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:**
  - [Logos]

- **Regulators:**
  - [Logos]

**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 players**

- **New entrants**
  - [Logos]

- **MVNOs**
  - [Logos]

**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

Moving to the fourth industrial revolution

1st
Mechanization, water power, steam power

2nd
Mass production, assembly line, electricity

3rd
Computer and automation

4th
Cyber Physical Systems

Digital Society
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

<table>
<thead>
<tr>
<th>Healthcare: use of wearable devices to offer personalized care</th>
<th>Security: cameras combined with image analysis could be proactive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing: sensors data help factory floor personnel in production</td>
<td>Logistics and shipping: location tracking and condition monitoring prevent damage</td>
</tr>
<tr>
<td>Retail: combination of data from online and brick-and-mortar shopping habits</td>
<td>Building management: sensors control adjust based on occupancy and location</td>
</tr>
<tr>
<td>Oil and gas: sensors help monitor oil pipelines to predictive maintenance</td>
<td>Agriculture: sensors measure soil to optimize irrigation systems</td>
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* 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

<table>
<thead>
<tr>
<th>LTE Cat-4 and above</th>
<th>LTE Cat-1</th>
<th>LTE Cat-M1 (eMTC)</th>
<th>Cat-NB1 (NB-IoT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;10 Mbps</td>
<td>Up to 10 Mbps</td>
<td>Variable up to 1 Mbps</td>
<td>10s of kbps</td>
</tr>
<tr>
<td>n x 20 MHz</td>
<td>20 MHz</td>
<td>1.4 MHz narrowband</td>
<td>200 kHz narrowband</td>
</tr>
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### Network technology for IoT

### Support a wide set of IoT service

- Mobile
- Video security
- Wearables
- Object tracking
- Utility metering
- Environment monitoring
- Connected car
- Energy management
- Connected healthcare
- City infrastructure
- Smart buildings
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 in depth HW installed based in our networks and its readiness for NB-IoT/LTE-M
- Preparing our networks with the SW versions that makes NB-IoT and LTE-M available
- Completing LTE nationwide coverage in low bands
- Assuring interoperability among different vendors
- Starting pre-commercial trials to push the ecosystem
Telefónica wants to connect people with its environment by giving support with an outstanding connectivity within the different OnLife scenarios... to give support to many OnLife Scenarios.
For all the challenging environment we need technicians with more ambitious profiles: they are the cornerstone of the change.