

Internet of Things

Shyam V Nath



Summer
Conference
Aug 21, 2014



Agenda

- Introduction to Internet of Things (IoT)
- Industry Landscape
 - Internet of Everything
 - Internet of Your Things
 - Smarter Planet
 - **Industrial Internet**
- Use Cases & Value Proposition
- Machine Data and Big Data Analytics
- Wrap up

About Shyam

- Principal Architect – Analytics
- Board of Director (SIGs), 30K+ member User Group (IOUG)
- Founder of BIWA Special Interest Groups in 2006, Exadata SIG in 2008 (9200+ members)
- Worked in IBM, Deloitte, Oracle and Halliburton, prior to GE
- Regular speaker Oracle Openworld, Collaborate, BIWA Summit on IoT, Business Analytics and Data Warehousing / Engineered Systems related topics
- OCP since 1998 (RDBMS V7 and up)
- Awarded IOUG Oracle Contribution Award - 2007

GE and Chevron



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Press Releases

In the News

Speeches

Publications

Media Resources

Chevron, GE Form Technology Alliance

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HOUSTON, Texas, Feb. 3, 2014 – Chevron Energy Technology Company and GE Oil & Gas announced today the creation of the Chevron GE Technology Alliance, which will develop and commercialize valuable technologies to solve critical needs for the oil and gas industry.

The Alliance builds upon a current collaboration on flow analysis technology for oil and gas wells. It will leverage research and development from GE's newest Global Research Center, the first dedicated to oil and gas technology.

"GE brings its leading manufacturing capabilities, worldwide marketing, distribution, and extensive R&D capabilities not only for oil and gas, but also other business sectors to this alliance," said Paul Siegele, president of Chevron Energy Technology Company and chief technology officer. "Together, we hope to bring impactful new technologies to the industry."

"Chevron's deep understanding of the oil and gas industry, combined with GE's long tradition of technology development and close collaboration with strategic partners, will uniquely position this new alliance to address the industry's technology needs," said Lorenzo Simonelli, president and CEO, GE Oil & Gas. "The solutions developed by this alliance will take on even more industry significance given Chevron's proven leadership in being first to field-test and deploy new technology breakthroughs."

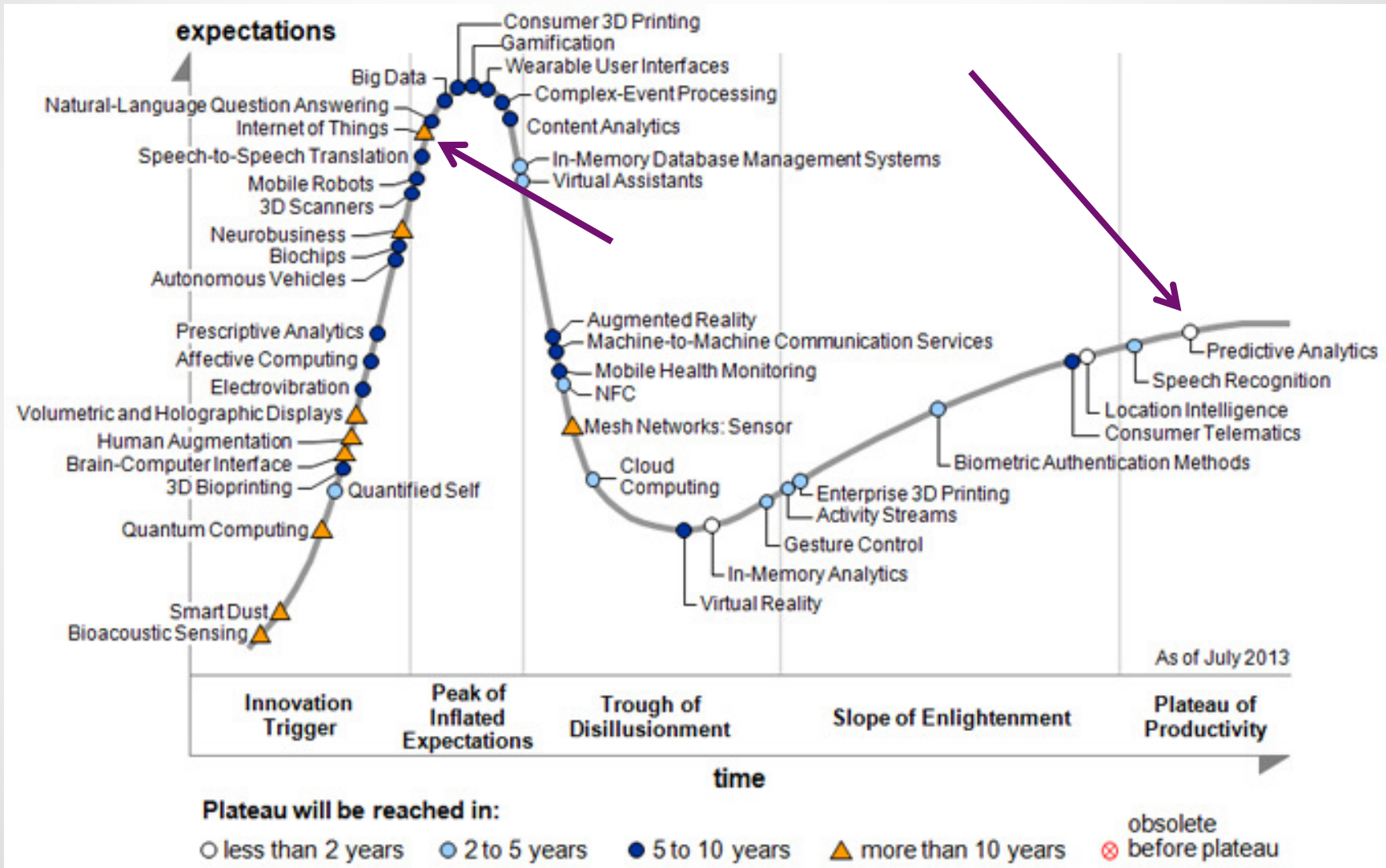
http://www.chevron.com/chevron/pressreleases/article/02032014_chevrongeformtechnologyalliance.news



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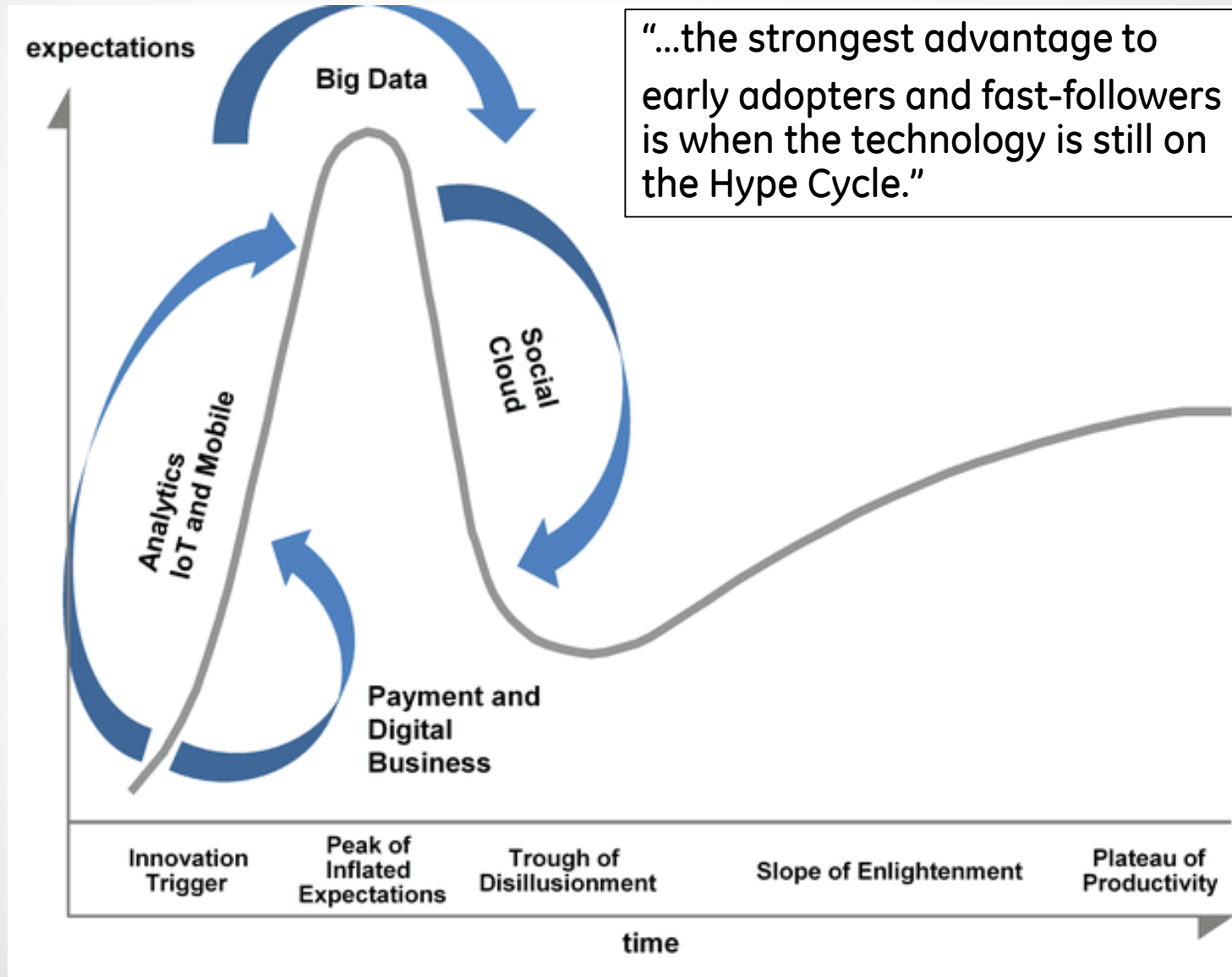


The Hype Cycle – Gartner July 2013



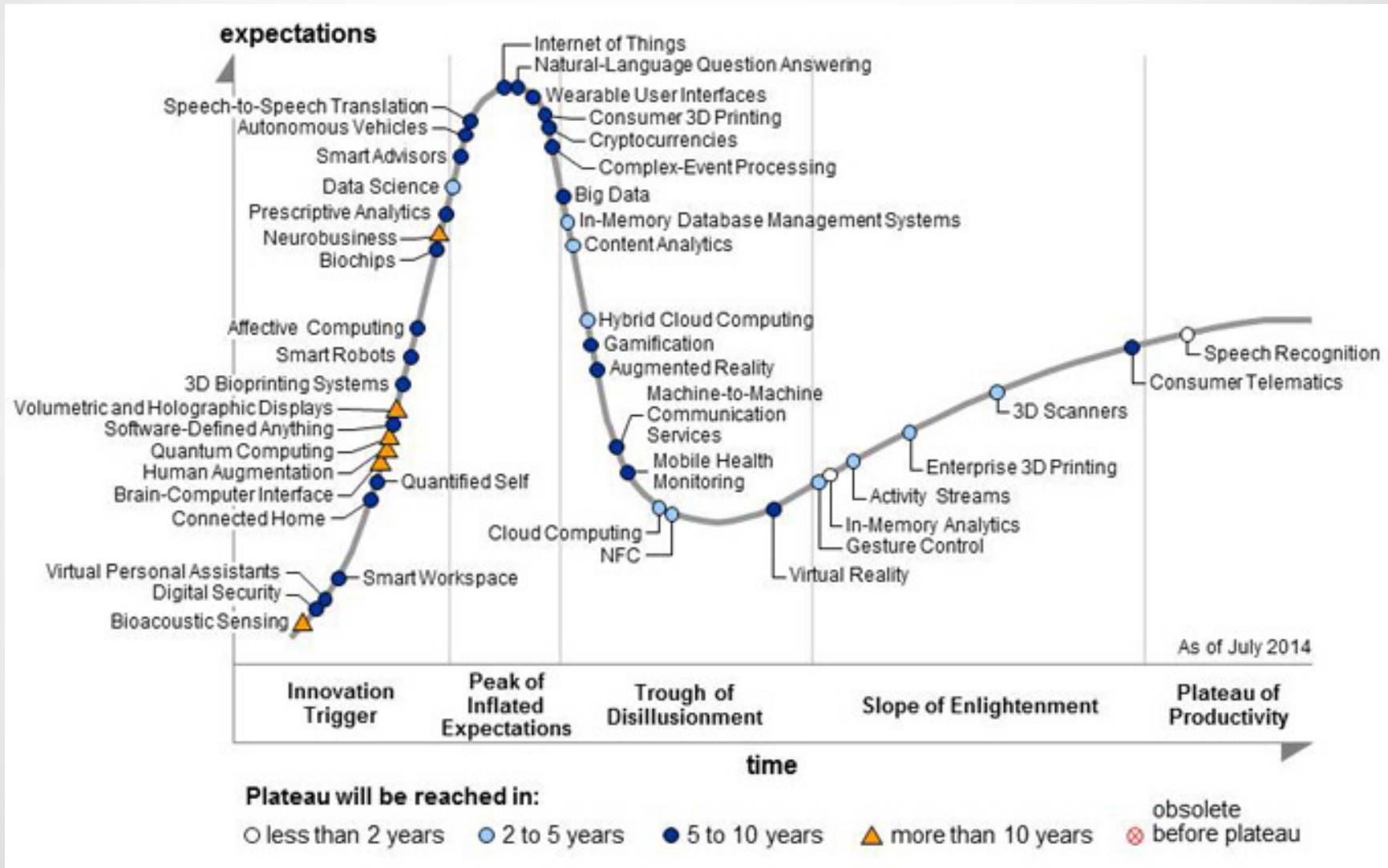
The 2013 Hype Cycle features Internet of Things, machine-to-machine communication services, mesh networks: sensor and activity streams.

Preview of 2014 – Hype Cycle



<https://www.gartner.com/doc/2816917?plc=ddp#a209530438>

Hype Chart 2014 - Hot-off the Press!



<http://www.gartner.com/newsroom/id/2819918>

Oracle President on IoT (Aug 18, 2014)

Oracle President Mark Hurd on the Internet of Things: 5 Takeaways

🕒 AUGUST 18, 2014 9:28 AM 💬 0 COMMENTS



As the co-president of American multinational computer technology firm Oracle Corporation, Mark Hurd understands the Internet of Things. His views on the Internet of Things can help you understand this concept and how it'll impact the world.

1. The Internet of Things Isn't Just About Computers

The Internet of Things describes a range of interconnected intelligent devices that go beyond computers, smartphones, and tablets.

"Home appliances, food, industrial equipment, pets, pharmaceutical products, pallets, cars, luggage, packaged goods, athletic equipment, and streaming data," Hurd explained in his article "The Internet of Things is Really the Internet of People."

Some of that data will be superfluous, but much of it will help businesses perform better and help individuals improve their health.

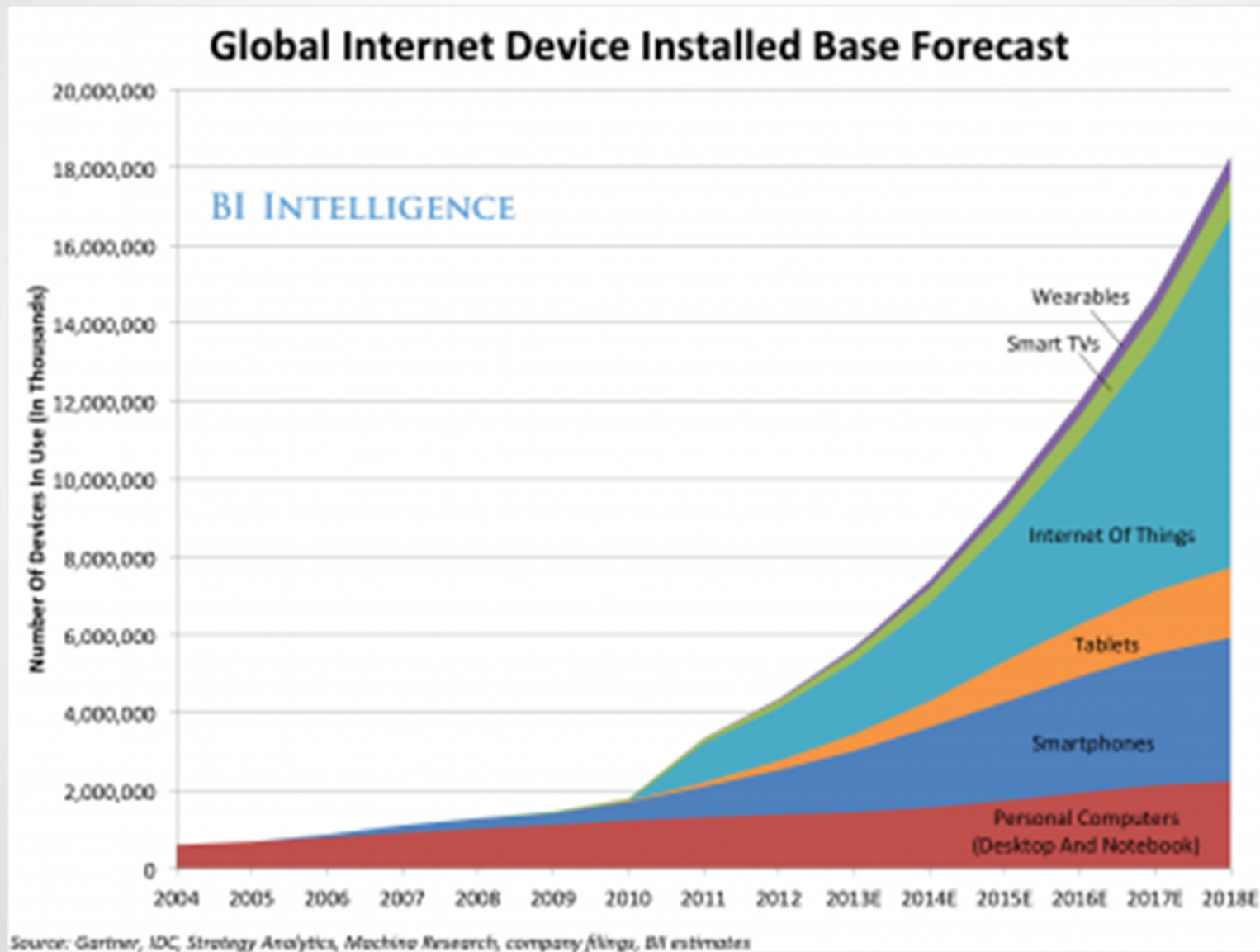
2. The Internet of Things will Affect Every Industry

Oracle Corporation's recent acquisition of MICROS Systems Inc. was a strategic move made to extend Oracle's current industry offerings. The MICROS' integrated software and hardware solutions for the hospitality and retail sectors would pair perfectly with its more general business solutions.

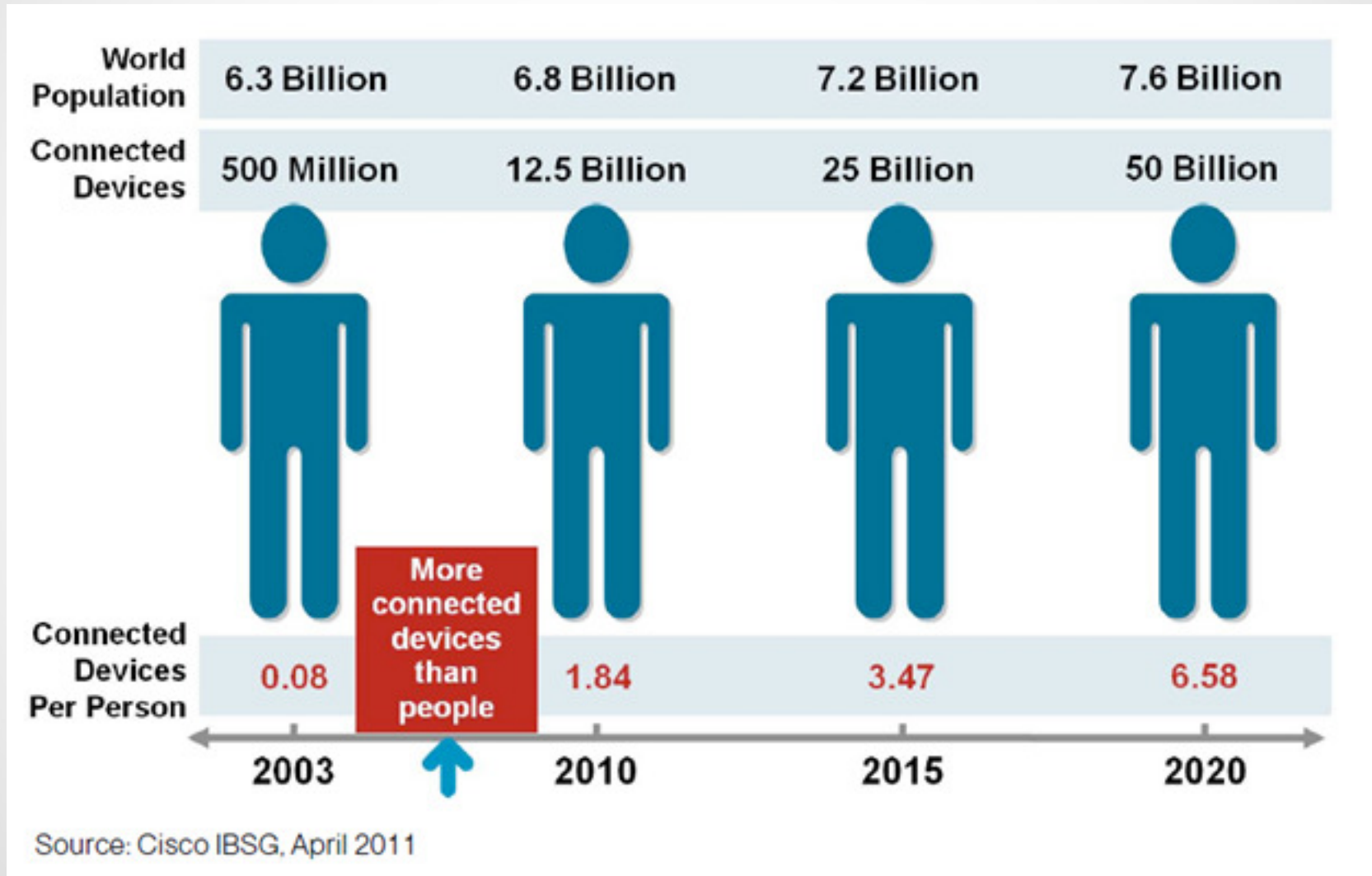
...Mark Hurd on IoT

- 1. The Internet of Things Isn't Just About Computers**
- 2. The Internet of Things will Affect Every Industry**
- 3. Companies Must Nurture Their Employees to Meet the Demand**
- 4. Companies Aren't Ready**
- 5. Companies Need to Start Thinking about the Internet of Things Today**

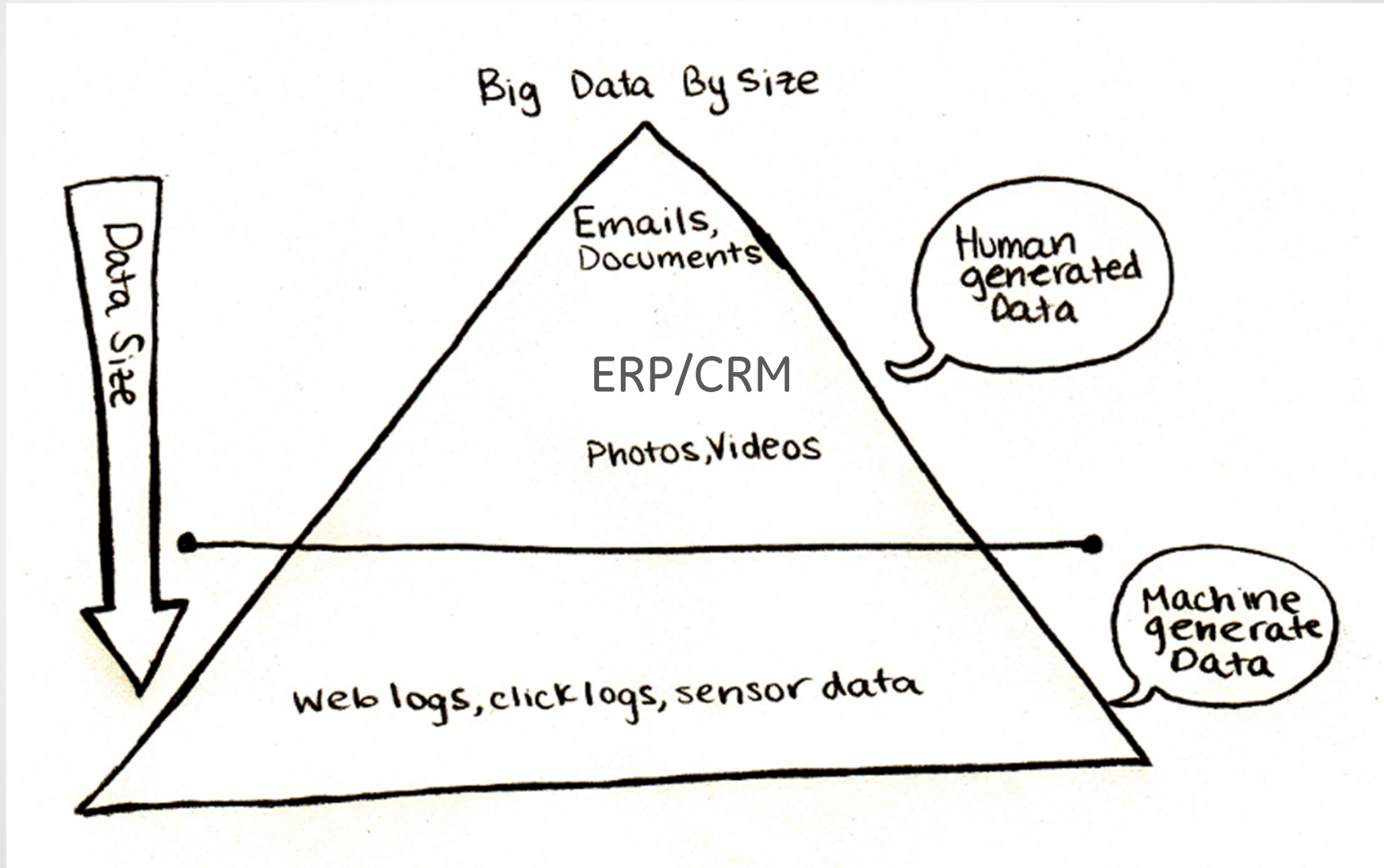
What are the “Things?”



Growing Number of Devices!

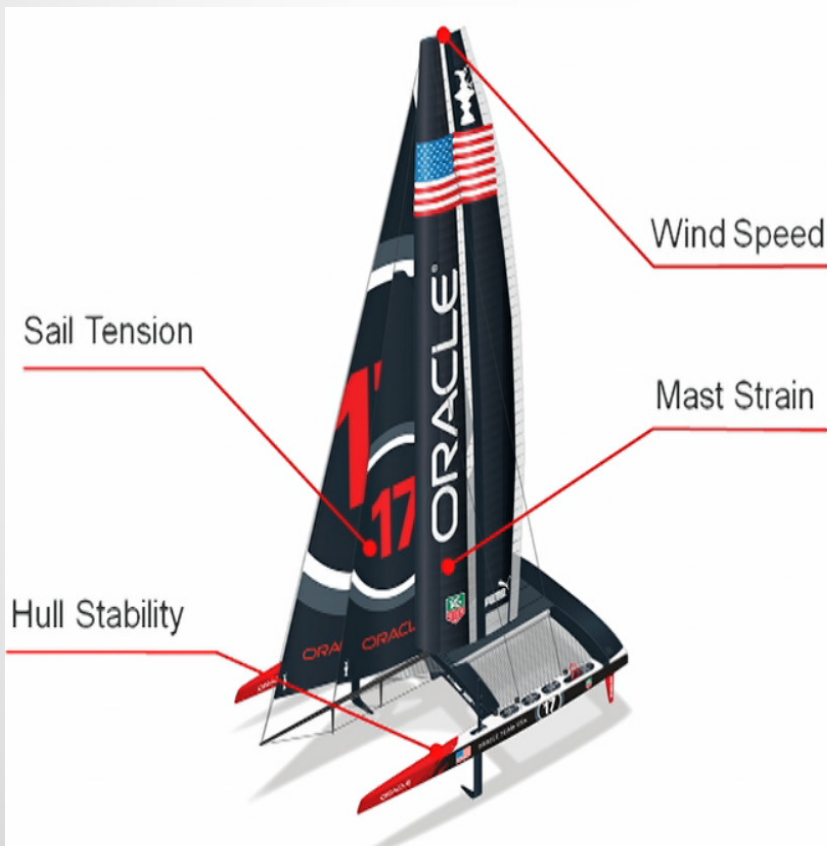


Big Data and IoT



Examples from Different Domains

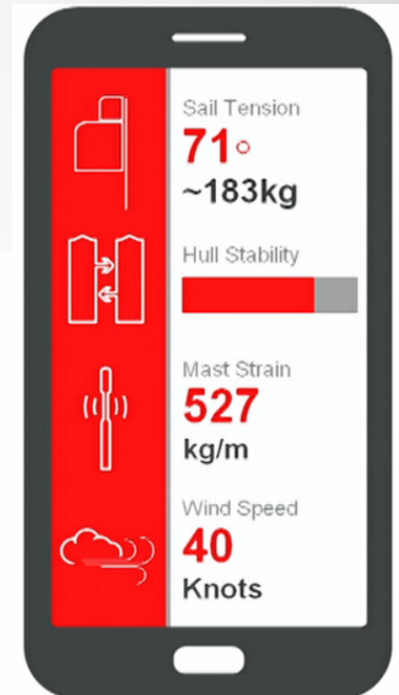
America's Cup: Yacht as a "Thing"
embedded with sensors



300
Sensors

3,000
Variables running
10 times per second

500 GB
Raw data
every sailing day



Ref: <http://medianetwork.oracle.com/video/player/3597777548001>

Wind Farms Explained Via Visuals!

Altamont Pass Wind Farm

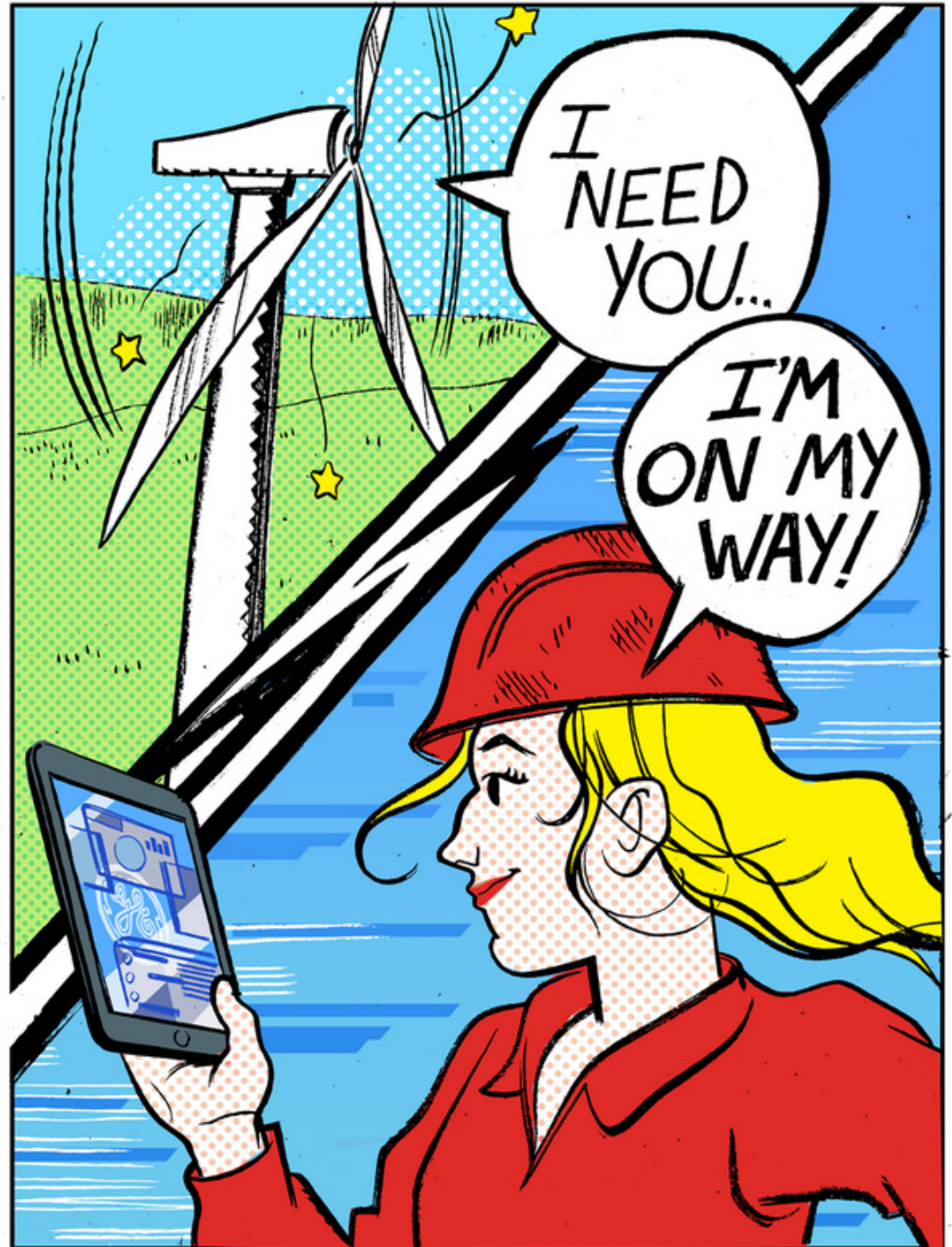


Turbines near Livermore, California

Location	Altamont Pass, Alameda County, California
Coordinates	 37°43'57"N 121°39'9"W
Commission date	1981

Power generation

Primary fuel	Wind
Units operational	4930
Nameplate capacity	576 MW
Annual generation	1.1 TWh



Remote Service Monitoring

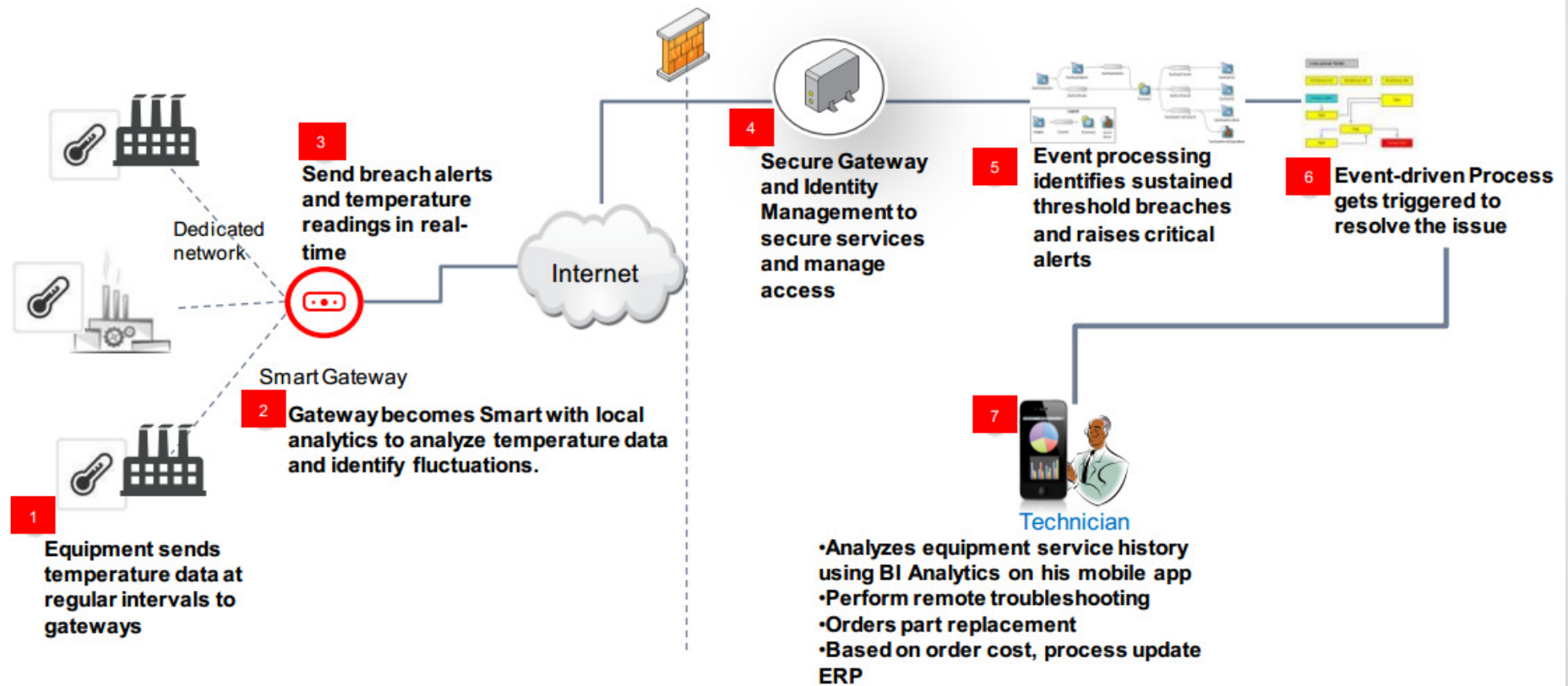


Figure 2: Remote Service Monitoring

IoT and SF Parking

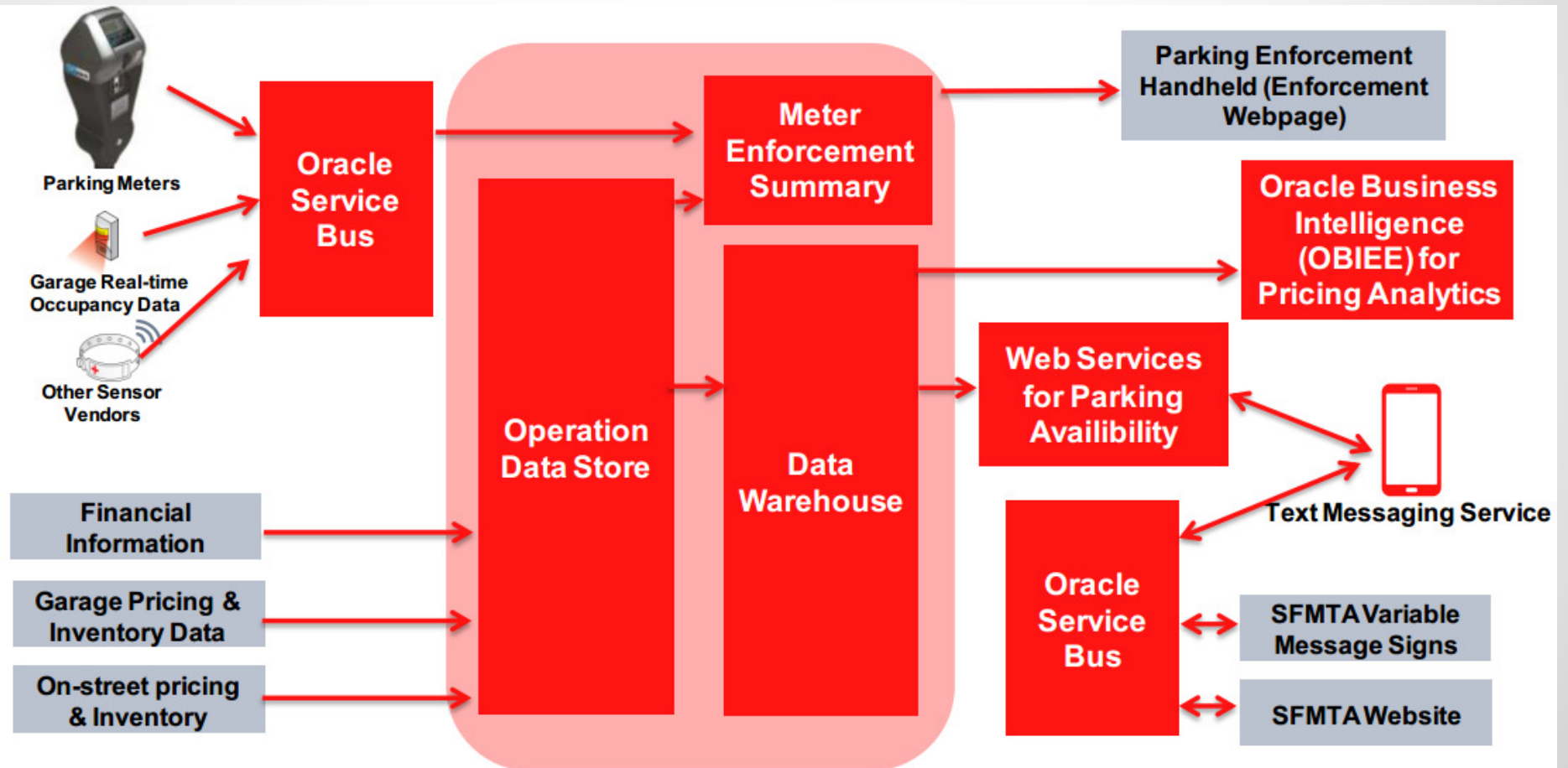


Figure 11: SFPark Architecture

<http://www.oracle.com/us/solutions/machine-to-machine/iot-wp-2190408.pdf>

Business Impact

- Sfpark's new parking management system:
 - 7,000 of SF's 28,800 metered spaces
 - 12,250 spaces in 15 of 20 City-owned parking garages
- Goal: reducing traffic by helping drivers find parking with Meters that accept credit and debit cards
- **Demand responsive pricing** helped encourage drivers park in underused areas and garages, reducing demand in overused areas.
- Improved Muni operations by reduced congestion, increasing citizen satisfaction

Chicago turns light poles into data collectors

The light poles along Chicago's Michigan Avenue will soon do more than illuminate the city's famous street.

The "Array of Things" initiative by the Urban Center for Computation and Data will install data-collecting systems on eight light poles along Michigan Avenue next month, the Chicago Tribune reports.

The sensors will be used to measure air quality, heat, light intensity, precipitation, sound volume, and wind.

The number of people near the light poles will also be measured by tracking wireless signals from mobile devices.



<http://www.smartplanet.com/blog/bulletin/chicago-turns-light-poles-into-data-collectors/>

Continuous Query Language (CQL)

Standards-Based Continuous Query Language (CQL) – Oracle Event Processing’s design environment and runtime execution supports standards-based, continuous query execution for IoT applications needing answers in microseconds to discern patterns and trends that would otherwise go unnoticed. Oracle Continuous Query Language (Oracle CQL) is a query language based on SQL with added constructs that support streaming data. From the example as described in Figure 2: Remote Service Monitoring, a sample CQL query to detect temperature alerts from remote machines occurring at least 5 times per minute and classify them as a “sustained temperature alert” would look like this

Continuously calculate the sustained temperature alerts from remote machines occurring at least 5 times every minute

```
SELECT SUM (alert) as c, sensorID, “sustained” as alerttype  
FROM AlertsInputChannel [range 60 minutes]  
GROUP BY sensorID  
HAVING SUM(alert)>5
```

http://docs.oracle.com/cd/E16764_01/doc.11111/e12048/intro.htm

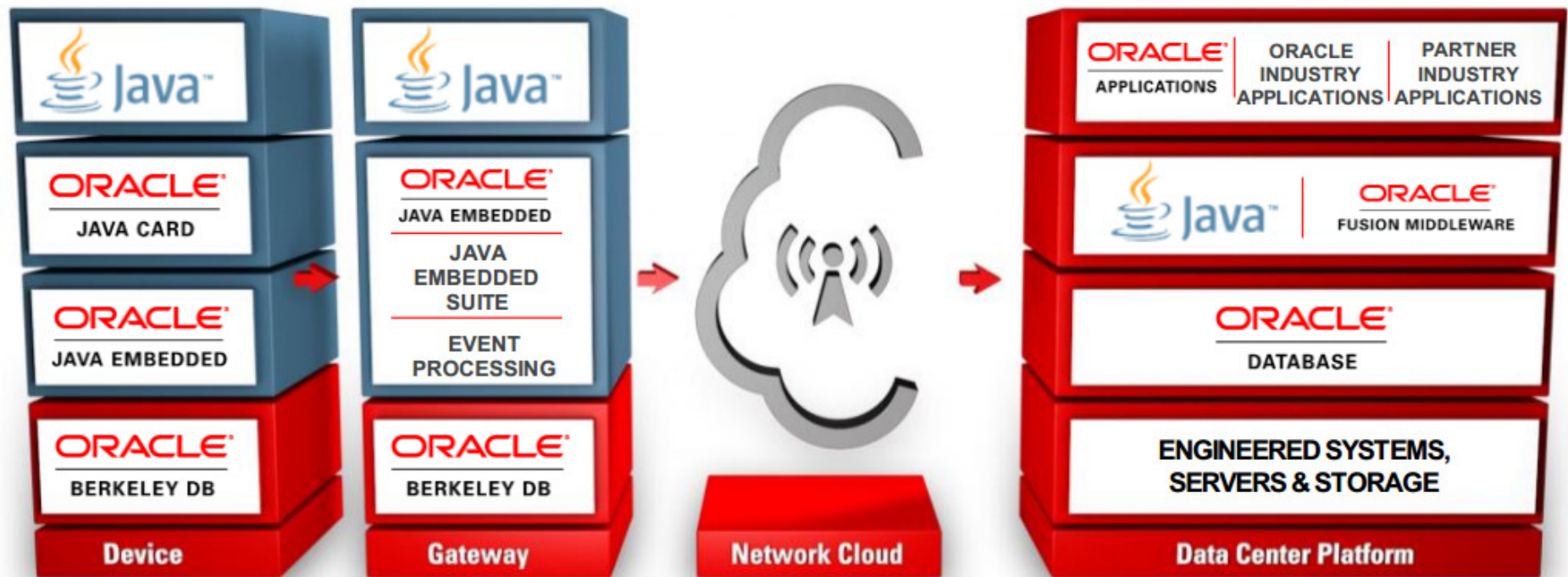
<http://www.oracle.com/us/solutions/machine-to-machine/iot-wp-2190408.pdf>

Pattern Match



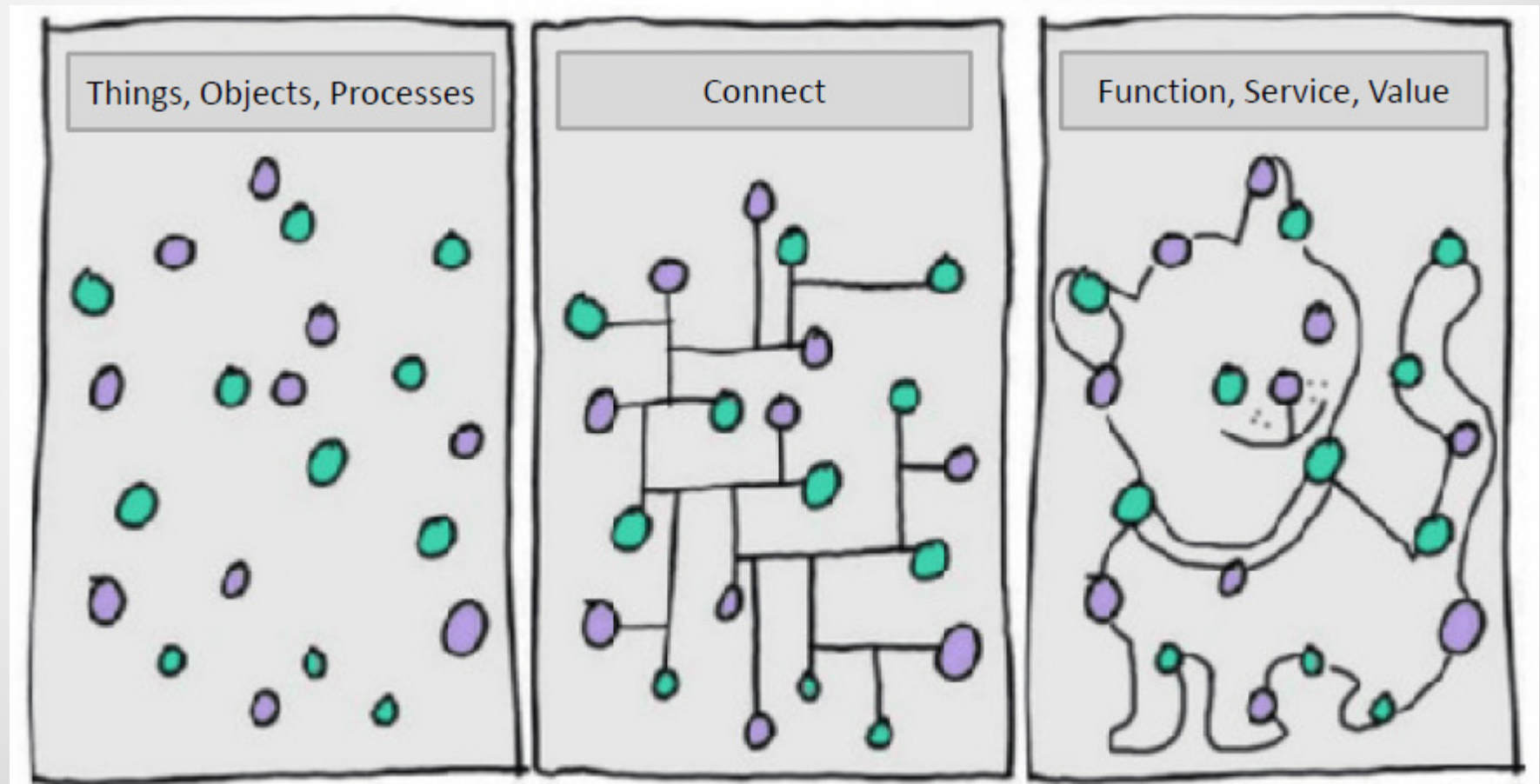
```
SELECT Alert.id
FROM OrderStream
MATCH_RECOGNIZE (
  MEASURES CustomerOrder.id as id
  PATTERN (CustomerOrder NotShipped)
  DURATION 10 minutes
  DEFINE
    CustomerOrder AS OrderStream.eventType = 1
    NotShipped AS OrderStream.eventType != 2
) as Alert
```

Oracle Internet of Things Platform








<http://www.oracle.com/us/solutions/machine-to-machine/iot-wp-2190408.pdf>

Value Creation by Industrial Internet



The value to customers is huge

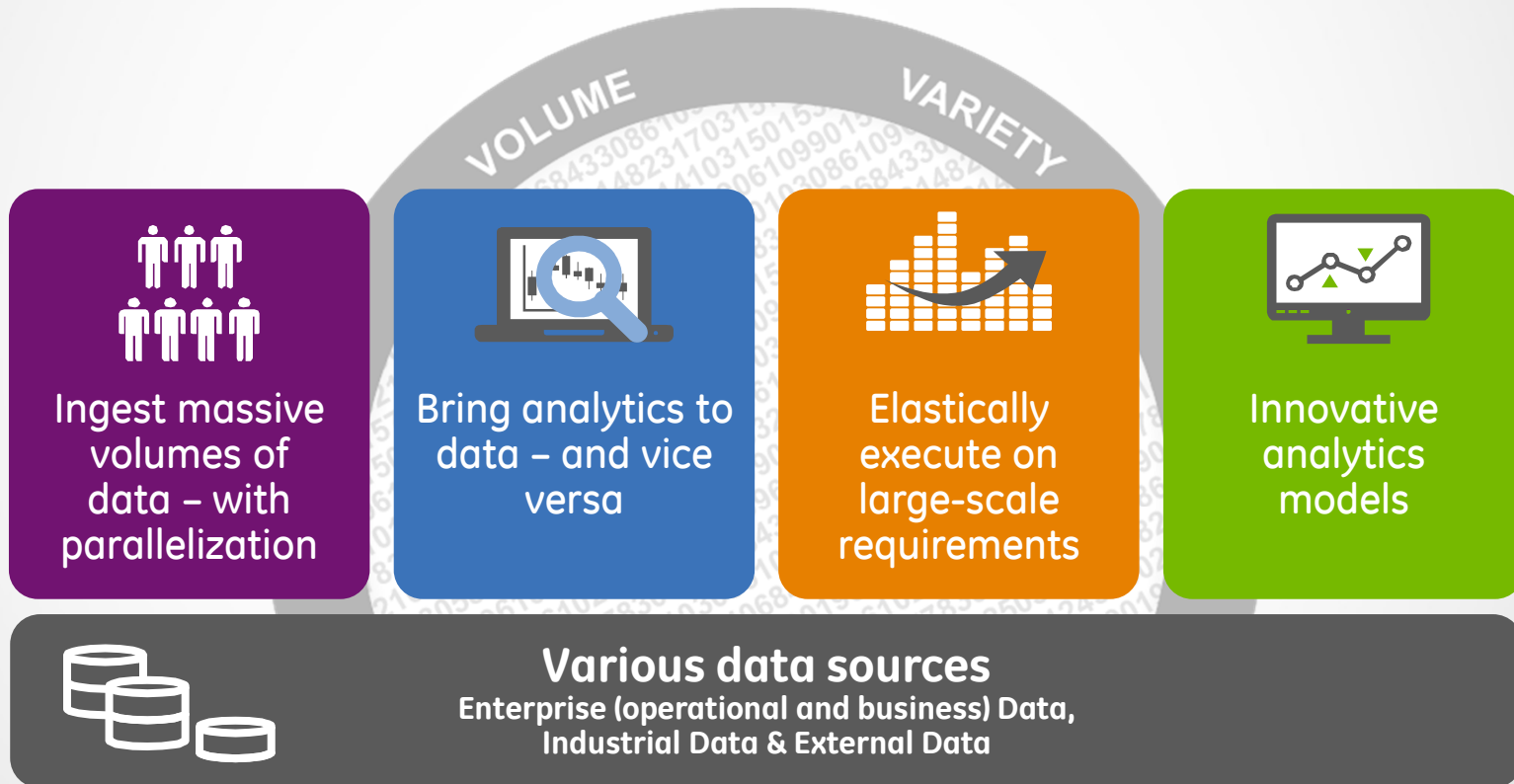
Connected machines and data could eliminate up to \$150 billion in waste across industries

Industry	Segment	Type of savings	Estimated value over 15 years (Billion nominal US dollars)
 Aviation	Commercial	1% fuel savings	\$30B
 Power	Gas-fired generation	1% fuel savings	\$66B
 Healthcare	System-wide	1% reduction in system inefficiency	\$63B
 Rail	Freight	1% reduction in system inefficiency	\$27B
 Oil and Gas	Exploration and development	1% reduction in capital expenditures	\$90B

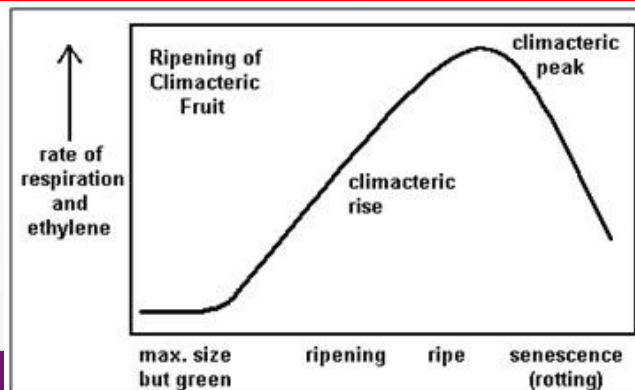
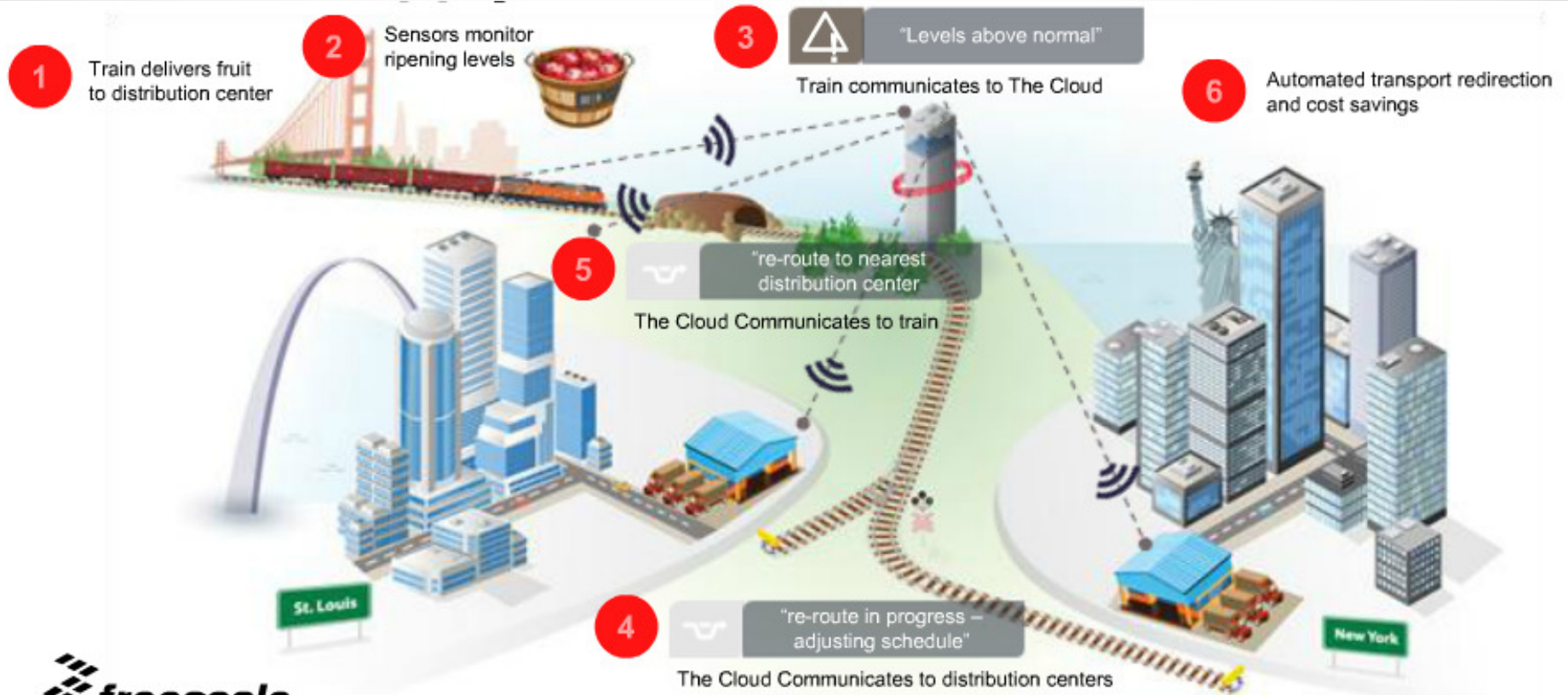
Note: Illustrative examples based on potential one percent savings applied across specific global industry sectors. Source: GE estimates

Industrial Internet: Big Data Analytics

Delivering sharper insights to users

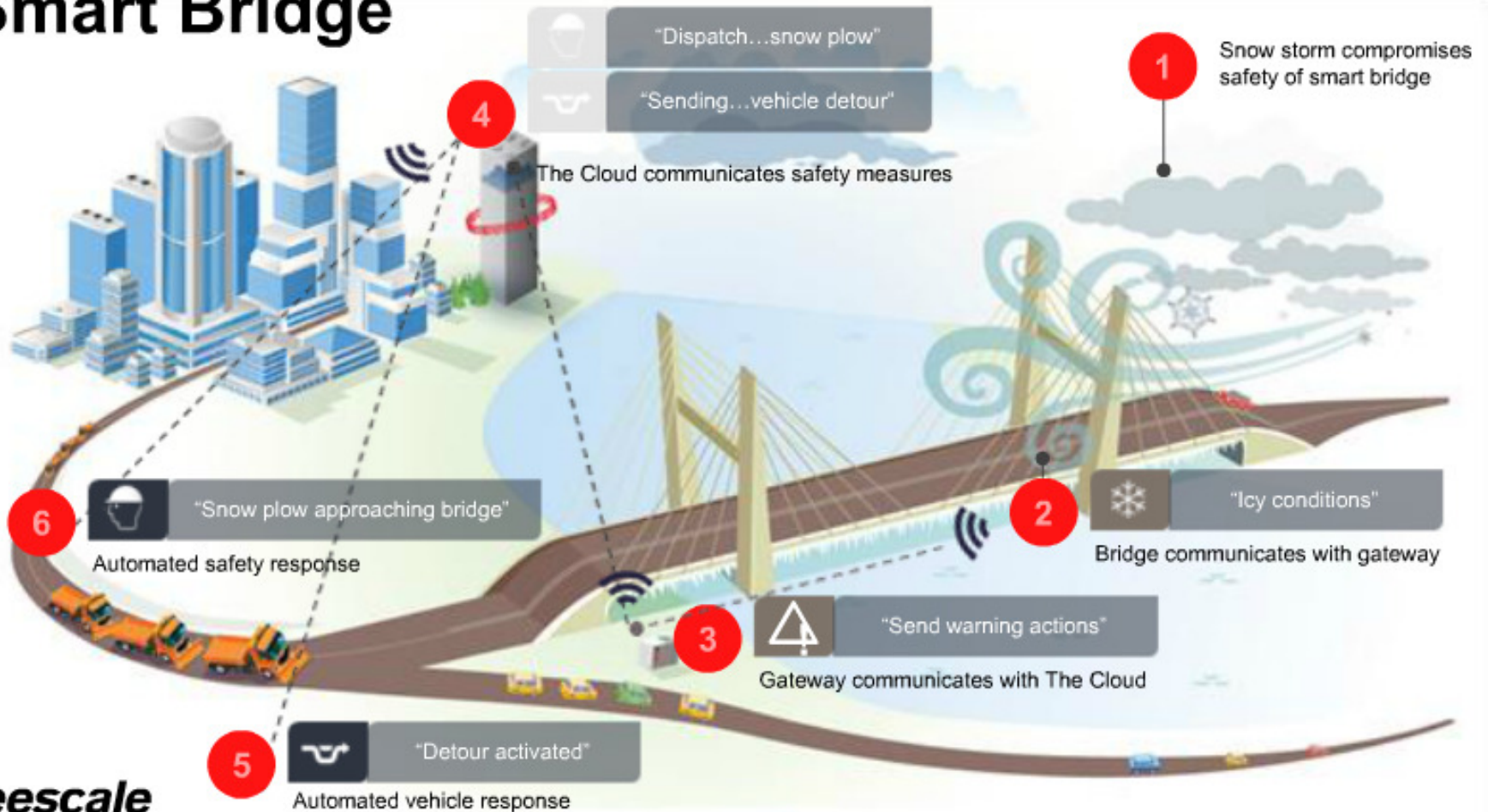


Smarter Supply Chain



Smarter Transportation Infrastructure

Smart Bridge



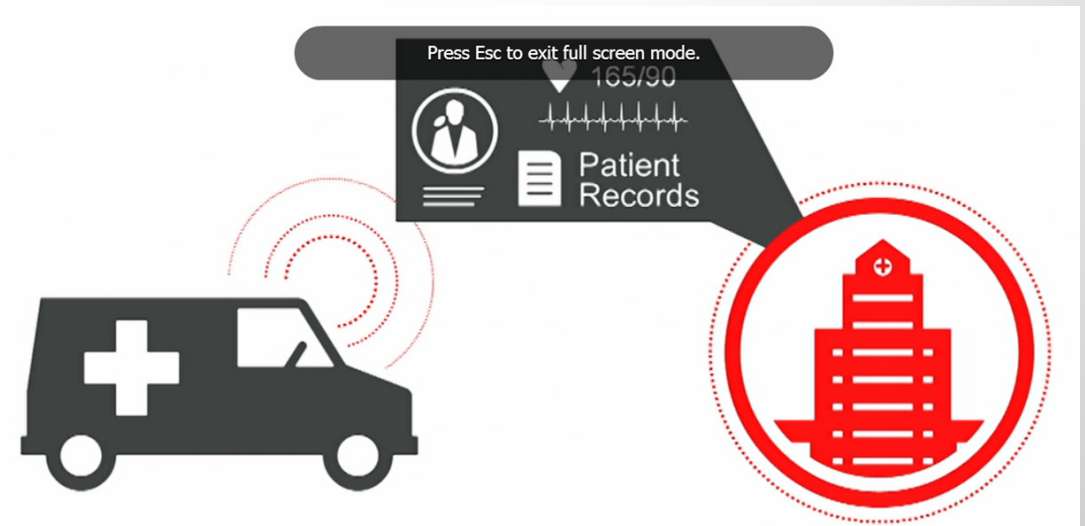
HealthCare

Remote monitoring of Patients, e.g. pregnant ladies with gestational diabetes in a town with no doctors.

Glucose level can alter blood pressure.

Monitoring of blood pressure via wearable that can be transmitted to health care monitoring facility that can route the nearest ambulance. (Uber!!!)

Hospital / doctor is ready for the patient by the time patient arrives.

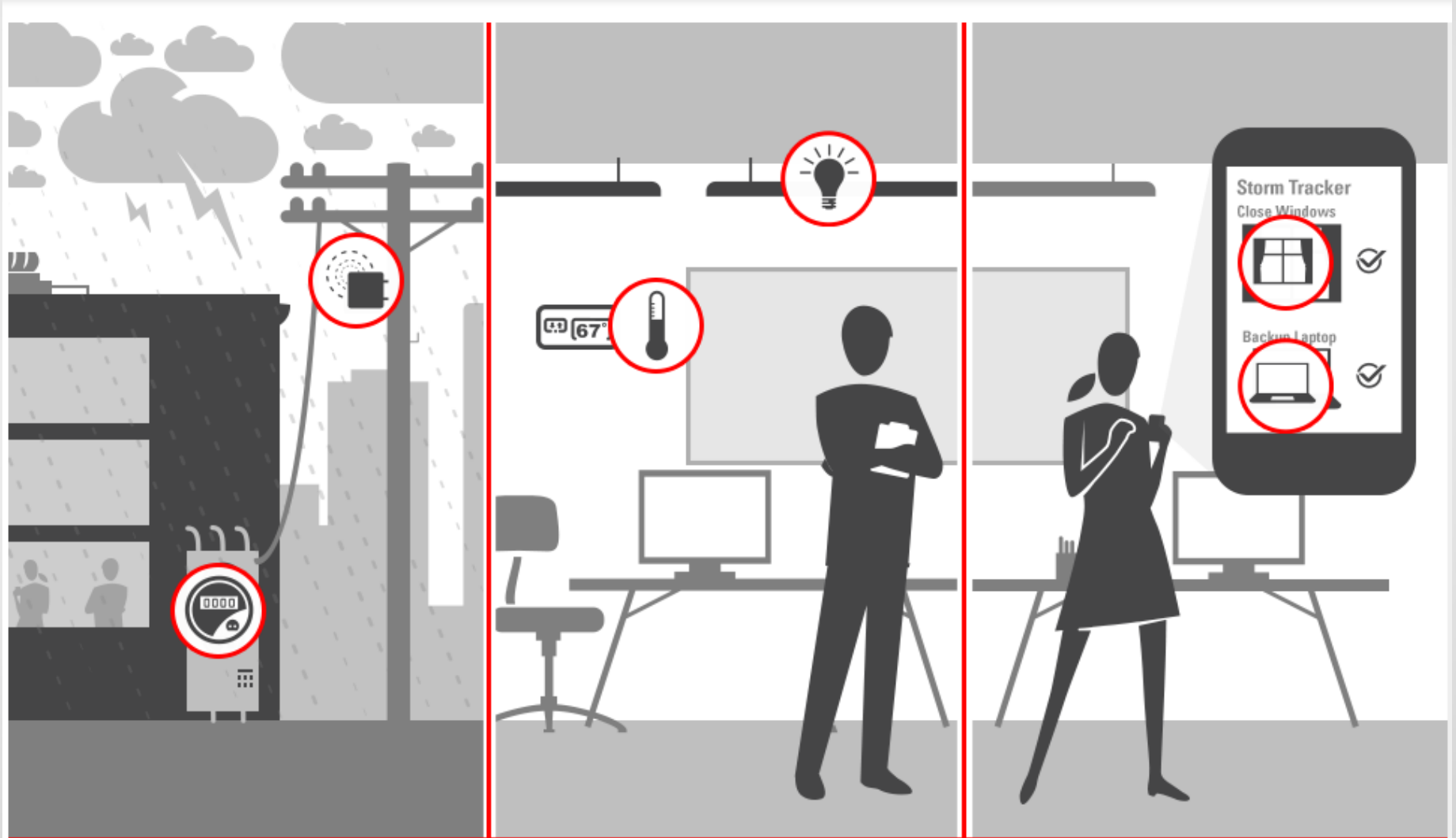


Ref: <http://medianetwork.oracle.com/video/player/3597777548001>

From Home to Hospital

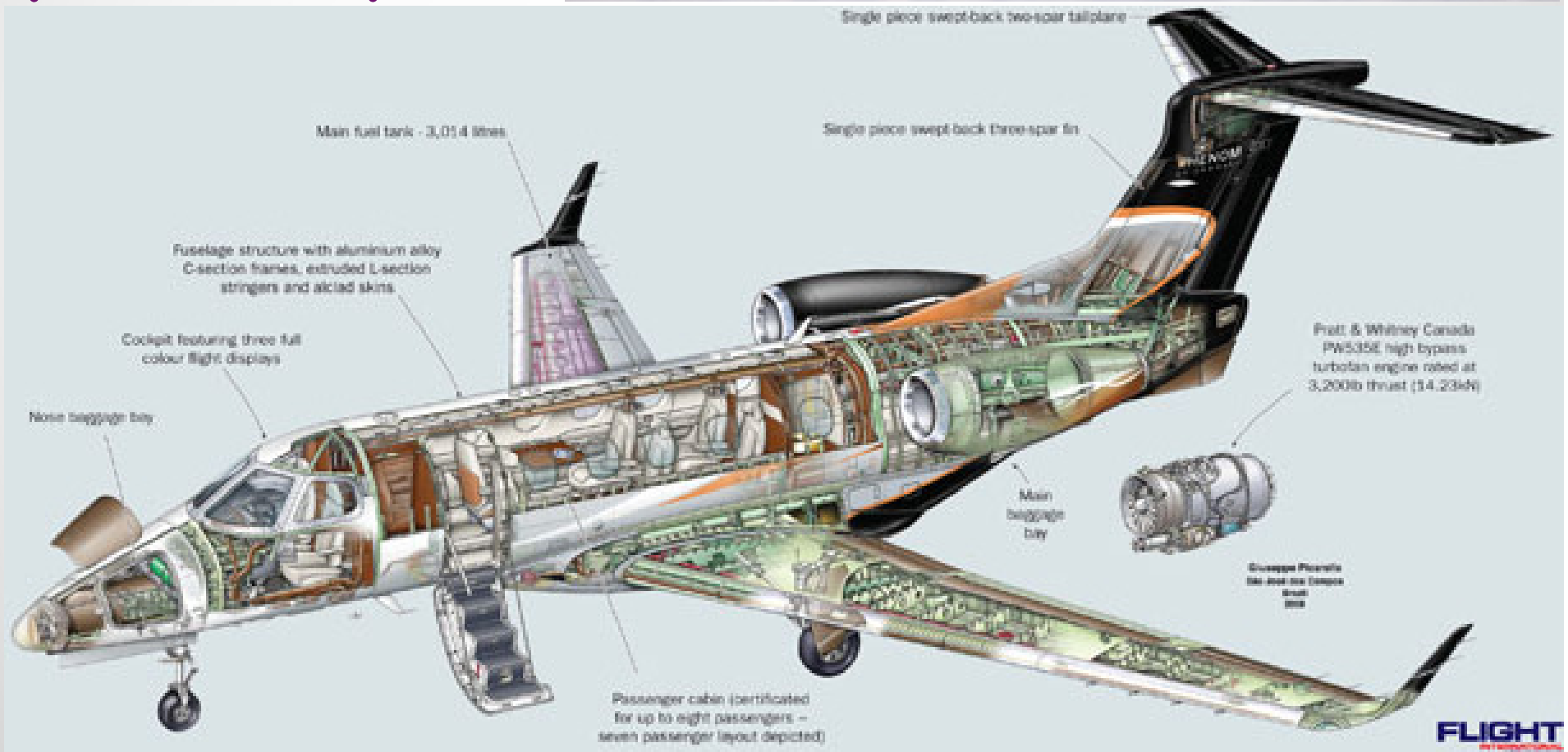


Smarter Grid and Homes



<http://www.oracle.com/us/solutions/internetofthings/overview/index.html?ssSourceSiteId=ocomtr>

Different “Views” of Aircraft as Asset Model (Data Mart)



Data from Jet Engine

We Used to Get...



Takeoff
Diagnostics Data
(Averaged)



Cruise
Diagnostics Data
(Averaged)



Landing
Diagnostics Data
(Averaged)



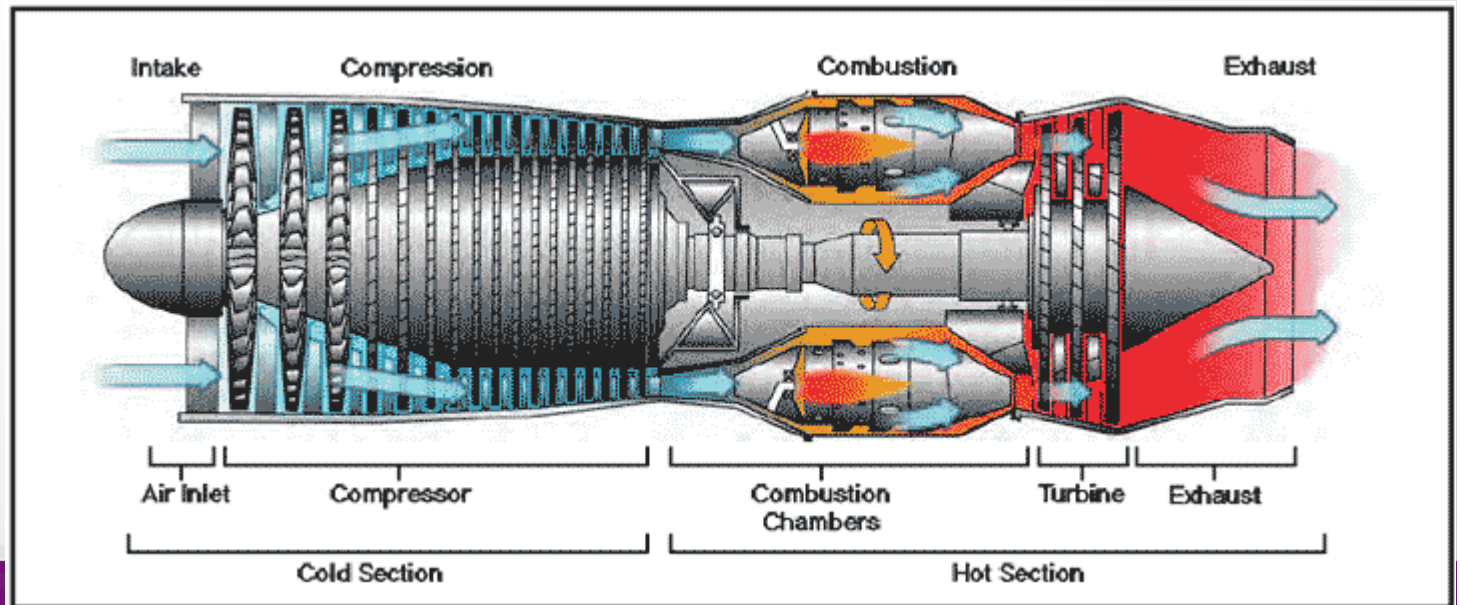
Making “Sense” of the “Sensors”

EGT = Exhaust Gas Temperature

The temperature of the exhaust gases as they enter the tail pipe, after passing through the turbine

A good indicator of the health of engine (just like human body temperature)

Recording and interpreting the EGT can help to detect several jet engine problems.



Other Innovations Driven by IoT

A Batteryless Sensor Chip for the Internet of Things

Requiring so little power means PsiKick's chip can function even with the small amounts of power that can be scavenged without using a battery.

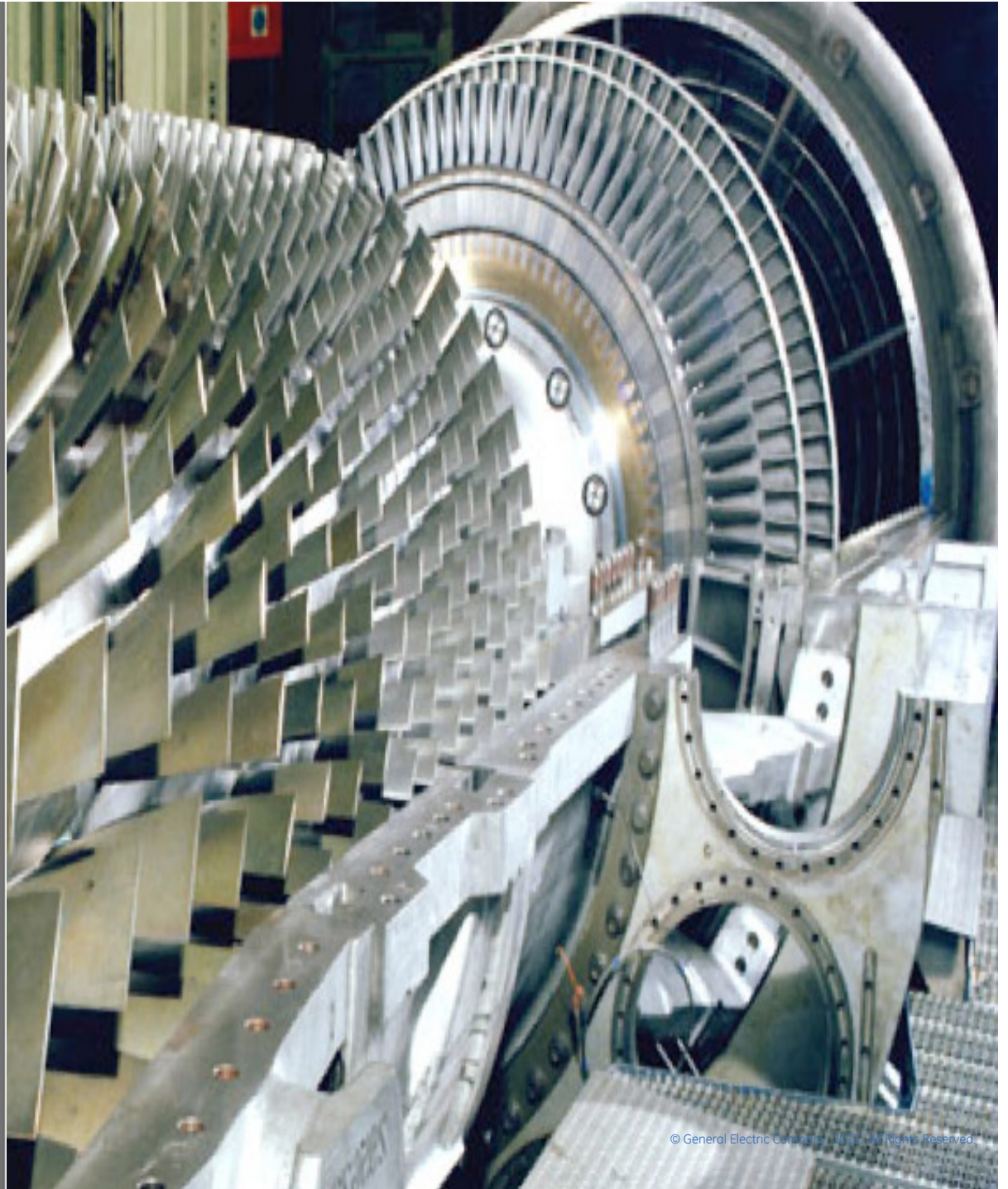
Wentzloff and Calhoun have tested their chip design in a wearable EKG monitor that runs entirely on body heat.

The device required 0.1 percent of the power consumed by a typical EKG monitor, Wentzloff says.

In the future, the energy could come from a small solar panel; an antenna that collects ambient radio wave energy; a thermoelectric material that absorbs body heat; or piezoelectric devices that collect energy from movement.

Value Of Big Data Analytics

1 Gas Turbine Compressor Blade Monitoring Potential:
500 Gigabytes Per Day





David Gilford @dgilford · 20h

"A single power generating unit creates 1 TB of data each day" - @Jeffmelt on Industrial Internet #IIoT #BNEF2014 pic.twitter.com/OPT9Hend3e

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Forces shaping the Industrial Internet

1 Internet of things

A living network of machines, data, and people

2 Intelligent machines

Increasing system intelligence through embedded software

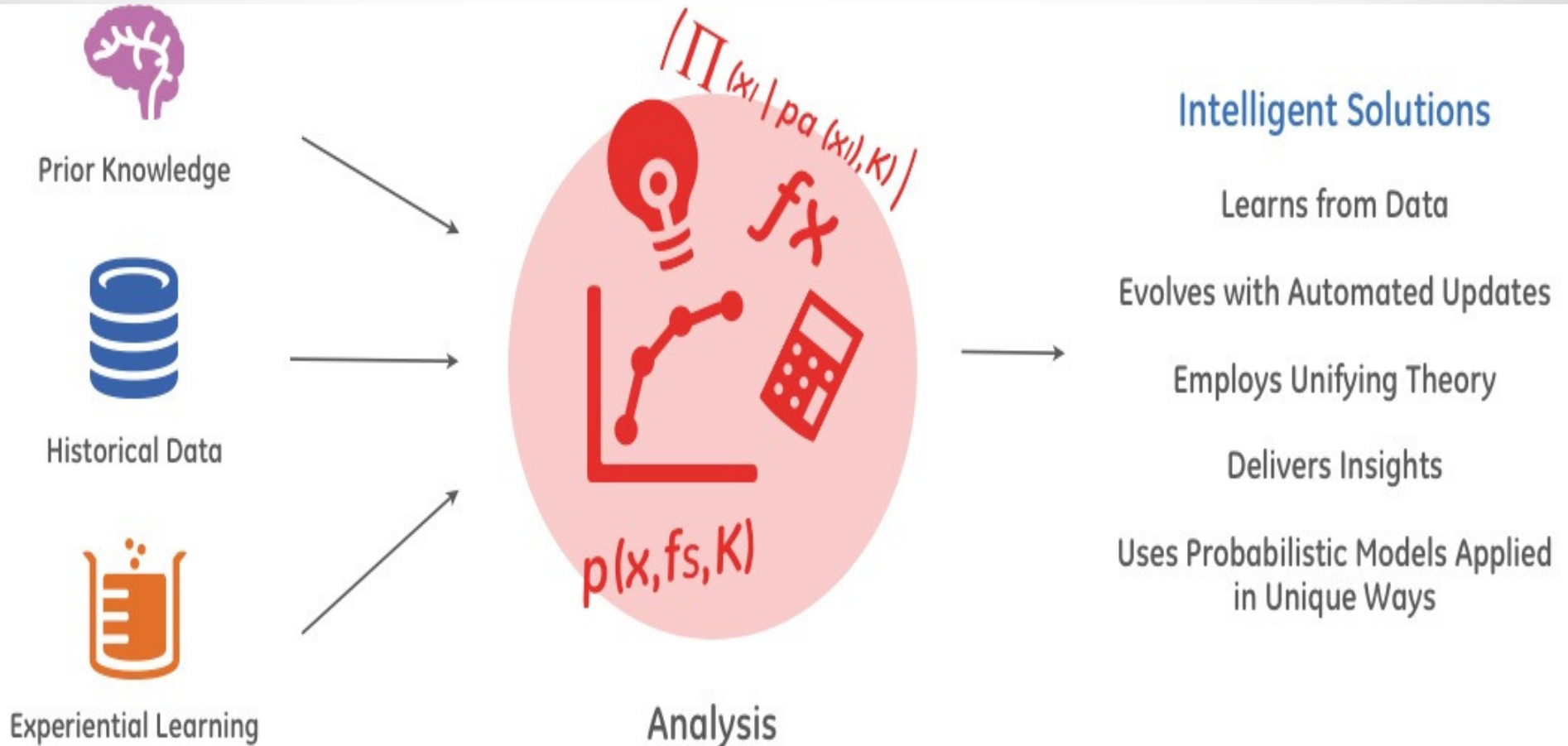
3 Big Data

Transforming massive volumes of information into intelligence

4 Analytics

Generating data-driven insights and enhancing asset performance

Apply Batch or Real-Time Analytics to the Machine-Generated Data



Cloud
for efficiency
and agility



Going mobile:
anytime/
anywhere
Access

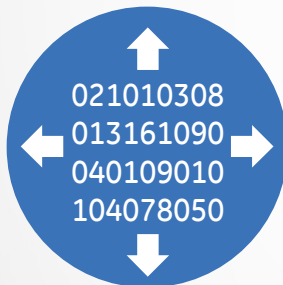


End-to-end
Security



Industrial Internet computing requirements

Predictive
insights from
Big Data

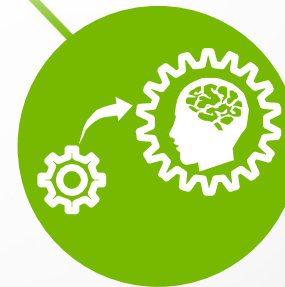


Consistent and
meaningful
**User
experience**

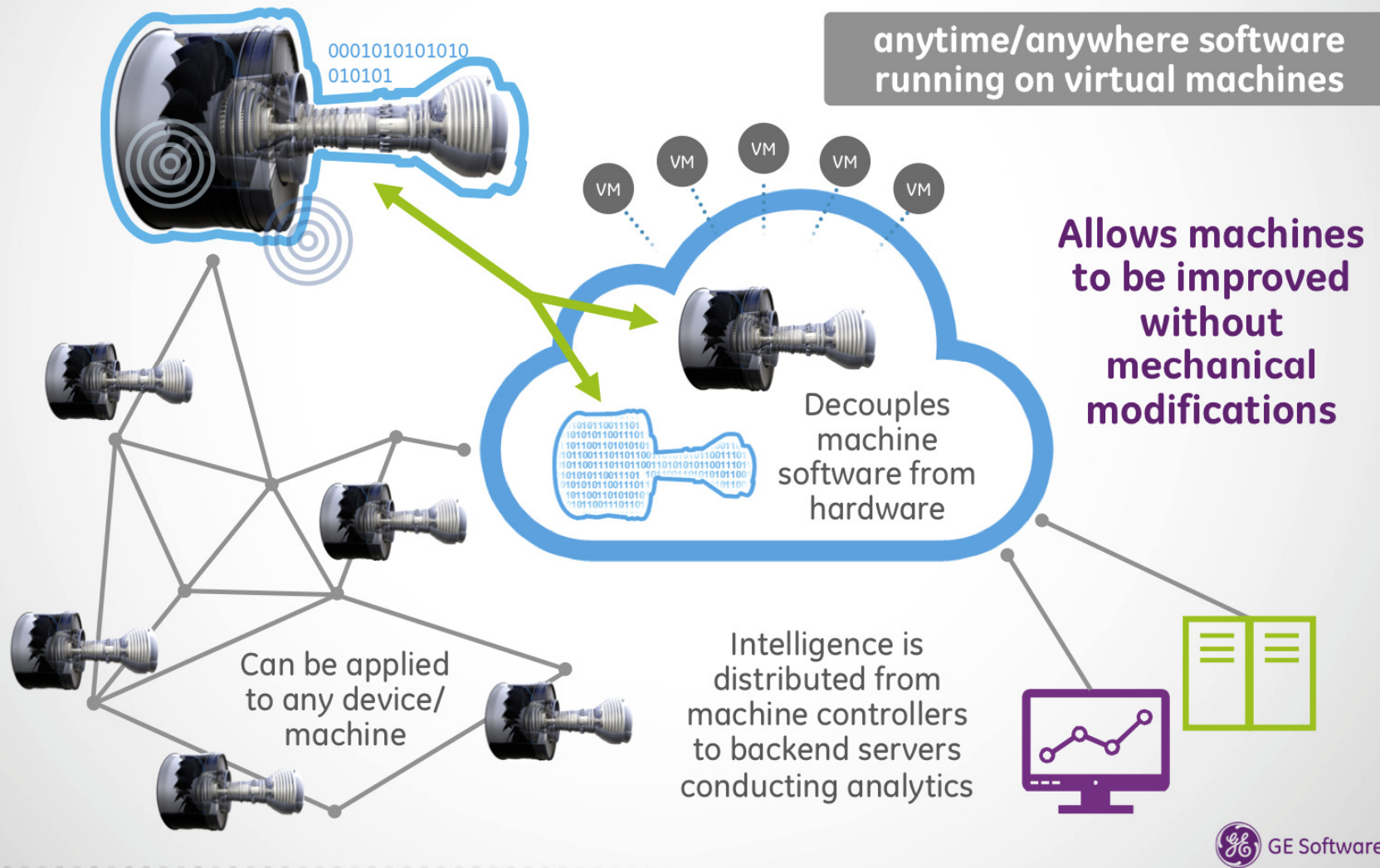
Cloud based Integrated
**Asset
Management**



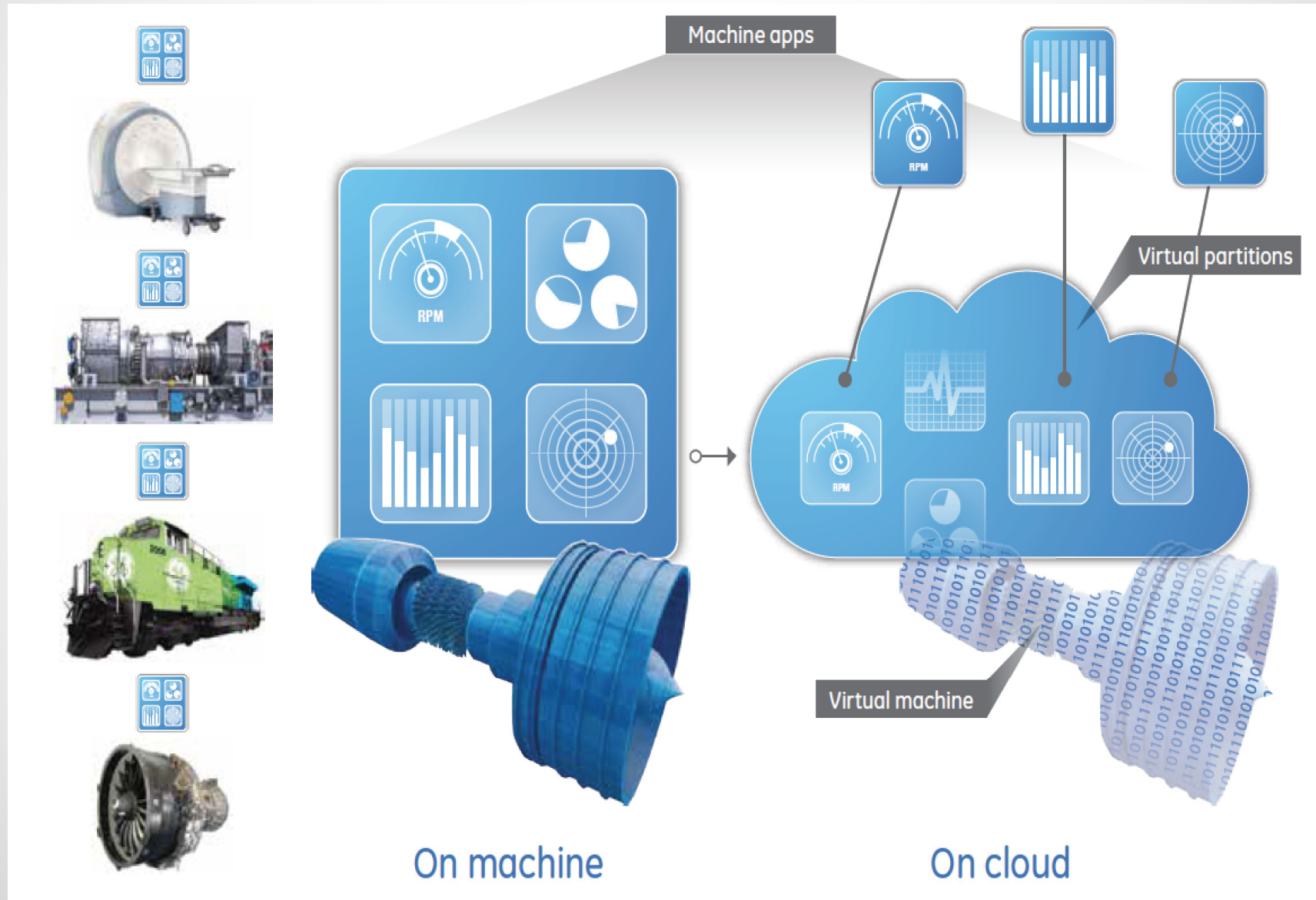
Transition to
"Brilliant machines"



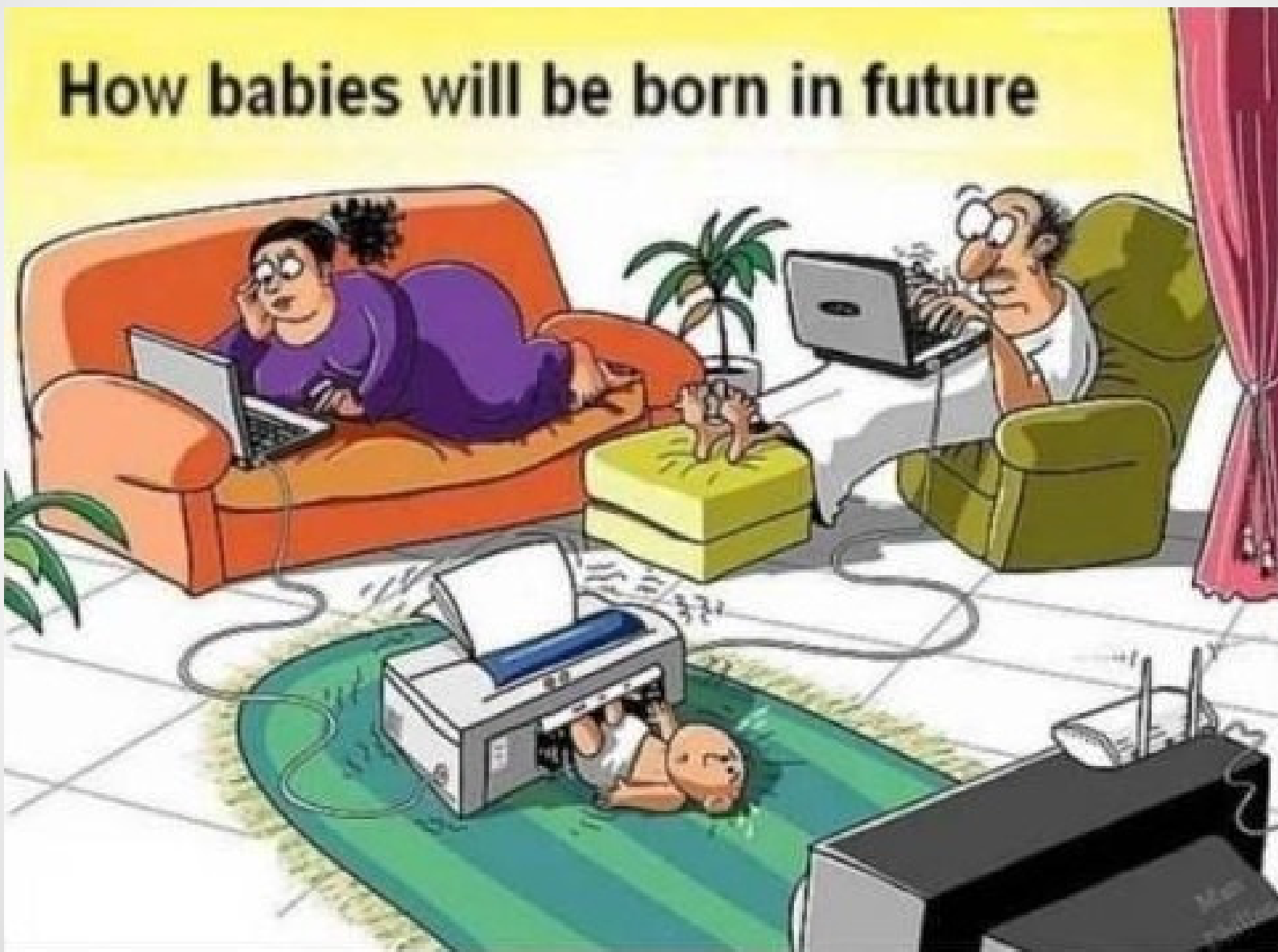
Software-defined Machines



Software Defined Machines



How babies will be born in future



Q&A

ShyamVaran@Gmail.com



Thank You!

