

SCALING THE IoT

Enabling a world in which consumers and businesses enjoy rich new services, connected by intelligent and secure mobile networks

THE INTERNET OF THINGS BY 2025*

\$1.1 Trillion Total IoT Market Application Service Revenue Opportunity

*Source: GSMA Intelligence, 2018

North America:
\$337bn

Latin America:
\$47bn

Europe:
\$242bn

Middle East/Africa:
\$55bn

Sub-Saharan Africa
\$12bn

Commonwealth of
Independent States
\$26bn

Asia-Pacific:
\$386bn

TOTAL CONNECTED DEVICES

2018: 9.1 billion

2025: 25.2 billion

CELLULAR CONNECTIONS

2018: 760 million

2025: 3.1 billion

2G, 3G, 4G	LICENSED LPWA	2G, 3G, 4G	LPWA
694 million	66 million	1.3 billion	1.8 billion

NUMBER OF CONNECTIONS IN VERTICAL SECTORS BY 2025



Smart Cities: \$1 billion



Connected Industry: \$12.5 billion



Connected Vehicles: \$1.2 billion



Consumer Electronics: \$3.4 billion



Smart Home: \$5.41 billion

THE GSMA INTERNET OF THINGS PROGRAMME

What is the Internet of Things?

GSMA DEFINITION: The Internet of Things describes the coordination of numerous machines, devices and appliances connected to the Internet through multiple networks.

These connected devices include vehicles, utility meters, tracking devices, vending machines, consumer electronics and wearable technology, as well as smart phones and tablets.

The GSMA's Internet of Things Programme is an industry initiative focusing on the following areas:

COVERAGE of machine friendly, cost effective networks to deliver global & universal benefits. This includes Mobile IoT, which refers to low power wide area, 3GPP standardised, secure, operator managed IoT networks, operating in licensed spectrum.

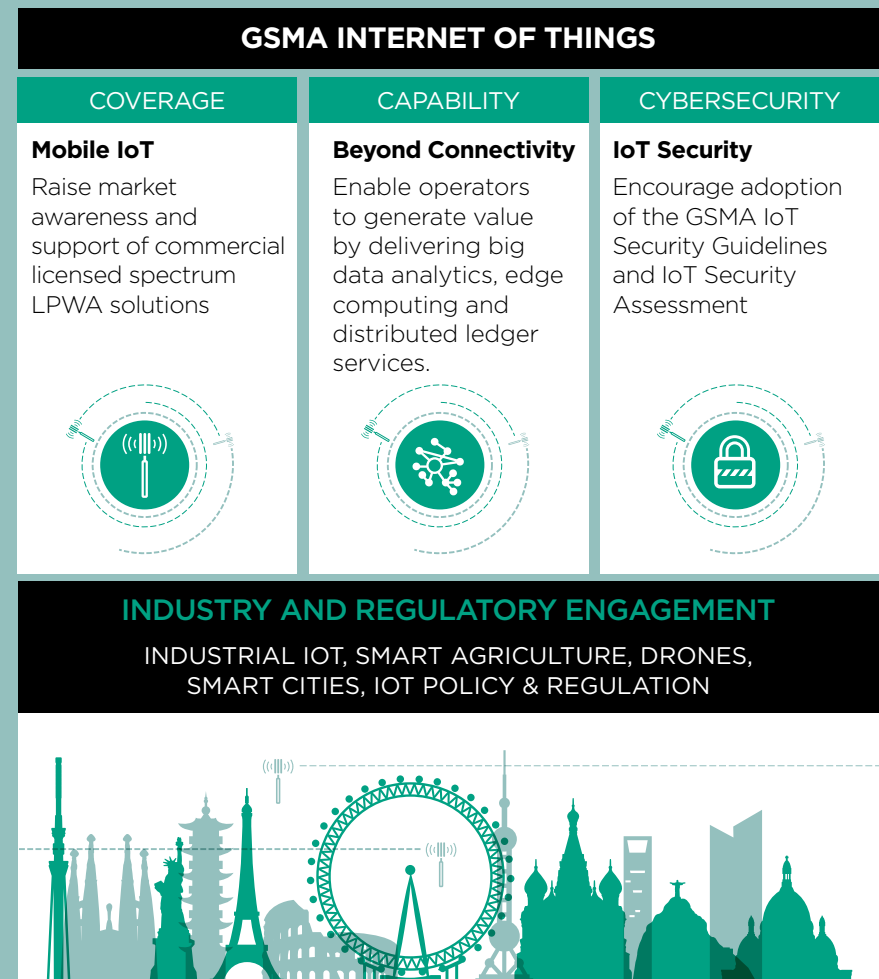
CAPABILITY to capture higher value services beyond connectivity, at scale. For example, enable operators to generate value by delivering big data analytics, edge computing and distributed ledger services.

CYBERSECURITY to enable a trusted IoT where security is embedded from the beginning, at every stage of the IoT value chain. Achieved by providing a flexible IoT security framework and a proven approach to end-end-security with the GSMA IoT Security Guidelines and IoT Security Assessment.

By developing key enablers, facilitating industry collaboration and supporting network optimisation, the Internet of Things Programme is enabling consumers and businesses to harness a host of rich new services, connected by intelligent and secure mobile networks.



KEY INITIATIVES OF THE GSMA INTERNET OF THINGS PROGRAMME



COVERAGE

MOBILE IoT = TRUSTED IoT



Cost effective operator managed solutions to securely scale the IoT

Mobile IoT refers to low power wide area (LPWA) 3GPP, standardised, secure, operator managed IoT networks operating in licensed spectrum, including Long-Term Evolution for Machines (LTE-M) and Narrowband-IoT (NB-IoT). These are designed for IoT applications that are low cost, use low data rates, require long battery lives and often operate in remote and hard to reach locations, often beyond power sources.

LPWA technologies will connect billions of devices, and existing cellular networks have evolved to deliver service that can scale as the market grows and provide complete IoT connectivity. Mobile operators and their ecosystem partners are experienced and trusted providers of

secure, managed IoT solutions, and are therefore best placed to extend their reach to serve the full range of IoT applications. The adoption of these standardised technologies in licensed spectrum will allow cost effective delivery of services and eventually enable the supply of mobile modules for devices for a few dollars.

Mobile IoT delivers connectivity on a massive scale today and will continue to do so in the 5G future enabling key IoT applications. 3GPP has agreed that the LPWA use cases will continue to be addressed by evolving LTE-M and NB-IoT as part of the 5G specifications. This will enable a smooth operator migration path to 5G NR frequency bands while preserving LTE-M and NB-IoT deployments.

www.gsma.com/MobileIoT



As the official industry community for LPWA technologies in licensed spectrum, the GSMA Mobile IoT Innovators unite over 1000 companies and provide a vibrant ecosystem around Mobile IoT. The community provides members with exclusive benefits, such as the opportunity to promote their solutions in the Mobile IoT Innovators Directory. Find out more and join for free now.

www.gsma.com/miotti

COVERAGE

Connected Cow: NB-IoT enables Precise Cow Oestrus Prediction Data



In China, most dairy farms rely on manual observation to find oestrus, which is time and labour consuming (often at midnight) with high rate of omission. Such practice makes it difficult to raise reproduction rate and milk output.

Connected Cow is a major innovative project conducted in a dairy farm with over 50,000 cows in Yinchuan city. Developed by China Telecom, Huawei and Aotoso, the "Little Shepherd" cow oestrus detection cloud system adopts NB-IoT. The NB-IoT sensor strapped on the neck of each cow can measure its body temperature to ensure its safety while detecting oestrus for timely mating.

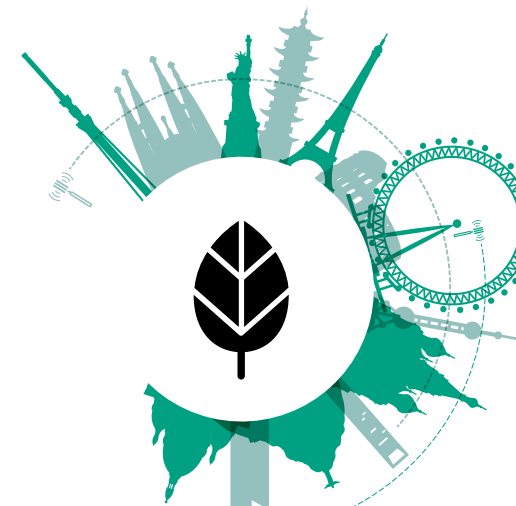
Benefits

- **High detection rate** – the detection rate of the system can reach up to 95%, which effectively increases pregnancy rate, shortens pregnancy intervals, reduces cost, and increases milk output.
- **Realization of comprehensive connection, wide coverage, and low energy consumption** – with NB-IoT network, the system can realise comprehensive connection with terminals up to 100,000 for a single system. The batteries can last for more than 6 years.

- **Stable performance** – NB-IoT sensor supports data storage, and can work at environmental temperatures of -30°C–45°C with IP65 protection grade.

Besides cows, the system can also be applied in beef farms, dairy enterprises, and livestock raising associations. China Telecom started the NB-IoT sensor deployment to 50,000 cows, and up to 1.2 million by the end of 2017. The recent studies show there are 150 million cows worldwide, with huge demand to innovative IoT solutions like "Little Shepherd" from the industry.

Details: <https://www.gsma.com/iot/mobile-iot-case-study-greater-china/>



CAPABILITY

Beyond Connectivity



Unlocking the potential of the Internet of Things. The GSMA is working with mobile operators on common enablers which facilitate global business models and reduced costs for operator driven services beyond connectivity. In the area of IoT Big Data, the delivery of harmonised data sets and valuable insights generated from big data analytics is accelerating the deployment of operator-led IoT Big Data services. The GSMA

and operator community are also working together to identify how edge computing and distributed ledgers can be effectively adopted to enable the deployment of services in verticals such as logistics, automotive and industrial IoT. A common, collaborative and interoperable approach in these areas will usher in a new era of IoT solutions helping the market to scale.

www.gsma.com/IoTCapability

ENABLERS FOR DELIVERING SERVICES BEYOND CONNECTIVITY

IoT Big Data

Distributed Ledgers

Edge Computing

Smart London: Air Quality Monitoring with IoT Big Data Analytics

Poor air quality in London and many other cities is causing an acknowledged public health problem. Air pollution is now the world's fourth-leading fatal health risk. If cities are to continue to flourish and prosper then they must tackle this air pollution crisis.

The GSMA is working with the Royal Borough of Greenwich on an air quality initiative utilising mobile, IoT and big data technologies, which aims to improve the health prospects and quality of life for citizens, while providing city administrators with vital information to implement new solutions and quantify their success. www.gsma.com/smartlondon

CAPABILITY

Unlocking the full value of IoT Big Data across verticals



The Internet of Things is generating a huge amount of data that is currently retained in vertical silos. To illustrate how data from multiple sources can be combined and utilised, creating valuable assets and great monetisation potential, consider the following examples:

SMART CITIES

Sensor data from public and private vehicles, traffic lights and road sensors may be combined with information on weather and large events or festivals, in order to optimise event traffic flow and transport in real time.

SMART AGRICULTURE

Data from sensors can help manage disease, pests and crop conditions efficiently. Yields improve by managing the crops and livestock according to their condition and external factors such as weather or diseases. Improved logistics can also ensure that less food is wasted.



CYBERSECURITY

IoT SECURITY

Enabling a Trusted IoT



Without security, the Internet of Things will cease to exist. To enable a trusted market, companies have to take responsibility to embed security from the beginning, at every stage of the IoT value chain.

As the established, trusted providers of secure IoT services in licensed spectrum, mobile operators will not only ensure the long-term sustainability and growth of the market, they also represent decades of extensive security expertise. Therefore, the GSMA, together with the mobile industry, has developed a comprehensive set of IoT Security Guidelines, backed by an IoT Security Assessment scheme, to provide a proven and robust approach to end-to-end security.

The GSMA IoT Security Guidelines:

- Include 85 detailed recommendations for the secure design, development and deployment of IoT services

- Cover networks as well as service and endpoint ecosystems
- Address security challenges, attack models and risk assessments
- Provide several worked examples

The GSMA IoT Security Assessment:

- Based on a structured approach and concise security controls
- Covers the whole ecosystem
- Can fit into a supply chain model
- Provides a flexible framework that addresses the diversity of the IoT market

Multiple global operators and companies from the wider industry have already adopted the guidelines and the assessment, which have proven to provide long-term value in creating a trusted IoT. The GSMA continues its work with mobile operators and the wider industry to further accelerate the adoption of the guidelines and the assessment.



To ensure your IoT products and services are secure, download the GSMA IoT Security Guidelines and IoT Security Assessment for free:

gsma.com/IoTSecurity

CYBERSECURITY

Securing the Port of the Future

Secure IoT Solutions for the Smart City



Led by the University of Seville and the Port Authority of Seville, the Tecnoport 2025 project uses Internet of Things solutions to improve the efficiency of transport and logistics in south west Spain.

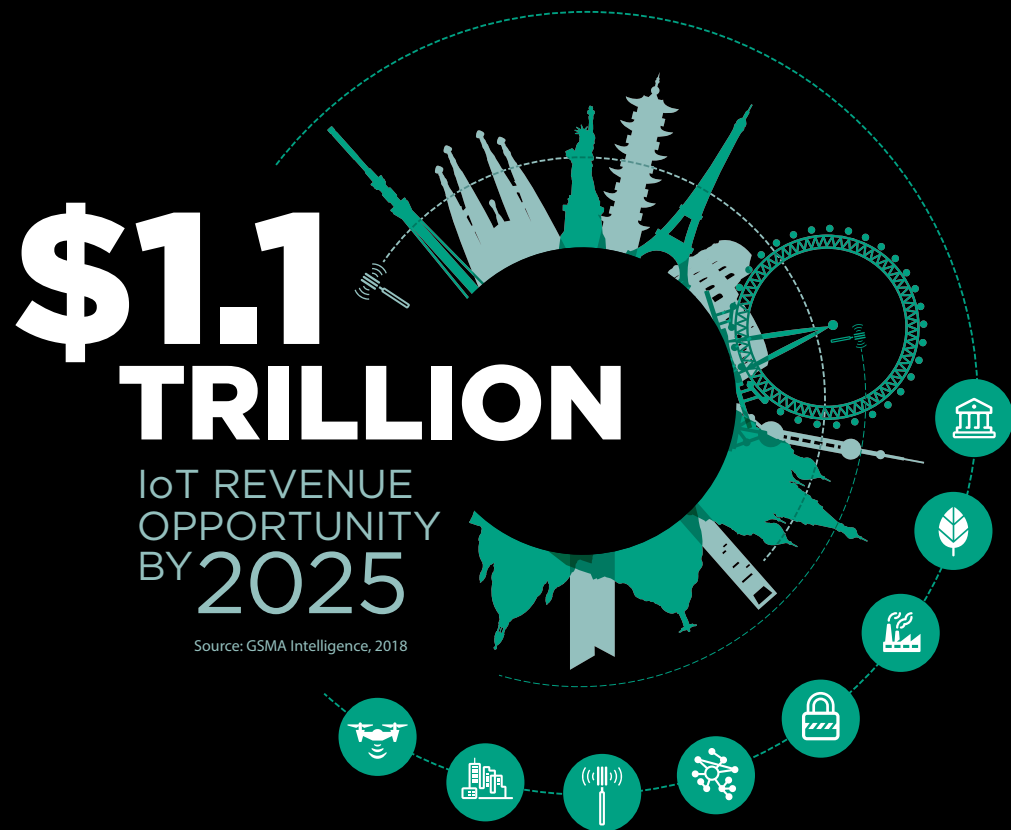
Implemented by a consortium of five companies, including telecoms operator Telefónica, the project uses new wireless networks and sensors to improve the tracking and remote control of containers passing through the port, and to optimise the rail and river traffic in the area.

In line with the GSMA IoT Security Guidelines, Tecnoport 2025 uses a combination of virtual private networks (VPNs), private access point names (APNs), multiple-factor authentication mechanisms and other measures to keep the new IoT solutions secure.

In key components of the project – the managed connectivity platform that controls cellular connectivity,

and the FIWARE-based Smart City Platform that aggregates the data generated by remotely deployed sensors connected via wireless networks. Telefonica has found that the assessment process has helped to highlight some important security features that hadn't been raised before, all of which were implemented by the Tecnoport 2025 team. Tecnoport 2025 are now planning to use a similar approach as the basis of other smart city services in the port and the city of Seville, considering that the assessment scheme strengthened the security of their networks and systems, with the IoT solution also increasing the competitiveness and efficiency of the port.





INDUSTRY AND REGULATORY ENGAGEMENT

The GSMA is working to align market perspectives, drive adoption and grow the market across key vertical sectors

The GSMA works closely with its partners in the industry to align its strategy and to ensure its initiatives are adopted. By determining common capabilities, we will make a positive impact on the industry, creating solid foundations for the Internet of Things.

Regular engagement and communication with the industry will lead to better market understanding, resulting in improved IoT products and services, superior user experience and greater connectivity, enabling the market to grow.

In particular, the GSMA is working with

- governments and city planners to create smarter, more efficient cities;
- the automotive industry and wider ecosystem to grow the connected vehicle market;
- mobile operators and the drones industry to identify common challenges which would benefit from collective action



The IoT Knowledgebase for Policy and Regulation is an online tool to help policymakers and regulators unlock IoT opportunities in their regions, understand new IoT business models and learn about emerging policy and regulatory best practice from around the world.

www.gsma.com/IoTKB

INDUSTRY ENGAGEMENT

DRONES

Demonstrating a central role for the mobile industry

Mobile networks are constantly evolving, offering drones superior wide area, high speed and secure connectivity. Support for data payload and BVLOS (Beyond Visual Line of Sight) flight assistance are two key areas where cellular networks are very strongly positioned. Drones can also enhance smart city services, such as traffic flow and deliveries. Mobile networks can be used to securely identify a drone and its location in order to help ensure the safety of commercial drones and mitigate privacy, safety and security risks.

www.gsma.com/drones

INDUSTRIAL IOT

Driving the next industrial revolution with Mobile IoT

Mobile IoT technologies are low cost and offer very wide area coverage – making them bound to revolutionise the industrial market. The GSMA is working with mobile operators and their ecosystem partners – established, reliable and trusted service providers – to accelerate the adoption of Mobile IoT in the industrial sector.

www.gsma.com/industrialIoT

SMART AGRICULTURE

Powering efficient and intelligent workflows

Mobile operators are uniquely positioned to offer reliable and trusted services to increase productivity and profitability in agriculture. IoT Big Data and low power wide area networks in licensed spectrum (Mobile IoT) are vital in making agriculture a technology-driven, smarter and more efficient industry.

www.gsma.com/smartagri

SMART CITIES

Creating smart city benefits with IoT technologies

The growth of the Internet of Things will help drive cost efficiencies and deliver rich new services to smart cities. With vast experience and existing network infrastructure, mobile operators are the trusted partners for delivering IoT solutions.

The GSMA is helping mobile operators and cities work together to create sustainable, long-term benefits for businesses and citizens through IoT technologies.

www.gsma.com/smartcities

IoT POLICY AND REGULATION

Growing the socioeconomic benefits of the Internet of Things

The accelerating growth of the Internet of Things is transforming economies and societies. The GSMA is working to create a sustainable policy and regulatory environment to support the successful scaling of the IoT.

Promoting government support for the growth of IoT services is the most effective way of establishing a trusted network, capable of realising the socioeconomic benefits of the IoT. Governments and regulators can help build consumer trust by promoting an industry led approach to privacy and security, and fostering collaboration and a constructive dialogue across the various players of the IoT industry value chain aimed at identifying industry best practices.

Building trust and providing a level playing field for all technologies will give confidence to consumers and the industry that will generate help to drive global adoption of the IoT.

The IoT spans multiple departments, organisations and industries, therefore new challenges arise. Working in collaboration, on a common and consistent approach, will maximise the market opportunity.



