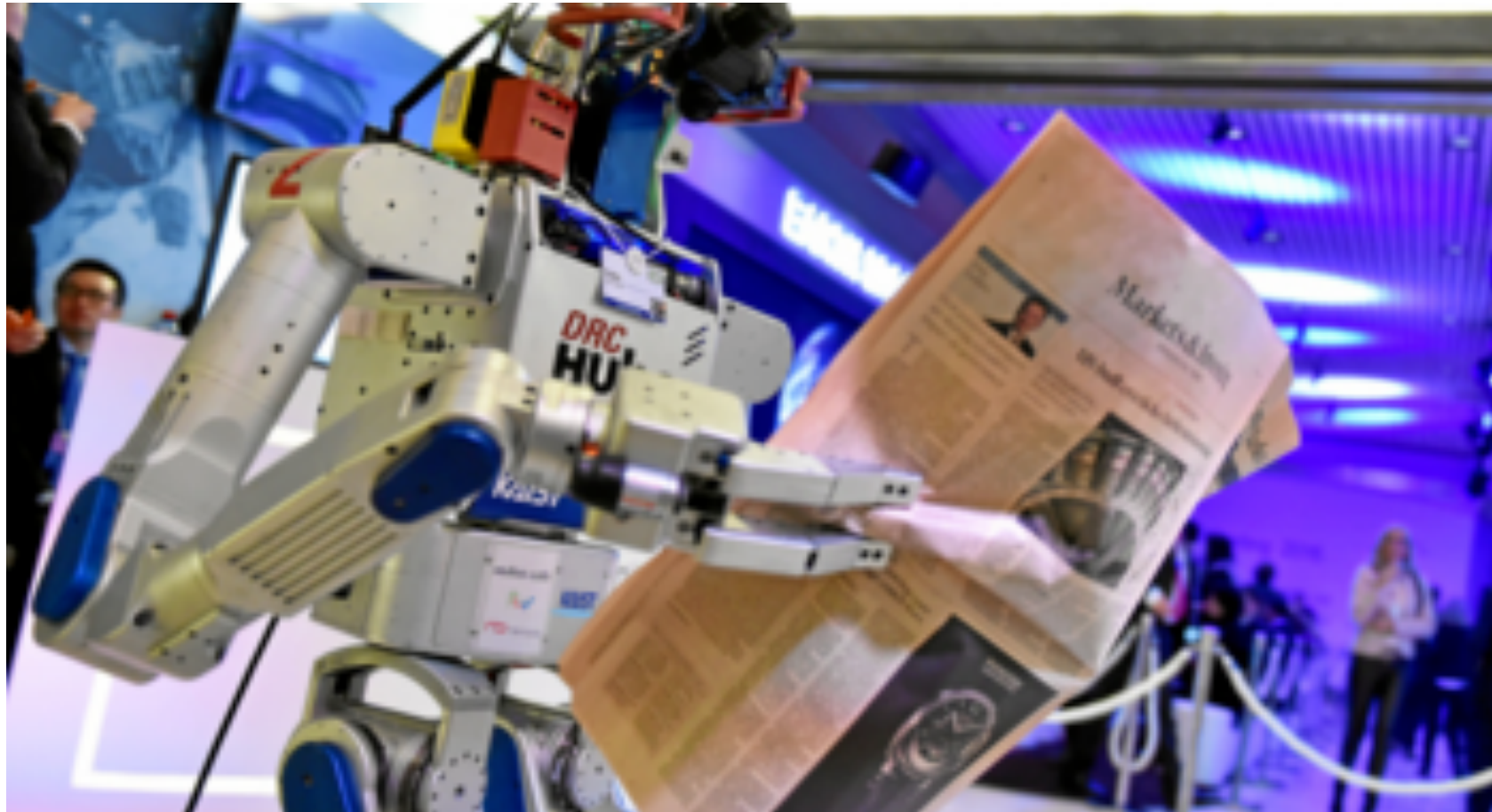


“Cyber Systems Security”
-
“Digital Assets are vulnerable and fragile”
Internet of Things

Adolf J. Doerig, January 27th,2016 HTA Lucerne



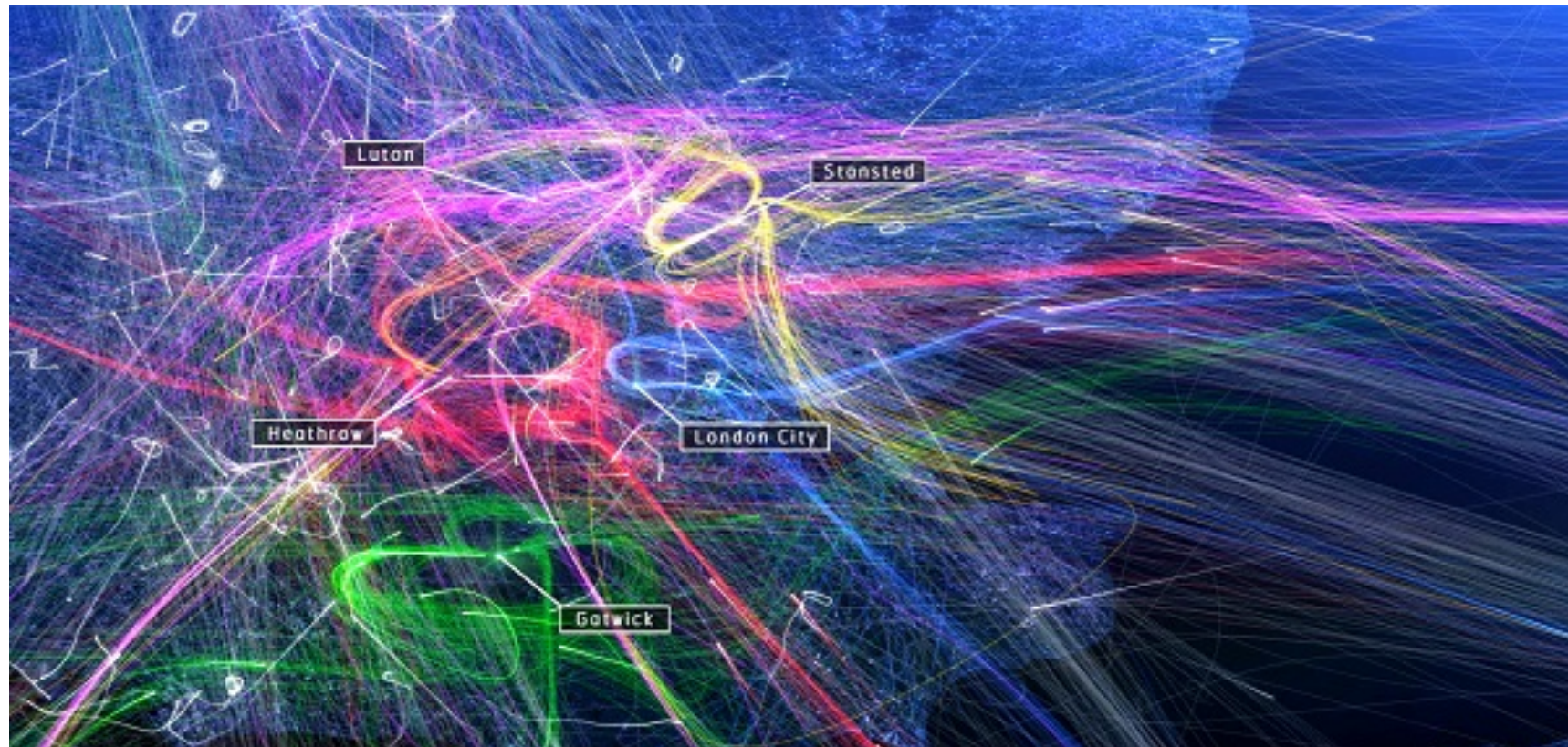
4th Industrial revolution (WEF)



Globaler, hochkomplexer Welthandel (WEF)



NATS - the UK's leading provider of air traffic control services.



Aircraft Engines

Situation

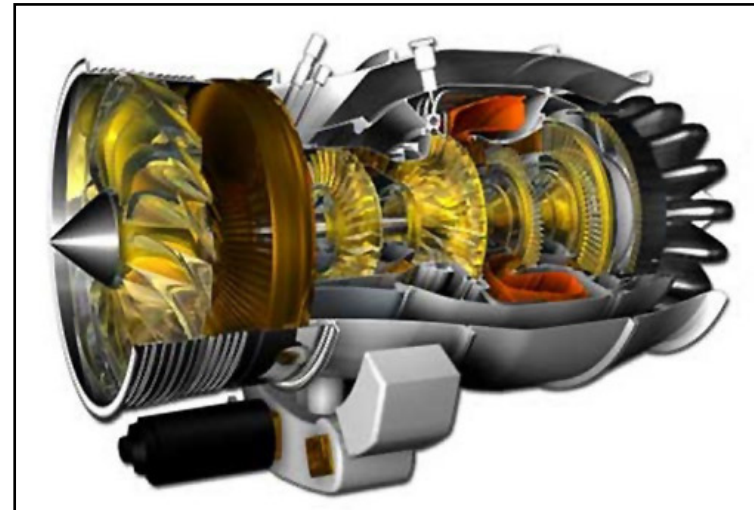
Multimillion \$ plane engines require parts, preventative maintenance and overhauls

Problem

Expensive emergency repairs, lack of parts on hand, steep regulatory penalties for mistakes

Solution

- 1000 sensors per engine
- Download after each landing
- Analytic dashboards for maintenance crews



Impact

- Predictive analytics forecast failures and parts acquisitions in advance
- Significantly reduced in flight failures
- Lower maintenance costs

Social robots (**JIBO**, **Amazon Echo**, **Sphero**, ..)





Attack Surface and Threat Environment



2007

2015

2020

Digital Content

Attack Surface and Threat Environment

Web Front Ended
apps



2007

There's an "app" for
that



2015

Big Data Apps
Everywhere!



2020

Apps

Attack Surface and Threat Environment

Dawn of
Smartphones



2007

Smartphone/tablet
ubiquity



2015

Internet
of things



2020

Devices

Attack Surface and Threat Environment

MySpace



2007

Focus on
monetizing



2014

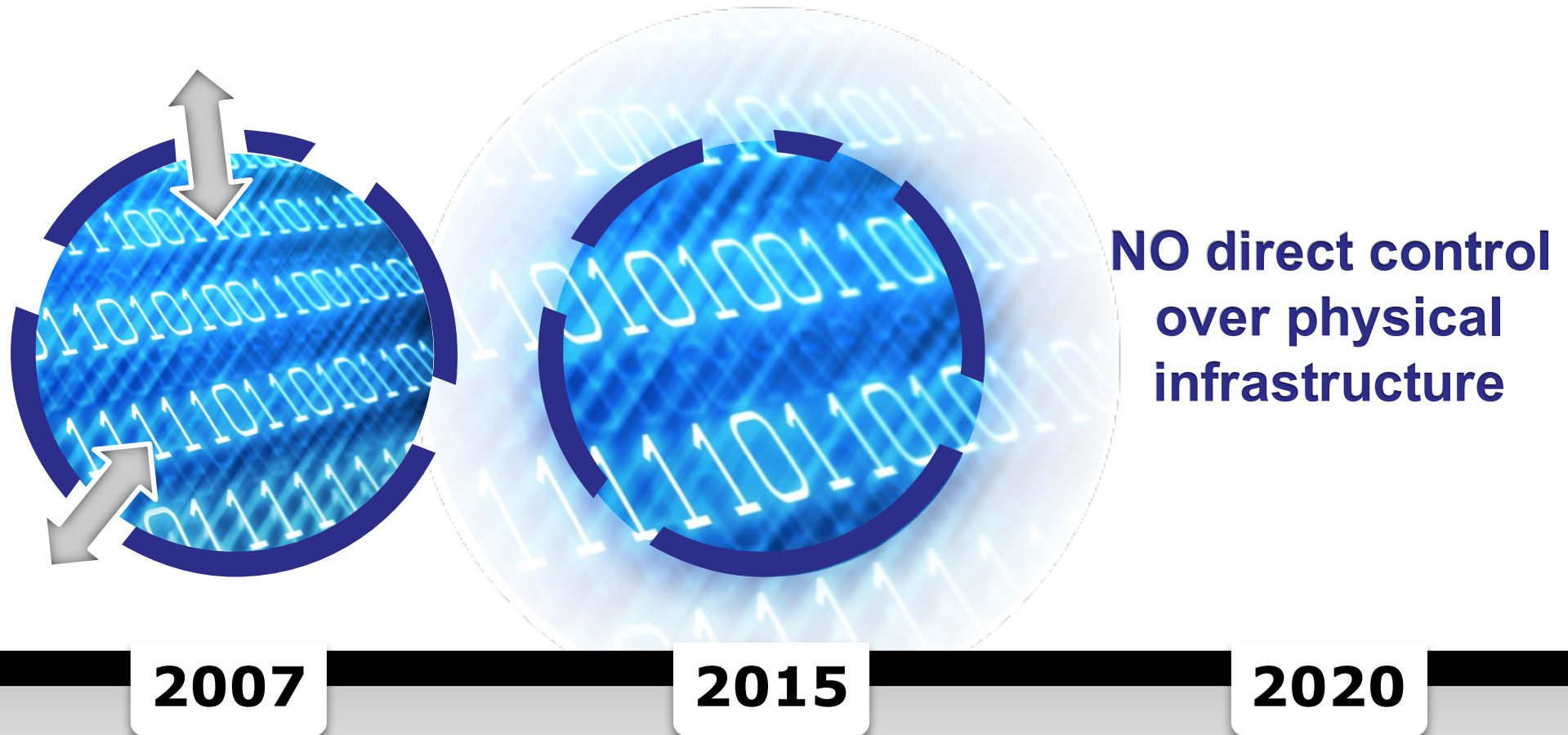
Total
Commercialization of
social media: **absence
of privacy**



2020

Social Media

Attack Surface and Threat Environment



Perimeter

Attack Surface and Threat Environment



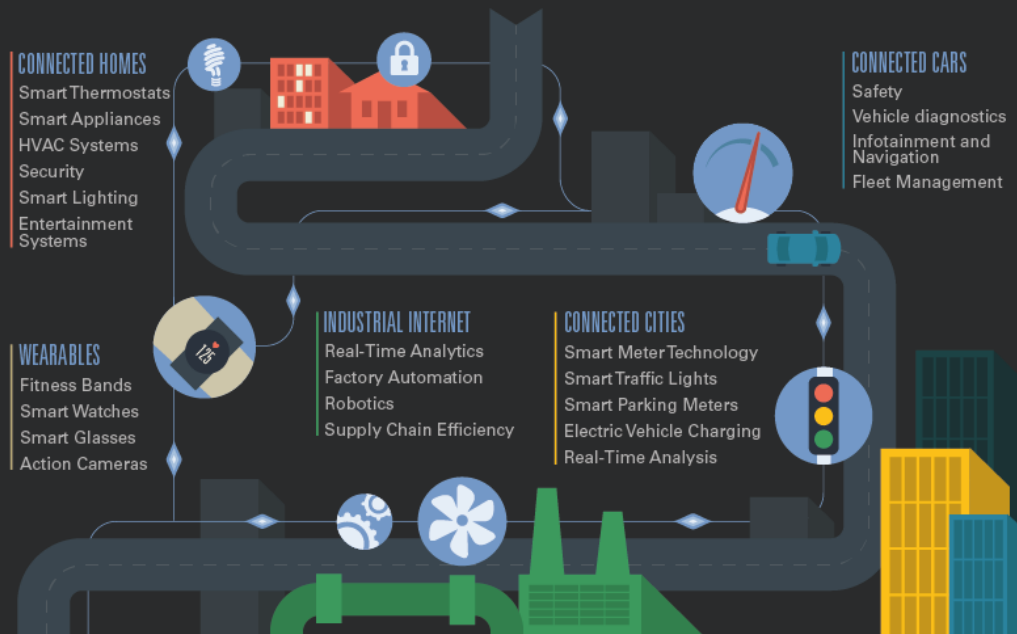
IoT THE INTERNET OF THINGS

PREPARED BY
GOLDMAN SACHS
GLOBAL INVESTMENT RESEARCH



WHAT IS THE INTERNET OF THINGS?

The Internet of Things connects devices such as everyday consumer objects and industrial equipment onto the network, enabling information gathering and management of these devices via software to increase efficiency, enable new services, or achieve other health, safety, or environmental benefits.



HOW DID WE GET HERE?

With key obstacles gone, the cost of connectivity has declined at the same time that new ways to analyze mountains of data have developed.

COST OF SENSORS

\$1.30 → .60
AVG. COST
over the past 10 years.

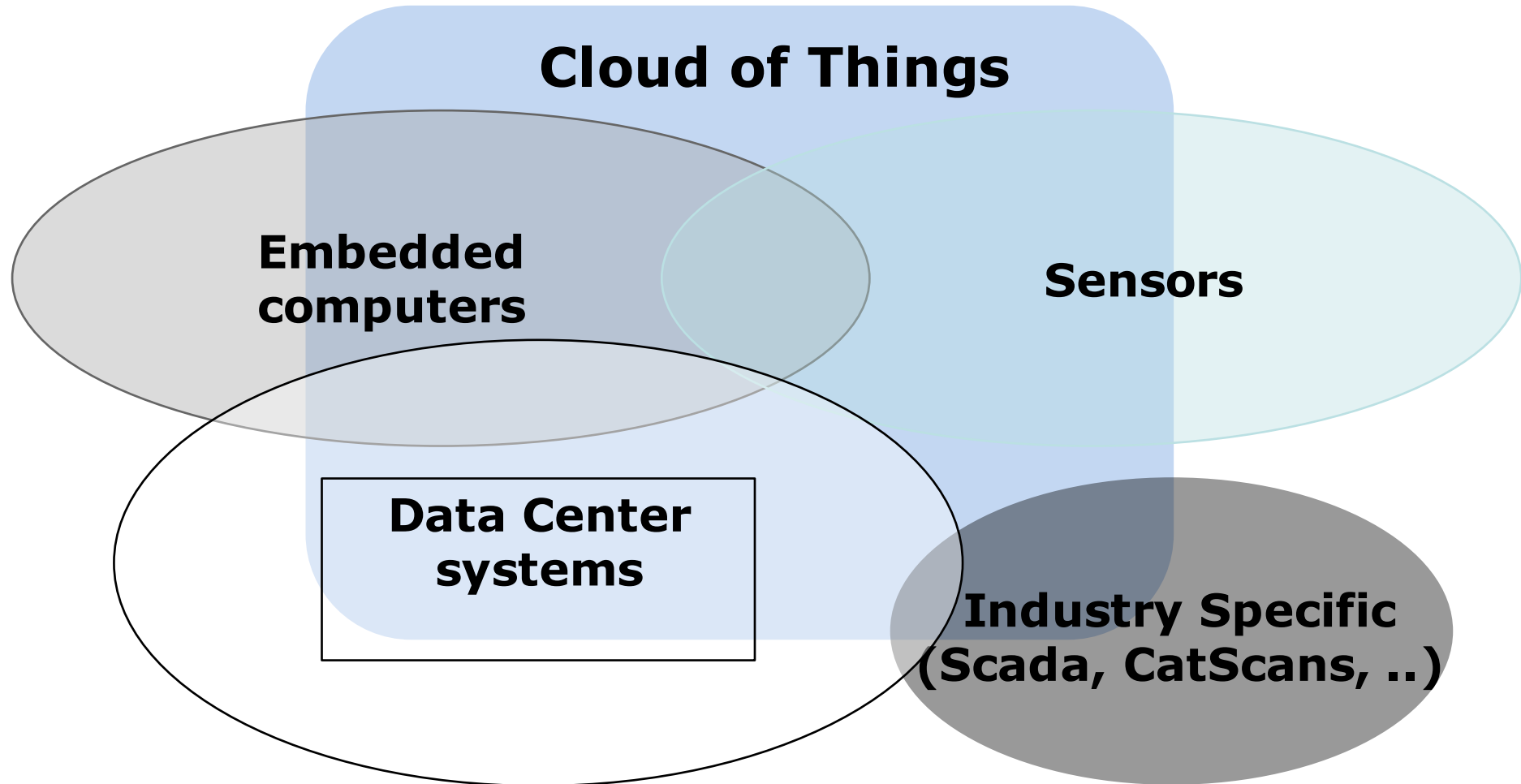
COST OF BANDWIDTH

↓ 40x
over the past 10 years.

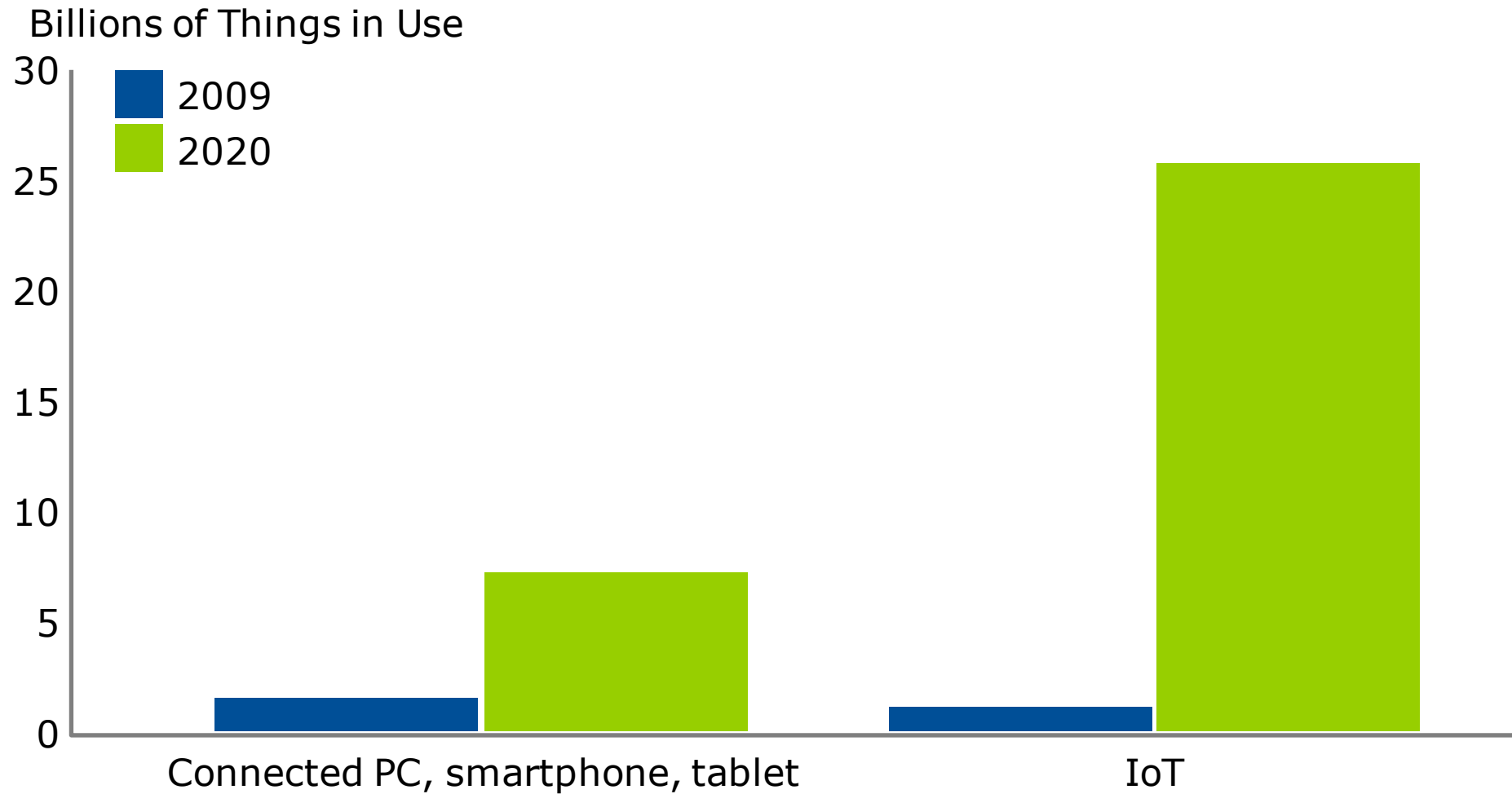
COST OF PROCESSING

↓ 60x
over the past 10 years.

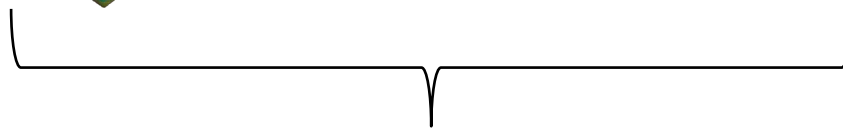
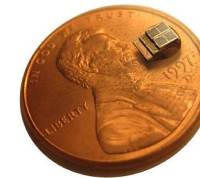
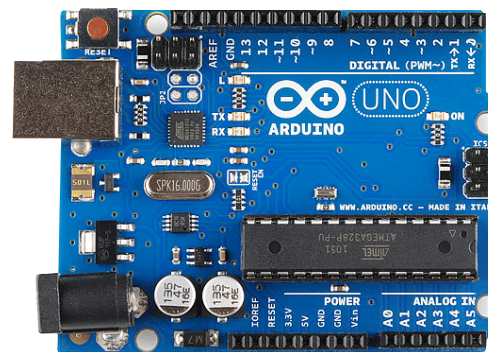
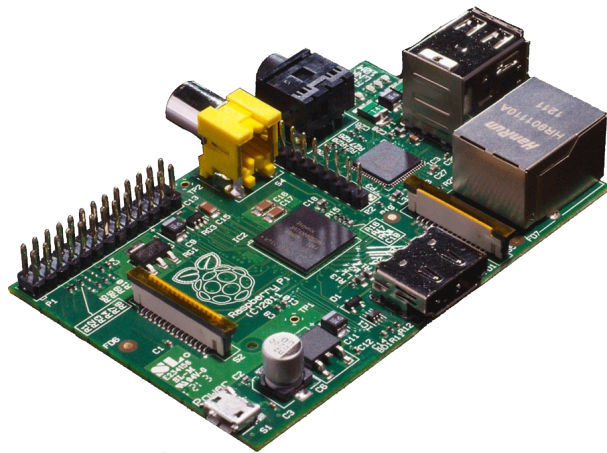
IoT, Sensors, and Tiny Computers



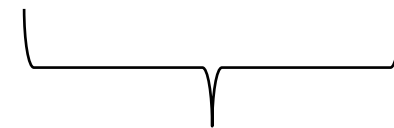
Gartner: Growth of the Internet of Things



Sensors: Raspberry Pi, Arduino, and Motes

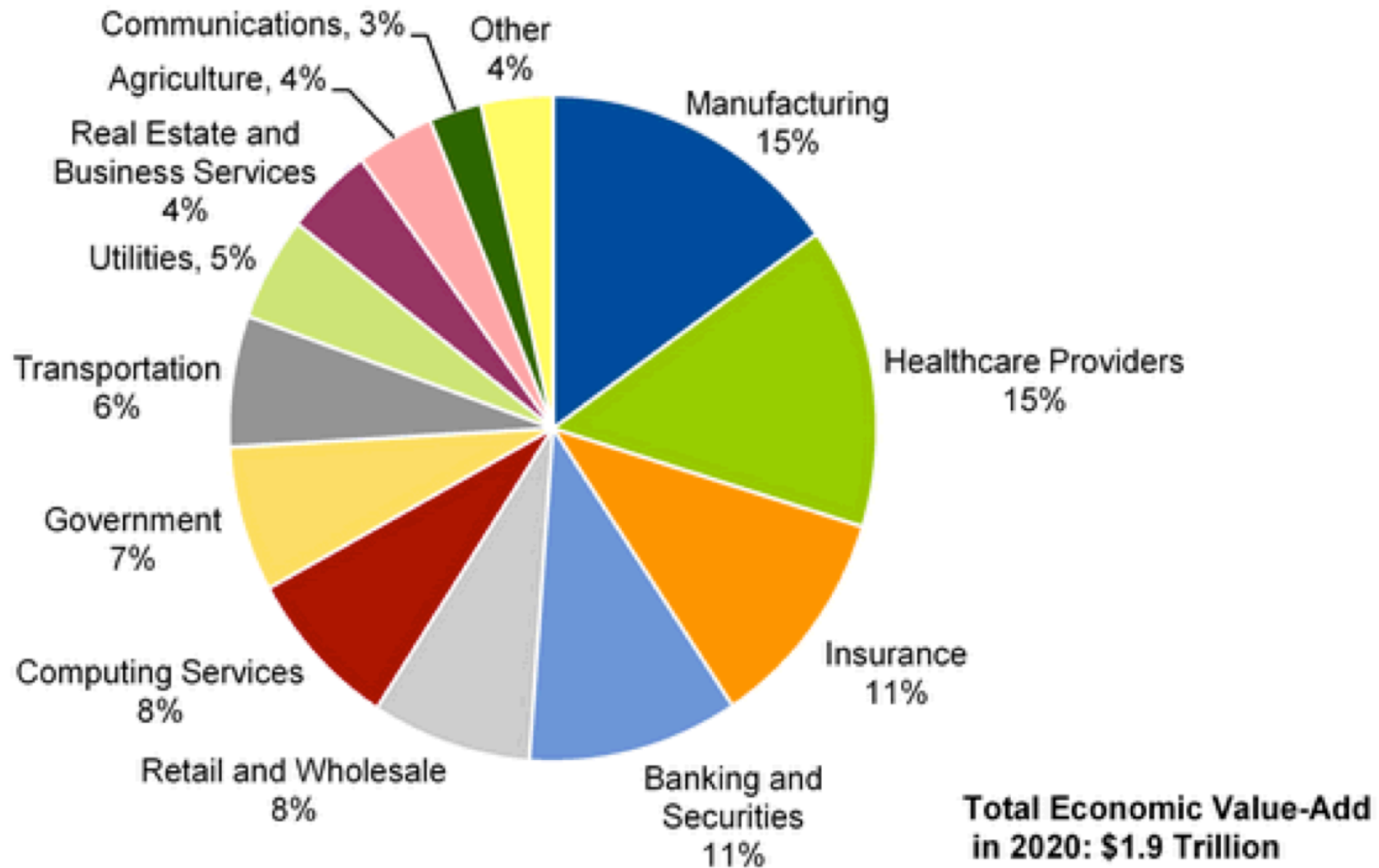


Programmable



Only Emits Data

Internet of Things by Industry, 2020



Libelium Smart World

Air Pollution

Control of CO₂ emissions of factories, pollution emitted by cars and toxic gases generated in farms.

Forest Fire Detection

Monitoring of combustion gases and preemptive fire conditions to define alert zones.

Wine Quality Enhancing

Monitoring soil moisture and trunk diameter in vineyards to control the amount of sugar in grapes and grapevine health.

Offspring Care

Control of growing conditions of the offspring in animal farms to ensure its survival and health.

Sportsmen Care

Vital signs monitoring in high performance centers and fields.

Structural Health

Monitoring of vibrations and material conditions in buildings, bridges and historical monuments.

Quality of Shipment Conditions

Monitoring of vibrations, strokes, container openings or cold chain maintenance for insurance purposes.

Smartphones Detection

Detect iPhone and Android devices and in general any device which works with Wifi or Bluetooth interfaces.

Perimeter Access Control

Access control to restricted areas and detection of people in non-authorized areas.

Radiation Levels

Distributed measurement of radiation levels in nuclear power stations surroundings to generate leakage alerts.

Electromagnetic Levels

Measurement of the energy radiated by cell stations and WiFi routers.

Traffic Congestion

Monitoring of vehicles and pedestrian affluence to optimize driving and walking routes.

Smart Roads

Warning messages and diversions according to climate conditions and unexpected events like accidents or traffic jams.

Smart Lighting

Intelligent and weather adaptive lighting in street lights.

Intelligent Shopping

Getting advices in the point of sale according to customer habits, preferences, presence of allergic components for them or expiring dates.

Noise Urban Maps

Sound monitoring in bar areas and centric zones in real time.

Water Leakages

Detection of liquid presence outside tanks and pressure variations along pipes.

Vehicle Auto-diagnosis

Information collection from CanBus to send real time alarms to emergencies or provide advice to drivers.

Item Location

Search of individual items in big surfaces like warehouses or harbours.

Waste Management

Detection of rubbish levels in containers to optimize the trash collection routes.

Smart Parking

Monitoring of parking spaces availability in the city.

Golf Courses

Selective irrigation in dry zones to reduce the water resources required in the green.

Water Quality

Study of water suitability in rivers and the sea for fauna and eligibility for drinkable use.

Insurers Wake Up to Personal eHealth



BodyTel (blood pressure)

GlucoTel (blood sugar)



PillCam (digestive track)

iHealth Oximeter (pulse, oxygen)



Moticon (pressure, temp)



BodyGuardian
(cardio)

The Data Sensors Collect

- Events generating data
 - Vibration
 - Temperature, humidity
 - Wind speed, direction
 - Air/liquid flow or pressure
 - Location, navigation
 - Tilt level, rotation
 - Light, sound
 - Radiation, chemicals
 - Biological
 - Heart rate, blood pressure
 - Brain activity, chemicals
 - Inventory, sales (RFID)



Data format: JSON or proprietary

Manufacturing Line Sensor Data

- Smart factory process control
 - Thermals, triggers, speed, tolerances...
 - Pressure, valve state
 - Corrosion, gas detector

- Analytics
 - Quality yield by machine
 - False positives on testing machines
 - As built profit analysis
 - Warranty exposures
 - Supplier quality exposures
 - Recalls
 - End-to-end quality
 - The biggest magnifying glass



Retail: Tracking Everything

- Where there's data, there are analytic opportunities
 - RFID: the quiet revolution
- Analytics
 - Aisle geo-navigation
 - Home appliances assist reorder
 - In-store recommendations
 - Anti theft comparison of basket versus smart shelf events
 - Smarter replenishment
 - Consistent customer experience
 - Sell-by date repricing or mark down

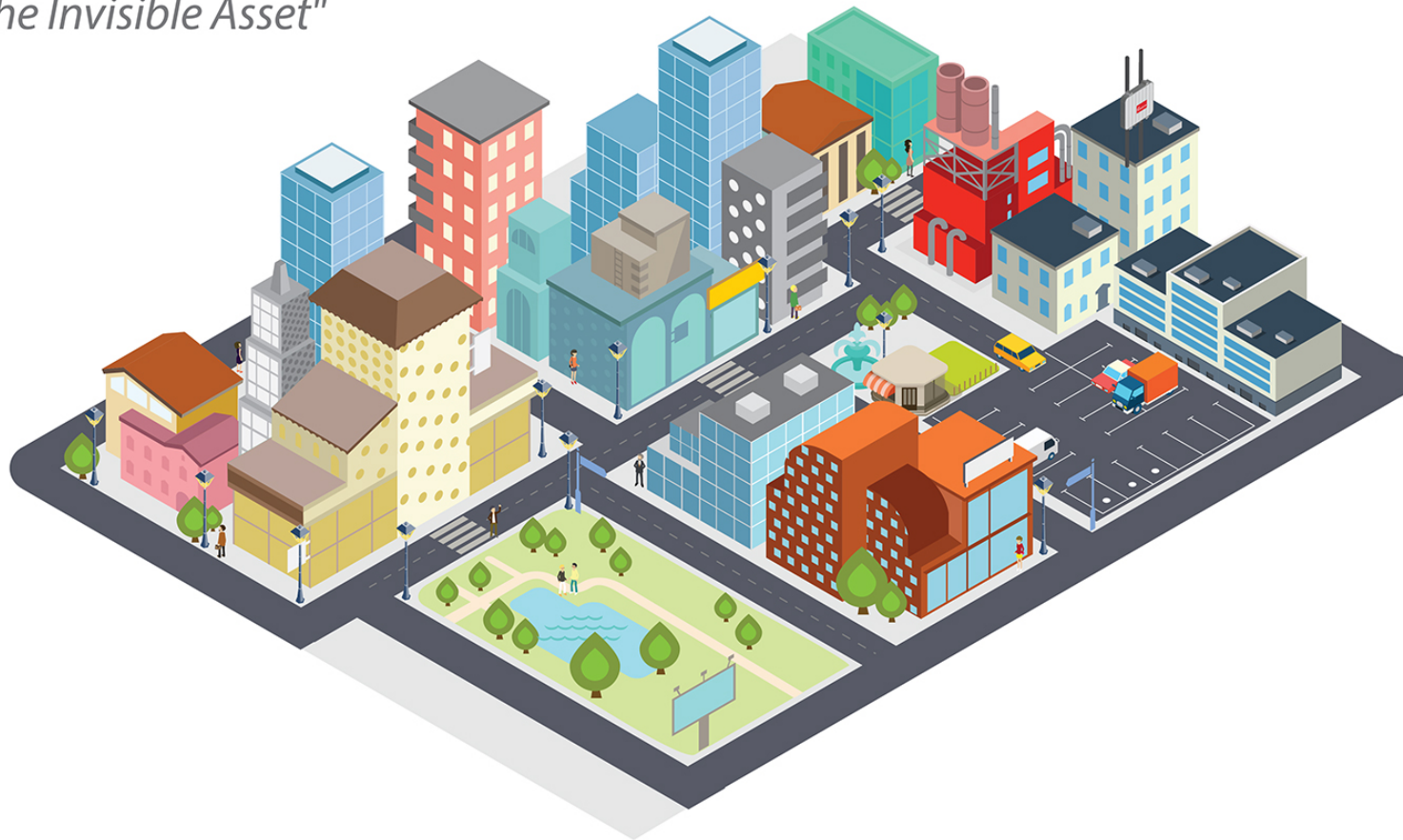


M2M
Machine-to-machine

IoT Security Infographic

Privacy, Authenticity, Confidentiality and Integrity
of the Sensor Data

"The Invisible Asset"



ISO/IEC 27001 in Practice



**“We don’t pay much attention to information security.
We’re hoping our competitors will steal our ideas
and become as unsuccessful as we are.”**

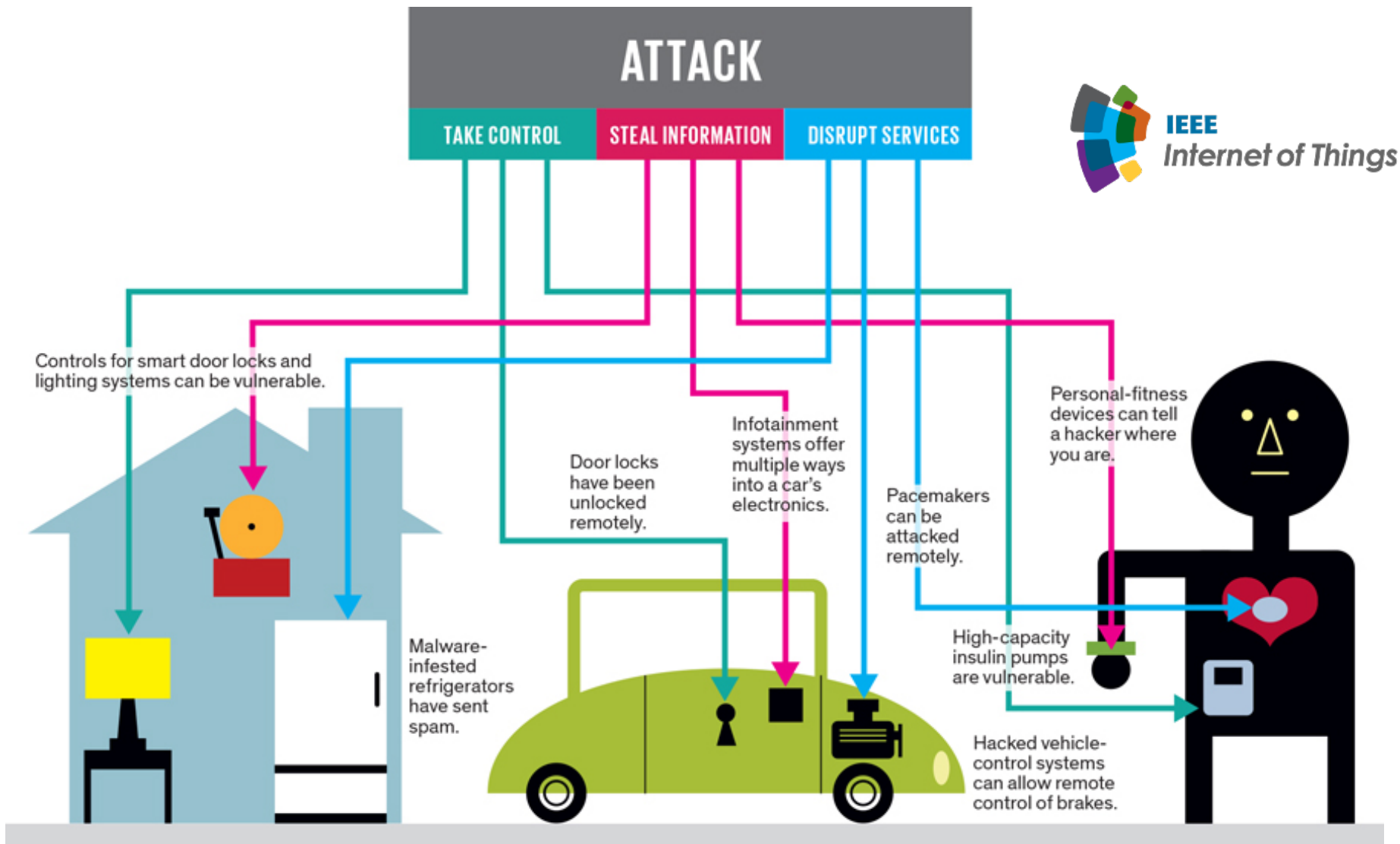


LoRa[®] Alliance

Wide Area Networks for IoT



How to Build a Safer Internet of Things



Thesis - Today's IoT is full of security flaws. We must do much better.

- Transformation of Infrastructure, Business and Threat Makes Traditional Cyber Security Less Relevant
- New Strategies Must be Based on Risk, Context and be Responsive To Rapidly Changing Environments
- Big Data, Analytics Can Be Leveraged to Create Intelligence-Driven Security Models that Meet These Needs
- Anti-Fragility in a System of Systems Engineering Approach

Wrap up

“We cannot solve problems by using the same kind of thinking we used when we created them.”

Albert Einstein

