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IOT / M2M

Rıza DURUCASUGİL
Director, Innovation and R&D Strategies
Celtic Plus Vice-Chair
NetWorld2020 Steering Board Member

Celtic-Plus
Smart Connected World
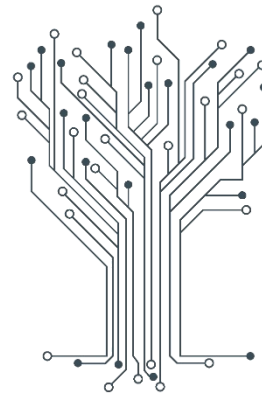
Netas at a glance

Turkey's #1 System Integrator

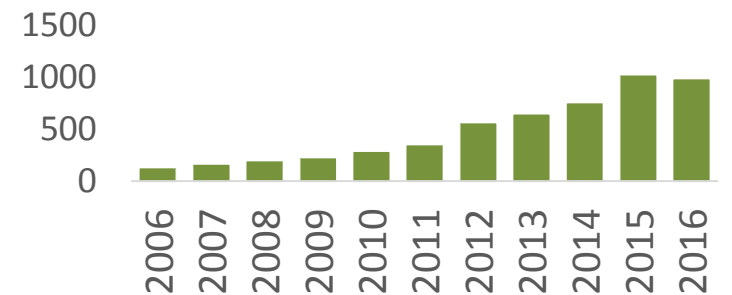2016 Top 500 ICT Companies Survey – "Systems Integrator Of The Year"

Solid R&D experience in IT sector
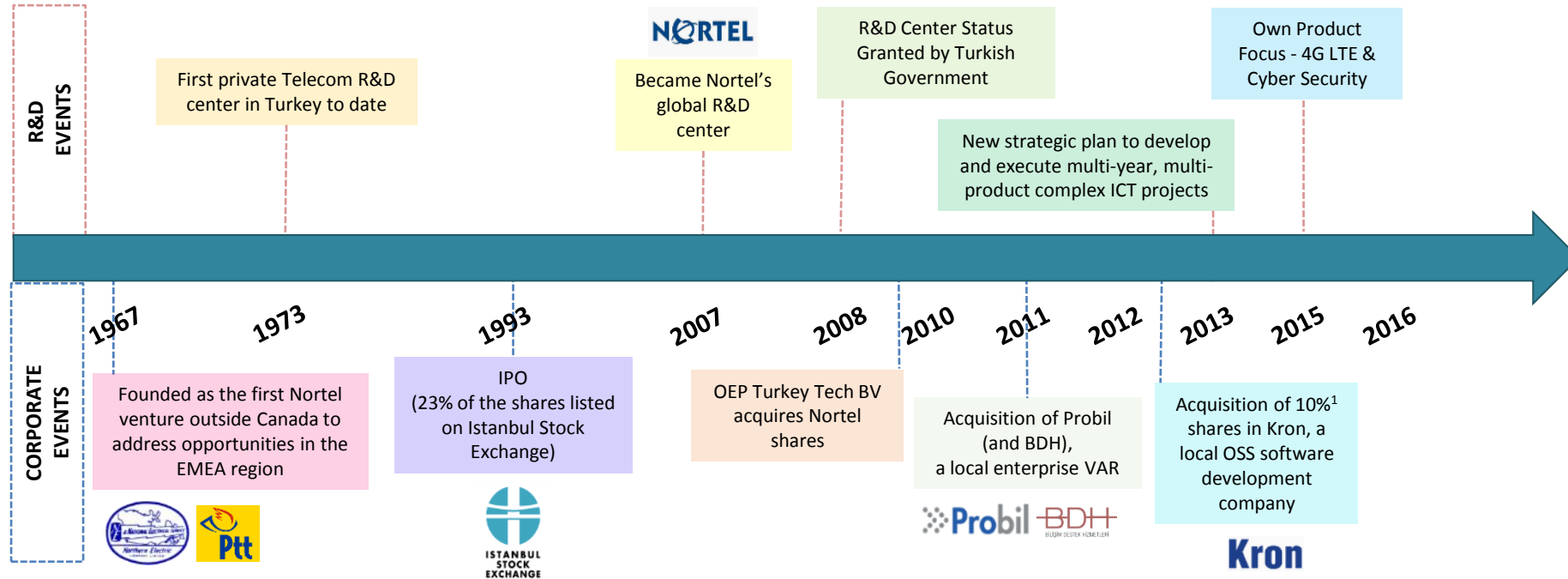
$500M software exports within last 10 years

International markets constitute 20% of our total sales revenue

Sales revenue increased 10 times in the last 10 years

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Netaş History

- **44 years R&D experience**, first and largest private telecom R&D in Turkey
- Develops ICT software solutions for **more than 200 global operators**

R&D EVENTS

- First private Telecom R&D center in Turkey to date
- Became Nortel's global R&D center (NORTEL)
- R&D Center Status Granted by Turkish Government
- New strategic plan to develop and execute multi-year, multi-product complex ICT projects
- Own Product Focus - 4G LTE & Cyber Security

Timeline: 1967 · 1973 · 1993 · 2007 · 2008 · 2010 · 2011 · 2012 · 2013 · 2015 · 2016

CORPORATE EVENTS

- Founded as the first Nortel venture outside Canada to address opportunities in the EMEA region
- IPO (23% of the shares listed on Istanbul Stock Exchange)
- OEP Turkey Tech BV acquires Nortel shares
- Acquisition of Probil (and BDH), a local enterprise VAR
- Acquisition of 10%[1] shares in Kron, a local OSS software development company

- Turkey's **software export champion**

2007 Turkey SW Export Champion	2008 Turkey SW Export Champion	2009 Turkey SW Export first runner-up	2010 Turkey SW Export Champion	2011 Turkey SW Export first runner-up	2012 Turkey SW Export first runner-up	2013 Turkey SW Export first runner-up	2014 Turkey SW Export Champion	2015 Turkey SW Export Champion

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Strong R&D Technology Know-how

Commercial and Academic R&D Output

220 patent applications in the last 3 years

$500M software exports in the last 10 years

Technology Know-how

Cyber Security

Internet of Things

Multimedia

4.5 G and 5G

Defense Communication Solutions

Applications

Competent Workforce

800 + R&D engineers

Age Average **33**

National and International Partnerships

Vice Chairman of the Board of Celtic Plus

European Union Networld 2020 Board Member

ETSI membership / oneM2M studies

5GIA Membership

25 Application to H2020-Celtic Plus-ITEA

Over 200 collaborations with 16 Different European Countries (164 institutions - 39 universities)

4.5G Base Station-Rel 12/13 "ULAK" Consortium

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Definition of Internet of Things - IOT

- An IOT Solution that collects data from physical objects analyzes that data and takes action to accomplish a business goal
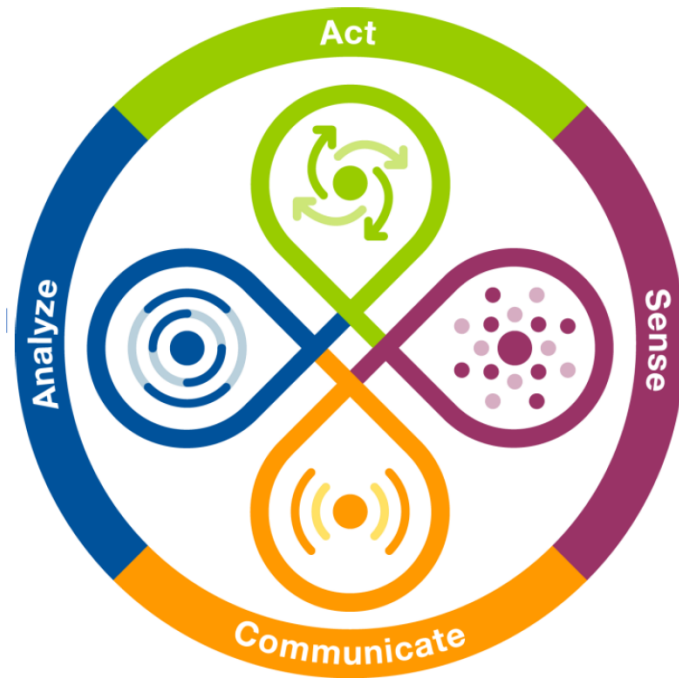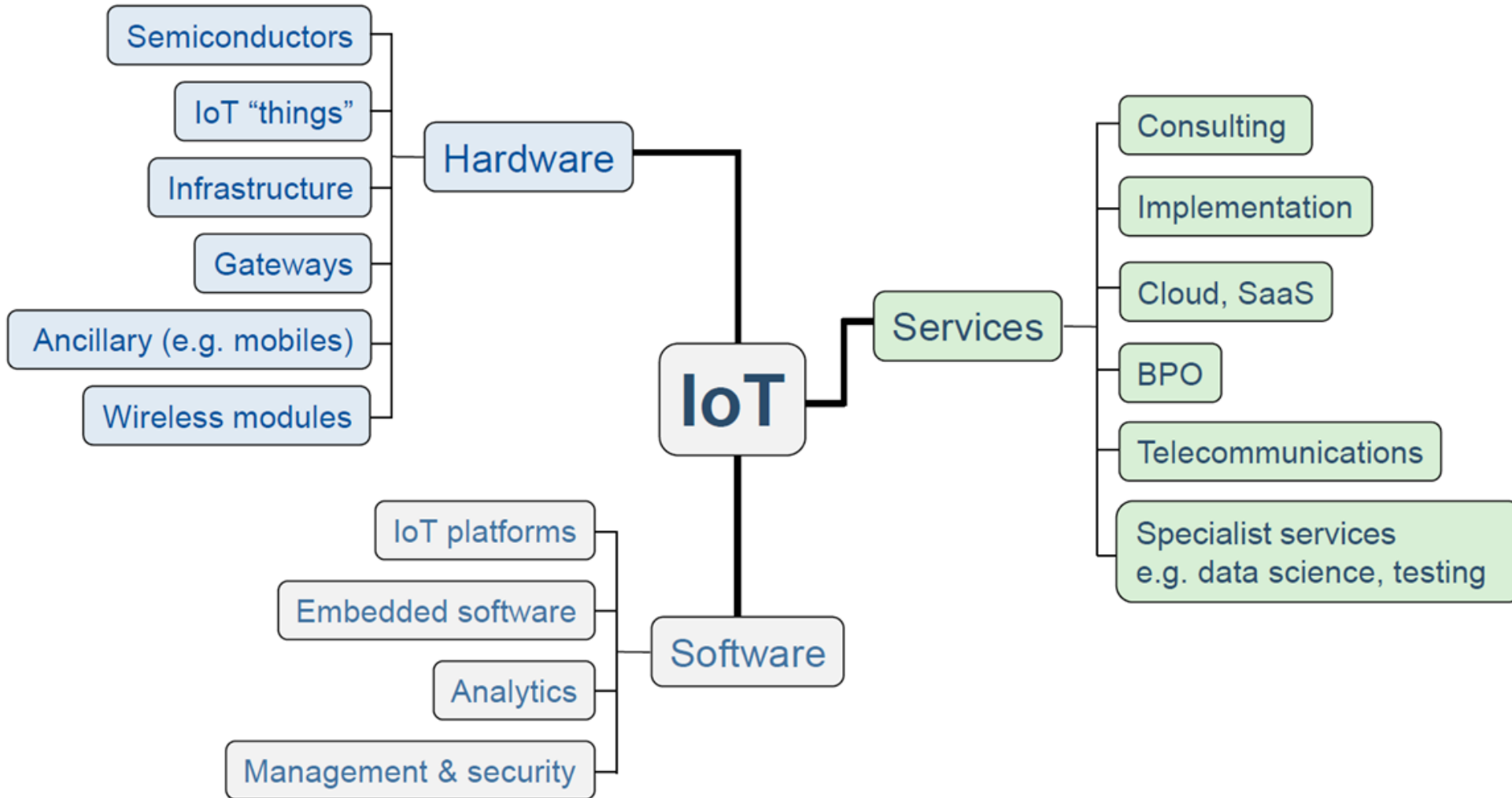
- "IOT uses information and communication technologies (ICTs) to improve quality of life, efficiency of urban operation and services, and competitiveness, while ensuring that it meets the needs of present and future generations with respect to economic, social, environmental as well as cultural aspects".
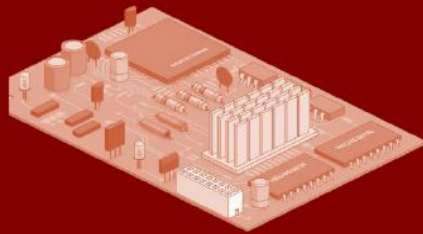
A. Al-Fuqaha, M. Guizani, M. Mohammadi, M. Aledhari and M. Ayyash, "Internet of Things: A Survey on Enabling Technologies, Protocols, and Applications," in *IEEE Communications Surveys & Tutorials*, vol. 17, no. 4, pp. 2347-2376, Fourthquarter 2015.

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IOT - Overall Pictures

- Improves Performance
- Reduce Costs
- Creates Innovative Services
- Generates New Revenue Streams

A. Al-Fuqaha, M. Guizani, M. Mohammadi, M. Aledhari and M. Ayyash, "Internet of Things: A Survey on Enabling Technologies, Protocols, and Applications," in *IEEE Communications Surveys & Tutorials*, vol. 17, no. 4, pp. 2347-2376, Fourthquarter 2015.

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Main Components of IOT

Breaking Down an IOT Solution

Edge

- Devices and Appliances
- Sensors & Actuators
- Gateways/Aggregation

Platform

- Data Ingestion
- Data Analytics
- Policy & Orchestration
- Device and Platform Mgmt.
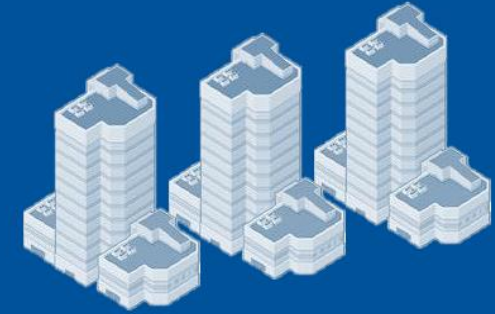
Enterprise

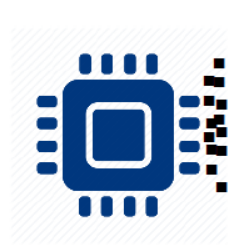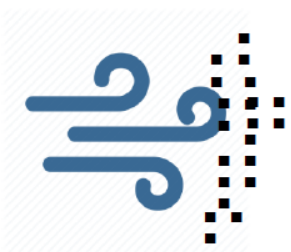- Business Applications
- Business Processes
- Edge Devices

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Breaking Down IOT: Edge Devices

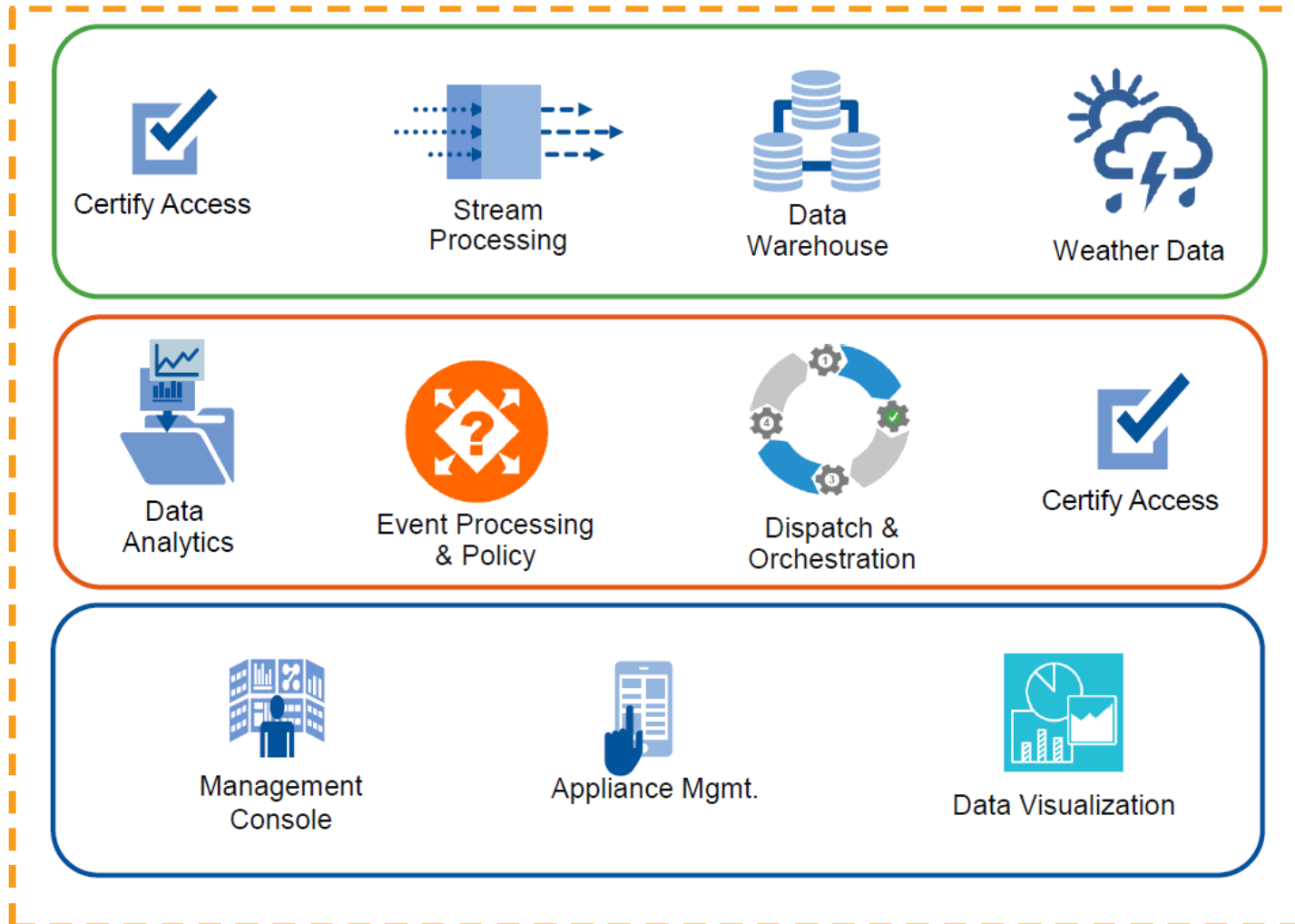| Environment	Sensors	Appliances/Things	Aggregation/Gateways
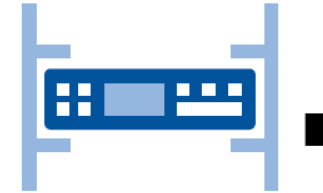
- Analog
- Real time

- Digital
- Embedded OS
- Near real time
- Proprietary protocol over serial bus

- Basic analytics
- Event-driven or interval polling
- Larger message
- Proprietary protocol over 802.X

- Optional
- Moderate analytics
- Event-driven or interval polling
- Largest message
- HTTP or MQTT over Ethernet

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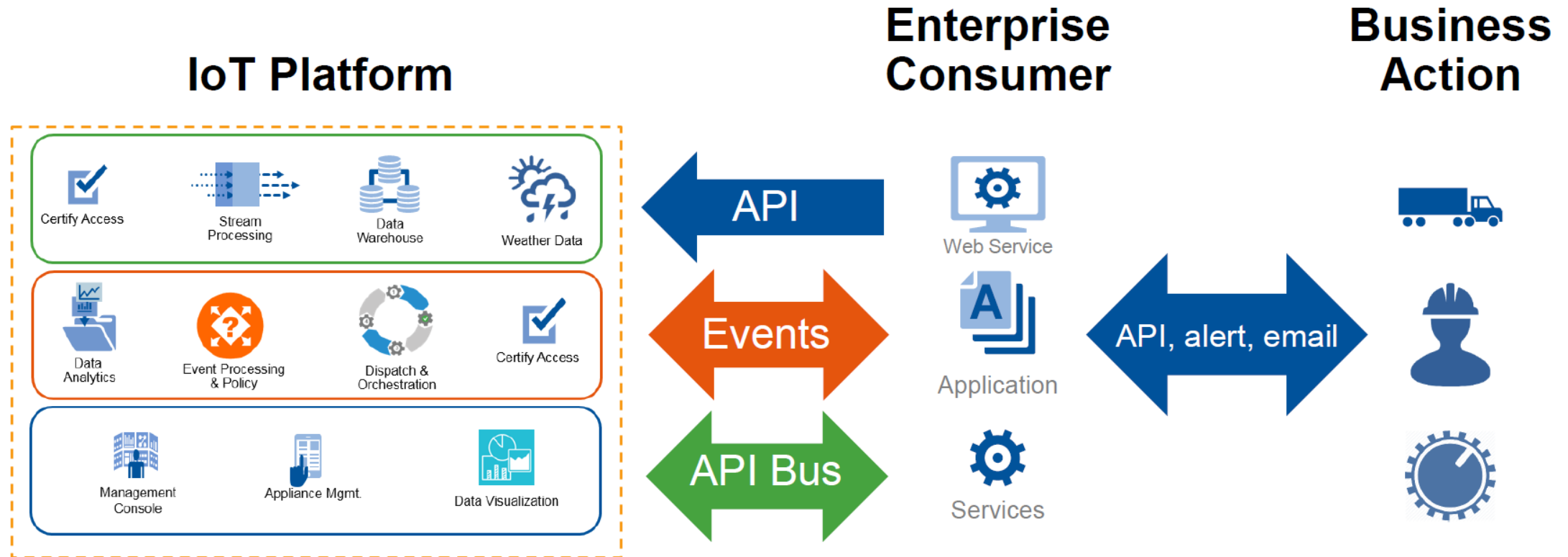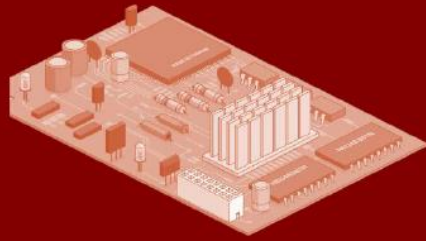# Breaking Down IOT: Platform

Data Ingestion

- Certify Access
- Stream Processing
- Data Warehouse
- Weather Data

Intelligence and Action

- Data Analytics
- Event Processing & Policy
- Dispatch & Orchestration
- Certify Access

Platform Management

- Management Console
- Appliance Mgmt.
- Data Visualization

Getting Data Out of the Platform

IoT Platform

Enterprise Consumer

Business Action

Certify Access

Stream Processing

Data Warehouse

Weather Data

Data Analytics

Event Processing & Policy

Dispatch & Orchestration

Certify Access

Management Console

Appliance Mgmt.

Data Visualization

API

Events

API Bus

Web Service

Application

Services

API, alert, email

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Future of the IOT

IoT Edge

- Commoditization of sensors
- Innovation of "things"
- Protocol and data consolidation
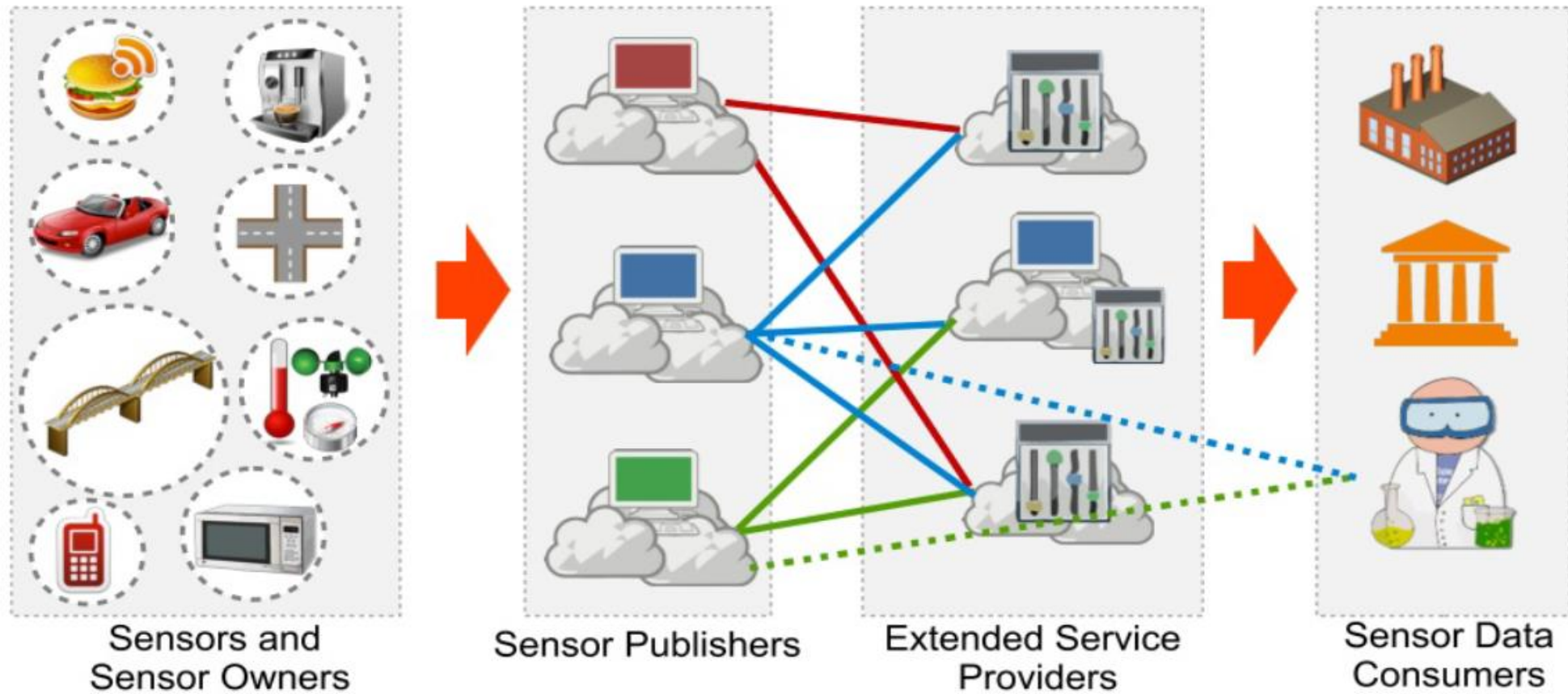- New attack surface

IoT Platform

- Volatile, rapidly evolving market
- Point solutions first, then general purpose
- Hyperscale cloud providers have advantage
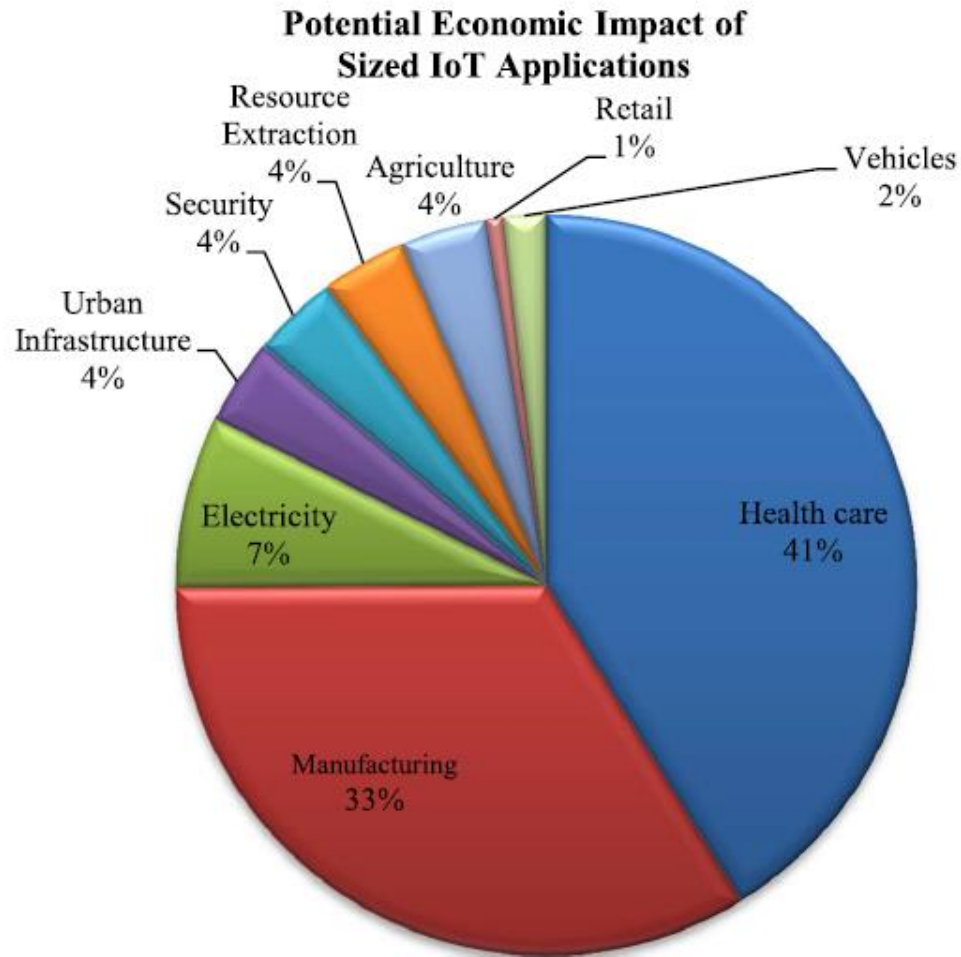- Data flow is new intellectual property

Enterprise

- Automation drives security
- Additional security and management vendors
- New IoT architect skills

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The Sensing As A Service Model

Sensors and Sensor Owners

Sensor Publishers

Extended Service Providers

Sensor Data Consumers

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IOT - Potential Impact by 2025

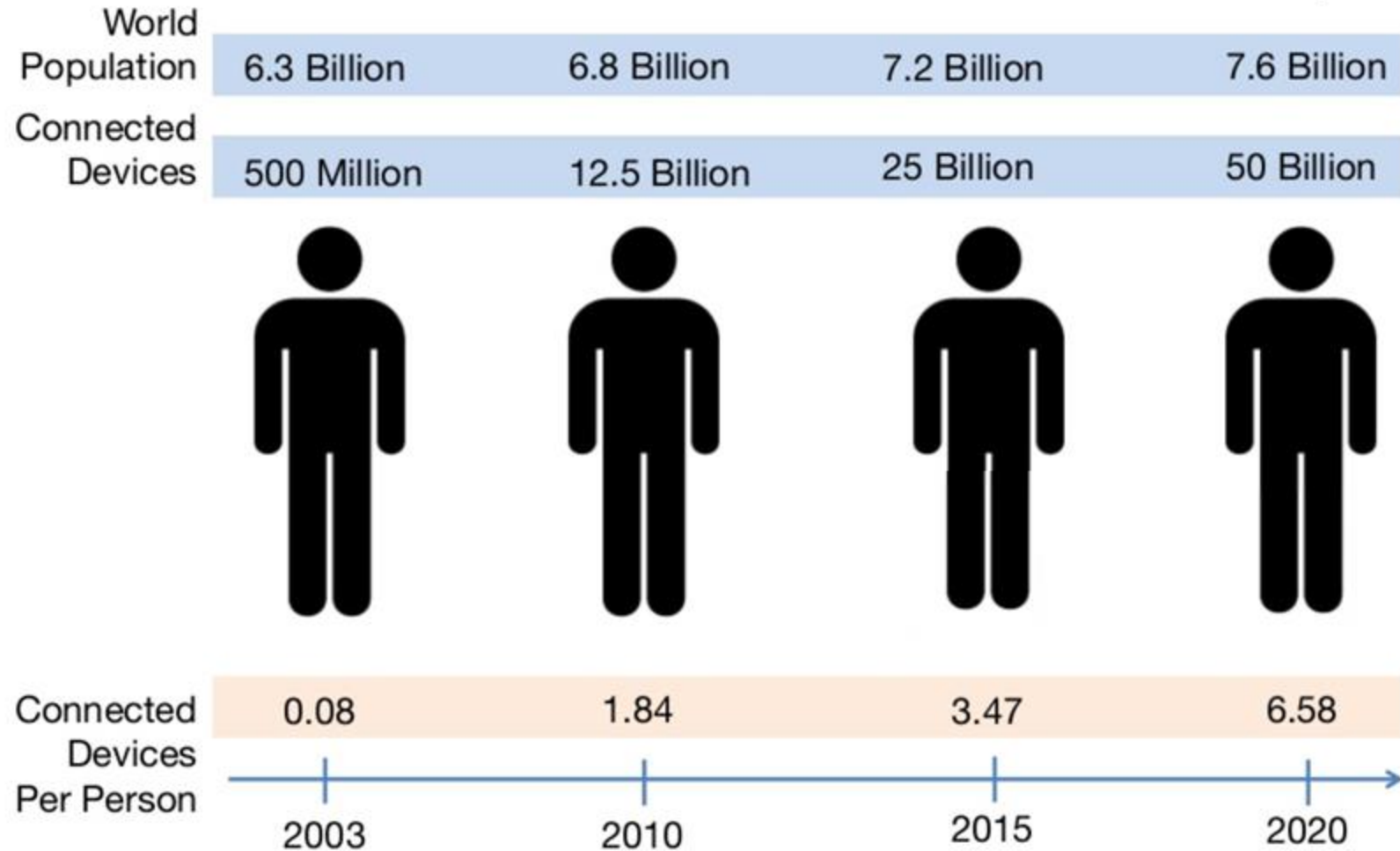**Potential Economic Impact of Sized IoT Applications**

Sized applications	Potential economic impact of sized applications in 2025 $ trillion, annually	Estimated scope in 2025	Estimated potential reach in 2025	Potential productivity or value gains in 2025
Health care	1.1–2.5	• $15.5 trillion cost of treating chronic diseases • $400 billion cost of counterfeit drugs, 40% addressable with sensors • 50 million nurses for inpatient monitoring — Developed world: $30 per hour — Developing: $15 per hour	• 70–80% mobile penetration in patients who account for bulk of health-care spending • Counterfeit drug tracking — Developed world: 50–80% — Developing world: 20–50% • Inpatient monitoring — Developed world: 75–100% — Developing: 0–50%	• 10–20% cost reduction in chronic disease treatment through remote health monitoring • 80–100% reduction in drug counterfeiting • 0.5–1.0 hour time saved per day by nurses
Manufacturing	0.9–2.3	• $47 trillion in global manufacturing operating costs	• 80–100% of all manufacturing	• 2.5–5.0% saving in operating costs, including maintenance and input efficiencies
Electricity	0.2–0.5	• 27,000–31,000 TWh global electricity consumption • $200 billion spending on transmission lines • 300 billion consumer minutes outage	• 25–50% of consumers could adopt energy management • 25–50% of grid monitored through sensors • 50–100% of consumer meters automated	• 2–4% reduction in demand peaks in the grid • Reduction of total load on grid • Operating/maintenance savings; shorter outage time through automated meters
Urban infrastructure	0.1–0.3	• 200–300 hours commuting time per urban worker per year • $200 billion spent on urban water • $375 billion cost of waste handling	• 40–70% of working urban population living in cities with smart infrastructure • 50–70% of large urban regions adopting smart water infrastructure and waste handling	• 10–20% reduction in average travel time through traffic and congestion control • 10–20% reduction in water consumption and leaks with smart meters and demand control • 10–20% reduction in cost of waste handling
Security	0.1–0.2			
Resource extraction	0.1–0.2			
Agriculture	~0.1			
Retail	0.02–0.10	• $6 trillion cost of crime	• Adoption of advanced surveillance by countries accounting for 50–70% of global GDP	• 4–5% crime reduction through improved surveillance

Future of IOT

More Connected Devices Than People

World Population	6.3 Billion	6.8 Billion	7.2 Billion	7.6 Billion
Connected Devices	500 Million	12.5 Billion	25 Billion	50 Billion
Connected Devices Per Person	0.08	1.84	3.47	6.58
	2003	2010	2015	2020

[Source: Cisco IBSG, April 2011]

5G for IOT

Hyper-speed transmission
Hyper-connectivity
Hyper-cost effectiveness
Hyper-efficient energy utilization
Hyper-reliability
Hyper-fast response
Hyper-mobility
Hyper-accurate positioning

5G over Everything

UHD-TV, Hologram
RRH
Stadium & Shopping mall
Low power BS
Sensors IoE
Remote Healthcare
Avionic Cellular
High speed Train
Traffic Safety
Motion Games

x 1,000 — increasing wireless capacity 1,000 times

7 Billion — connecting 7 billion people

7 Trillion — connecting 7 trillion "things"

90% — saving 90% energy

0 Latency — perceiving zero downtime

Examples

Gas Monitoring

Generate **USD 69Billion** by reducing meter-reading costs and increasing the accuracy of readings for citizens and municipal utility agencies.
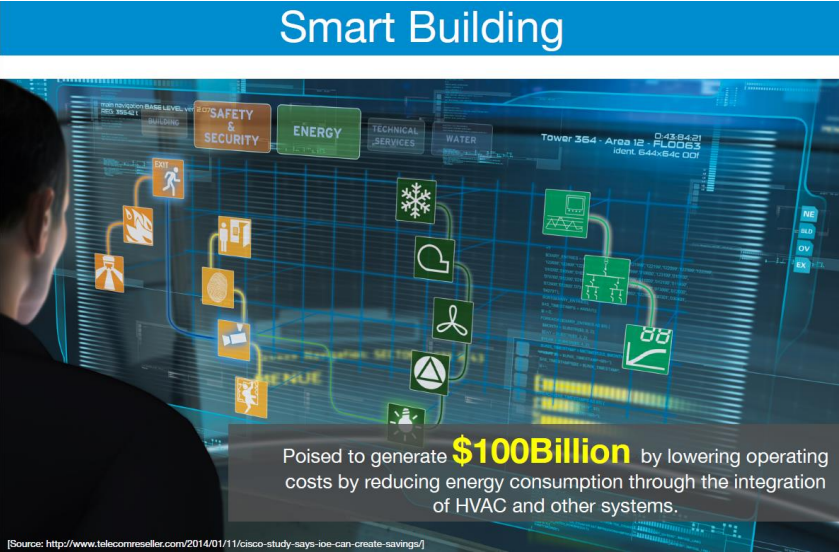
[Source: http://www.telecomreseller.com/2014/01/11/cisco-study-says-ioe-can-create-savings/]

Smart Parking

Create **USD 41Billion** by providing visibility into the availability of parking spaces across the city.

Residents can identify and reserve the closest available space, traffic wardens can identify non-compliant usage, and municipalities can introduce demand-based pricing.

[Source: http://www.telecomreseller.com/2014/01/11/cisco-study-says-ioe-can-create-savings/]

Smart Building

Poised to generate **$100Billion** by lowering operating costs by reducing energy consumption through the integration of HVAC and other systems.

[Source: http://www.telecomreseller.com/2014/01/11/cisco-study-says-ioe-can-create-savings/]

Water Management

Could generate **USD 39Billion** by connecting the household water meter over an IP network to provide remote information on use and status

[Source: http://www.telecomreseller.com/2014/01/11/cisco-study-says-ioe-can-create-savings/]
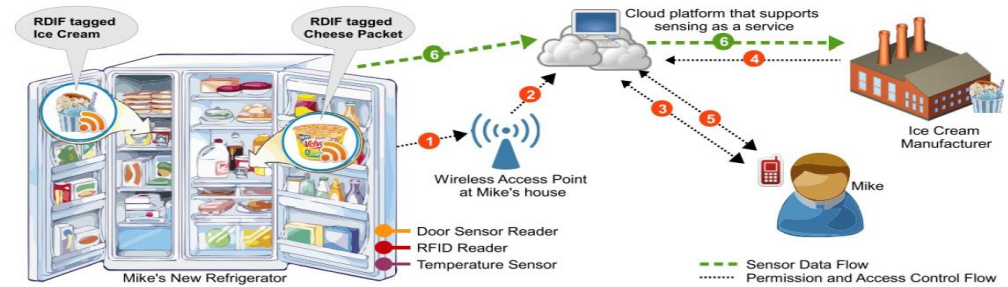
Examples

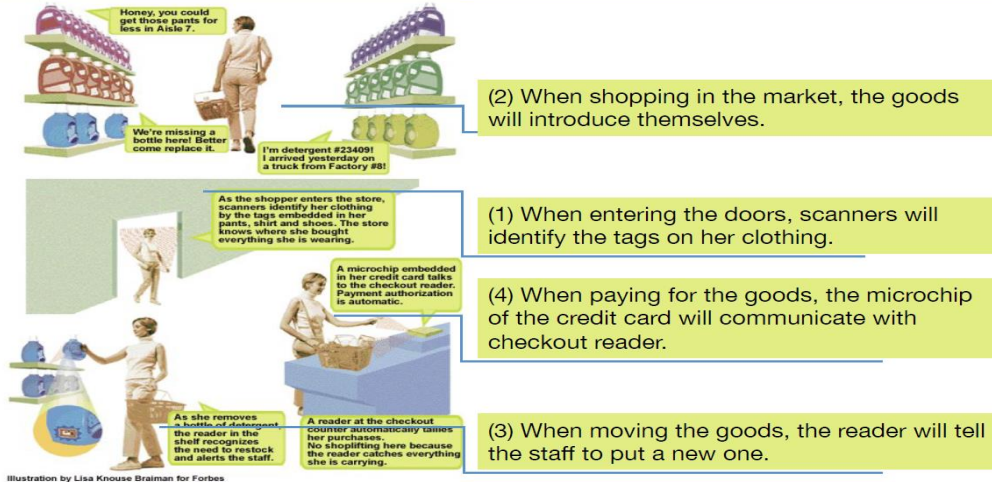Efficient Waste Management in Smart Cities Supported by the Sensing-as-a-Service
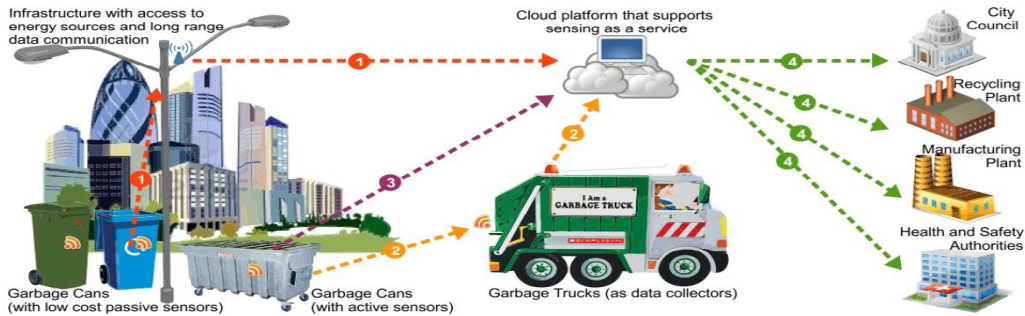
[Source: "Sensing as a Service Model for Smart Cities Supported by Internet of Things", Charith Perera et. al., Transactions on Emerging Telecommunications Technology, 2014]

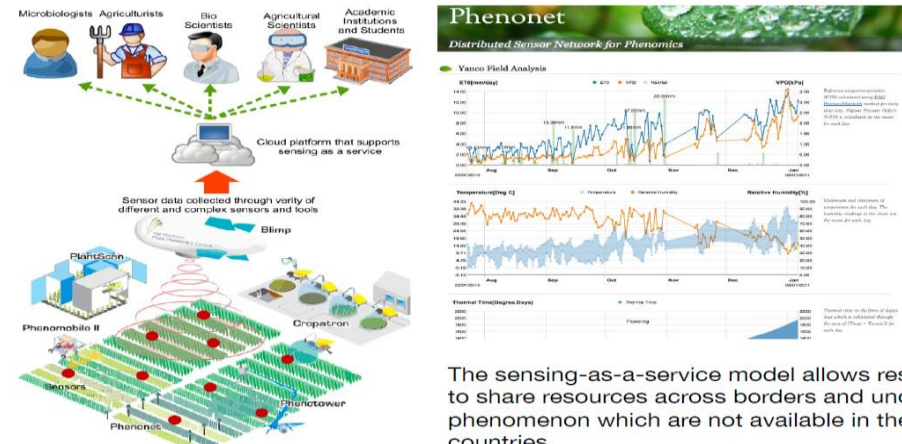Smart Home Scenario – Interactions in Sensing-as-a-Service Model

[Source: "Sensing as a Service Model for Smart Cities Supported by Internet of Things", Charith Perera et. al., Transactions on Emerging Telecommunications Technology, 2014]

IOT Application Scenario - Shopping

(2) When shopping in the market, the goods will introduce themselves.

(1) When entering the doors, scanners will identify the tags on her clothing.

(4) When paying for the goods, the microchip of the credit card will communicate with checkout reader.

(3) When moving the goods, the reader will tell the staff to put a new one.

Efficient and Effective Collaborative Research Supported by Sensing-as-a-Service Model

The sensing-as-a-service model allows researchers to share resources across borders and understand phenomenon which are not available in their own countries.

IOT Risks With Examples

Vehicle Hacking

Wireless hacks can alter a car's electronic control units (ECUs) and sensors to affect brake systems, send false tire pressure signals, or start and stop the engine remotely

GPS Spoofing

Counterfeit GPS signals can facilitate hijacking or cause collision and damage to ships, aircrafts, drones

Healthcare Device Hacking

Implantable Medical Devices (IMDs) that control heartbeats, deliver painkillers or insulin, or measure vital signs to report to doctors and nurses can be jammed and made to fail

Industrial Hacking

Foreign hacking groups have been caught infiltrating water control systems for a U.S. municipality

Smart Home Hacking
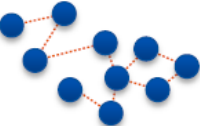
Smart door locks can be opened and lock codes changed remotely to break into a home without any sign of forced entry

Connected-Car Mandate

National Transportation Safety Board (NTSB) wants the government to require that all new vehicles be able to wirelessly communicate with other cars to help prevent crashes and increase overall safety

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Selected IOT Technologies

🔒 IoT security tools	IoT analytics & data science 🔍
Event stream processing	IoT device management
LPWANs	Low power short range networks
IoT processors	IoT operating systems
IoT platforms	Gateways

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IoT - Hype Cycle of Internet of Things 2015

Figure 1. Hype Cycle for the Internet of Things, 2015

expectations

iBeacons and Bluetooth Beacons
Internet of Things
Predictive Analytics
Smart Transportation
Wearables
Low-Cost Development Boards
Home Energy Management/Consumer Energy Management
IT/OT Alignment
Automobile IP Nodes
Cloud MOM Services
Personal Health Management Tools

IT/OT Integration
Quantified Self
IoT Architecture
Event Stream Processing
Wide-Area IoT Networks
Embedded Software and Systems Security
Real-Time Analytics
IoT Platform
Connected Home

Operational Technology Platform Convergence
Operational Technology Security
Big Data
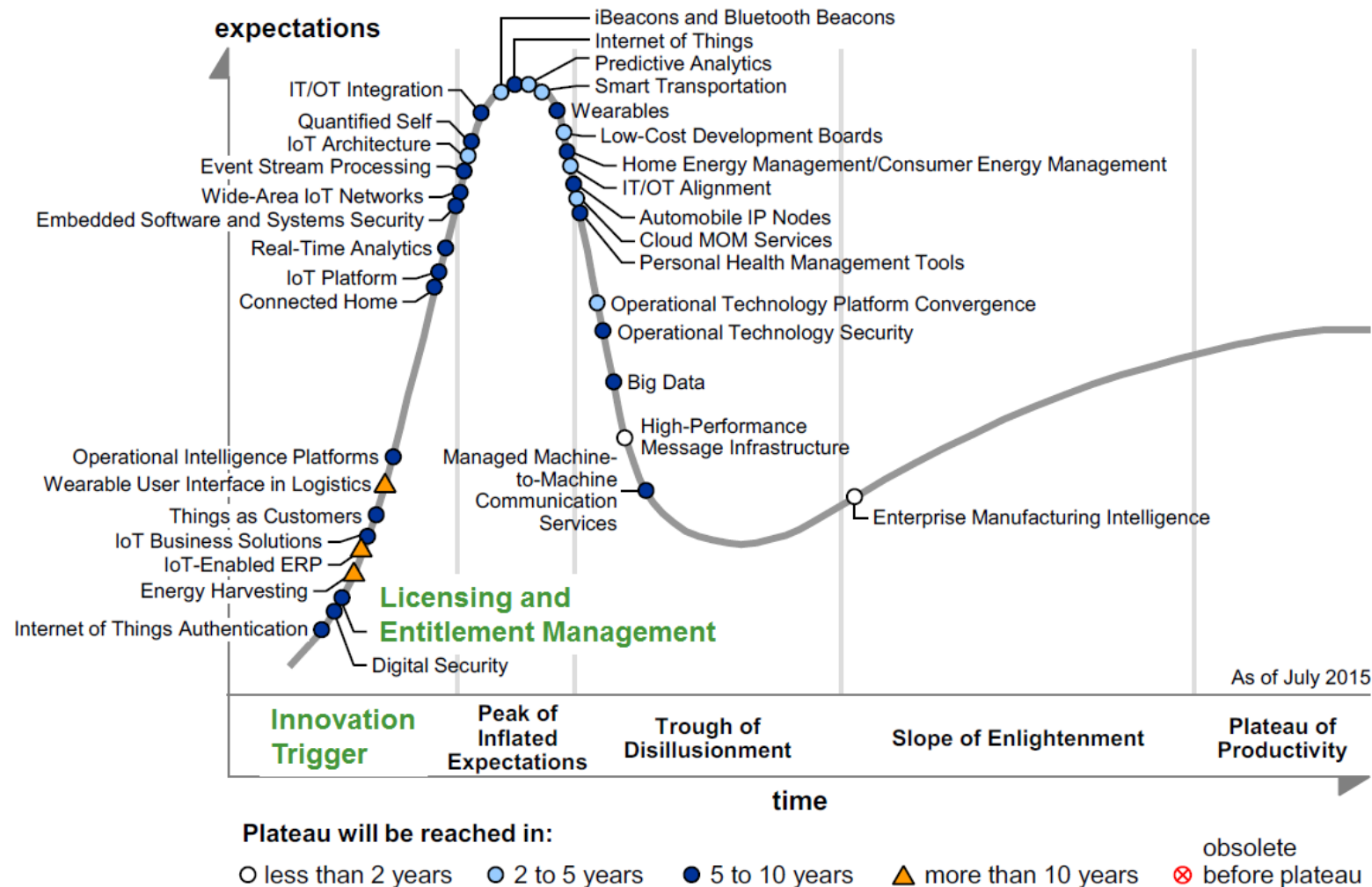High-Performance Message Infrastructure

Operational Intelligence Platforms
Wearable User Interface in Logistics
Things as Customers
IoT Business Solutions
IoT-Enabled ERP
Energy Harvesting
Internet of Things Authentication

Managed Machine-to-Machine Communication Services

Enterprise Manufacturing Intelligence

Licensing and Entitlement Management

Digital Security

As of July 2015

| Innovation Trigger | Peak of Inflated Expectations | Trough of Disillusionment | Slope of Enlightenment | Plateau of Productivity |

time

Plateau will be reached in:

○ less than 2 years   ○ 2 to 5 years   ● 5 to 10 years   △ more than 10 years   ⊗ obsolete before plateau

Source: Gartner (July 2015)

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Smart Connected World

is
a correct platform to convert dreams into reality

The Only Limit Is Your Imagination - Unleash Your Creativity
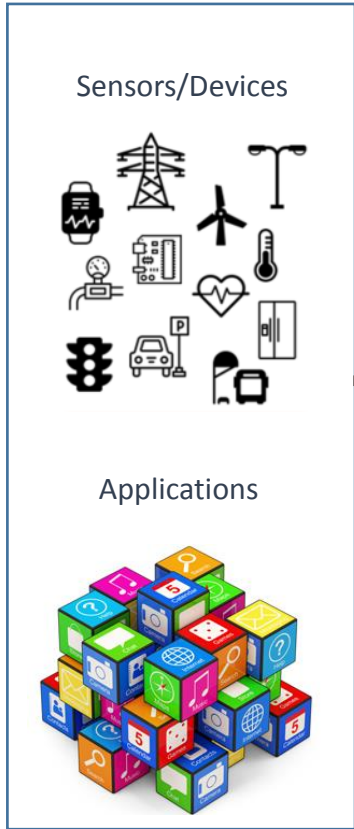
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Thank You
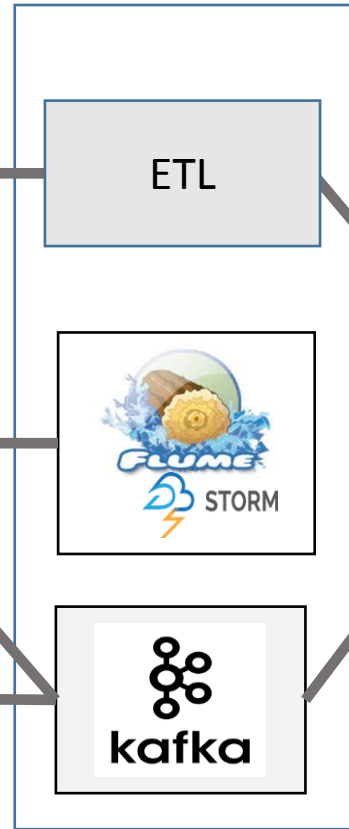
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Digitalization, Integration, IOT, Big Data & Analytics
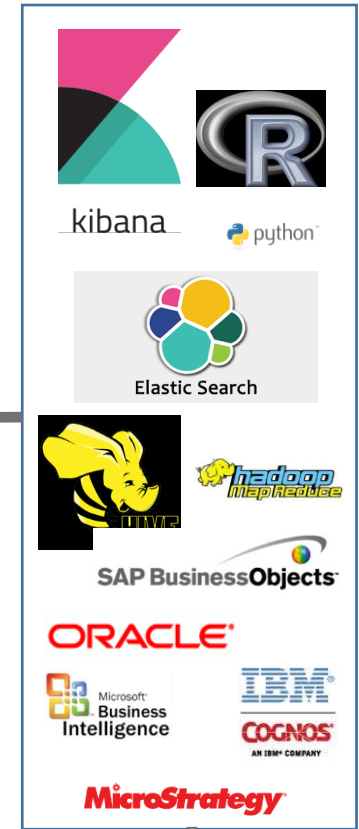
From Any Sources   *From Any Database*   *By Any Integration*   *To Any Storage*   *By Any Analytics & Visualization Tool*

Sensors/Devices

Applications

Structured Data

Semi-Structured Data

Internet of Things

WWW   Machine Data   Mobile

Unstructured Data

Social

LinkedIn   YouTube

ETL

STORM

kafka

ORACLE

NoSQL

HDSF hadoop

Microsoft SQL Server

PostgreSQL

kibana   python

Elastic Search

HIVE   hadoop MapReduce

SAP BusinessObjects
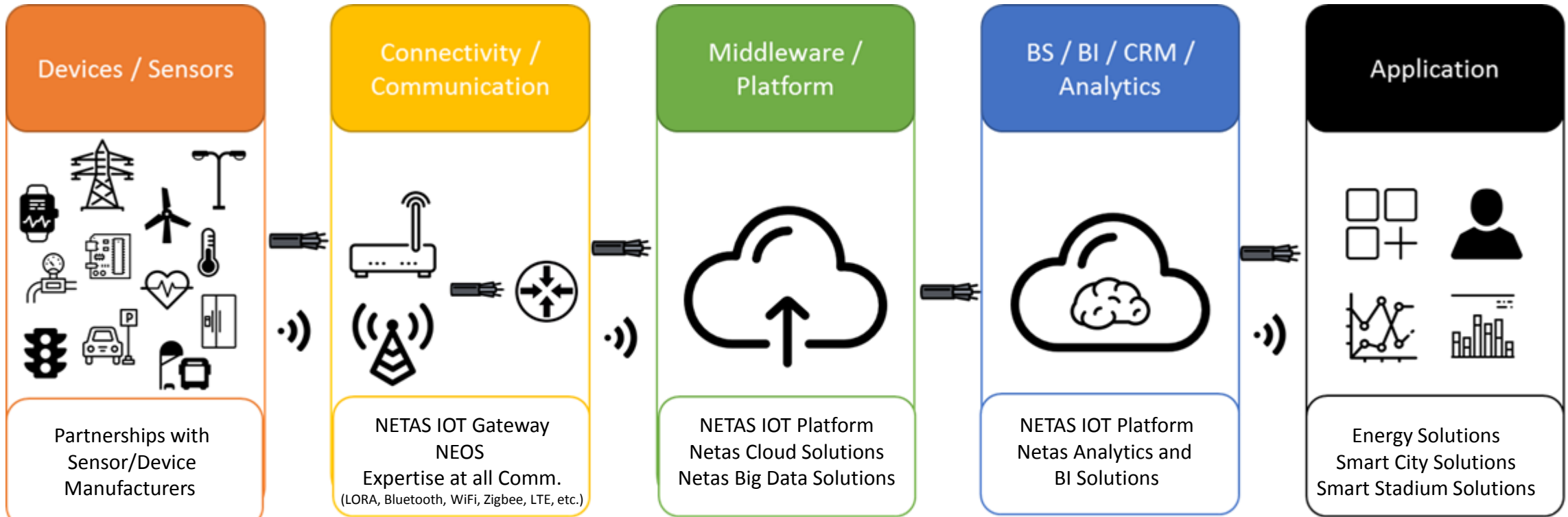
ORACLE

Microsoft Business Intelligence   IBM COGNOS AN IBM COMPANY

MicroStrategy

Command, Control, Preventive Maintenance

We combine our customers business processes with Big Data Analytics' innovative advanced and predictive analytics techniques and give power to perform predictive analyses and effective reporting.

How Do We Do It?

Devices / Sensors
Partnerships with Sensor/Device Manufacturers

Connectivity / Communication
NETAS IOT Gateway
NEOS
Expertise at all Comm.
(LORA, Bluetooth, WiFi, Zigbee, LTE, etc.)

Middleware / Platform
NETAS IOT Platform
Netas Cloud Solutions
Netas Big Data Solutions

BS / BI / CRM / Analytics
NETAS IOT Platform
Netas Analytics and
BI Solutions

Application
Energy Solutions
Smart City Solutions
Smart Stadium Solutions

Custom Hardware Design, Custom Application and Solution Development Where Needed.

Netas R&D adds value to its customers with own Products and expertise on IOT, Hardware Design, Communication, Custom Software Development, Big Data, Analytics & Big Integration Projects.