5G/IoT
Oportunidades para la Transformación Digital de la Industria

Jaime Trapero, Head of Customer Marketing, Iberia & Morocco
Ericsson, enabling the full value of connectivity

180+ countries

140 years

45,000 patents

40% of the world's mobile traffic carried through our networks

50% of Cellular IoT networks globally
My first digital experience
Building trustworthy public transport services enabled by AI and 5G
“There is no Internet of Things today, only connected things”

Things are becoming connected. But we don’t have an Internet of Things yet.

More interoperability is needed.
From industry 1.0 to 4.0

1784  First mechanical loom
1870  First assembly line
1969  First programmable logic controllers
      Today

The fourth industrial revolution will require new business models, and new deployment options.
We don’t make tractors: we make sophisticated mobile information factories

(B. Lane, John Deere CEO)

- GPS shows where it is
- Microwave sensors measure cotton flow
- RFID tags let processors know the origin of each bundle
- Wireless communications
- Computing power of 8 PCs

From farming to smart agro
From sportswear to sport-based digital experience

‘I wear Under Armour’ + ‘I share my experience as an athlete powered by Under Armour’

Sources: BCG

...from high performance fabrics (...) data at the center of everything
(Plank, Under Armour CEO)
Connect — Cellular IoT growth revised up
Ericsson Mobility Report June 2018

— 3.5 billion cellular IoT devices projected in 2023
— 30% CAGR
— China leading the way with NB-IoT rollout
Revenue clear strategic driver for IoT with multitude of strategic paths discovered

100%
All interviewees see revenue growth as key strategic driver for IoT

“IoT is important to ensure customer retention”
– Asia Pacific service provider

“IoT offers good margins on top of the network”
– North American service provider

70%
Have not had a well-defined strategic path but rather testing and learning

“We are still testing and learning – you need to fail fast and often”
– North American service provider

“We have not had a clear strategy with IoT”
– North American service provider
Majority of service providers plan to move up the value chain

2/3 industry digitalization revenue beyond connectivity in 2026¹

60% only acting as network and connectivity providers today

80% want to move up the value chain

“We want to move up the value chain to leverage our customer relationships”
– North American service provider

“We becoming an E2E solution provider is where the biggest revenues are”
– European service provider

¹ Ericsson 5G Business Potential study
70% of IoT leaders are focusing on cellular IoT

“3GPP resonates with our brand and focus on security”
- European service provider

90% identified security as key differentiator

“One of our unique selling points is we are in the lead when it comes to security”
- Asia Pacific service provider
60% mentioned analytics as next major opportunity

“Our innovation hub enables partners and customer to develop new solutions”
- Asia Pacific service provider

80% using standards and APIs to enable 3rd party development

“Our aim is to become a data-driven company as an enabler to our customers”
- European service provider
Enterprise digital transformation progression

Transform

Operate

Integrate

Supply

Transform
Digitally transform entire business

Evolve
Develop new business and delivery models

Optimize
Improve existing processes through efficiencies

Network Provider
Connectivity Provider
Service Enabler
Service Creator
Network Developer
What are we doing about it?

Connect  Manage  Secure  Collaborate  Monetize
What are we doing about it?

Connect  Manage  Secure  Collaborate  Monetize
You can somatise latency

Mobile delays comparable to watching a horror movie

..., heart rate increases 38%

If mobile videos take > 2s to load, NPS may drop by at least 4 points

Impact on NPS

+4.5

-4

Source: Ericsson ConsumerLab
LIVING WITH LAG*

*when slow internet causes disruption or delay to the user
**Connect** — The network experience matters. Don’t connect with just anything

<table>
<thead>
<tr>
<th>Device Type</th>
<th>Location</th>
<th>Geo Territory</th>
<th>Available Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple Sensor</td>
<td>Indoor</td>
<td>GPS</td>
<td>3GPP simple</td>
</tr>
<tr>
<td>Multi Sensor</td>
<td>Outdoor</td>
<td>Country</td>
<td>Enterprise WIFI</td>
</tr>
<tr>
<td>Machine Controller</td>
<td>Industrial Complex</td>
<td>City</td>
<td>3GPP complex</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Available Services</th>
<th>Data Tariff</th>
<th>QoS Class</th>
<th>Latency</th>
<th>Cost Per Device</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unlimited</td>
<td>Bandwidth Min</td>
<td>Value 1-6</td>
<td>Device Cost</td>
</tr>
<tr>
<td></td>
<td>10 GB</td>
<td>Bandwidth Max</td>
<td>4</td>
<td>£0.0X</td>
</tr>
<tr>
<td></td>
<td>1 GB</td>
<td>Queue Priority</td>
<td></td>
<td>Data Cost Per Mb</td>
</tr>
</tbody>
</table>

**Illustrative**
The business case of industry digitalization fueled by IoT & 5G

**Massive IoT**

- **10-100X** Connected Devices
- **10X** Battery Life

Create digital twins and predictive maintenance

**Critical IoT**

- **$204 – 619 Bn**
  Industrial digitalization
- **1000X** Mobile Data Volumes
- **5X**
  Lower Latency

Intelligence orchestration and remote control
5G will allow a myriad of new use cases

**Massive MTC**
- Smart Agriculture
- Fleet Management
- Logistics
- Tracking
- Smart Meter
- Low cost, low energy
- Small data volumes
- Massive numbers

**Critical MTC**
- Traffic Safety & Control
- Industrial Application & Control
- Remote Manufacturing
- Remote Training
- Remote Surgery
- Ultra reliable
- Very low latency
- Very high availability

**Enhanced mobile broadband**
- Enterprise
- Home
- Venues
- Mobile/Wireless/Fixed
- Non-SIM Devices
- Smartphones
- VR/AR
- Broadcasting
- 4K/8K UHD

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4G

5G
What are we doing about it?

Connect  Manage  Secure  Collaborate  Monetize
Manage - Connectivity, devices and data

LPWA LTE-based architecture with a range from NB-IOT to LTE to 5G

Manage connectivity globally, with common billing and subscription plans

Semantic data, to support zero-touch fast onboarding of devices

Standards are key for ecosystem collaboration
What are we doing about it?

Connect  Manage  Secure  Collaborate  Monetize
Secure — building trust is essential for collaborative IoT

Can I trust the identity of the device?

Can I be sure that data has not been manipulated?

Is the network resilient to attacks?

Is my operation compliant?

Managing the volume of devices, ecosystem players and data volumes requires automation
What are we doing about it?

Connect  Manage  Secure  Collaborate  Monetize
New business models, Industry relevance and Partnerships are keys to monetize 5G

Do you agree with the following?

- We can’t pay for 5G by simply raising rates on consumers as they are tapped out: 64%
- We need to find new revenue-sharing models to monetize 5G: 68%
- We need to provide industry-specific services to monetize 5G: 68%
- Third party collaboration is an essential element in monetising 5G: 77%
- IoT will play a major role in monetizing 5G: 86%

Source: Ericsson 5G readiness survey 2017
Building 5G ecosystems

Source: Ericsson
..., but vertical industry leaders moving into the 5G space

Source: Arthur D. Little, Ericsson, clippings
Customer value augmented - by an offering built upon a wide collaborative ecosystem
What are we doing about it?

Connect  Manage  Secure  Collaborate  Monetize
## Industry use case categories

<table>
<thead>
<tr>
<th>Category</th>
<th>Use Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Agro</strong></td>
<td>Field monitoring &amp; mapping, Livestock routing &amp; monitoring, On-field applications</td>
</tr>
<tr>
<td><strong>Auto</strong></td>
<td>Autonomous driving, Connected services, Safety &amp; traffic efficiency</td>
</tr>
<tr>
<td><strong>Energy &amp; Utilities</strong></td>
<td>Smart energy mgt., Smart grid, Medical data mgt.</td>
</tr>
<tr>
<td><strong>Financial Services</strong></td>
<td>Lending, payments &amp; invest., Hospital apps</td>
</tr>
<tr>
<td><strong>Health</strong></td>
<td>Hospital apps, Field Devices</td>
</tr>
<tr>
<td><strong>Mfg.</strong></td>
<td>Field Devices, Medical data mgt.</td>
</tr>
<tr>
<td><strong>Media &amp; Entmt.</strong></td>
<td>Advertising, Entertainment, Urban &amp; infra. security</td>
</tr>
<tr>
<td><strong>Public Safety</strong></td>
<td>Cyber security, Monitoring, com. &amp; analytics, Passenger inf.</td>
</tr>
<tr>
<td><strong>Public Transport</strong></td>
<td>Monitoring, com. &amp; analytics, Operational efficiency</td>
</tr>
<tr>
<td><strong>Retail</strong></td>
<td>Customer experience, Smart ticketing, Promotion solution</td>
</tr>
</tbody>
</table>
| **Other**         | Other, Other, Other, Other, Other, Other                                  

Source: Ericsson
The analysis of 5G use case clusters offers a complementary vision

Addressable market for telcos (2026, USDbn)

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Real-time Automation
Enhanced video
Other
Monitoring & tracking
Connected vehicle
Hazard & mnt. sensing
Smart Surveillance
Autonomous Robotics
Remote Ops
AR/VR

Source: Ericsson
Of the total 5G/IoT enabled value in 2026, up to 47% is addressable by operators.

- **Digitalization revenues for ICT players**
  - US bn, 2026: $3,458

- **5G enabled revenues**
  - 38%
  - $1,307

- **Operator addressable revenues**
  - 47%
  - $415 (32%)
  - $204 (16%)

Source: Ericsson and Arthur D. Little
Use case cluster overview and definitions

Cluster definitions

Enhanced video services
- Next generation video telecommunication services that allows for next generation content consumption

Real-time automation
- Applications that leverage data from sensors in real-time to trigger specific actions autonomously

Monitoring and tracking
- Extensive, and often in real-time, asset tracking combined with next generation navigation capabilities

Connected vehicle
- Applications to provide moving vehicles with a continuous, nationwide connection

Autonomous robotics
- Machines that perform tasks and behave autonomously, with limited human intervention

Hazard and maintenance sensing
- Applications leverage sensors and algorithms to provide alerts for mission critical activities to aid decision making

Smart surveillance
- Cameras and sensors, a large number of objects are identified and analyzed in real-time

Remote operations
- Enable remote control, via human intervention, of machinery and/or vehicles from any location

Augmented reality
- Live view of real-world environment are augmented by visual and audio aids

Source: Ericsson and Arthur D. Little
Realizing smart manufacturing

With the new standards in cellular connectivity, almost every asset in a factory can be connected and managed in order to solve operational challenges.
Example of use cases enabled by cellular networks in a digital factory

**Automation use cases**
- Supply chain automation and assembly control
- Overview of entire production line and value chain processes for operational efficiency and quality
- Robot controller as cloud-based application
- Artificial intelligence automated quality testing
- Flexible production with cloud robotics

**Location use cases**
- Asset management
- Warehouse management
- Workforce safety and utilization

**Monitoring use cases**
- Remote plant monitoring
- Traffic management and route optimization (internal logistics, automated guided vehicles)
- Preventive and prescriptive maintenance
- Environmental compliance and regulations
- Workforce efficiency and manufacturing quality
The future connected manufacturing industry

Connected flows
The factory is integrated with wider networks, other factories and logistics.
- Logistics securely tracked throughout manufacturing process
- Awareness of precise location of vehicles

Connected site
The factory floor is a highly specialized environment with diverse needs.
- Extreme reliability and low latency
- Secure, high reliability, high availability network

Globally connected company and products
The factory-shipped, installed and delivered goods are globally connected and serviced.
- New forms of customer engagement
- New services and partner ecosystems enabled
Ericsson Nanjing Manufacturing Plant – Smart Wireless Manufacturing

A joint initiative between Ericsson and China Mobile on connected screw drivers in a smart wireless manufacturing context

In Ericsson’s Nanjing factory, 2000+ employees operate 1000+ high-precision screw drivers on the production line daily. Motion sensors and reset switches are attached to the connected screw drivers for maintenance recording.

Prior to this project, maintenance was carried out manually at fixed intervals, when the equipment was calibrated and lubricated.

More information here.
Ericsson Nanjing Manufacturing Plant — Connected screw driver solution

The challenge
— Ericsson’s Nanjing factory uses 1000+ high-precision screw drivers in the base station production line
— The site operates 364 days a year and maintenance was done manually at fixed intervals, when the equipment was calibrated and lubricated, creating large amounts of manual maintenance workload

The solution
— Motion sensors and reset switches are attached to IoT modules of connected screw drivers for maintenance recording
— The solution uses NB-IoT for connectivity, leading to Ericsson’s first massive IoT solution for smart manufacturing

The result
— By connecting the screw drivers, employees can measure and track utilization of each tool and only perform maintenance when needed, leading to a 50% reduction in maintenance workload
— The factory reached breakeven in less than 6 months and RoI of 210% in the first year

Networks
Off-the-shelf
Platform
Device ecosystem
App ecosystem

Ericsson Nanjing Manufacturing Plant – Connected screw driver solution

Connected screw drivers

NB IoT/ Cat M1

China Mobile NB-IoT network

China Mobile vEPC

Analytics

Mobile Application visualization

Web Application visualization
PIMM
Pilot for Industrial Mobile Communication in Mining

- Evaluate mobile communication in an industrial context
- Consider strict requirements on safety and robustness in underground mining

- Increased productivity and Improved Safety
- Industrial 5G requirements
- Understand eco system, business models, etc.
Remote operation
Robot remote control with haptic feedback over LTE

— Evaluate mobile communication in industrial remote operation
  — Remote operations in mines – an industrial use case with strict requirements on reliability and latency.
  — Explore the use of industrial haptic communication in mobile networks

— Greatly improved health and safety
— Increased availability of personnel
— Capture key requirements for 5G

Partners:

Photo: ABB
Ericsson & Telefonica = 5TONIC

Scope
- 5G in its broadest sense
- Ecosystem focus
- Government support
- Evaluate concrete 5G use cases

Ecosystem

Technologies IN FOCUS
- New Radio Access technologies
- Small Core and Network Slicing
- Multi-cloud control and orchestration

1st OpenLab in Europe
Objective
Optimize intra-factory logistics

Functionality
Automated-Guided Vehicles (AGVs) take on all intra-factory logistics tasks, being guided and coordinated from the cloud

Role of 5G
Provide minimum RTT comms between an Automated Guidance SW in the cloud (at the network edge) and every AGV in a factory

Key 5G Features
Ultra-reliable low-latency Comms
KPIs: Availability, Mobility, Low Latency (min RTT), Security

Operator
Vendor
Vertical
Technology
Government
University
Startup/ Accelerator

TBD
UC: Automated Factory Logistics
High-level architecture & ecosystem

AGV manufacturer deploys and upgrades SW as if were to run on a public cloud

- Virtualized AGV SW runs here
- New Smart AGV Orchestration runs here

Sensor info continuously updated via 5G
Control orders continuously sent back via 5G
Are you ready?

Connect  Manage  Secure  Collaborate  Monetize
Customer value augmented - by an offering built upon a wide collaborative ecosystem

Device Manufacturers

Service Providers

Industries and enterprises

Application Developers