The Internet of Things and the Engineers Role in the Digitalization of the Society

Systems and Network Global Direction

14.09.2017

We are involved in a challenging landscape…

Competition and Environment

Competition:

Regulators:

New players

New entrants

MVNOs

Digital Natives

Born around Customer
Data centric with full traceability
Ecosystems (platform, integration, APIs, etc.)
Consistency and Best Experience
Track and measure processes
Lean operations & Automation in DNA

New ways of business

Data driven models
Free services
Ad supported

New customers expectations

Higher quality / lower price
Loyalty shift
Choice ability
Closer and immediate

… and both the new digital native players and other industries are changing the rules obliging us to accelerate

Retailers

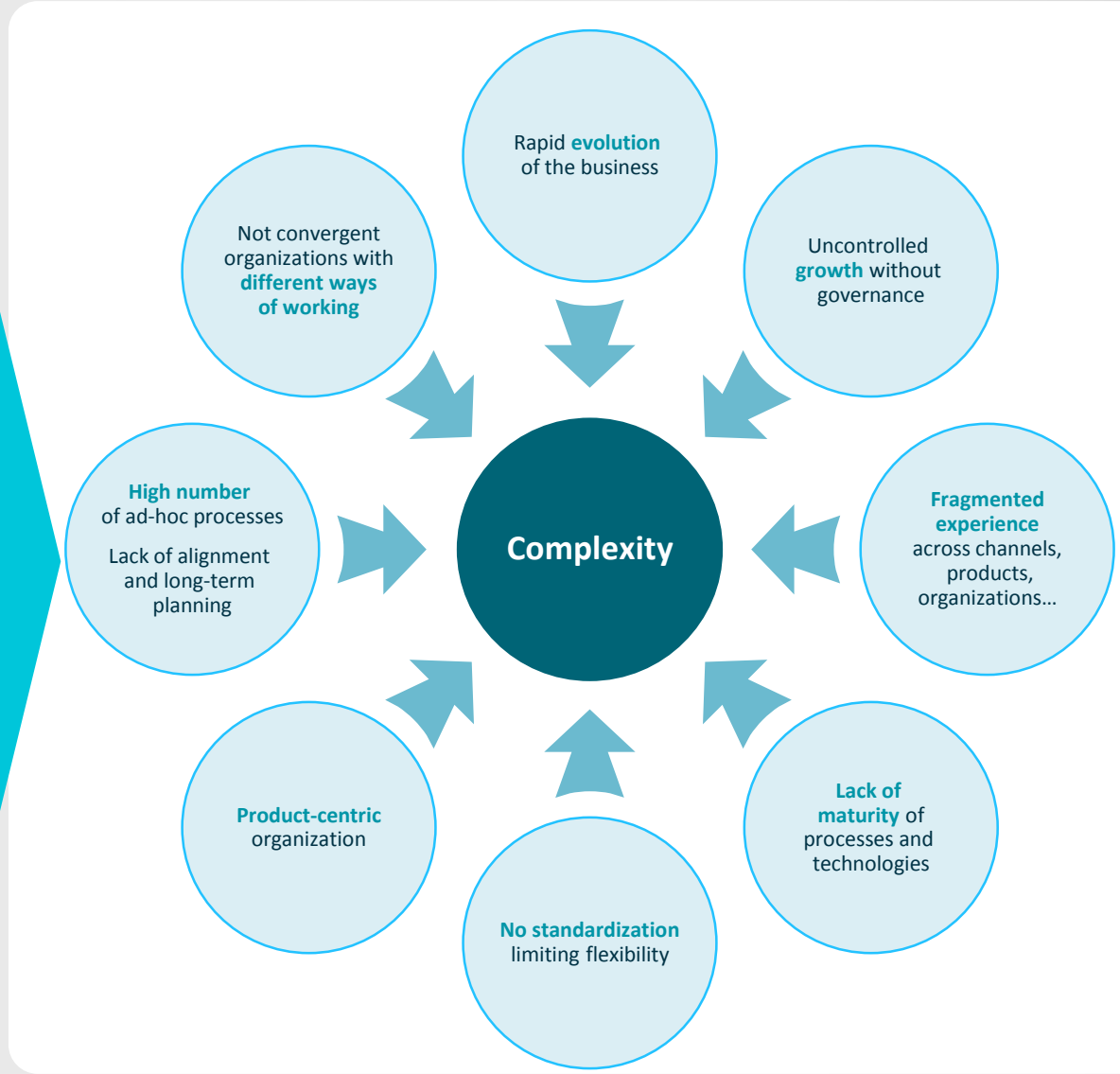
Allow customers to **manage an order from different channels in a seamless way, click & collect,** and **dispatch several orders as soon as they're available**

Transport companies

Allow to **see a picture of the driver** when requesting a service

Banks

Allow customers to **perform actions** and **manage and request all their information through the app**



One of the triggers for this tremendous change is going to be the massive IoT explosion that we expect

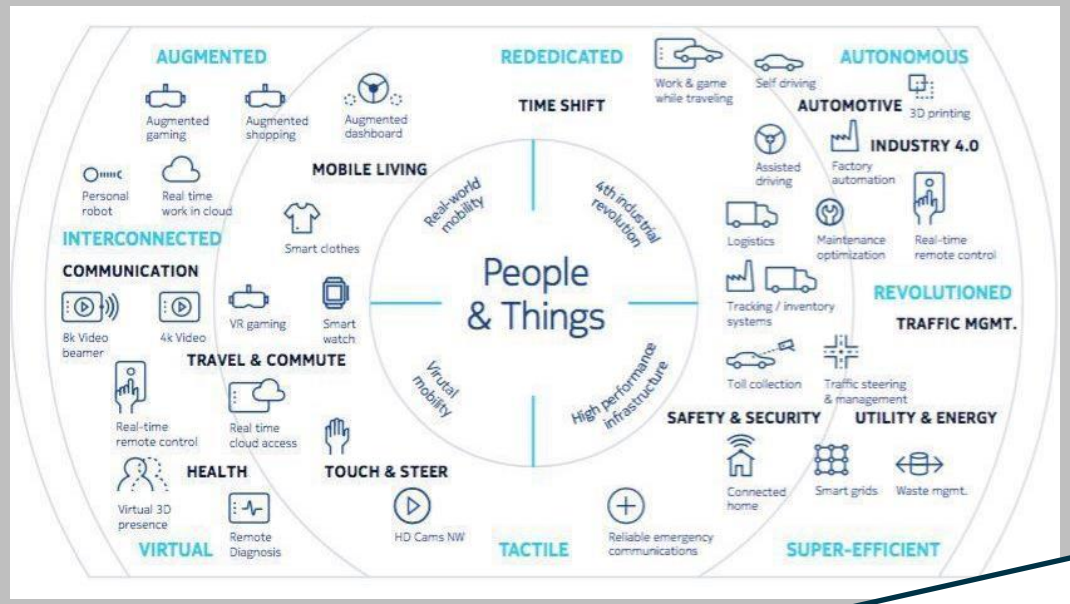
Definition

Internet of Things (IoT)

is a network of physical objects (devices, vehicles, appliances) embedded with sensors, software, and network connectivity, so they can collect, exchange, and act on data, often without human intervention

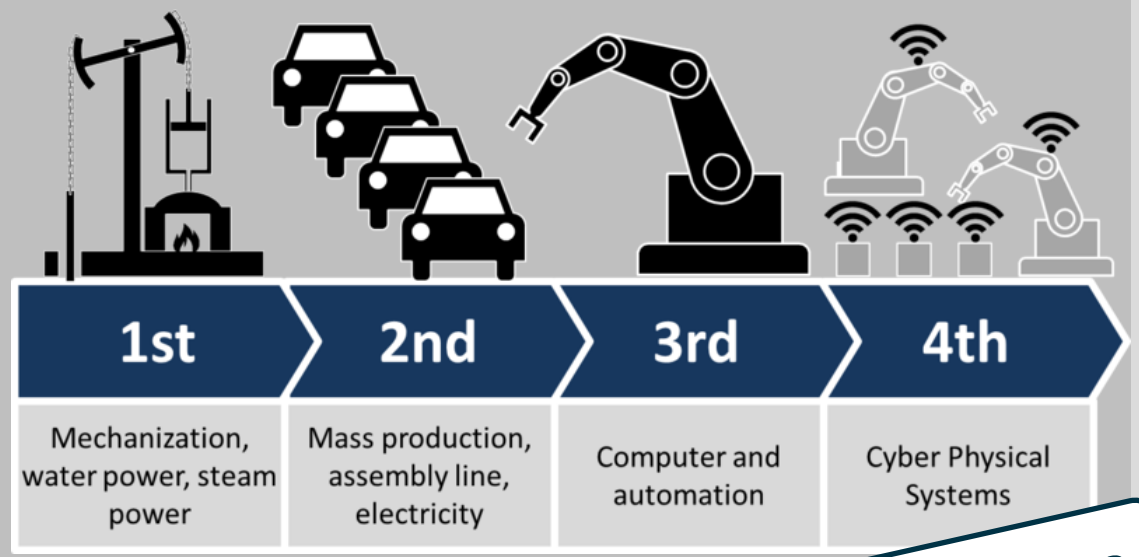
Internet of Things has the power to change our world

Transforming the society and its dynamics



Digital Society

Moving to the fourth industrial revolution



Industry 4.0

Enhancing human-machine collaboration…

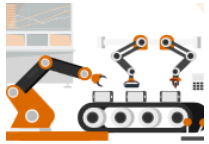
Many businesses stand to benefit in a **connected system** in which **human experts can use data to drive more insightful decision-making**

Illustrative

Healthcare: use of wearable devices to offer personalized care

Security: cameras combined with image analysis could be proactive

Manufacturing: sensors data help factory floor personnel in production



Logistics and shipping: location tracking and condition monitoring prevent damage

Retail: combination of data from online and brick-and-mortar shopping habits

Building management: sensors control adjust based on occupancy and location

Oil and gas: sensors help monitor oil pipelines to predictive maintenance

Agriculture: sensors measure soil to optimize irrigation systems

* Pwc 2017. Global Digital IQ Survey: Internet of things

… And making possible a multitude improvements

Real-time analytics

Enhanced worker and equipment productivity

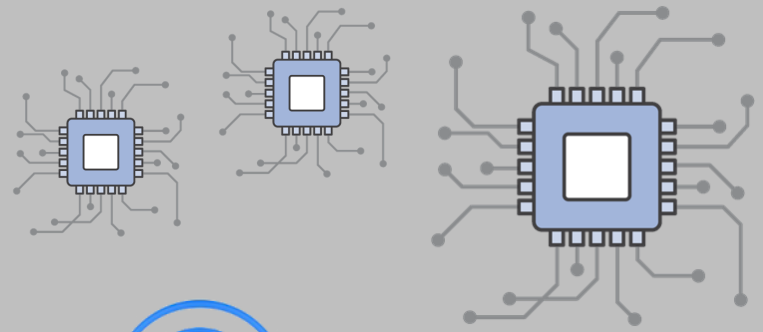
Better Customer Service

Effective comm Man-machine

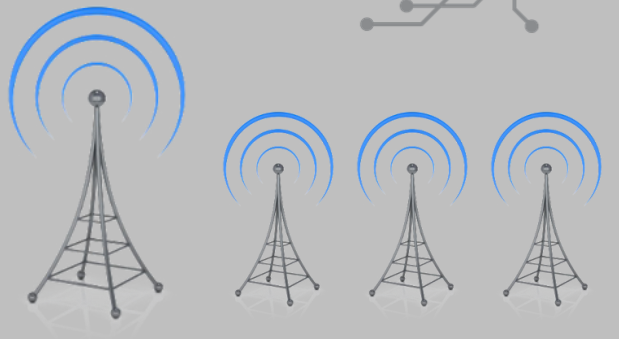
New revenue streams (mix of products)

Elements

Devices

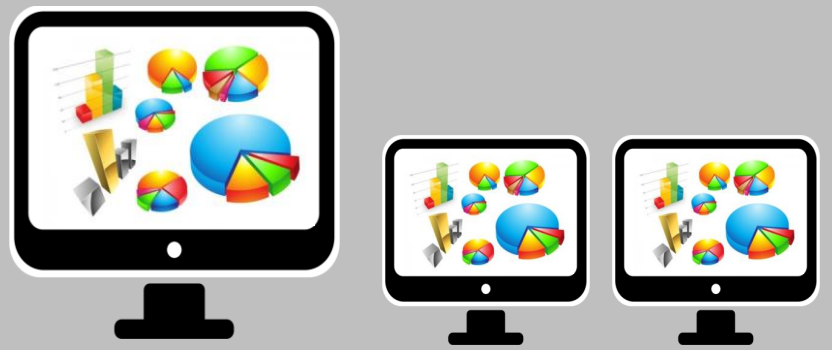


Connectivity



Service Platforms

Analytics



IoT Network Technologies are ready

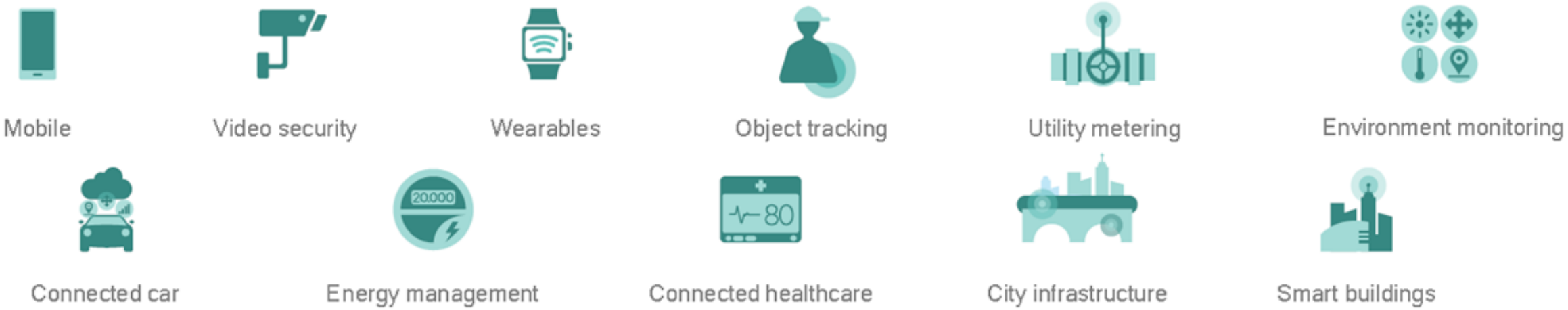
Scaling up in **performance and mobility**

Scaling down in **complexity and power**

LTE Cat-4 and above	LTE Cat-1	LTE Cat-M1 (eMTC)	Cat-NB1 (NB-IoT)
>10 Mbps	Up to 10 Mbps	Variable up to 1 Mbps	10s of kbps
n x 20 MHz	20 MHz	1.4 MHz narrowband	200 kHz narrowband

Network technology for IoT

Support a wide set of IoT service

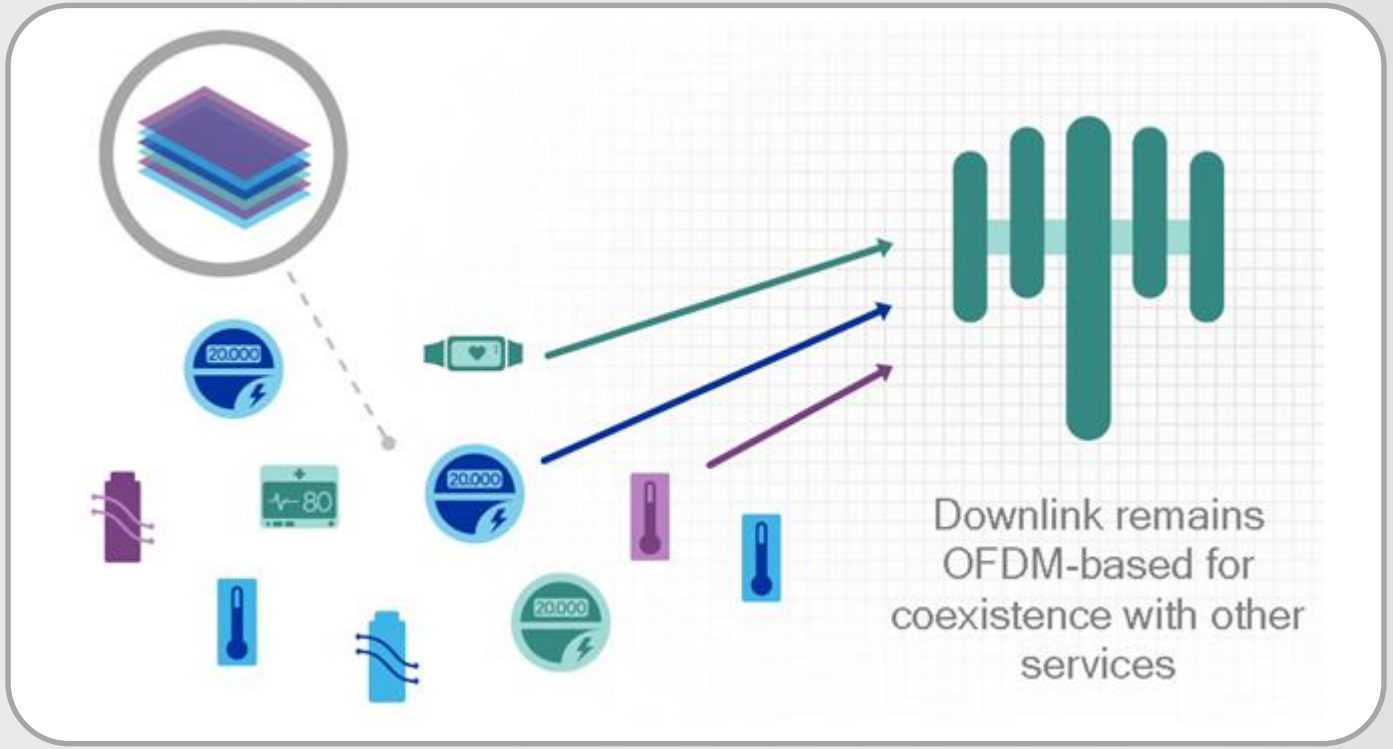


And future 5G New Radio will add improvements for IoT…

New mechanisms for **reducing the signaling load** when billions of devices are connected, including connection-less information transfer

Grant-free transmission of small data exchanges

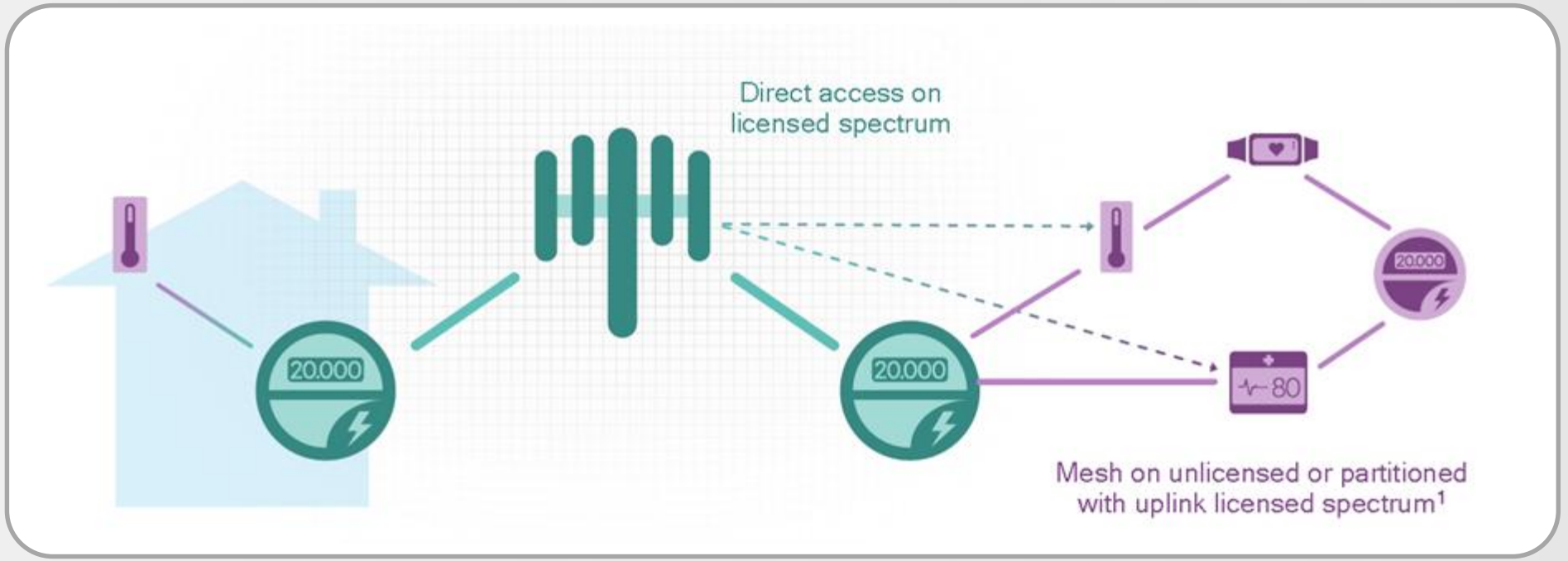
- Eliminates signalling overhead for assigning dedicated resources
- Allows devices to transmit data asynchronously
- Capable of supporting full mobility



Other proposals for **increasing the capacity by multiplexing several users** either with codes or other mechanisms (Huawei's SCMA or Qualcomm's RSMA)

… following many approaches

Improving effective uplink coverage by supporting network managed multihop mesh



Problem: uplink coverage

Due to low power devices and challenging placements, in e.g. basement

Solution: Managed uplink mesh

Uplink data relayed via nearby devices-uplink mesh but direct downlink

Telefónica is getting its Networks ready for this IoT explosion...

Analyzing HW installed

- Analyzing in depth HW installed based in our networks and its readiness for NB-IoT/LTE-M

Preparing our Networks

- Preparing our networks with the SW versions that makes NB-IoT and LTE-M available
- Completing LTE nationwide coverage in low bands

Assuring **interoperability**

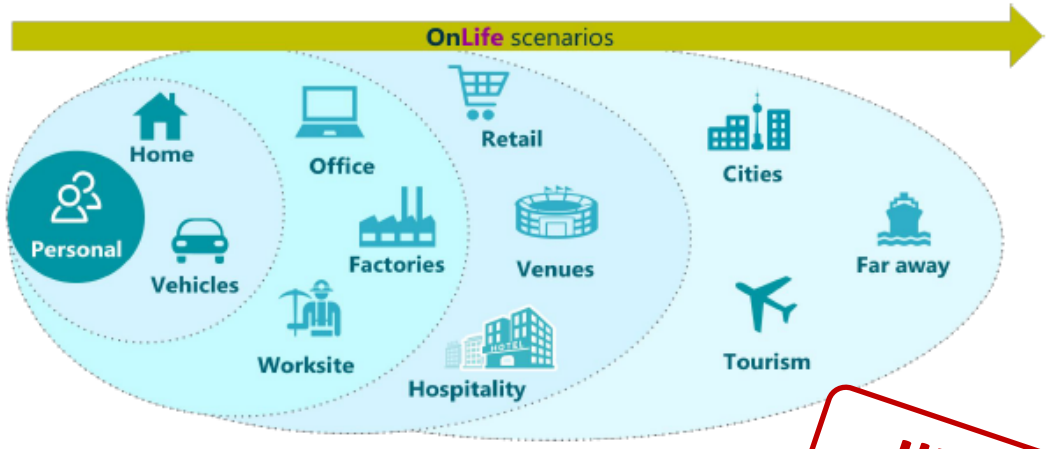
- Assuring interoperability among different vendors

Pre-commercial trials

- Starting pre-commercial trials to push the ecosystem

… to give support to many OnLife Scenarios

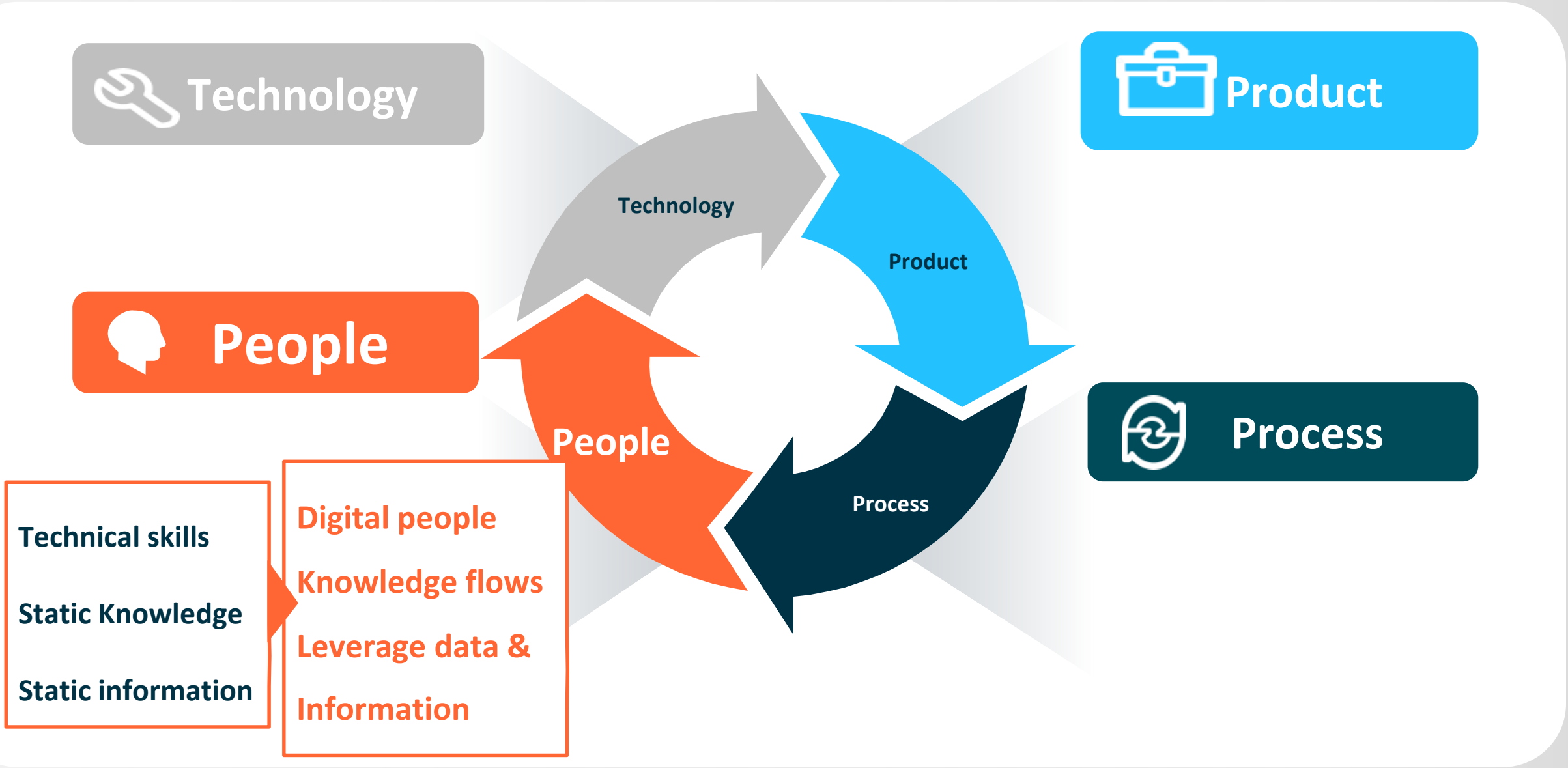
Telefónica wants to **connect people with its environment** by giving support with an **outstanding connectivity** within the **different OnLife scenarios**



Illustrative

Personal	Home	City	Industry (Digital Worker)
• Lost & Found Tracking • Connected Shoes • Smart Glove • Dog Sense	• Smart Home • M Base	• Waste Mgmt • Parking • Lighting	• Water Meter • Helmet • Bottle Sensor

For all the challenging environment we need technicians with more ambitious profiles: they are the cornerstone of the change

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