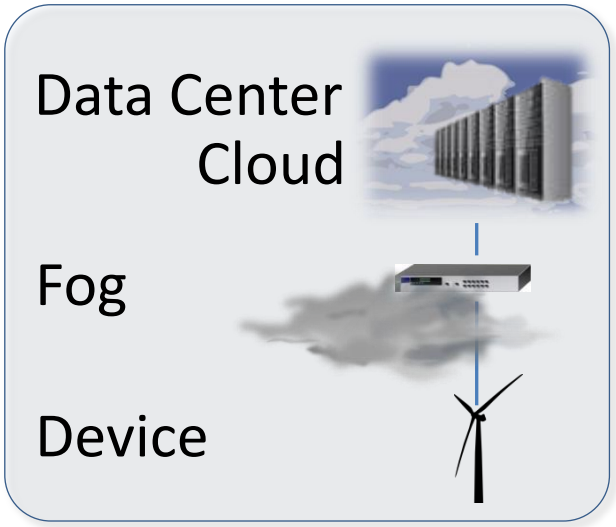
DoD CBM+ 2007

IIoT Class Overview

SO WHAT IS NEW ABOUT THE IIOT TECHNOLOGY?

IT/OT Convergence in the IIoT

Information **T**echnology



IT

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OT

Operational **T**echnology

- IT: Enterprise computing. Data Center. Cloud.

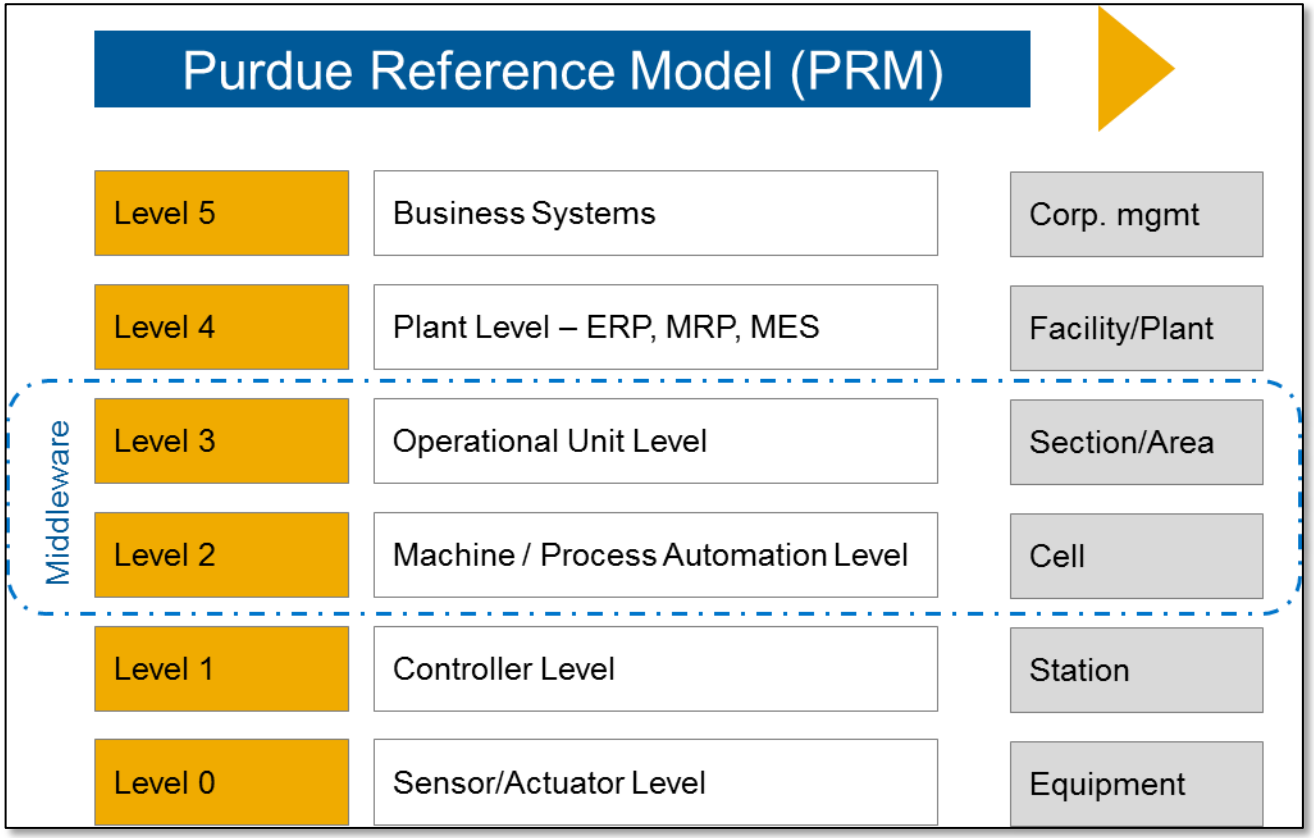
  Fog.

- OT: Embedded and industrial systems. Machine to Machine. Secure, closed networks

Industrial Automation Levels

- IIoT is the next, higher, level of digital integration

ISA-99 Purdue Model



IT

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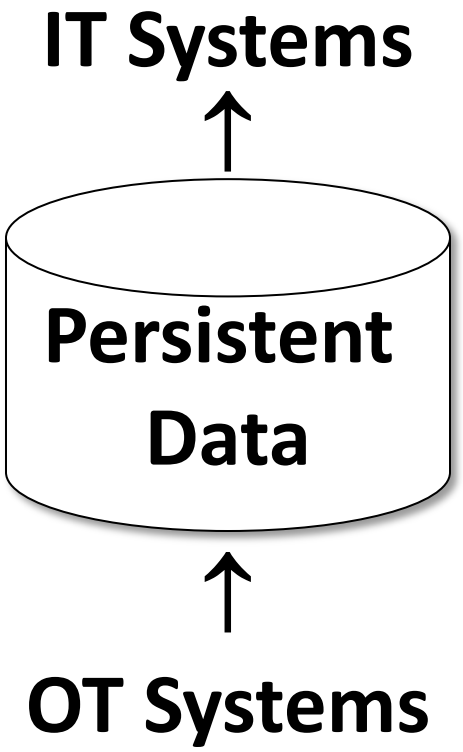
OT

https://blogs.saphana.com/2015/04/13/bridging-chasm-m2m-iot-part-3/

Persistent Data

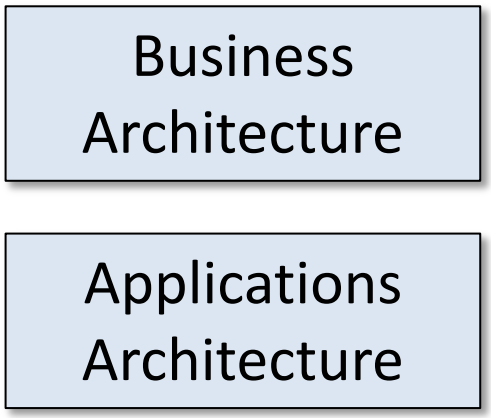


- IIoT IT systems make use of OT data
- Presently, OT systems consume and use their raw data on-line, but do not accumulate it
- IIoT accumulates OT data as Persistent Data

IIoT Analytics

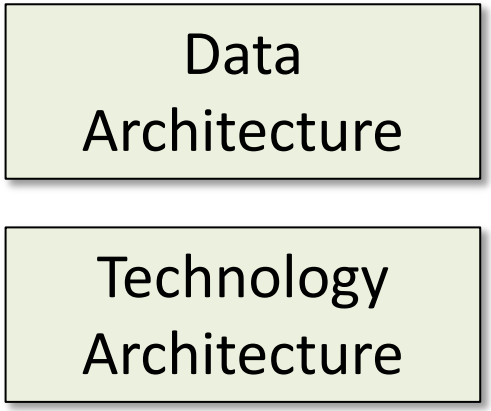
IIOT APPLICATIONS

Enterprise Architecture View



Added Value

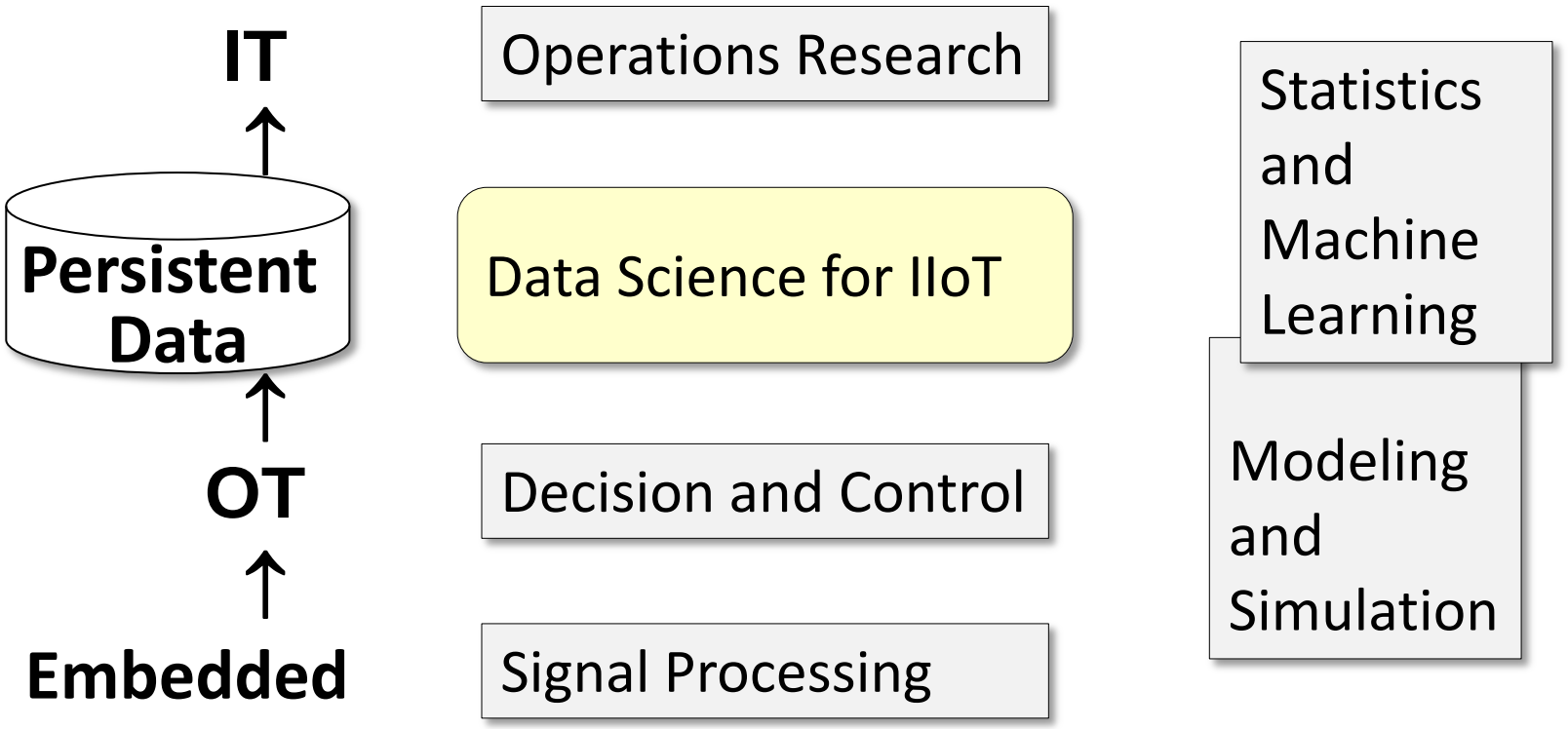
- IIoT Applications
  - Analytics: process and analyze the data
  - Operations: business processes



Technology Investment

- IIoT Platform
  - Collect and manage data
  - Needed to run applications
  - Most action, so far

Analytical Disciplines



EXAMPLE

Airline IIoT Example

- Aircraft fleet monitoring

IT

- IT: Airline Data Center
  - Aircraft fleet data

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- OT: Aircraft on-board network – 1553 Bus
  - Avionics
  - Flight Data Recorder

OT

Airline IIoT Value Add Applications

- Analyze aggregated fleet operational data
- Asset Management
  - Manage engine maintenance and replacement
- Operations
  - Improve fleet fuel burn

IIoT Analytics

CLASS COVERAGE

Planned Lectures

- April 11, **Angel**
- April 18, **Kleiner Perkins**
- April 25, **Teradata**
- May 2, **Cisco**
- May 9, **Konica Minolta**
- May 16, **Intel**
- May 23, **Oracle**
- May 30, **Alchemist Accelerator**
- June 6, **GE Digital**

IIoT Dimensions