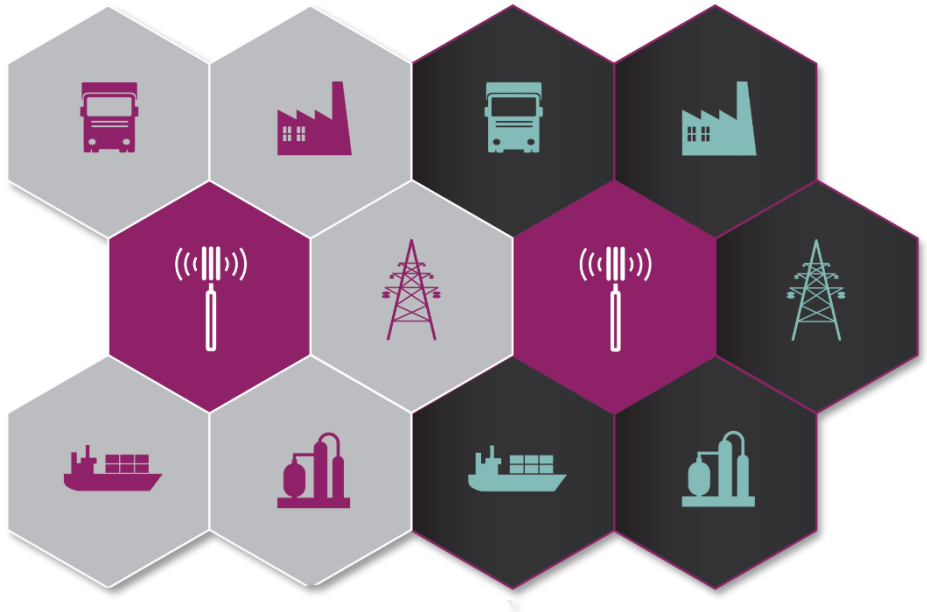
IoT Webinar – Industry 4.0

OPTIMISING INDUSTRIAL IoT

with Mobile IoT



24 October 2018

Featured Speakers:

- **Sam Brown**, IoT Technical Manager, GSMA
- **Mobeen Khan**, AVP, IoT Strategy and Product Management, AT&T Business Solutions
- **Erik Josefsson**, Head of Advanced Industries, Internet of Things, Ericsson
- **Bob Rigouts**, Product Manager, Connectivity, Atlas Copco

ABOUT THE GSMA

The GSMA was founded in **1987**

12 offices worldwide

UNITING **750+** MOBILE OPERATORS

WITH **350+** MOBILE COMPANIES In the broader mobile ecosystem

The GSMA represents the interests of mobile operators worldwide

The world's leading mobile industry events, Mobile World Congress, Mobile World Congress Shanghai, and Mobile World Congress Americas, together attract

192,000+

people from across the globe each year

8.8+ billion mobile connections worldwide

América Móvil, AT&T, Axiata advancing asia, Bharti, 中国移动 China Mobile, China Unicom 中国联通, T-Mobile, etisalat, KDDI, kt, MTN, NTT docomo, orange, ooredoo, SK telecom, TATA, Telecom Italia, Telefónica, telenor, Telstra, Turk Telekom, verizon, VimpelCom, vodafone

Connecting Everyone and Everything to a Better Future

MOBILE IoT TODAY

ECOSYSTEM

1100+ GSMA Mobile IoT Innovator Companies

42 IoT Labs In 19 countries

INDUSTRY-WIDE SUPPORT

Support for Mobile IoT from **56 MNOs** and **37 vendors** worldwide

70 COMMERCIAL LAUNCHES in 34 MARKETS

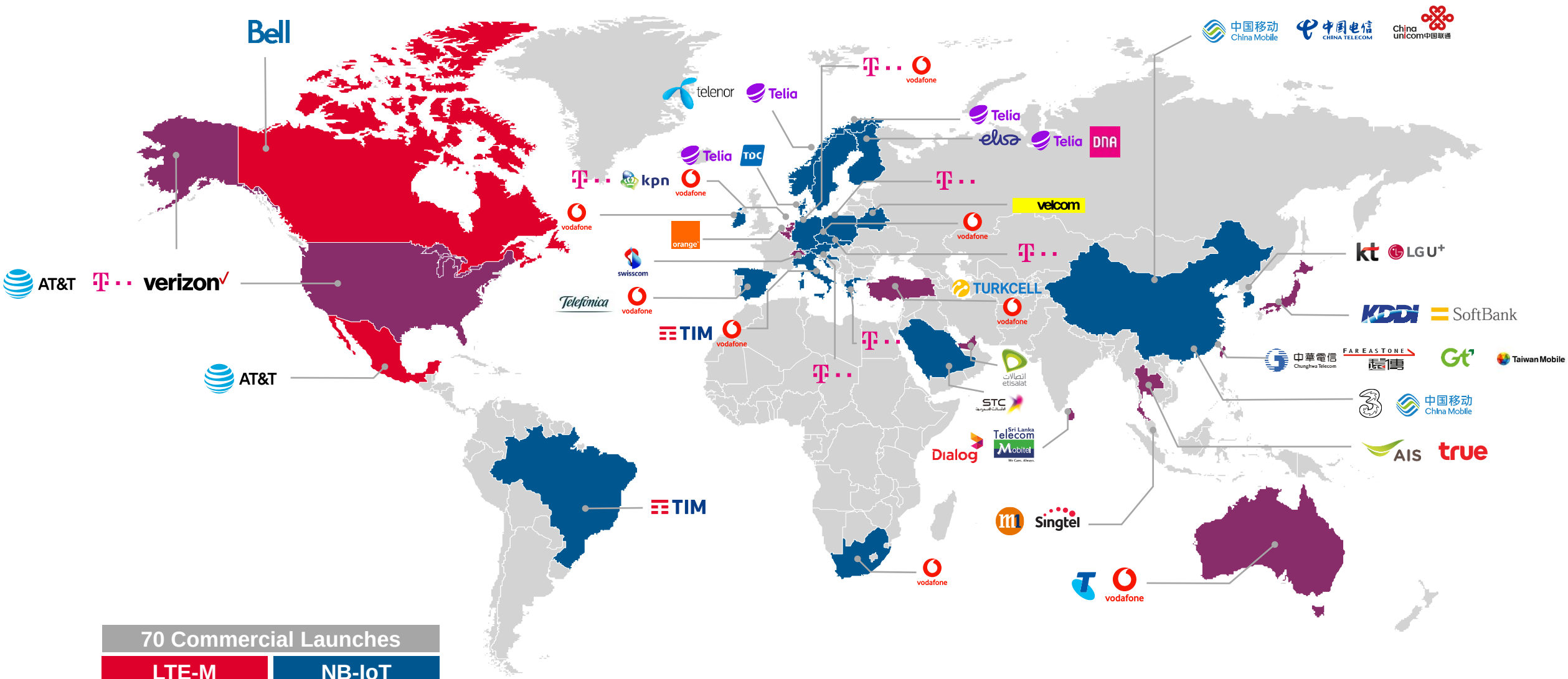
COMMERCIALLY AVAILABLE

100+ Modules
25+ Developer Kits

LTE-M

NB-IoT

MOBILE IoT GLOBAL COVERAGE



70 Commercial Launches	
LTE-M	NB-IoT
Both LTE-M and NB-IoT	

INDUSTRIAL MOBILE IoT FEASIBILITY STUDY

How Mobile IoT is Changing the Industrial Landscape

China Unicom, Kysun and Wanxiang Group, Ericsson, Horus, Huawei, Hothink and Tanda

Cellular technologies are evolving to meet the growing demand in industry for more production data, predicative maintenance and greater automation. Using licenced spectrum to provide low power wide area (LPWA) connectivity - Mobile Internet of Things (Mobile IoT) technologies are playing a pivotal role in connecting factories, machines, industrial equipment and sensors, to enable a more advanced, efficient and flexible way of working.

Example Industrial Use cases

- Production monitoring and analysis of automotive parts
- Smart factory – predictive maintenance, environmental monitoring, andon call system
- Plant equipment predictive maintenance
- Fire and toxic gas detection

https://www.gsma.com/iot/industrial-iot-feasibility-study-mobile-iot/

The Benefits of Mobile IoT in Industrial

- Scalability & Affordability – wireless networks allow a lower cost per connection
- Flexibility – Wireless networks allow sensors and connected assets to be re-deployed easily and effectively
- Mobility – Assets can be connect whether they are stationary or not and the connection can continue outside of the industrial location
- Longevity of technology – 3GPP Mobile IoT technologies LTE-M and NB-IoT are part of the 5G family

INDUSTRIAL IoT – CASE STUDY

Mobile IoT: Smart Industrial Factory

Ericsson

Telecoms equipment maker Ericsson is using the cost-effective and reliable connectivity provided by Mobile IoT networks to make its factories in Sweden, Estonia and China more efficient and flexible.

- Mobile IoT enables the factories to efficiently collect data from sensors and communicate wirelessly to:
  - Ensure critical equipment has not been moved
  - Allow machine operators to call technical support
  - Real-time monitoring and analysis of production data
  - Flexibly monitor environmental conditions
  - Monitor the level or material in storage boxes
  - Maintain tools are correctly calibrated
- The benefits:
  - Wireless solution offers mobility, flexibility and allows retrofitting
  - Enables the manufacturer to collect intelligence on site
  - Reduced lead-time for problem-solving
  - Potential savings of ~€200 (US$230) per added sensor

https://www.gsma.com/iot/ericsson-smart-industrial-factory/

BUILDING A VIBRANT ECOSYSTEM

MOBILE IoT INNOVATORS
1100+ companies

EVENTS
Networking Events, Meet-Ups, Q&As

NEWSLETTERS
Monthly briefings on the latest news, case studies, market developments

GSMA SUPPORT
82+ MNOs and Vendors

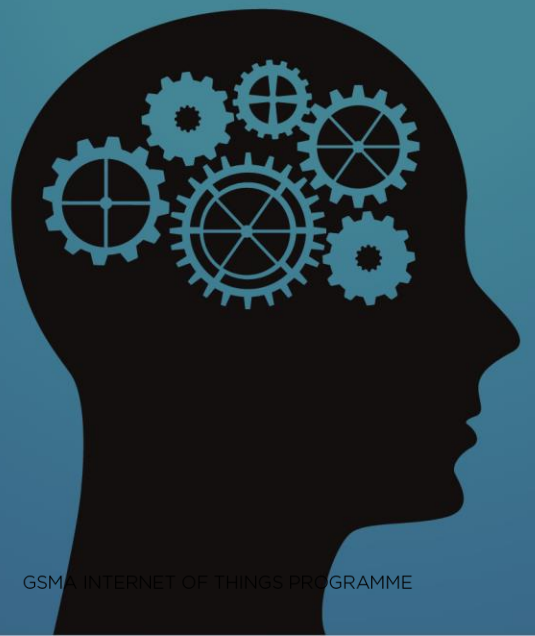
RESOURCES
Modules, Development Kits, Resource Library

DIRECTORY
The official industry index for companies working with LPWA technologies in licensed spectrum

ASK THE MOBILE IoT EXPERTS
Access to leading industry experts and Mobile IoT pioneers

GSMA MOBILE IoT
INNOVATORS

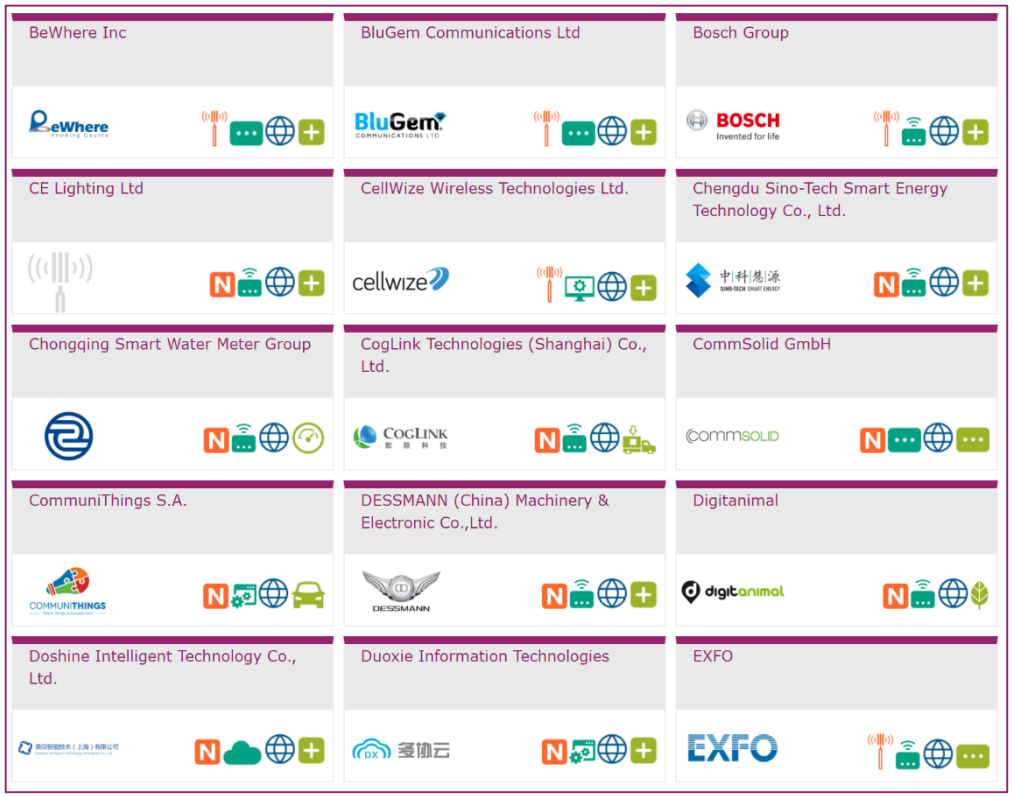
Mobile IoT = Trusted IoT



gsma.com/mioti

MOBILE IoT INNOVATORS DIRECTORY

- Exclusive promotional opportunity for members of the GSMA Mobile IoT Innovators
- Detailed information including target market, industry verticals, company profile, contact details
- Increased exposure to mobile operators and the wider ecosystem, helping to create new business and revenue opportunities in the Mobile IoT market



GSMA MOBILE IoT INNOVATORS

GSMA INTERNET OF THINGS PROGRAMME

Optimizing Industrial IoT with Mobile IoT

AT&T IOT

Mobeen Khan | AVP IOT Product Marketing Management

10.24.2018

AT&T Business

AT&T Innovating with IoT

44M
Connected Devices
Q2 2018

2

IoT Foundries
Redefining innovation

9

AT&T Relationship with
Top 10 Fleet providers

29

Major Auto Brands
AT&T Connected cars

21m

Connected cars in the US and abroad

3.2m

Connected Fleet Vehicles

2.2m

Connected Asset mgmt. devices

8

AT&T Spotlight Cities

AT&T Business

The AT&T IoT platform

AT&T Business

Solutions

Connected Car | Fleet Management | Healthcare | Asset Management | Connected Home | Smart Cities | Agriculture Oil and Gas | Retail | Consumer Electronics Wearables

IoT Platform

AT&T DataFlow

AT&T Control Center

Multi-Network Connect

IoT Devices

Analytics

Data Orchestration

Billing Management

Service Management

Device Management

APIs

Cloud

Cybersecurity

Professional Services

AT&T Business

RAMPING UP TO 5G

1G

1980

Analog

Voice

2G

1990

Digital

GSM

Voice Capacity

3G

2000

UMTS/CDMA

HSPA+

Voice & Data

4G

2010

LTE/LTE-A

Broadband

Data & Video

5G

2018+

"Puck" device

Mobile devices

Mobile Broadband

"Smart"

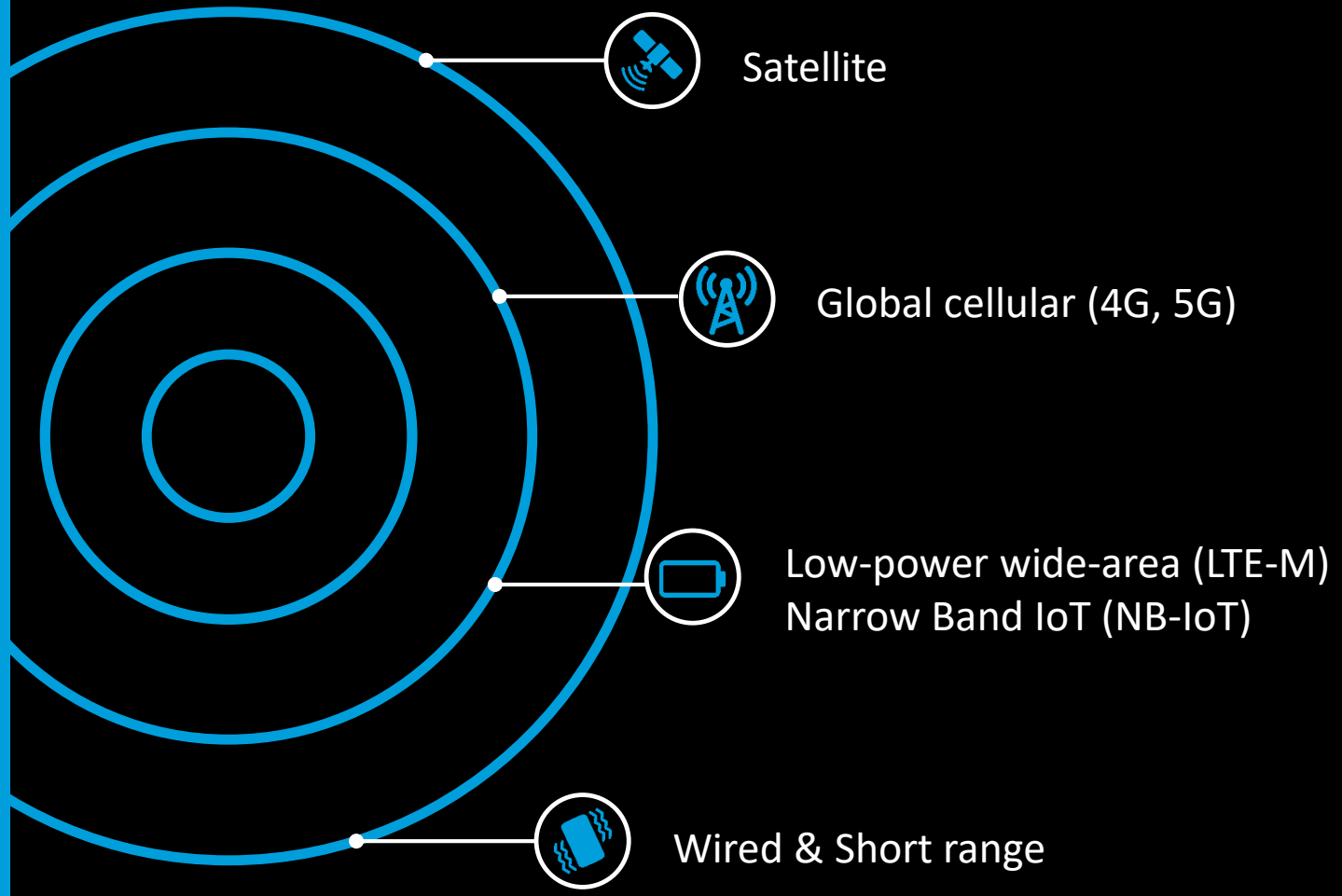
Network Slicing

LTE-M/NB-IoT

LATENCY, RELIABILITY & SPEED

SPEED

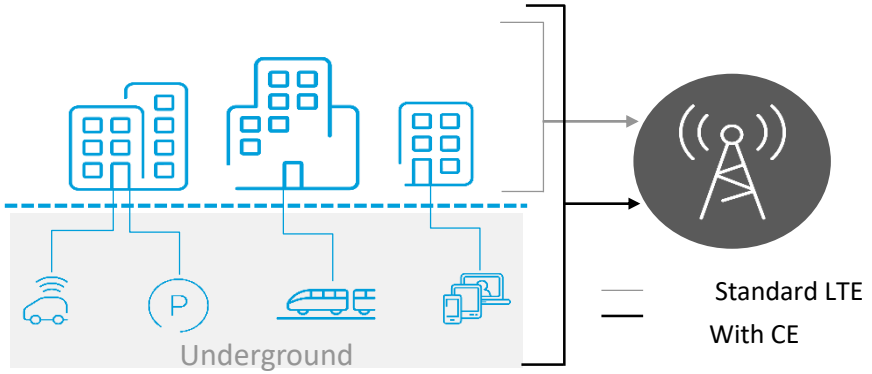
Network & Connectivity Evolution



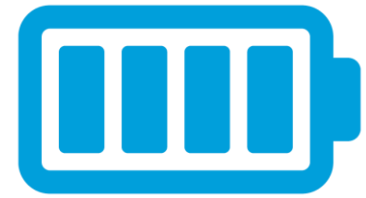
LTE-M Differentiators & Benefits : Voice and Mobility

Being voice capable widens pool of use cases, differentiating the network from other LWPAs

Ability to maintain connection while in motion expands opportunities to use LTE-M



Improved in-building and subterranean coverage*



Power Saving Mode (PSM) & Extended & Discontinuous Reception (eDRX) can extend battery life up to 10 years

"Out-of-the-box" connectivity with no additional configuration, or pairing with access points required.

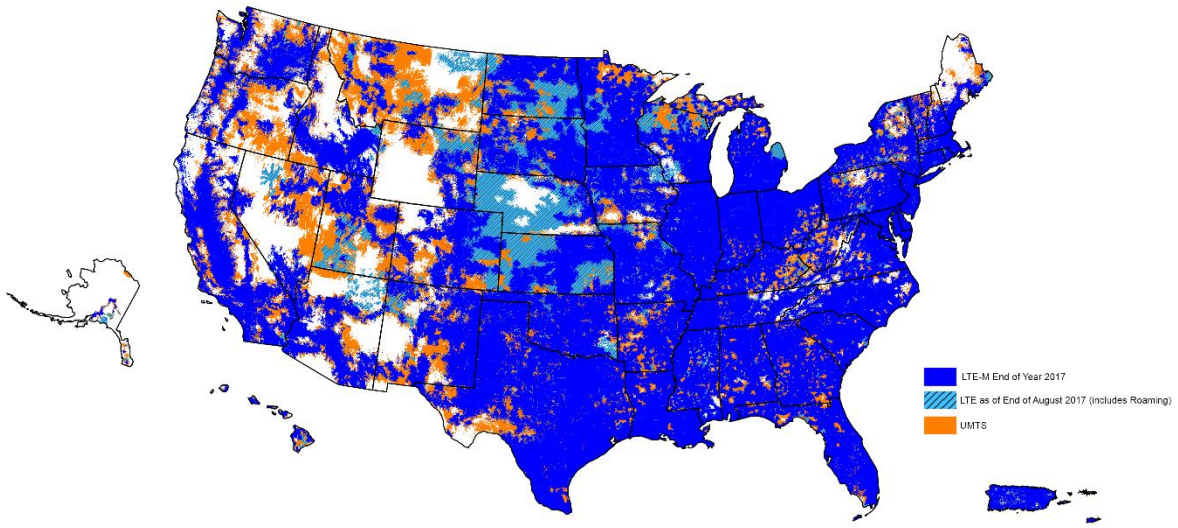
Does not require customer premise cabling, dependence on an existing network connection, or deployment of routers.

Voice available EOY 2018, Mobility Q1 2019

AT&T Business

AT&T LTE-M Outdoor Coverage

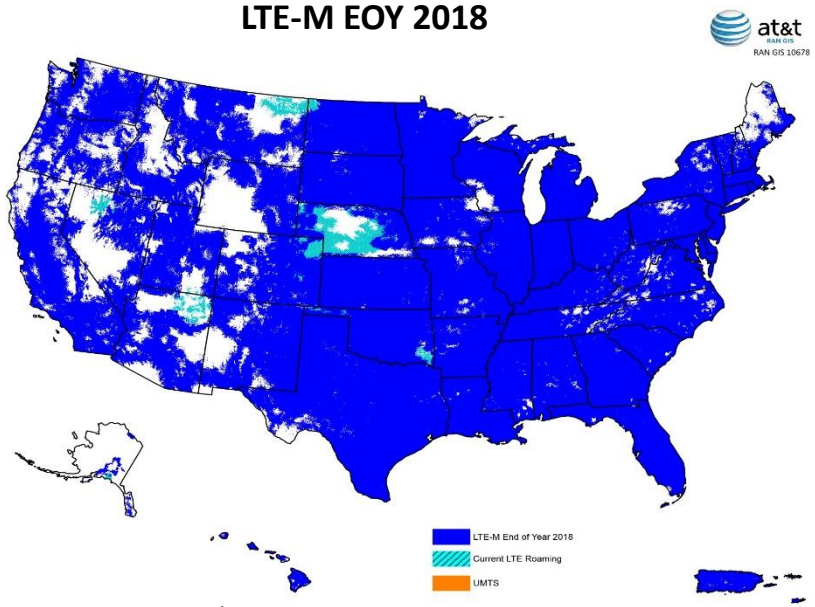
Current LTE-M Coverage



Coverage Map generated using
-**110 dBM** outdoor designs

LTE-M covers **90%** area square miles and **99.5%** of POPS covered of EOY17 legacy LTE footprint

LTE-M EOY 2018



Coverage Map generated using
-**110 dBM** outdoor designs

LTE-M coverage is equivalent to legacy LTE. Both LTE-M and legacy LTE coverage exceeds 3G coverage by EOY 2018

The coverage represented in the coverage map does not provide a guarantee of coverage. The coverage map is an illustrative representation of available coverage that has been sourced in part from a third party, and the accuracy of the information cannot be guaranteed. A compatible device is required. Coverage may change periodically without notice. There may be a delay in updating the coverage map to represent actual changes made to network coverage. Updates cannot be made in real-time. The information provided in the coverage map is covered under NDA, and may not be shared outside of your organization. Reproductions, replicas, duplicates, facsimiles or copies or any kind may not be used on a public-facing website. AT&T is not responsible for any inaccuracy in the coverage contained in this coverage map.

AT&T Business

LTE Application Use Cases

Example use cases for Broadband Cellular and LPWA technologies[1]

Bandwidth	Technology	Devices
1 Gbps	Cat-4	Routers • Network bridges • Gateways • High resolution video Endpoint concentrators
100 Mbps		
10 Mbps	Cat-1	Video surveillance • Connected healthcare • In-car hotspot Retail signage • Digital signage • In-car infotainment Enterprise PDA
1 Mbps		
100 Kbps	LTE-M	Asset trackers • Telematics • Smart watches • Alarm panels Pet trackers • Smart Appliances • Point of Sale terminals Gas/water meters • Patient monitors
10 Kbps	NB-IoT	Smoke detectors • Parking control • Smart agriculture Sensors • HVAC Lighting • Electric meters Industrial monitors
1 Kbps		

This table includes a summary of potential application use cases for cellular and LPWA IoT communication. Not all are listed and many use cases may work well across multiple network technologies.

[1]Source: CAT-M vs. NB-IoT: Energy Consumption vs. Payload, Sequans Communications, January 2016

AT&T Business

Vertical Focus

ENERGY

HEALTHCARE

PUBLIC SECTOR

FINANCIAL SERVICES

RETAIL

MANUFACTURING

AT&T Business

Industrial IoT Inbound/Outbound Logistics

AT&T Fleet Management

AT&T Fleet Manager for Enterprise	• Large, complex and integrated fleet opportunities 
AT&T Fleet Manager for Government	• Government fleets with security requirements • FirstNet 
Fleet Complete	• Small to midsize fleets and retail customers • State and local light-duty vehicles 
Fleet Manager	• Specialize in State and Local Government winter/summer operations 

Tracking & Trailer : Shipping Company

Company provides plumbing installation and repair to a large metropolitan area. With a growing team of mobile technicians, it needs a solution to better manage and monitor its workforce to meet customer demand.

HOS Compliance : Seafood Distributor

Company drivers have always manually logged their drive-time details on paper but need automated logbooks to comply with new federal mandates.

Key Considerations

- Reliability
- ELD mandate
- Cost & Budget
- Technology

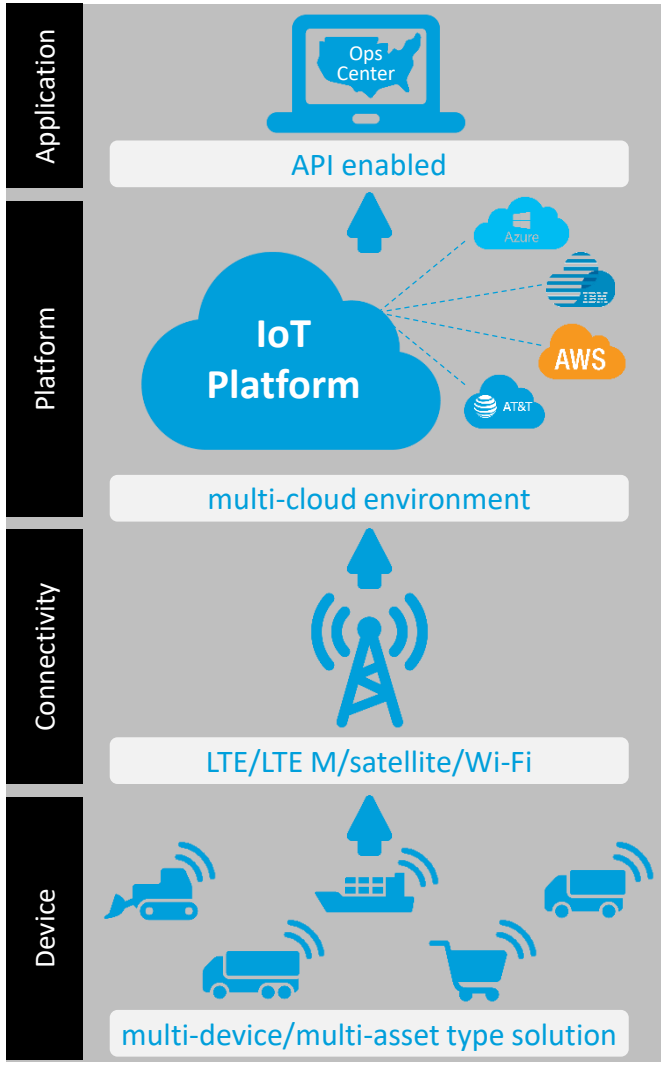
- Service Support
- Safety
- Connectivity
- Security

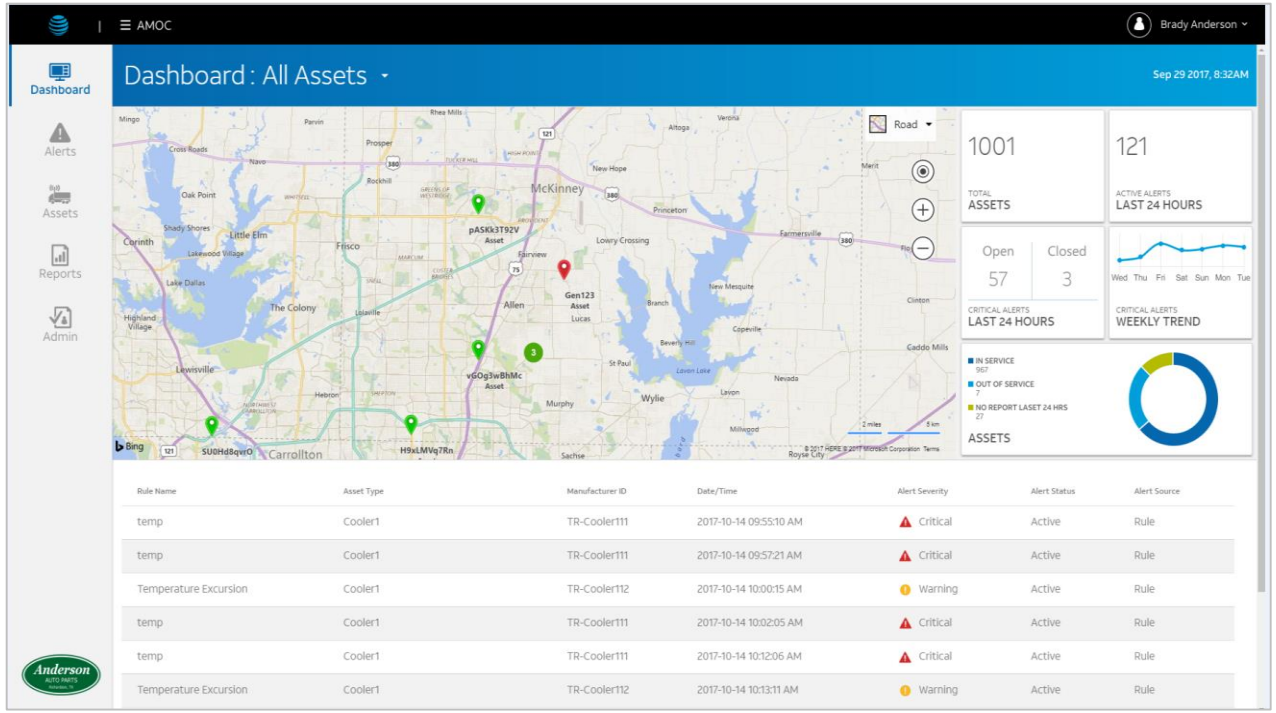
AT&T Business

1 & 2 Frost & Sullivan: "Developments in Connected Truck Market Shaping the Future of Logistics, Global, Jun. 12, 2017.

Industrial IoT Inbound/Outbound Logistics

AT&T Asset Management Operations Center





Manufacturing

Transportation/ Shipping

Government

Asset Tracking

Healthcare

Cold Chain Integrity

Retail

Connected Coolers

Temperature

Door open/close

Location

AT&T Business

Industrial IoT Process Management

AT&T LTE-M Button

Purchase LTE-M Button

Supported devices are preconfigured to connect securely to the AWS IoT 1-click service

Deploy with a single click

From the AWS-1 Click console, select a prebuilt Lambda function or customize for your use case

View reports

View utilization and status reports of your device deployments anytime through the AWS IoT 1-Click console

1,500 clicks or 3 years of service

3 types of click functions

Easy portability

Highly secure And reliable LTE-M Network

Industrial Manufacturing

Customer objectives

- Manufacturing company operations staff “walk the line” and inspect manufacturing equipment multiple times a day to ensure proper operation. Looking for an efficient and cost effective solution to save manual log entries

AT&T solution

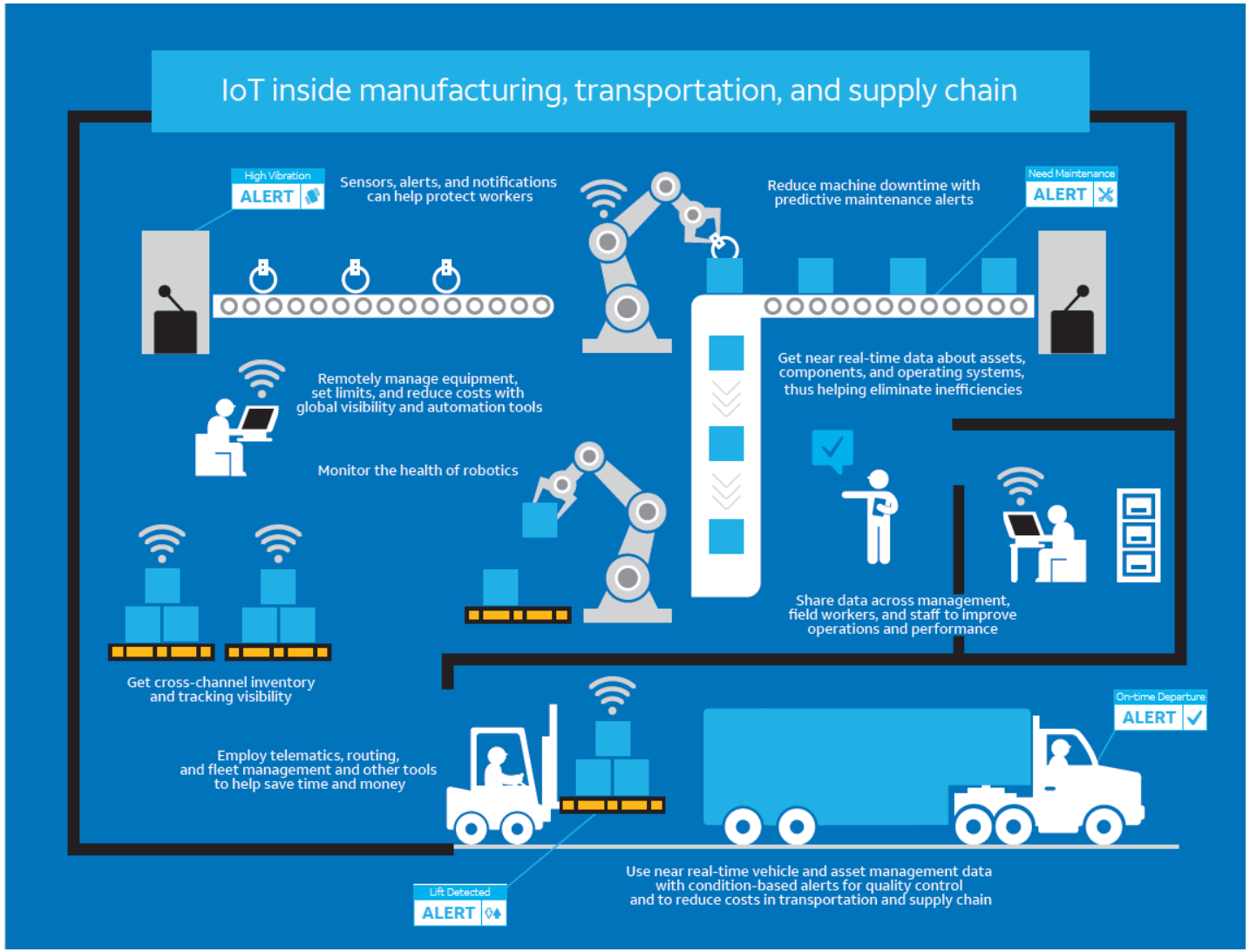
- With the AT&T LTE-M Button, customers don’t need to manually log entries for faulty equipment. With a click, they can report and request service for equipment, potentially saving them millions in operational costs

Customer value

- Save time with automatic reporting
- Save costs with reduced equipment downtime
- Speed up manufacturing process

AT&T Business

Industrial IoT Ecosystem



"2017 Voice of Customer Study in IoT Manufacturing," Frost & Sullivan

AT&T Business

AT&T Business

att.com/iot

Mobile IoT in industry

Bob Rigouts

Atlas Copco

Atlas Copco in figures

Customers in

180

countries

34 000

employees in
90 countries

Established in

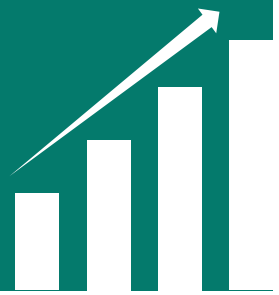
1873

Stockholm,
Sweden

Turnover of nearly

86 BSEK

9 BEURO



Operating profit margin

21,9%

2017 figures, continuing operations

Atlas Copco

Customers in all industries















Atlas Copco

Compressor Technique

Product offering

Compressed air equipment and solutions

Industrial gases

Gas compressors, expanders

Service

Value of IIoT

REGIONAL
DIAGNOSTIC CENTERS

150.000
SALES LEADS

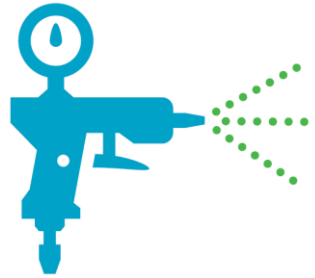
OPERATIONAL
EFFICIENCY

IMPROVED
MACHINE DESIGN

CUSTOMER
EXPERIENCE

>98%
UPTIME

ENERGY
SAVINGS



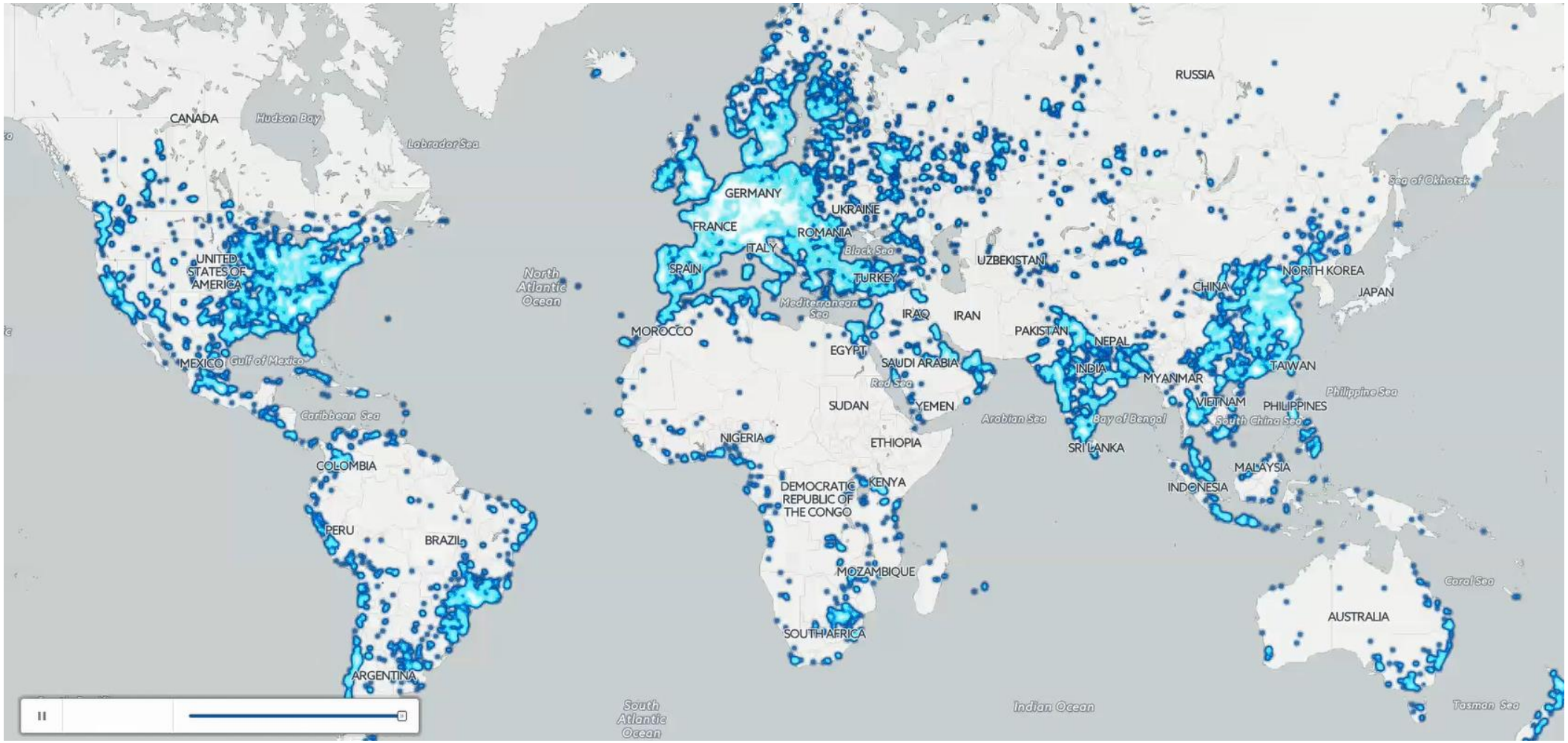
GUARANTEED
AIR QUALITY

Atlas Copco

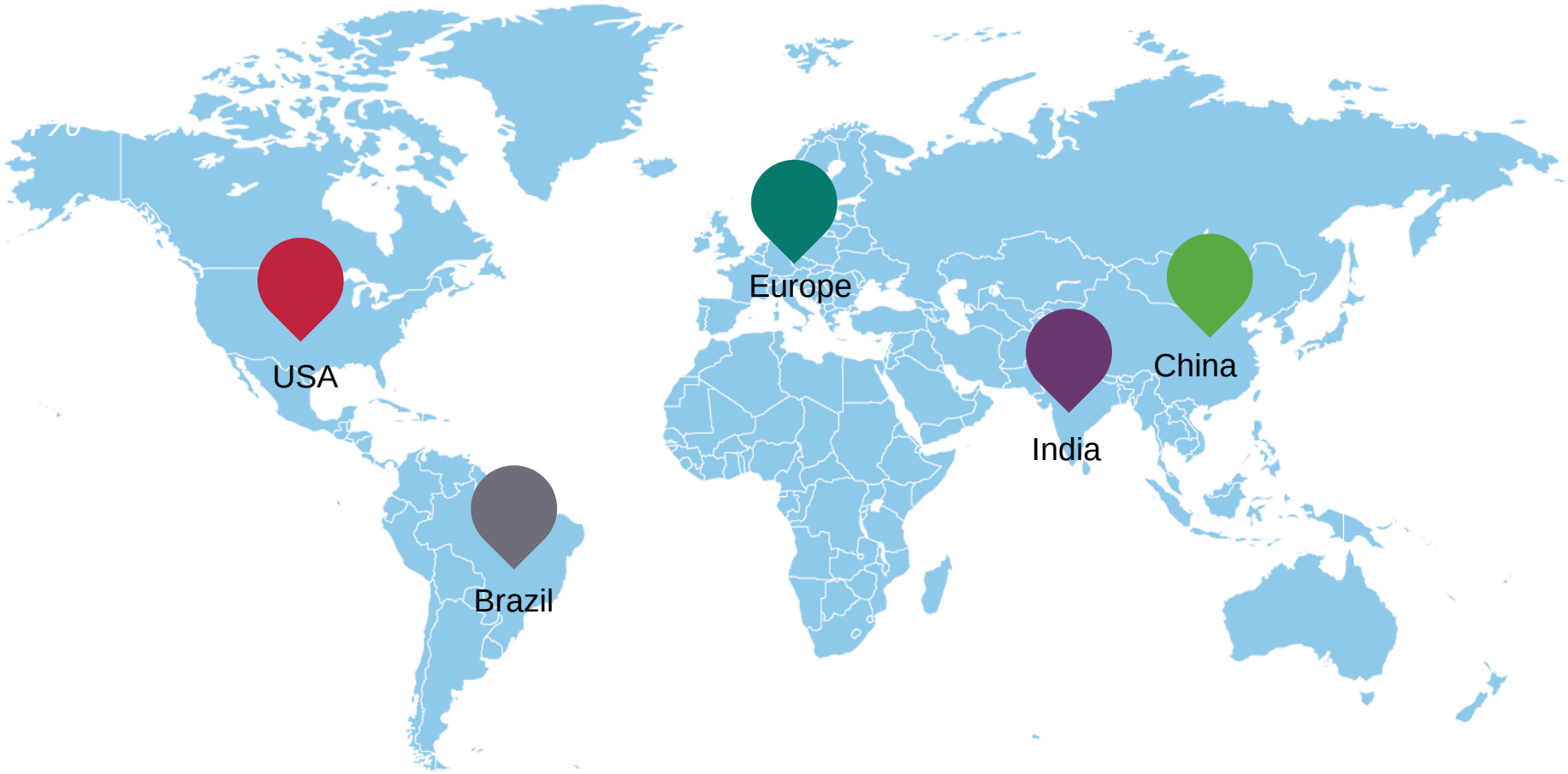
Connecting machines

Connecting machines

+150 000 rolled out



Global Production (Compressor Technique)



Challenges

Global solution	Cost effective	Technology lifetime
• Factories share components & ship to all continents	• Every machine is connected: adding cost	• AC Equipment survives technology lifetime
• Single SKU product with global coverage • Certification • Global network partner, single SIM	• Cost effective hardware • Cost effective data plan • Future proof design	• Obsolescence 2G, 3G, ... • Embedded module: technology shelf life • External gateway: bridge to latest technology

Atlas Copco

Going forward with 4G LPWA

- Secure & licensed spectrum
- Cost effective vs 3G & 4G
- Global solution:
  - Cat M1 + NB1 combined
  - Extending coverage: fall back to other ‘G’
  - Networks to cover remote industrial locations
- Allows for over the air firmware updates
- Improved building penetration
- Potential for energy sensitive applications
- Limited bandwith is acceptable

Committed to sustainable productivity.

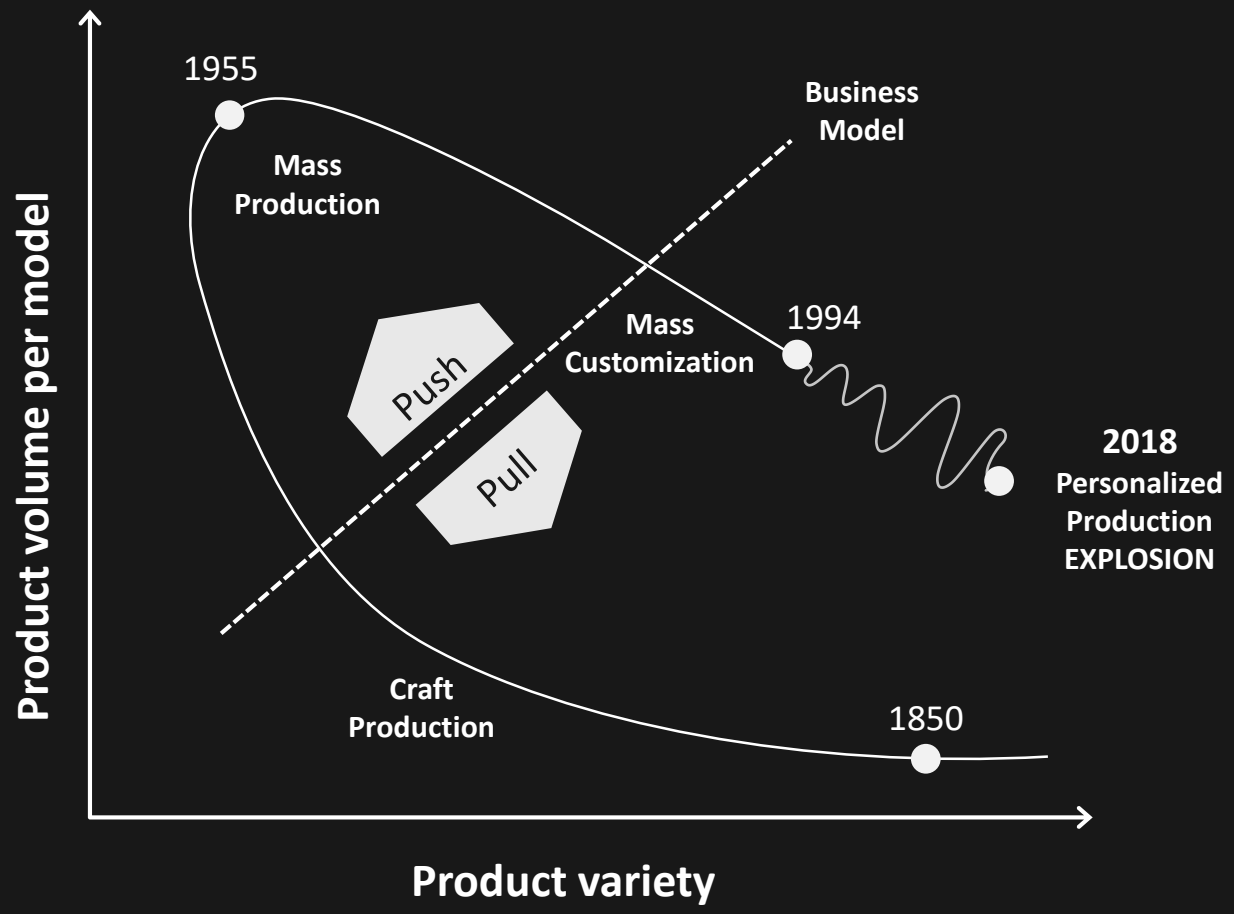

Atlas Copco

The perfect storm of 5G and Industry 4.0

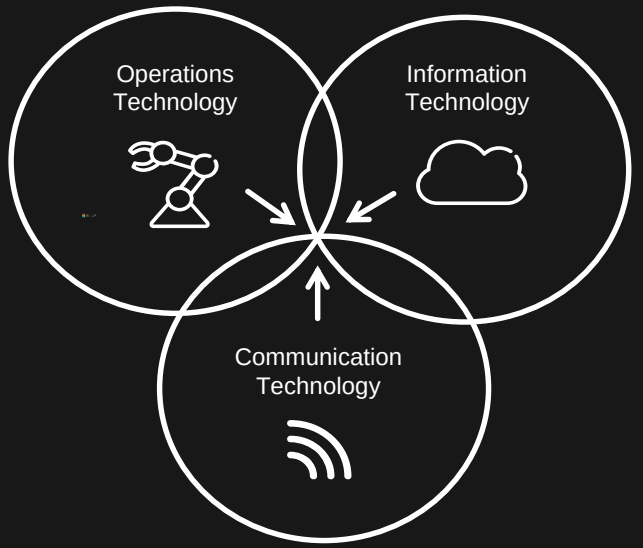
Erik Josefsson, Head of Advanced Industries Ericsson 2018-10-24

The perfect storm

Need for ultra flexibility and mass customization



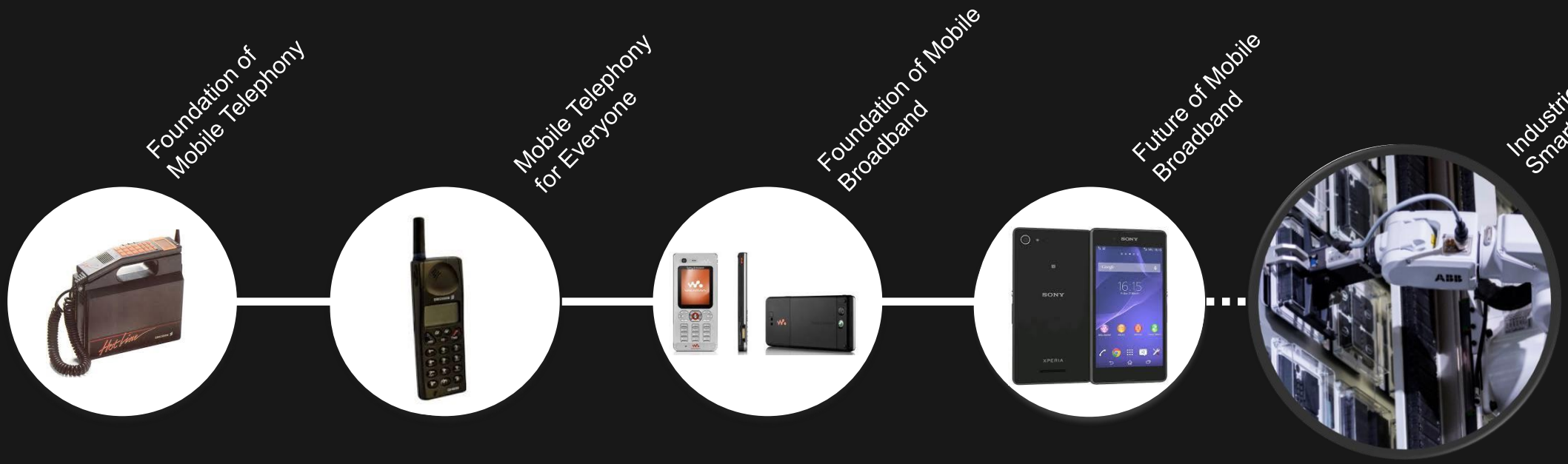
Industry 4.0



80% of all processes reinvented or eliminated by digital in 2020

The perfect storm

the 5th generation wireless communication



5G

Massive

Connect everything

100x
Connected Devices

~15 years
Battery Life

1.000.000 /km²
Density of connected devices

Create digital twins and predictive maintenance

99,999%
Data transmission reliability

10Gb/s
Extreme bandwidth

<10ms
Ultra low latency

Intelligence orchestration and remote control

Critical

Cut the wires

$ 204 – 619 Bn

Industrial digitalization

Set the foundation for Industrial IoT & 5G today

Industrial Applications and MES/ERP systemns

IoT Accelerator

- IoT Device Management
- API Exposure
- Connectivity Management
- GoS Monitoring

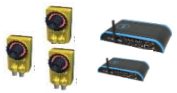
Network

Enterprise LTE/5G Network

- Enterprise O&M
- NW Slicing / Core NW
- Radio infrastructure

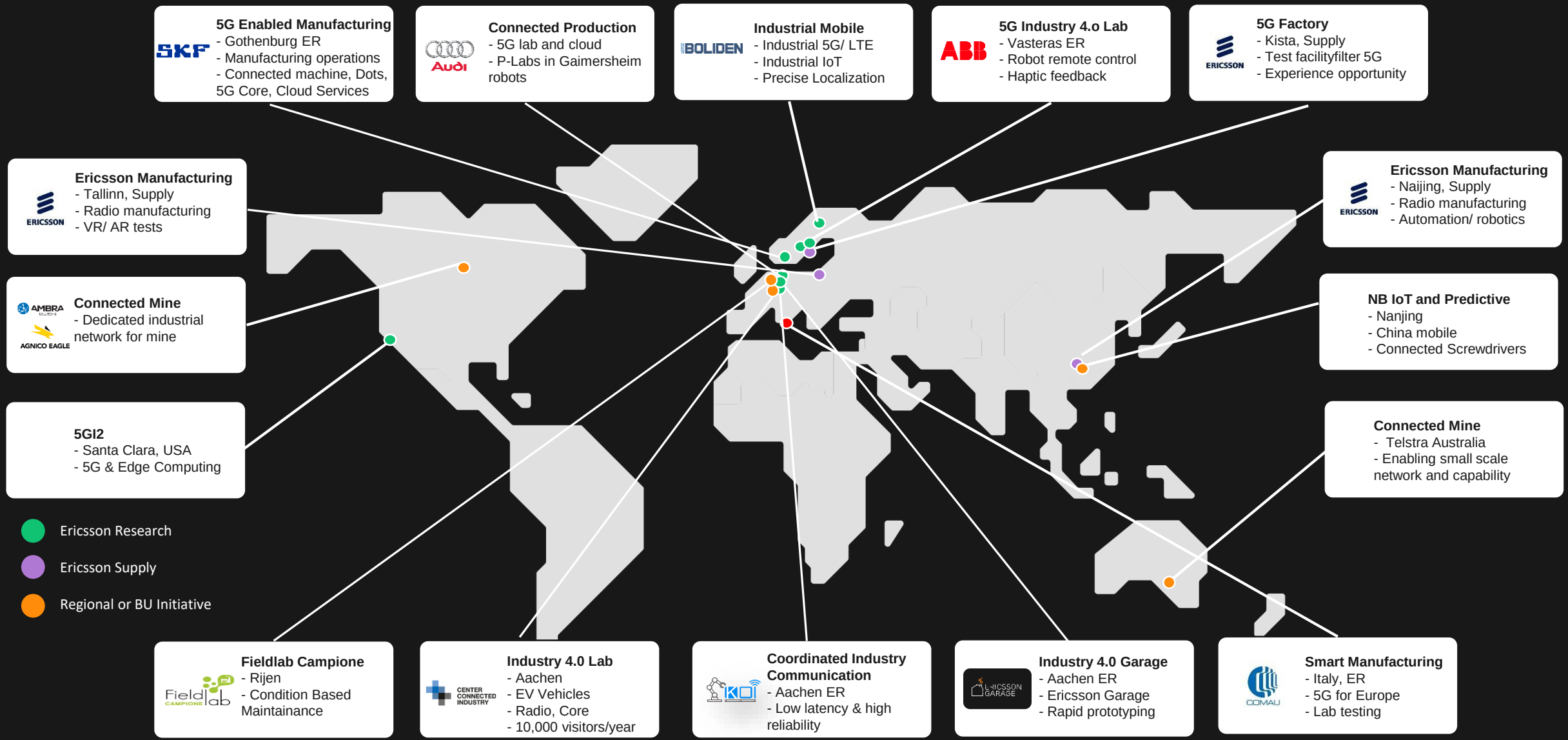
Smart Wireless Manufacturing

Massive



Critical

Industry 4.0 at Ericsson



Enable industrial IoT and set foundation for 5G

Cellular for industries – Best-effort communication requirement

Shop floor lan – Communication with relaxed synchronization requirement

Deterministic network – Communication with precise synchronization requirement

Radio latency

100 ms | ~50 ms | 10 ms | 1 ms | 100 us

Latency

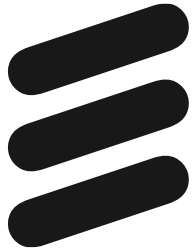
Industrial IoT services:

- Asset Monitoring, parameterization, etc. (Kbps – Mbps)E.g. NB IoT
- Augmented Reality (AR) 20-50 ms (Mbps – Gbps) for digital twin
- Haptic feedback remote control ~ 10-20 ms (Mbps – Gbps) !
- PLC to robot controller ~5-20 ms guaranteed latency Kbps - Mbps !
- Precise Location (Radio or UWB)
- Automated guided vehicles (AGV) & Automated storage and retrieval systems (AS/RS) <50 ms latency Kbps
- Robot controller to robot ~4-8 ms guaranteed latency 1-10 Mbps !
- Programmable logic controllers (PLC to PLC) <100 ms guaranteed latency Kbps - Mbps !
- Critical monitoring and safety shutdown ~4-12 ms guaranteed latency (Kbps) !
- **Real-time process optimization** ~1ms guaranteed latency Mbps !

Served today by: Wireless | Wired solutions

Potential to evolve: LTE | Wireless potential | 5G | Wired solutions

Source: Based on Ericsson insight from ongoing R&D work with engagements



THANK YOU

QUESTIONS AND ANSWERS

gsma.com/IoT