IoT – Internet of Things
General topics

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Content

1. What is IoT – Basic definitions
2. IoT Infrastructure
3. For what functions/applications IoT can be used for and what challenges IoT can cover?
4. IoT in industrial and automotive applications
5. Key services using IoT platform

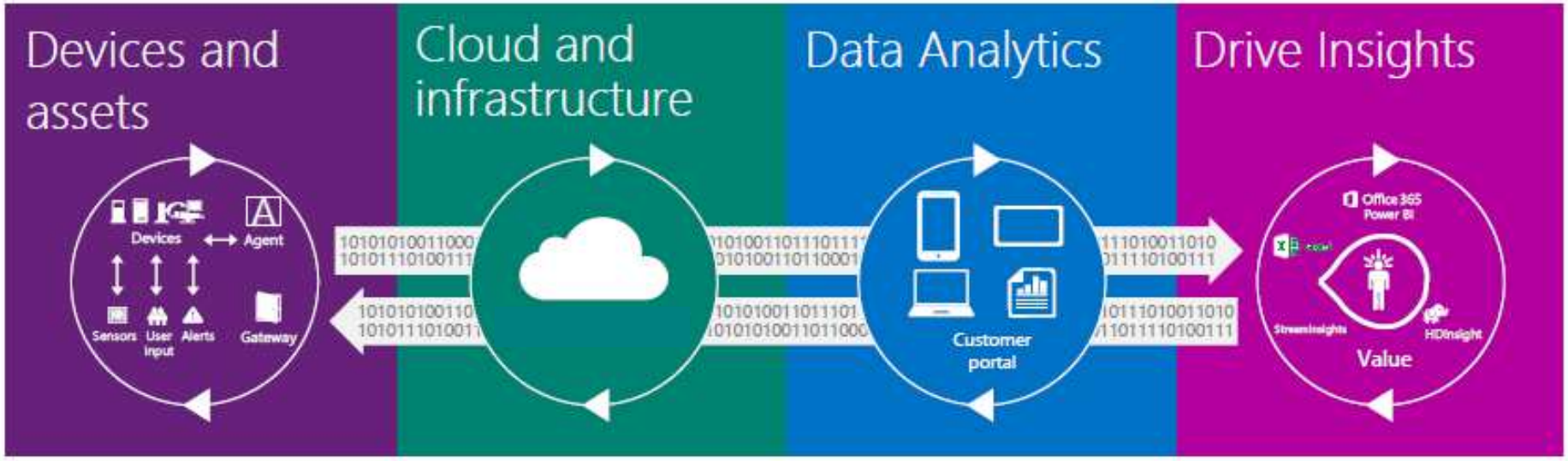
Slides are mostly based on the presentations from
The 8th Annual INTERNET OF THINGS European Summit

What is IoT – Basic definitions

Internet of things is an idea from computer science to connecting ordinary things (lights, doors, sensors, actuators) to a computer network to make them "intelligent".

In did it is an embedded system that connects each thing together over the internet.

The connections allow each thing to collect and exchange data, and we can control them remotely or by setting rules or chains of actions.



What is IoT – Basic definitions

Battle of the buzzwords: M2M v IoT v IoE

Machine to Machine
M2M

A *device*...
that captures an *event*...
transmits it over a *network*...
to an *application*....
that translates it into
meaningful information.

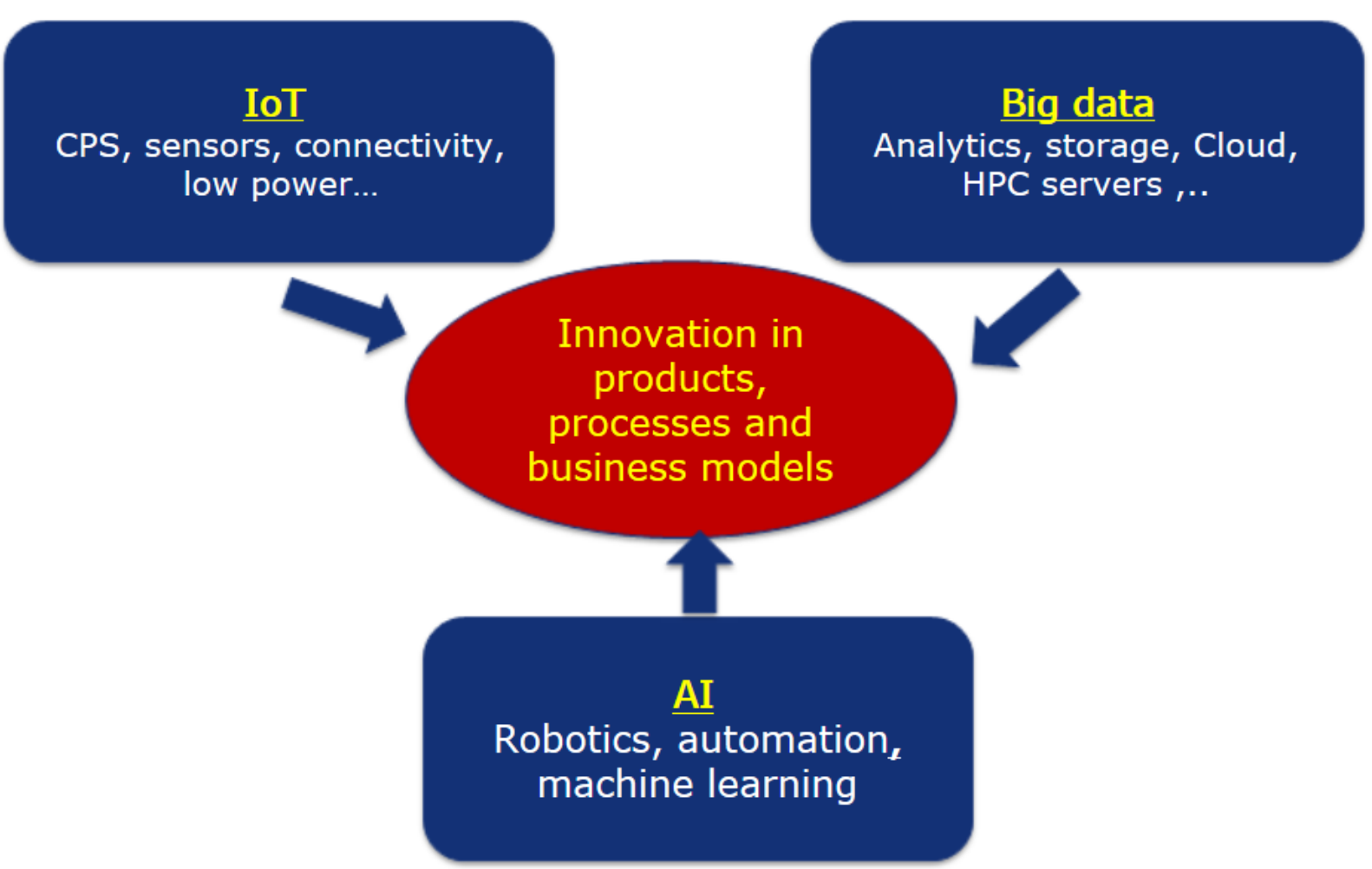
Internet of Things
IoT

A network of uniquely identifiable *"things"* that communicate *without human interaction* using IP connectivity

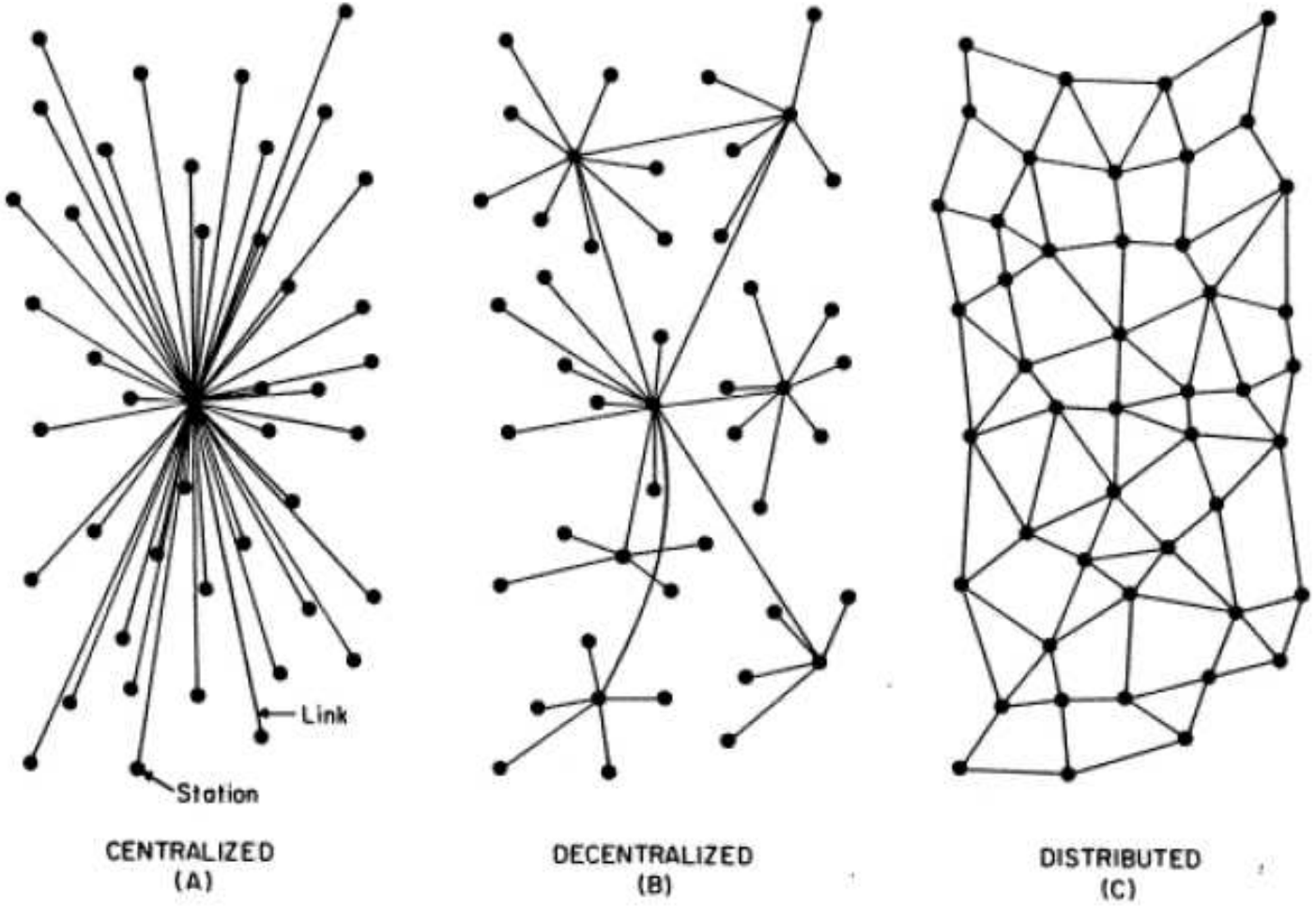
Internet of Everything
IoE

Bringing together the *people, process, data & things* to make networked connections more relevant by *turning information into actions.*

What is IoT – Basic definitions



IoT Infrastructure



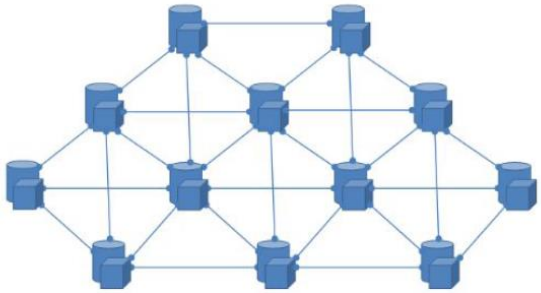
Towards **Smart Decentralization**

Dumb Decentralization	Smart **Centralization**	Smart **Decentralization**
• "Dumb" devices • No connectivity / sharing of data • Human mediators	• Smart devices, dumb network • Cloud as decision maker • Single point of failure	• Data and Resource Sharing • Local Real-time Decision Making • Smart adaptive and intelligent network

IoT Infrastructure - Blockchain

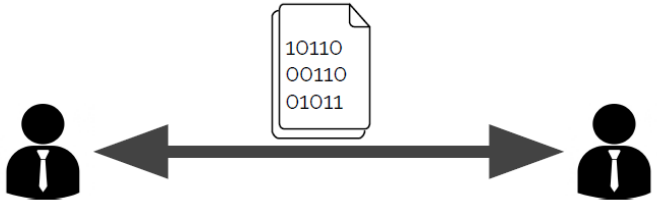
*"Blockchain is a **decentralized, peer-to-peer network** where participants maintain an **append-only database** where global consensus is reached on the **validity of new datasets**."*

1. Blockchain is a decentralized, Peer-to-Peer Network

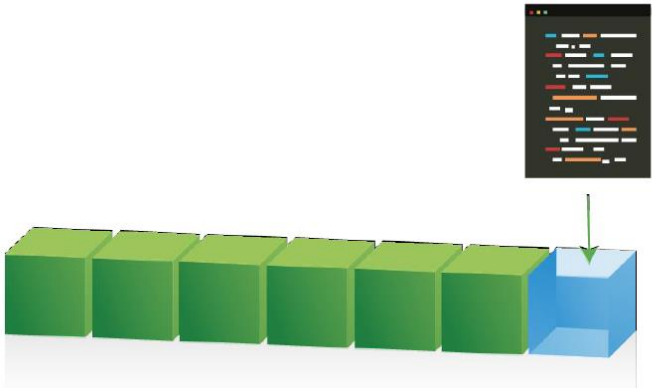


Decentralized

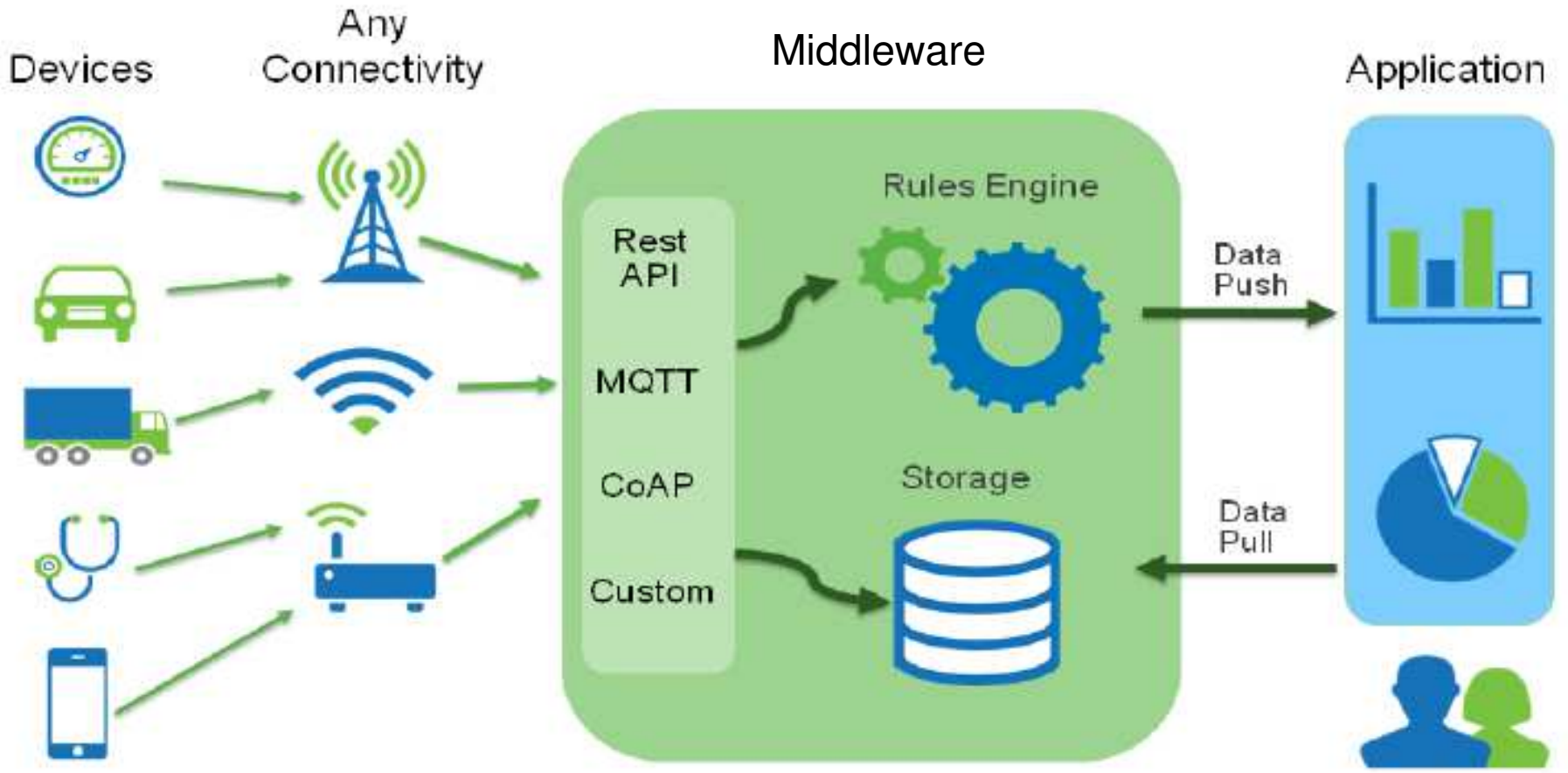
2. All data is shared among all the peers (can be encrypted)



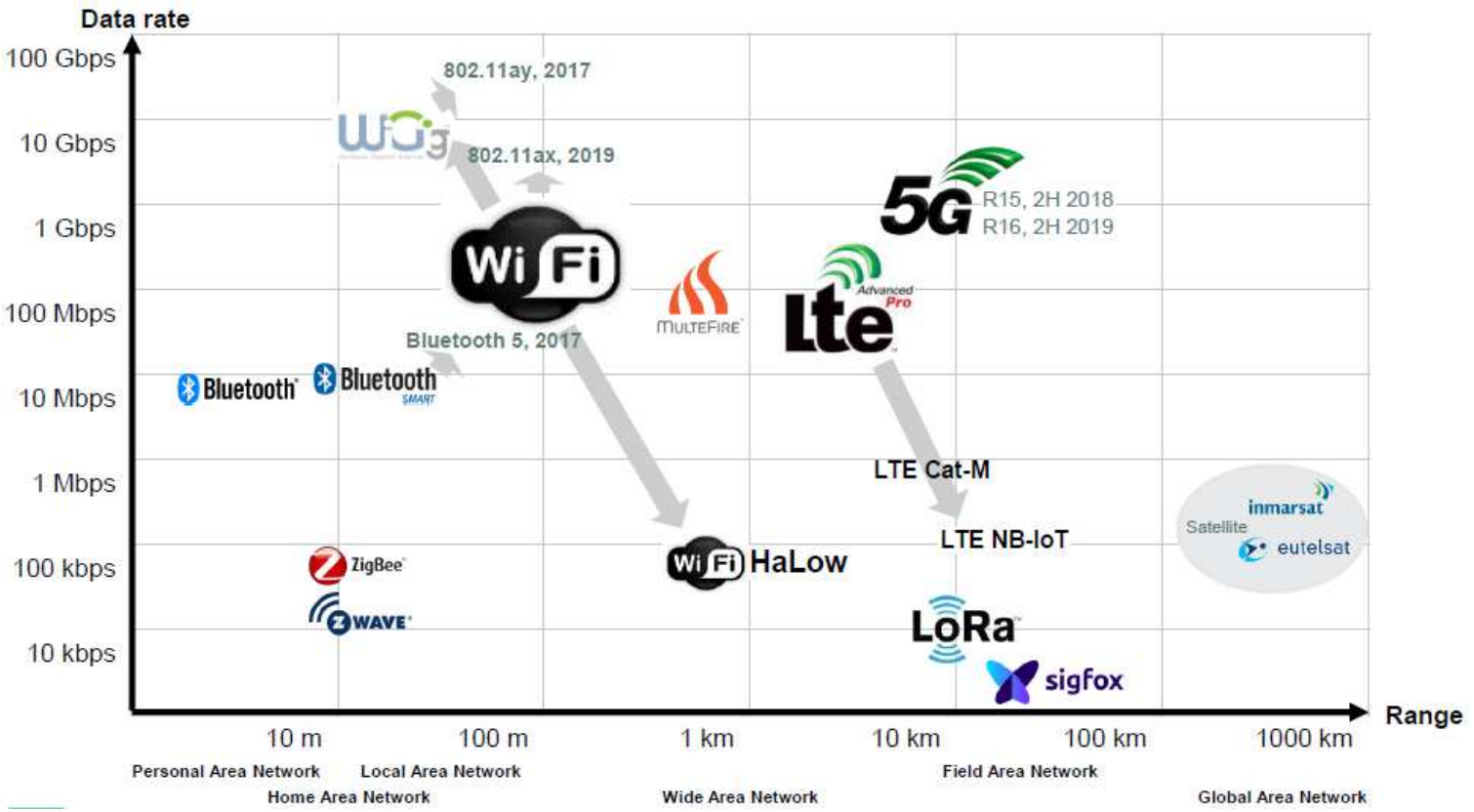
3. The data is being validated via some consensus mechanism and the proof is then input into a Block, the Block is appended to the Blockchain and secured.



IoT Infrastructure



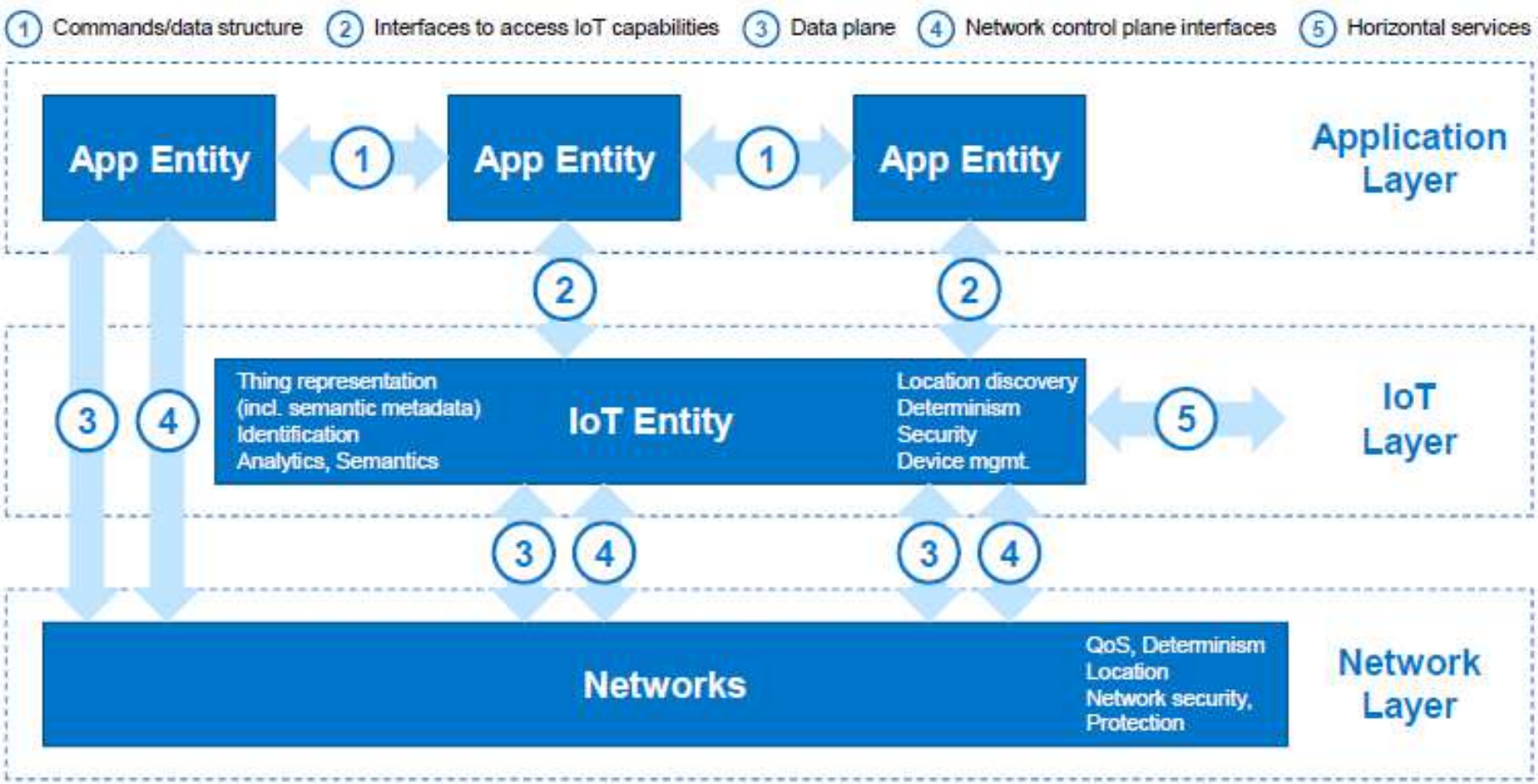
IoT Infrastructure – Communication technologies



RC requirements

- ❑ Unlicensed
- ❑ Long range
- ❑ High data rate
- ❑ Low power
- ❑ High reliability
- ❑ Low latency
- ❑ High security
- ❑ Low cost
- ❑ Ruggedized
- ❑ Fixed things
- ❑ Roaming things
- ❑ Outdoor

IoT Infrastructure - Middleware



For what functions/applications IoT can be used for and what challenges IoT can cover?

Build things

IoT begins with your things. Build with your things, from adding sensors to creating smart devices, to start your IoT solution.

Control your things

Deploy IoT solutions that control, monitor, and manage your things, allowing you to capture real-time data.

Analyze data

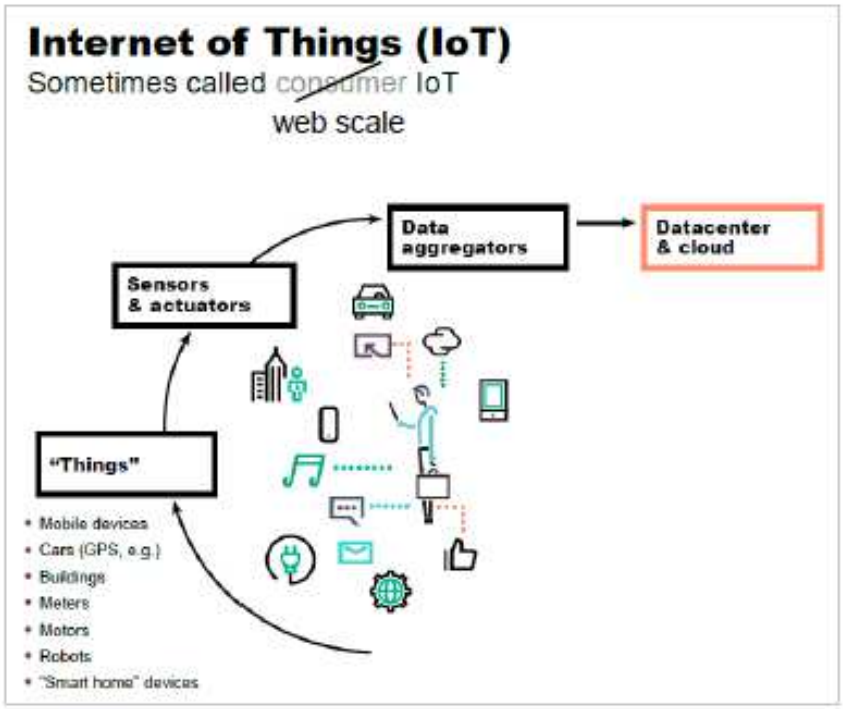
Take the data you collect and apply advanced analytics to uncover new business insights.

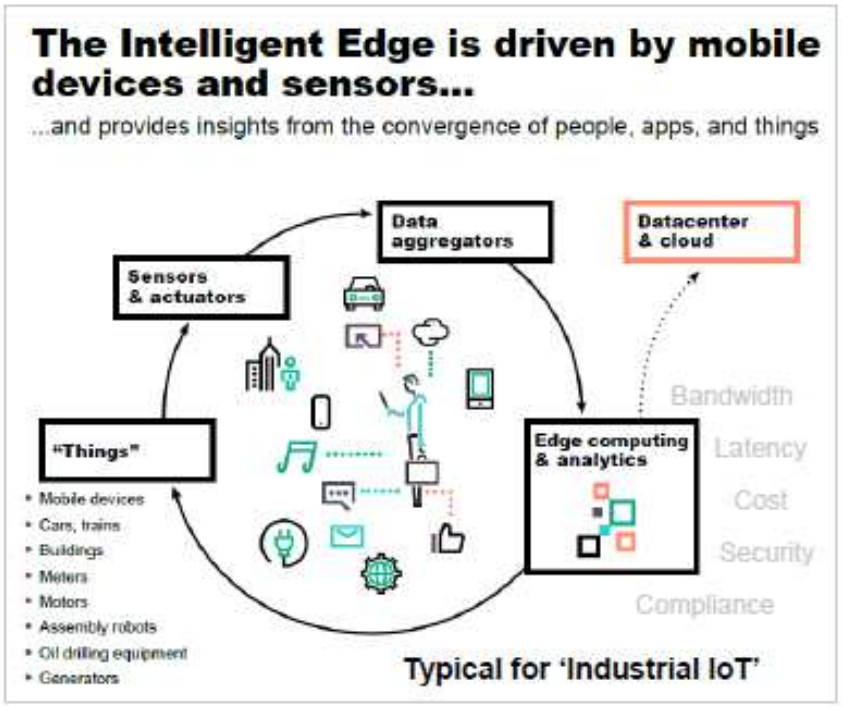
Act on insights

Transform insights into action through powerful applications—creating new revenue and business opportunities.

For what functions/applications IoT can be used for and what challenges IoT can cover?

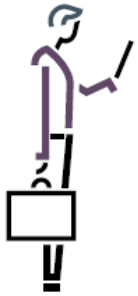
Intelligent Edge
and Industrial IoT





For what functions/applications IoT can be used for and what challenges IoT can cover?

The world will be **Hybrid**



The **Intelligent Edge** is going to unleash an Industrial IoT revolution

Services are going to be even more critical

For what functions/applications IoT can be used for and what challenges IoT can cover?

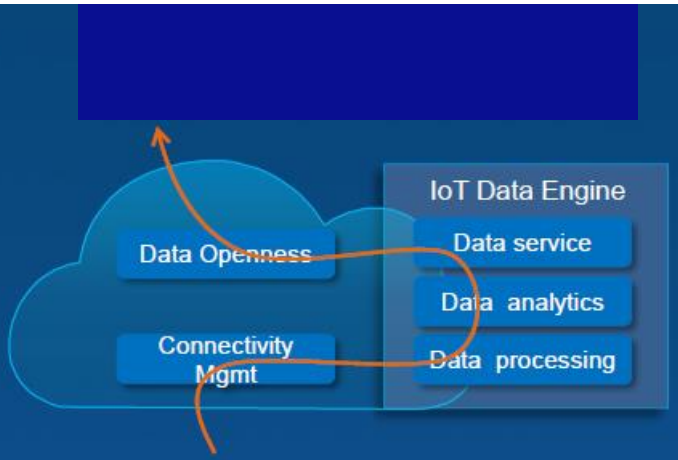
IoT changes traditional business models & requires a mindset shift

		TRADITIONAL PRODUCT MINDSET	INTERNET OF THINGS MINDSET
VALUE CREATION	Customer needs	Solve for existing needs and lifestyle in a reactive manner	Address real-time and emergent needs in a predictive manner
	Offering	Stand alone product that becomes obsolete over time	Product refreshes through over-the-air updates and has synergy value
	Role of data	Single point data is used for future product requirements	Information convergence creates the experience for current products and enables services
VALUE CAPTURE	Path to profit	Sell the next product or device	Enable recurring revenue
	Control points	Potentially includes commodity advantages, IP ownership, & brand	Adds personalization and context; network effects between products
	Capability development	Leverage core competencies, existing resources & processes	Understand how other ecosystem partners make money

IoT in industrial and automotive applications

Massive Data Processing

- 10M connections, 1M concurrences
- Hadoop, Spark & in-memory DB
- Vertical-cross data analytics, i.e., smart home, connected car, smart city
- Big data OLAP, ML studio



Real-time Stream Analytics

- Smart Home: face identification
- Fleet Management: fatigue driving, smoking, calling
- Smart City: threats (masked, gun, action), satisfaction measurement, VIP service

Predictive Maintenance

- Elevator fault detection & maintenance
- Smart home energy usage analysis & warning
- Equipment fault analysis & maintenance
- Industrial monitoring & alarm

Artificial Intelligence

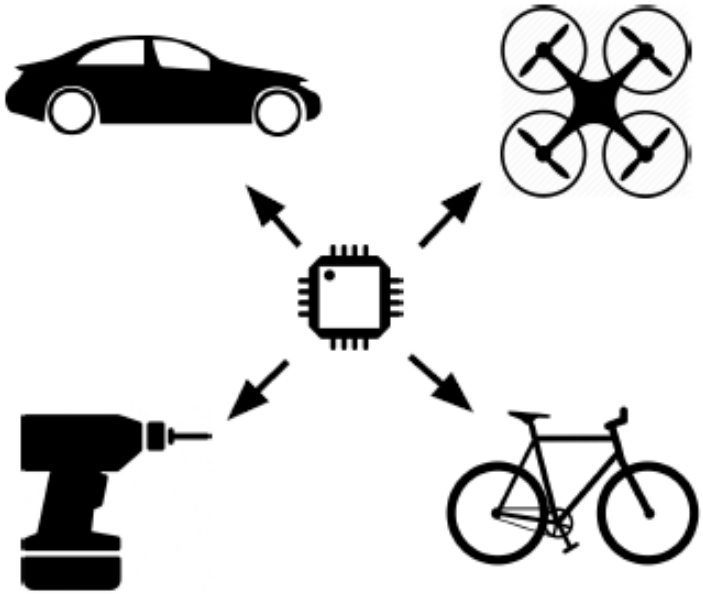
- Smart Home: machine learning for human behaviors, automatic watering, & pet feeding
- Human-centric recommendation for health, food, wearable, transportation, etc…

Location Based Service

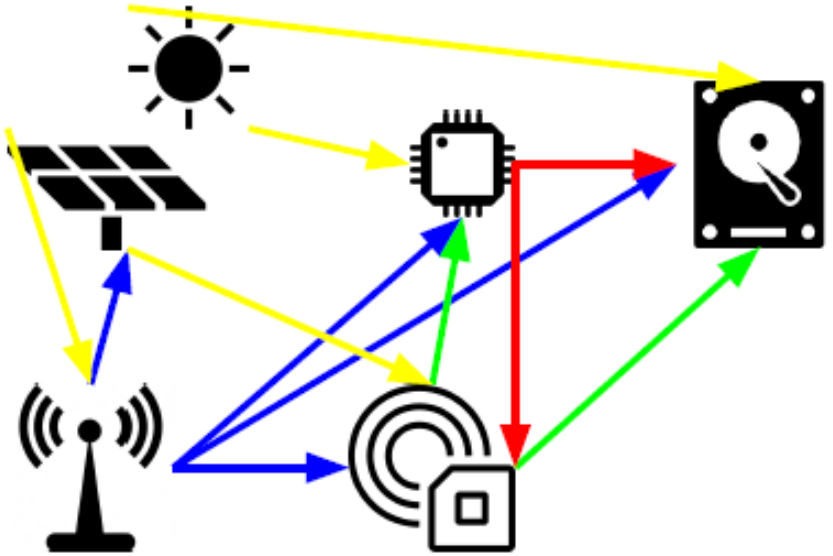
- Connected Car: tracking, navigation
- Logistic: truck tracking, goods delivery tracking
- Child tracking, pet tracking, elderly tracking

IoT in industrial and automotive applications

Anything with a chip in it can be leased

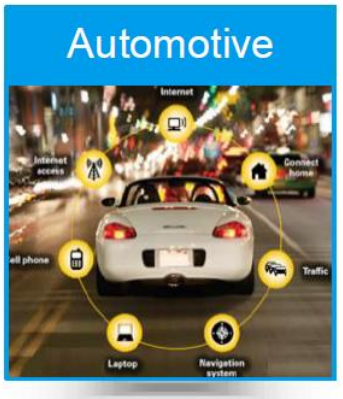


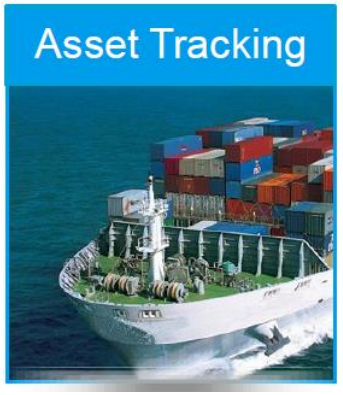
Devices trade resources among each other

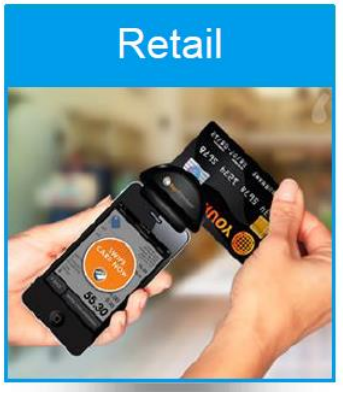


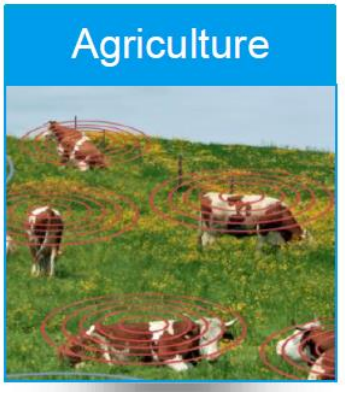
IoT in industrial and automotive applications

MAHLE

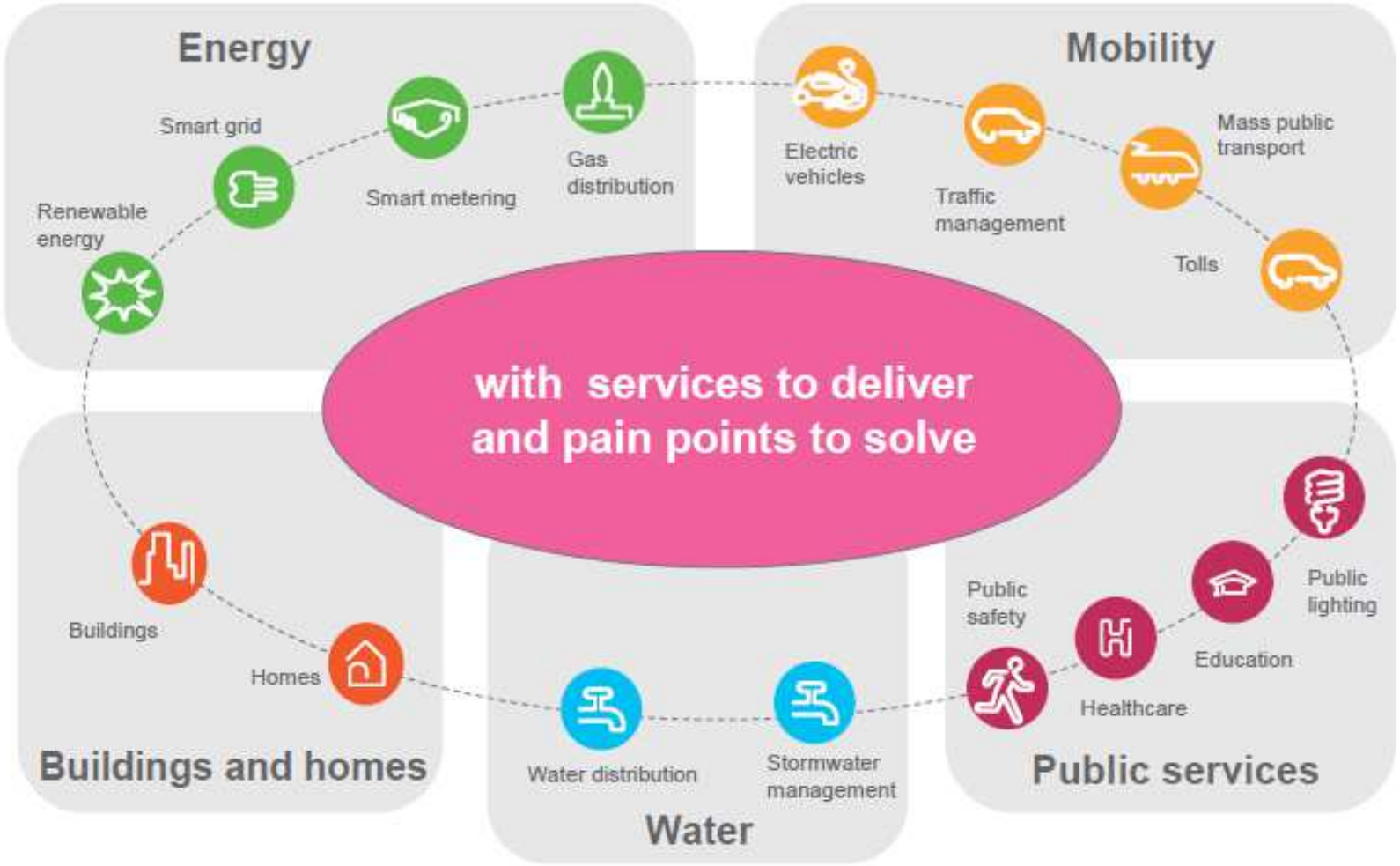








Key services using IoT platform



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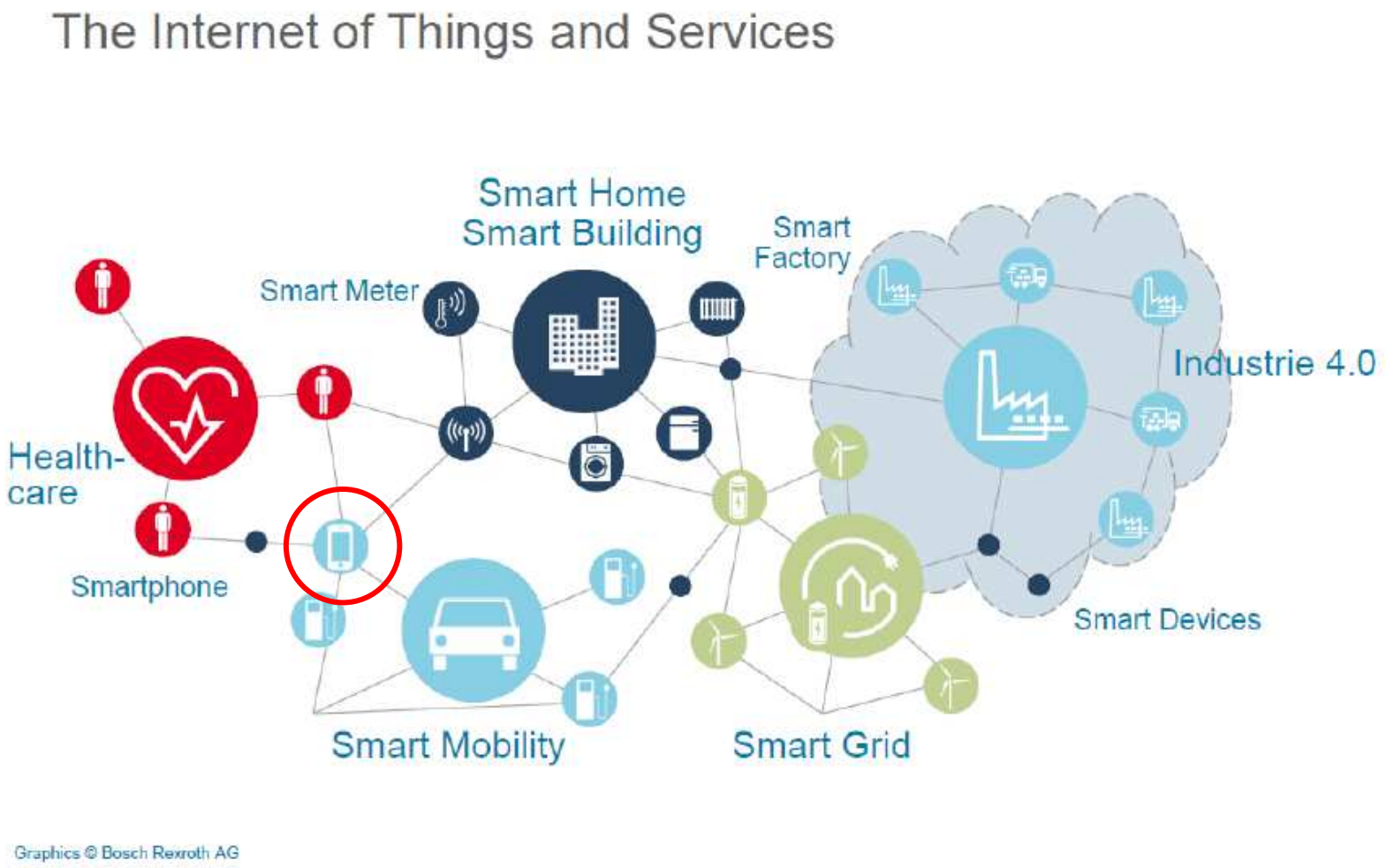

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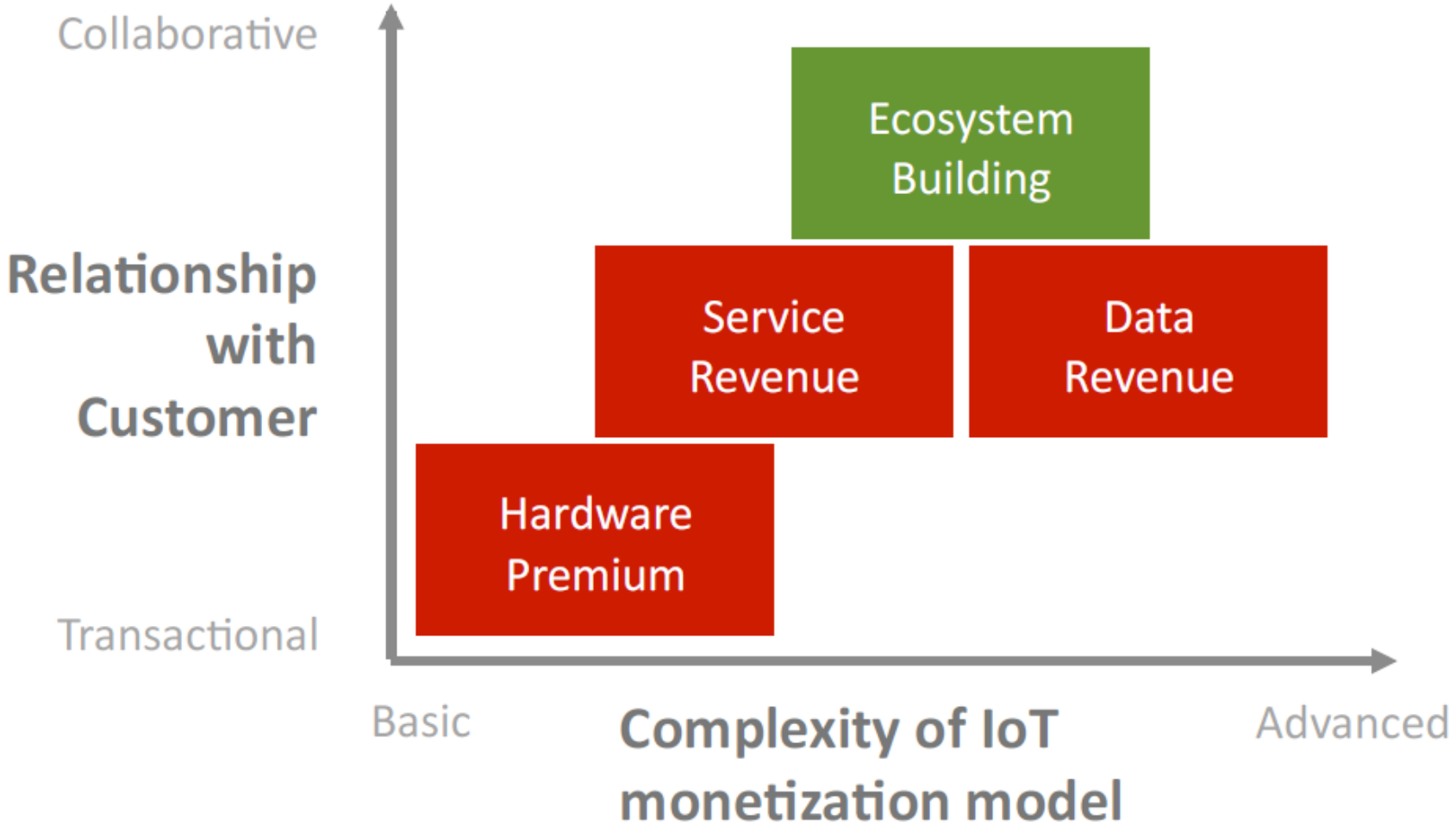

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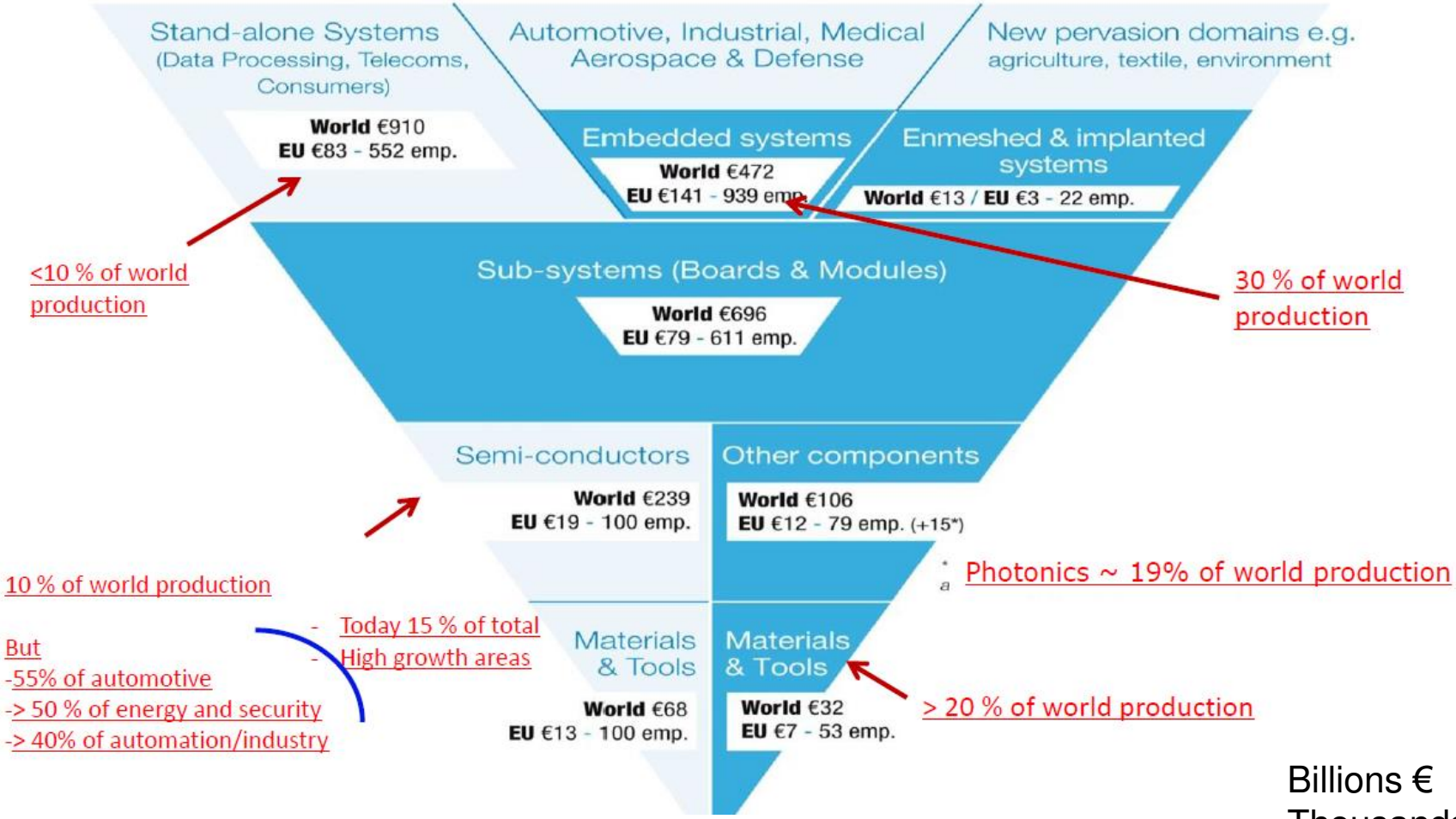

Billions €
Thousands emp.