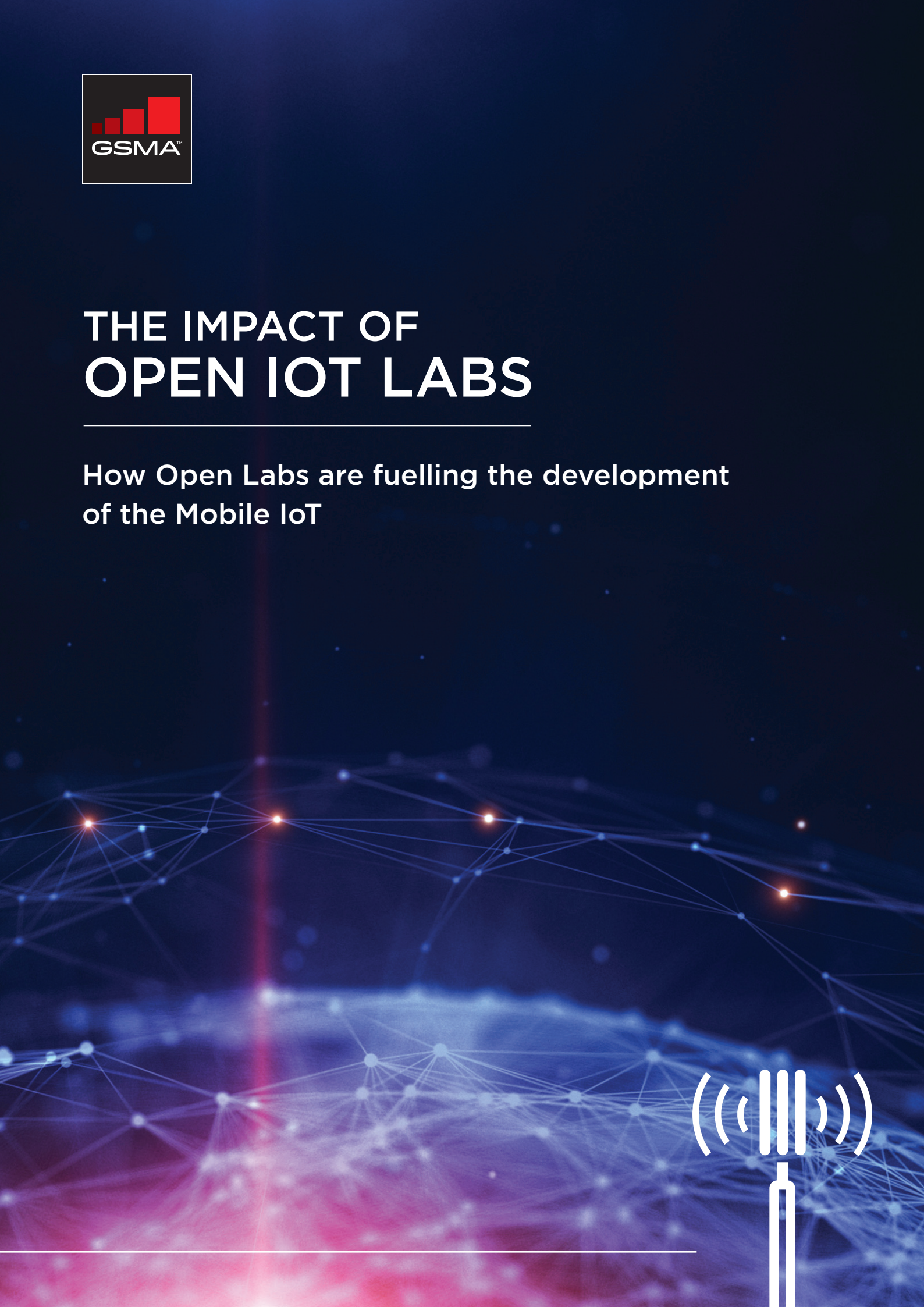
GSMA

THE IMPACT OF OPEN IOT LABS

How Open Labs are fuelling the development of the Mobile IoT



About the GSMA

The GSMA represents the interests of mobile operators worldwide, uniting nearly 800 operators with more than 300 companies in the broader mobile ecosystem, including handset and device makers, software companies, equipment providers and internet companies, as well as organisations in adjacent industry sectors. The GSMA also produces industry-leading events such as Mobile World Congress, Mobile World Congress Shanghai, Mobile World Congress Americas and the Mobile 360 Series of conferences.

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1. Introduction

This document explains the benefits of running and accessing "Open IoT Labs" – testing and development facilities specifically designed to support the emerging Mobile IoT ecosystem. It draws on interviews with Oi Brazil, Huawei, Nokia and China Mobile, as well as other information provided by Open IoT Lab owners. The paper is targeted at mobile operators and vendors who are considering launching Open IoT Labs, which can bring considerable value to their partners and customers.

WHAT IS AN OPEN IOT LAB?

Open IoT Labs are a key component of the emerging Mobile IoT ecosystem, which is supporting the development of the low power wide area (LPWA) technologies finalised in Release 13 of the 3GPP standards, including Long-Term Evolution Machine Type Communications (LTE-M), Narrowband IoT (NB-IoT), .

Mobile operators and network equipment vendors generally set up Open IoT Labs to help IoT service providers (such as smart energy, smart parking, smart lighting companies, among many others) to test their device prototypes, fine-tune their IoT services, and provide technical support in preparation for commercial deployments. The labs generally give access to specialised teams of experts and to laboratory equipment able to provide measurements and logs.

Network equipment vendors have long run mobile technology laboratories, using them for various purposes, from internal research and development (R&D) to certification services for external customers. Mobile operators use such labs to test new networking technologies and help mature them before implementing them in commercial networks.

The labs are also used to perform compliance tests for customers who wish to deploy new devices and services on mobile operators' existing networks. The latter tests are different from standard certification tests that are typically run by commercial testing houses.

In most cases, Open IoT Labs facilitate close interactions between network equipment vendors and mobile operators with the following partners:

- IoT platform vendors supporting managed connectivity, device management and data presentation services
- Chipset and module vendors
- Manufacturers of IoT devices, such as sensors, actuators, gateways
- IoT application developers
- Vertical partners
- System integrators

Open IoT Labs are opening in many different geographical regions/countries. The GSMA provides a public online searchable database of these Open IoT Labs and promotes them to the IoT community via the GSMA website.

2. Enabling collaboration, educating the ecosystem and expanding the IoT

The Internet of Things (IoT) is expanding dramatically, as Mobile IoT technologies continue to open up new use cases for cellular connectivity. Mobile operators are working with the broader ecosystem to accelerate this expansion. Open IoT Labs are among the key mechanisms for this kind of collaboration.

Having established Open IoT labs in England, Germany and Italy, Vodafone says: "One of our main objectives is to accelerate ecosystem development and the commercial availability of NB-IoT devices. This involves working with customers, device vendors and chipset/module/network vendors to provide a safe, easy-to-access environment to accelerate the activities linked to this objective."

Seeking to stimulate the growth of the IoT and facilitate the creation of new services, TIM opened an Open IoT Lab in Turin in November 2016. It describes the lab as "a place to do research and innovation with a different approach, more suited to deal with the peculiarities of a new reality that has just begun to show its full potential." TIM's Open Lab is designed to enable companies to work collaboratively to develop devices, services and new solutions ahead of network and market availability. TIM says the end-to-end solutions and prototypes in its IoT Open Lab enable potential users to see what new IoT networks and platforms can do, and then assess the added value in their specific business contests.

Similarly, Orange says its Open IoT Lab in Châtillon, near Paris, enables prospective users to discover new Mobile IoT solutions. "There is a need for a phase of education on the merits of licensed LPWA (low power wide area technology) and the difference it can be bring to their use case compared to existing cellular or other LPWA," Orange explains. "It is also a place where the end-to-end solution can be developed and tested, from the device and applications to the IoT platform."

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Indeed, Open IoT Labs can play an important educational role. Telefónica says its Open IoT Labs in Spain, Chile and Brazil help its customers to understand how Mobile IoT connectivity can enable digital transformation and enhance existing IoT solutions. It describes its Thinx open lab as an "inclusive ecosystem [that] helps us to join forces with every actor in the IoT value chain." Telefónica regards the Thinx lab as much more than a tech lab, as it supports the co-creation of IoT devices and digital transformation, as well as technical radio testing.

Network equipment makers also see considerable value in collaboration through Open IoT Labs. Nokia says "we need to have the green flag from the entire ecosystem to have commercial products," while Huawei describes Open IoT Labs as "a powerful tool for educating both mobile operators and non-telco companies about NB-IoT."

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3. Enabling Testing and Certification

Open IoT Labs typically provide end-to-end infrastructure, which enables developers to test solutions across a variety of access technologies, transport protocols, network service platforms and business service tools. The labs can also be used to certify chips, modules, network equipment and applications. In particular, Open IoT Labs can be used for systems integration and interoperability testing. They provide an environment where chipset makers and module suppliers can check that their new products are fully compatible with network equipment. The labs can perform certification, run plugfests and test IoT platforms. "We can issue reports and stamps, which demonstrate compliance, making it easier for developers to access the telecom industry and sell their products," says Nokia.

China Mobile's Open IoT Lab in Yingtan city, Jiangxi province, can be used to certify chips, modules, network equipment and applications with China's leading operator. Similarly, Telefónica says its "Thinx Openlabs include a comprehensive certification program with our reference certification partner with an model that includes field test, lab test and also GSMA IoT Security Assessment scheme. This certification may be done in Madrid and Santiago de Chile."

Vodafone says it is leveraging the work within the NB-IoT Forum and GCF (the Global Certification Forum) to offer a certification environment. "Additionally we are extending our IoT device validation service to also include NB-IoT and facilitating the end-to-end process for our partners," it notes. Oi adds that its open lab in Rio de Janeiro, Brazil, enables partners to prototype, develop, validate and demo new solutions on platforms that support multiple technologies.

However, some operators are taking a different approach. Orange says its Open IoT Lab is focused on device ecosystem development. "We do not plan to use it for chipset–network interoperability testing or for chipset certification," the Paris-based operator says. "We are asking visitors to ensure that this step is already completed before they reach us so that we support them directly in the device and service development."

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>
> Says Nokia

4. Building a Partner Ecosystem

One of the key objectives of Open IoT Labs is to provide an environment in which partners can work together to apply Mobile IoT technologies to new concepts, solutions and use cases. For example, a new Open IoT Lab established by China Mobile in Beijing is enabling enterprise partners and equipment vendors to develop and test new Mobile IoT products and applications. The operator says it is building an ecosystem to support the development of compatible equipment and applications than can harness the full potential of the Mobile IoT. "Whereas we used to focus on bringing information to customers, we are now also bringing information to things," China Mobile explains. "As well as testing the capabilities of the technologies, we are exploring the business cases."

Similarly, TIM regards its IoT Open Lab as an environment to facilitate and enable the growth of new ecosystems, encompassing stakeholders from beyond the traditional telecoms sector. "Partner companies who choose to access the TIM IoT Open Lab can then rely on the technological support of TIM to understand and verify the characteristics of the new mobile network, and better design their own products," it says. "TIM partners will also have the opportunity to begin to develop and test their solutions relying on a pre-commercial network."

Vodafone says its labs provide visibility and inspiration to visitors about the potential of NB-IoT technology. "Our ambition is to provide environments that attract partners from across the whole ecosystem and different verticals," it adds. "It is important for us provide an environment that fosters innovation and collaboration and goes beyond a traditional test environment. We provide a range of multi-vendor coverage, development tools and performance analysis tools to support different partners with end-to-end services." Vodafone's labs provide software development kits (SDK) with a set of application programming interfaces (APIs) to enable the development of customised solutions within the mobile environment.

Some Open IoT Labs are actually joint initiatives between a mobile operator and a partner. For example, Fraunhofer IML and Deutsche Telekom jointly established the Telekom Open IoT Labs (TOIL), which are designed to bring together Fraunhofer's expertise in rapid hardware prototyping, energy harvesting and testing facilities with DT's industry customer base and specific expertise in NB-IoT connectivity. DT says the joint labs serve as a rapid prototyping environment. "New devices are typically designed, built and tested against DTAG's infrastructure from zero to finish in a time span of six weeks to enable quick and successful real-world validation and feedback gathering from actual users," it adds.

The Telekom Open IoT Labs look to engage with partners in a series of steps:

1. Invite client to TOIL to understand and develop specific use case needs
2. Design and build necessary NB-IoT hardware within 4-6 weeks
3. Leverage NB-IoT by fully connecting prototyping hardware to the DT live network
4. Conduct real-world field test with clients with up to hundreds of devices
5. Gather feedback and data from testing as early as possible to validate devices and use cases
6. Incorporate feedback and start iterative improvement process at steps 1 and 2

Huawei and Nokia, also see Open IoT Labs playing a major role in the development of new IoT ecosystems. Huawei says its provides an "agile development environment [that] enables vertical partners from various industries to start developing products and commissioning services. We can help vertical industry partners on hardware design, antenna selection, and battery improvement and so on."

Nokia adds that its labs enable its chipset partners, operator customers and independent developers to test prototype IoT products and services on actual Nokia network equipment. "You can perform a proof of concept, test a use case, validate a business case or customer experience in a real environment," the company adds.

> "New devices are typically designed, built and tested against from zero to finish in a time span of six weeks to enable quick and successful real-world validation and feedback gathering from actual users" Deutsche Telekom adds

5. The Benefits of Open Approach

> By definition, Open IoT Labs are intended to be used by a wide range of players, including start-ups, universities and companies that don't have a pre-existing relationship with the lab's owner. Such an open approach is helping to drive the expansion of the Mobile IoT ecosystem, while encouraging the joint development of new use cases, services and applications, and enabling IoT innovations to be effectively "crowd-sourced".

Oi's Rio lab epitomises this philosophy. Its goal is to enable collaborative development by encouraging the use of open source technologies and partnerships. By opening its doors to developers, start-ups, universities and other companies, the Rio lab aims to crowdsource IoT innovations and applications tailored for the Latin American market.

Orange also believes start-ups can add considerable value to the Mobile IoT ecosystem. "We understand that the different verticals using IoT and M2M are made of various players from small start-ups to large groups. Having an open approach is key to ensure that we can attract them to use Mobile IoT solutions," it says. In a similar vein, Telefónica describes its Thinx lab as "a powerful IoT innovation tool for our clients and also our start-ups programmes Wayra and Openfuture."

Nokia stresses that you don't need to be a supplier or customer of Nokia to make use of its open IoT labs or the associated software development kits (SDKs). If developers can't physically get to one of the labs, they can use the SDK remotely, but will still need to test a prototype on a mobile network.

NEXT STEPS FOR OPEN IOT LABS: GREATER GEOGRAPHIC REACH

Most of the mobile operators and equipment vendors operating Open IoT Labs plan to expand the facilities. Vodafone, which has labs in multiple locations, is extending their reach by establishing interim or permanent satellite labs globally. "This is an important platform that will enable us to evolve the capabilities flexibly to meet requirements across the different locations," Vodafone says.

Similarly, Telefónica is planning to expand its Thinx network, which has four labs in its footprint involving four main radio access vendors, key module and chipsets and IoT platforms. "We have capabilities to help companies to test in-situ and also in remote," Telefónica says. "We hope to improve our labs with more networks, technologies and also extend our locations in both Europe and Latin America."

Meanwhile, Orange is equipping its One LTE-M Open IoT Lab in Europe with a full range of test tools to complete in-depth performance analysis on the different dimensions of LPWA connectivity (battery life, coverage and stability). "Lighter lab set-up and IoT showrooms are also planned in the Orange Affiliates and will be used to ensure that the local ecosystem of partners and integrators can develop their solution before the commercial launch," Orange adds.

Equipment vendor Huawei hopes that by the end of 2017 there will be 30 NB-IoT Open Labs established worldwide. "But we think it is still not enough, so we have to innovate," Huawei says. "Hence, we have announced tools like SoftRadio, a software suite that allows developers to access NB-IoT Open Labs via the Internet for remote innovation and commissioning."

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