MOBILE IoT CASE STUDY:

How Asia Pacific Intelligently Connects to IoT

FEBRUARY 2019

LTE-M NB-IoT

About the GSMA

The GSMA represents the interests of mobile operators worldwide, uniting more than 750 operators with over 350 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 the industry-leading MWC events held annually in Barcelona, Los Angeles and Shanghai, as well as the Mobile 360 Series of regional conferences.

For more information, please visit the GSMA corporate website at www.gsma.com.

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About the GSMA Internet of Things Programme

The GSMA's Internet of Things Programme is an industry initiative to help operators add value and accelerate the delivery of new connected devices and services in the IoT. This is to be achieved by industry collaboration, appropriate regulation, optimising networks as well as developing key enablers to support the growth of the IoT in the longer term. Our vision is to enable the IoT, a world in which consumers and businesses enjoy rich new services, connected by an intelligent and secure mobile network.

For more information, visit gsma.com/iot or follow gsma.at/iot.

About the GSMA Asia Pacific

Headquartered in Hong Kong, the GSMA Asia Pacific coordinates the efforts of the GSMA and its members to monitor relevant policy and legislative developments in the region, identify priorities for the mobile industry, and develop and communicate consensus positions on these priorities. It represents the GSMA's views and initiatives at regional institution meetings and events, with offices in Beijing, Hong Kong, New Delhi, and Shanghai. It also convenes the industry-leading MWC event held annually in Shanghai, as well as the Mobile 360 Series in the Asia Pacific.

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Foreword

In the space of a few short years the GSMA's Mobile IoT Initiative has helped support the development and deployment of 89 commercial Low Power, Wide Area (LPWA) networks (as of February 2019) in 47 countries across both LTE-M and NB-IoT in licensed spectrum, with 22 networks available in Asia Pacific. These networks are now available across 80% of major IoT markets ushering in a new era of connectivity where everything from smart meters to vending machines to cows are being intelligently connected. These complementary technologies are also future proofed for the 5G era and will support and co-exist with other 5G technologies.

The Asia Pacific region (APAC) is at the forefront of this revolution. It is the largest regional IoT market in the world, followed by the United States and Europe, and will have the largest number of IoT connections by 2025 due in part to the adoption of the industrial sector. GSMA Intelligence estimates that it will also be the largest region in terms of revenues hitting approximately $386 billion in 2025, driven by government mandates and strong industrial IoT connection growth. Indeed, the average annual IoT spend by enterprises in the region rose 12% from 2017 to USD$4.8 million.

The diversity of new Mobile IoT solutions emerging from the region is astonishing. Beyond factory automation, smart metering and industrial applications, the technology is also touching unexpected areas such as intelligent litter-bin management systems, smart toilets and pet tracking – driving efficiencies that are enabling real-time decision making. It is also impacting critical areas such as agriculture by tracking and monitoring crops in real-time to improve yields. These advances in coverage and penetration is allowing businesses to connect things that were previously thought impossible, impractical or uneconomical.

The GSMA's Mobile IoT Initiative has played a critical role in standardising these networks across the globe and our Mobile IoT Innovators community, which now has over 2,100 members, is helping to build an ecosystem that is encouraging the development of mass market solutions that utilise the benefits of this technology. We have also recently launched the GSMA APAC IoT Partnership programme to help mobile operators and partners in Asia Pacific accelerate IoT adoption by facilitating the sharing and communication of innovation and ideas, promoting regional leadership and providing access to labs to test new use cases.

We are at the beginning of an incredible journey where Mobile IoT networks are connecting everything and everyone to a better future.

Julian Gorman,
Head of Asia Pacific, GSMA

1. Executive Summary

This report outlines how Mobile IoT technologies are being adopted for a wide range of use cases across the Asia-Pacific region. It describes the following applications:

◢ A NB-IoT-based solution for monitoring the temperature of perishable goods during transportation is being deployed by mobile operator AIS in Thailand. The solution can be configured to send a notification to the relevant distributor if the temperature of the cargo rises beyond a specific threshold.

◢ Japanese operator KDDI is using LTE-M connectivity to help climbers safely tackle Mount Fuji, Japan's highest mountain, in partnership with the municipalities in Gotemba City and Oyama Town. The solution enables climbers to use a web portal to track how busy the routes up the mountain are, as well as temperatures and humidity levels.

◢ In a pilot in Singapore, mobile operator M1 , OTTO Waste Systems and the National Environment Agency are deploying 500 smart litterbins. NB-IoT-connected sensors inside the bins can detect when they are full, enabling cleaning service providers to remove the trash at the right time, increasing efficiency and improving the urban environment.

◢ In Malaysia, mobile operator Maxis is using NB-IoT to connect environmental sensors in a plantation. In the trial deployment, the sensors capture humidity, temperature and rainfall data, which can be used by plantation managers to monitor the environmental conditions, predict yield and identify the parameters that drive productivity.

◢ Igloohome, a start-up part-owned by SingTel, is trialling the use of LTE-M and NB-IoT to connect digital locks that can enable smart access to properties and infrastructure assets. The solution can enable property owners to remotely control access to different sites, while monitoring who has entered and left a building.

◢ In Indonesia, an automated fish feeder is using NB-IoT to enable farmers to remotely monitor and control feeding patterns in their ponds. Designed by Indonesian mobile operator Telkomsel and start-up eFishery to replace a Wi-Fi-connected solution, the new NB-IoT fish feeder is plug and play and is power-efficient enough to run on batteries.

These deployments are just a small sample of the many different applications for Mobile IoT connectivity, underlining the versatility of NB-IoT and LTE-M, which combine low costs, low power usage and wide area coverage. Delivering reliable and secure connectivity, Mobile IoT networks are enabling businesses to efficiently monitor assets and automate processes, paving the way for another industrial revolution characterised by unprecedented responsiveness and flexibility. Mobile operator M1 says "first mover" clients are enjoying costs savings of up to 30% due to enhanced productivity and/or reduced operating expenditure. Enterprises in Asia Pacific increasingly see Mobile IoT as a core component of their current and future business.

At the same time, governments in Asia Pacific are exploring how Mobile IoT can help them accommodate the ongoing migration into cities taking place across region. Mobile IoT technologies could make buildings, transport and urban infrastructure much smarter and more efficient, while coordinating municipal operations, such as waste collection and disposal. As a result, Mobile IoT connectivity could help countries across Asia-Pacific urbanise in a smart and sustainable way.

> "Mobile IoT technologies could make buildings, transport and urban infrastructure much smarter and more efficient, while coordinating municipal operations, such as waste collection and disposal."

2. Introduction

Mobile IoT technologies are opening up new use cases for the Internet of Things, which enables consumers and companies to remotely monitor, control and coordinate their assets. Operating in licensed spectrum, Mobile IoT technologies provide low power wide area connectivity using mobile operators' existing infrastructure. Based on global standards, the primary Mobile IoT technologies – LTE-M and NB-IoT – are making it cost-effective to roll out IoT solutions, such as smart metering and asset tracking, that don't require high levels of throughput and low latency connectivity.

This report shows how LTE-M and NB-IoT are being deployed in the Asia Pacific region. Drawing on interviews with mobile operators and their partners, the report describes six very different Mobile IoT applications. These case studies highlight how Mobile IoT networks can be used to support a very wide variety of use cases. An integral part of both 4G and 5G connectivity, Mobile IoT technologies are playing a key role in enabling mobile operators and their partners to deploy innovative new solutions spanning almost every segment of the economy.

The report also helps to explain why Asia-Pacific is the world's fastest-growing region in terms of Mobile IoT connections. According to GSMA Intelligence (GSMAi), the region accounted for 59.4% of the world's Mobile IoT connections at the end of 2018. GSMAi forecasts that Asia-Pacific will account for more than one billion of the world's 1.9 billion Mobile IoT connections by 2025. In Asia Pacific, the value of the IoT market is growing at a CAGR of 29%, putting it on course to reach US$386 billion in 2025, driven by government mandates and strong industrial demand, according to GSMAi.

Some 22 mobile operators are participating in the GSMA APAC IoT Partnership Programme to accelerate the Internet of Things. The APAC IoT Programme represents the largest IoT community in the region, with over 500 partners, including consultants, developers, manufacturers, system integrators and vertical solution providers, as well as the following mobile operators: Celcom, Dialog Axiata, Digi, DTAC, Grameenphone, Indosat Ooredoo, M1, Maxis, Ncell, Optus, Robi Axiata, Smart Axiata, Smartfren, Singtel, Starhub, Telenor Connexion, Telenor Myanmar, Telenor Pakistan, True, Vodafone Idea, XL Axiata, and Xpand.

IoT revenue by region in 2025

Europe
242bn

Commonwealth of Independent States
26bn

North America
337bn

Middle East & North Africa
55bn

Asia-Pacific
386bn

Latin America
47bn

Sub-Saharan Africa
12bn
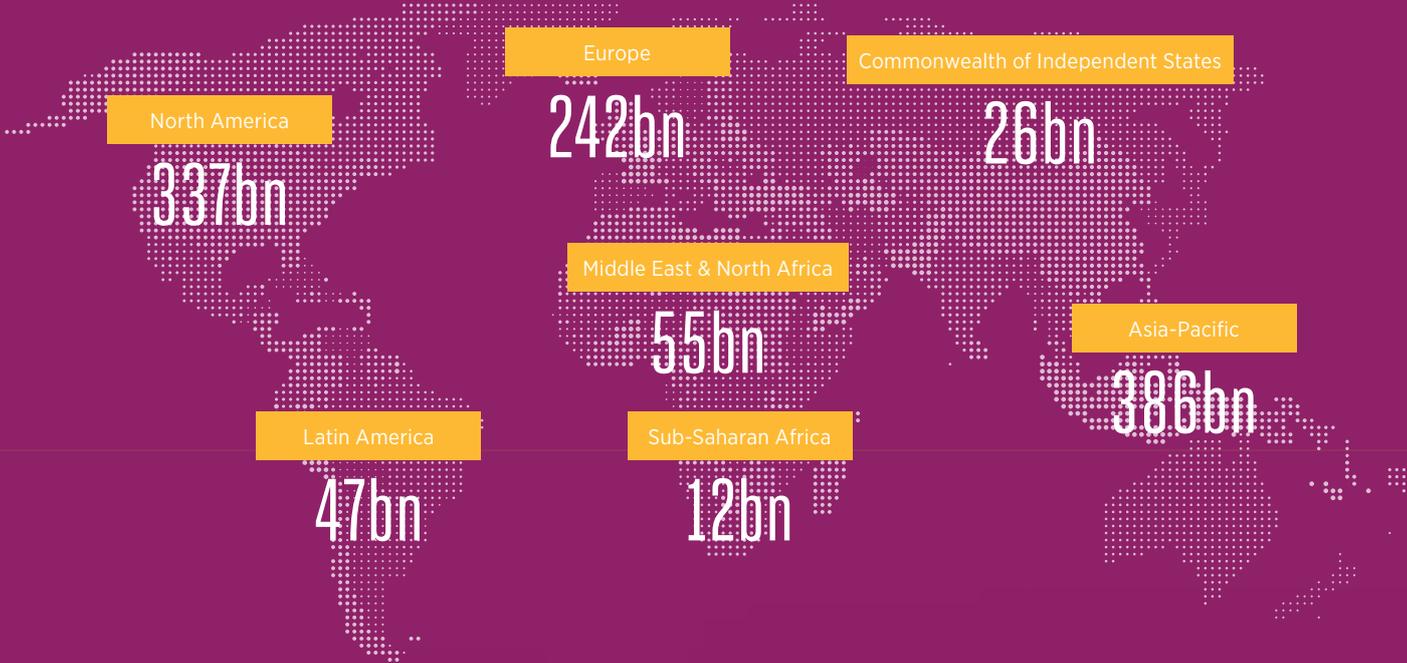
Source: GSMA Intelligence

3. Mobile IoT Case Studies

AIS THAILAND ON SMART COLD CHAIN - TRACKING TEMPERATURE DURING TRANSIT

In Thailand, mobile operator AIS has developed a Mobile IoT-based solution for monitoring the temperature of perishable goods during transportation. Fresh food, frozen food, medicine and some other goods need to be kept at a constant temperature during distribution to ensure they don't decay and that they reach end-customers in a pristine condition.

Connected "cold chain" solutions can be used to monitor the temperature of a cold storage container during transit and maintain the quality of goods, reducing the number of claims from customers that goods have decayed or been damaged during transportation. These solutions can be configured to send a notification to the supplier if the temperature rises beyond a specific threshold.

To meet the demand for a low cost solution that can be installed easily without impacting logistics companies' existing systems, AIS is using NB-IoT to connect on-board thermometers to its IoT platform, which can be used to record, analyse and display the resulting temperature data.

AIS says the compact battery-powered thermometer is cost-effective enough to be deployed at scale, while its small size and independent power supply means it can be quickly and easily installed or moved to another location. The device can measure the temperature between -50 and 20 degree Celsius. It can be configured to transfer temperature data to AIS IoT platform every x interval such as every three minutes and alert when the temperature changes by more than x degree Celsius such as one degree Celsius.

AIS says it is also using NB-IoT to monitor the electrical supply of the cooling system, allowing it to ensure there is sufficient power to cool the goods being transported. If the power supply is not working properly, the system is designed to relay the relevant data to the AIS IoT platform, thereby allowing the logistics company to proactively resolve the issues before any serious damage is caused.

"By installing the temperature-measuring devices in cold chain logistic systems, the quality of perishable goods can be assured - Mobile IoT connectivity can be used to notify the operating parties when issues arise and take necessary actions to prevent any damage to the goods," explains Asnee Wipatawate, Head of Enterprise Product and International Service of AIS. "The quality of IoT solutions becomes critical to mitigate this problem and therefore yield competitive advantages."

Temperature Sensor
NB-IoT Module
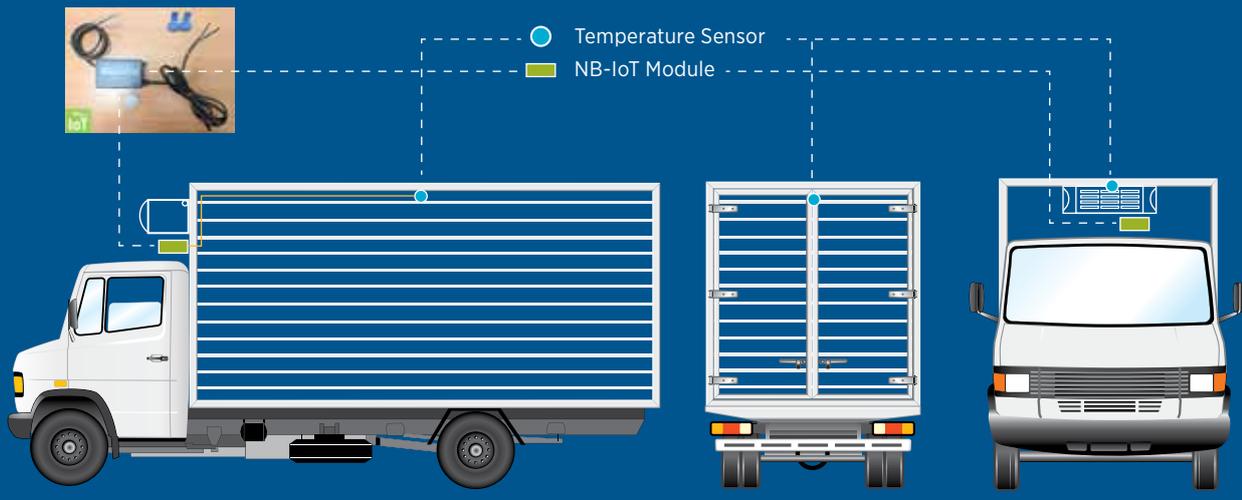
AIS' MOBILE IoT STRATEGY

AIS has rolled out both NB-IoT, which uses the 900MHz band, and LTE-M, which uses the 1800MHz band, across 77 provinces in Thailand. AIS says the NB-IoT network can support up to 100,000 IoT devices per base station with an operating range exceeding 10km, while delivering strong signals inside buildings. LTE-M, on the other hand, is well suited to supporting connected cars and asset tracking, voice/data connections, and any IoT solutions requiring larger data volumes, according to AIS.

The operator believes nationwide Mobile IoT connectivity will fuel economic development, improving the daily lives of Thais, supporting communities, and helping to protect the environment. It says the new Mobile IoT technologies are enhancing the capabilities of businesses across multiple industries, as well as enabling IoT innovations that can be used by the public and academic sectors. Early use cases include smart city solutions, such as smart lighting, bike sharing and infrastructure monitoring. AIS' IoT partners include

private and public organisations, universities and R&D departments, such as PTT, the state-owned energy company, Property Perfect, Krotron Group, Thammasat University, Khon Kaen University and Prince of Songkla University.

AIS has launched a motorbike tracker solution, which employs both GPS and NB-IoT technologies and teamed up with HIP Global Co., Ltd., a producer and distributor of security solutions to support Thailand's Metropolitan Police Division 1 in increasing its operating efficiency by deploying this innovative solution. The tracker devices have been fitted to 360 police motorbikes, which can now relay the coordinates of police patrols in near real-time via the NB-IoT network. When emergencies occur, a command centre uses the system to identify the nearest police officers and ask them to provide care to those who need immediate help.

The NB-IoT Motor Tracker service is now available at the nine police stations under the supervision of the Metropolitan Police Division 1: Chana Songkhram, Phayathai, Din Daeng, Dusit, Nanglerng, Bang Pho, Makkasan, Huai Kwang, and Samsen.

KDDI JAPAN ON MOUNT FUJI - TRACKING TRAFFIC AND WEATHER CONDITIONS

Japanese operator KDDI is using Mobile IoT connectivity to help climbers safely tackle Mount Fuji, Japan's highest mountain, in partnership with the municipalities in Gotemba City and Oyama Town. KDDI uses LTE-M to track the number of climbers at the starting point for an ascent (the trails can get crowded), as well as temperatures and humidity levels during the climbing season, which runs from mid July to mid September.

An IoT sensor installed at each of the starting points for an ascent of Mount Fuji tracks the temperature and humidity, together with the number of people passing that point. KDDI then makes that information available via a web portal, enabling climbers to plan their schedule, clothing and equipment. The municipalities can also use this information to make further improvements to the trails and the other facilities near the mountain. For example, the solution revealed that nearly 80% of the visitors enjoy walking around the surrounding hiking course without climbing the summit. In response, KDDI has installed virtual reality equipment in the trail centre, which enables visitors to experience dynamic 360-degree views from the starting point for an ascent toward the summit.

KDDI first used LoRa connectivity to enable the service when it was launched in 2017. For the 2018 season, it switched to LTE-M to reduce costs and extend coverage.

"Mieru Fuji-tozan" (Visualised Mount Fuji mountaineering) sensor installation site

Information captured by mountain sensors can be seen on smartphones and personal computers.

The LTE-M-enabled "Mieru Fuji-tozan" counter is significantly smaller and lighter than its predecessor.

KDDI believes low power wide area connectivity is set to change the way people enjoy a wide range of leisure activities beyond mountaineering, such as surfing, music festivals and other events. Connected sensors, similar to the ones on Mount Fuji, could be used, for example, to measure the size of waves, count the number of people in a supermarket aisle or monitor the number of cars arriving at a festival site or tourist attraction. The information collected by these sensors can enable an event or site manager to monitor congestion levels in real-time, and take action, as necessary.

KDDI'S MOBILE IoT STRATEGY

Having first launched its LTE-M commercial network in the north east of Japan in January 2018, KDDI announced nationwide coverage in June 2018. It says LTE-M will play a key role in enabling IoT services for its customers.

KDDI provides IoT customers with SIM management services through a web portal, which can track traffic volumes, billing data, connectivity status and other information. For large volume deployments, involving over five million LTE-M subscriptions, KDDI charges JPY 40 (US$0.37) per month per SIM, while the cost of a single subscription is JPY 100 per month (US$1) per SIM(in both

cases if the monthly usage needs to be 10 KB or less). The operator can also provide data analytics through a joint venture with Accenture, as it seeks to offer a one-stop IoT solution encompassing everything from connected sensors to the analysis and utilisation of data. "We aim to become business partners for our customers, solving their business challenges, rather than following the traditional product-led business model," explains Keigo Harada, General Manager and Head of IoT Business Planning Department at KDDI.

KDDI sees potential to use low power wide area connectivity to support a wide range of use cases, spanning telematics, smart meters, remote monitoring of industrial equipment, building facilities and agriculture, the tracking and management of vehicles, delivery and logistics, and security. The operator believes Mobile IoT technologies could also be used to monitor people's physical condition, flagging signs of heat stroke, for example.

In the agricultural sector, for example, KDDI has installed LTE-M enabled sensors in paddy fields to support fine-grained water level management for the crops. The Toyooka City Smart Agriculture Project is using LTE-M to collect data from water level sensors in the paddy fields, enabling farmers to monitor the growing conditions from a PC and smartphone.

> " The low power feature of LTE-M reduces the worry of securing power supply and the frequency of battery replacement, "
>
> **Keigo Harada,** General Manager and Head of IoT Business Planning Department at KDDI.

M1 SINGAPORE ON SMART BIN – OPTIMISING WASTE MANAGEMENT AND CLEANING RESOURCES

M1 Limited (M1), one of Singapore's leading full service communications providers, is working with OTTO Waste Systems Singapore Pte Ltd (OTTO), to provide a litter bin management system to the National Environment Agency (NEA). The new system is designed to enable the NEA to leverage technology to better manage the deployment of litter bins, as well as to optimise cleaning resources.

The NEA has been exploring how data can be used to enhance the effectiveness and efficiency of public cleaning. The new system utilises IoT sensors fitted within litter bins to track how full they are, so that the cleaning crew can be notified when they need to empty these litter bins. The NEA can also monitor the usage of litter bins to gauge if there are adequate bins in a particular area to serve the public. OTTO aims to deploy up to 500 of these smart bins during the first quarter of 2019.

M1 says the reliable and secure city-wide coverage provided by its NB-IoT, together with its support for industry standards, makes the technology well suited for large scale smart city applications, such as the proposed litter bin management system. Smart city solutions can also benefit from NB-IoT's power efficiency, which makes it viable to use batteries in connected devices, as well as reducing infrastructure and maintenance costs.

M1 developed the litter bin monitoring solution together with OTTO, who supplies the litter bin receptacles and SmartCity, who provides the centralised management system. "The collaboration with M1, using their NB-IoT network for smart waste management, allows our customers to enjoy easy access to useful real-time data for smarter planning and resourcing on waste management nationwide," says Christopher Lopez, Managing Director of OTTO Waste Systems. "We also see the potential of such implementations to help consumers have a greener environment to live in."

"Extensive research and development were carried out to produce the hardware and the methodology of installation to maximise the accuracy of the measurement in waste level and pollution in the environment," adds P. Renganathan, Director of SmartCity. "Through the strategic cooperation with M1, we will help companies to achieve greater cost savings and reach higher productivity."

M1'S NB-IoT (NARROWBAND INTERNET OF THINGS) STRATEGY

Following M1's launch of southeast Asia's first commercial nationwide NB-IoT network in August 2017, M1 has been using the network's low power wide area connectivity to support a wide range of applications, including smart power metering, smart street lighting, smart fleet management and smart logistics, as well as smart waste management. Moreover, M1 is using NB-IoT connectivity to enable a smart toilet monitoring system developed with Gabkotech, which uses human counter, density and gas sensors to optimise cleaning schedules for building managers and owners. "Through NB-IoT, M1 can enable the delivery of connectivity, digital services and data management with scale and security," says Alex Tan, Chief Innovation Officer of M1. "These will be key for the enablement of digital government, businesses and consumers, and early adopters have enjoyed costs savings of up to 30% due to enhanced productivity and or reduced operating expenditure."

In Asia, M1 expects IoT technologies to be widely adopted for urban IoT use cases, encompassing transport, smart cities and buildings. The key drivers of the IoT within Asia Pacific are largely driven and brought about by the rapid urbanisation of cities. Across the region, smart city initiatives spearheaded by government bodies, in partnership with the private sector, are accelerating the development of the ecosystem by aligning demand and supply.

In Singapore, M1 generally works with government bodies to define problems and develop appropriate IoT solutions, which can be piloted or tested in pre-operational deployments. "The urbanisation of cities, digital transformation of SMEs and digital living will be key trends moving forward in which IoT services are a key enabler.

After connecting IoT devices securely at scale, M1 can provide artificial intelligence and predictive analytics to enable customers and partners to further optimise their operations and improve business performance.

M1 Singapore NB-IoT Device

> " Through IoT, M1 can enable the delivery of connectivity, digital services and data management with scale and security "
>
> **Alex Tan,** Chief Innovation Officer at M1.

MAXIS MALAYSIA ON SMART AGRICULTURE – HELPING PLANTATIONS BOOST PRODUCTIVITY

In Malaysia, Maxis, the country's leading communications and internet service provider, and a customer are running a trial of Mobile IoT technologies to connect environmental sensors in a plantation. The sensors capture humidity, temperature and rainfall data, which is relayed to the plantation managers via NB-IoT. They can use this data which can be accessed from a PC or smartphone app, to ascertain the environmental conditions, predict yield and identify the parameters that drive productivity.

The agricultural organisation piloting Maxis' NB-IoT-enabled solution is seeking an efficient way to obtain reliable data from plantations in remote locations. Prior to the deployment of the connected sensors, workers had to physically visit each location to get relevant information about the crops. However, with the NB-IoT connected sensors in place, information can be obtained remotely and precisely, enabling resources to be employed more effectively and efficiently.

Maxis says the extensive coverage provided by Mobile IoT networks enables customers to monitor large geographic areas, including land covered in deep foliage. The technology is also designed to ensure reliable data transmissions. "To date, these pilot projects have validated the benefits of NB-IoT in terms of wider and deep coverage in remote deployments and the NB-IoT network has proven fit for purpose for the applications tested," says Claire Featherstone, Head of Business Solutions, Enterprise, Maxis. "The results demonstrate the benefits of regular, reliable data and the customer is now considering other possible use cases related to the plantation operations as part of the same project."

Plantation in Remote Locations

MAXIS' MOBILE IoT STRATEGY

Maxis anticipates businesses operating in highly competitive markets in the Asia-Pacific region will use IoT to improve operational efficiency, obtain insights from multiple data sources, create new business lines and improve their customer experience, enabling them to stay ahead of competition.

To support selected pilot projects by enterprise clients, Maxis has deployed NB-IoT in parts of its LTE mobile network. The operator says the early adopters are primarily from the utilities and agriculture sectors, but local governments and construction companies have expressed their interest in testing the technology. Utility companies are interested in using Mobile IoT to enable smart metering, while municipalities are exploring smart lighting and smart parking solutions. Although NB-IoT is only live in the locations required for the pilots, Maxis says it is technically ready for a mass deployment. Maxis is also preparing to provide customers with complementary enablers, such as device management and data aggregation, as well as analytics tools.

In 2019, Maxis is focused on building an ecosystem in Malaysia, which will help businesses adopt NB-IoT solutions. To that end, it has established an IoT Innovation Laboratory in Kuala Lumpur that acts as a bridge between Maxis' enterprise customers and device manufacturers and solution providers: the facility serves as an experiential showcase where Maxis' enterprise customers can see demonstrations of fully tested solutions. For customers with the necessary technological capabilities, the Lab provides access to a live NB-IoT network for testing purposes, thereby reducing the time it takes to ready a new solution for commercial deployment. The applications being tested in the Lab include agriculture soil and water measurement, smart utilities (water and electric), asset tracking, and smart parking, among others.

"From our own experience, we are beginning to see the importance of building an ecosystem locally which will help in convincing businesses to take up IoT solutions," says Claire Featherstone. "That is why we set up our IoT Innovation Lab to link our enterprise customers, device manufacturers and solution providers and enable them to conduct tests before going to market with their solutions."

Maxis also plans to certify devices and solutions tested at the Lab as compatible with the Maxis network to make it easier for businesses to adopt the technology. Moreover, the operator hopes developers will leverage the Lab as an incubator for ideas in the longer term. "It is still early days for NB-IoT in Malaysia, however, over time we hope more customers will see the benefits and work with us to create solutions to cater to their business needs," notes Claire Featherstone. "This is important to help catapult the industry and to unlock the significant productivity opportunities that exist as a result of deploying IoT-based technologies."

Maxis says there are numerous commercial IoT launches taking place across the Asia-Pacific region, fuelled by the growing availability of Mobile IoT-enabled equipment, business processes and systems. "Enterprises are beginning to see Mobile IoT as a potential key component of their current and future business. Malaysia is mobilising towards the emergence of NB-IoT and, for our part, Maxis is striving to build an ecosystem that offers more innovative enterprise solutions," concludes Claire Featherstone.

Maxis IoT Lab

SINGTEL ON CONNECTED ACCESS WITH DIGITAL LOCKS – FRICTIONLESS, SMART PERIMETER SECURITY AT SCALE

The remote access management and monitoring of high-value, distributed infrastructure assets is an historically difficult, labor-intensive, disconnected, and non-scaling burden. Singtel's vision of a frictionless, smart, highly scalable perimeter access control solution begins today with a planned commercial launch of igloohome's connected digital lock system.

Singtel and igloohome (a Singtel-funded start-up) are excited to announce the upcoming commercial launch of their Connected Perimeter Access solution, based on igloohome's connected lock technology. The solution provides real-time, scalable remote control, management, and monitoring of distributed infrastructure perimeter access. Igloohome works with leading property developers throughout Asia, including but not limited to Sansiri (Thailand), Capitaland (Vietnam), and Mitsubishi (Japan).

Matthew Ng, VP of Product igloohome says: "We have adopted carrier-grade IoT network technologies like LTE-M and NB-IoT as they are increasingly prevalent among global operator IoT solutions deployments. In Singapore, we rely on Singtel's NB-IoT cellular network because of its wide coverage and high availability. These high-quality public IoT networks gives us faster time-to-market, and obviate the need to deploy our own private network, or implement discrete connectivity hubs/gateways. LTE-M and NB-IoT are very power efficient, making our battery-powered smart locks more appealing to end users."

Igloohome is a worldwide partner of Airbnb, Booking.com, and Agoda, works with over 50 distributors, and ships to more than 90 countries. A global operator-deployed standard like NB-IoT is an essential element in support of igloohome's global business. Rahul Mehta, IoT Product Lead, igloohome comments: "We have extensively tested our NB-IoT locks across many countries in Asia, and they have performed well among all deployment scenarios – from deep indoor, to outdoor, and even remote locations. We are excited to meet the global market demand for our connected smart locks solution, a task that's simplified by a global IoT network standard like NB-IoT."

Igloohome first proved its technology in the vacation rental space, partnering with Airbnb to simplify host-controlled guest access without the need for a physical key exchange. The solution further enhanced host peace of mind with on-demand, detailed visibility of guest-specific room, site or location access.

Igloohome then broadened its offering to address the needs of different categories of home and property owners, addressing the operational and security limitations of physical keys, and enabling use cases like time-sensitive, remote monitored and controlled access for delivery and trade services, and access expiration for former tenants.

NB-IoT Smart Lock on Gate

Anthony Chow, CEO of igloohome, reflects, "Our vision is to create access ecosystems for smart cities, increasing efficiency and reducing costs. Globally deployed high-availability, power-efficient network standards like CAT-M1 (LTE-M) and NB-IoT help accelerate making our vision a worldwide reality."

SINGTEL'S MOBILE IoT STRATEGY

IoT depends heavily on low power wide area network, a technology that interconnects low-bandwidth, battery-powered devices over long ranges. In view of this, Singtel's main focus is on enhancing its low power wide area network to align with two 3rd Generation Partnership Project standards, Long Term Evolution for Machines (LTE-M or Category M1 (CAT-M1)) and NarrowBand IoT (NB-IoT). LTE-M is all about extending the battery life of devices while offering enough bandwidth for communication, while NB-IoT is a cost- and power-efficient technology that supports a wide range of commercial uses.

In Singapore and Australia, demand for IoT revolves around smart cities, utilities, and urban infrastructure such as smart meters, smart streetlights, energy management and industrial processes. To address the growing demand for IoT in both the enterprise and consumer space, Singtel partners with solution providers and government agencies to develop specific use cases for mobile IoT.

This includes utilities metering, smart locks, fleet management and environmental sensing.

"In this new paradigm where data-driven strategies are the bedrock of successful businesses, IoT is instrumental in enabling enterprises to mine valuable data from proprietary sources and devices. We are also actively researching new technologies such as artificial intelligence, machine learning and blockchain to develop mobile IoT solutions that can turn data into actionable business insights," says Diomedes Kastanis, Head of IoT, Singtel. "Asia Pacific's IoT adoption speed is phenomenal. From government to app developers, there is strong determination all around to accelerate IoT deployment."

NB-IoT Smart Lock on Metal Door

To move forward, the region will need to overcome fragmentation barriers. Countries in the region have varying levels of maturity in terms of infrastructure and IoT development. This, coupled with the diversity of languages and a lack of a uniform standard makes interoperability across countries difficult to achieve without regional collaboration.

> " IoT is instrumental in enabling enterprises to mine valuable data from proprietary sources and devices. We are also actively researching new technologies such as artificial intelligence, machine learning and blockchain to develop mobile IoT solutions that can turn data into actionable business insights "

Diomedes Kastanis, Head of IoT, Singtel.

TELKOMSEL ON SMART FISHERIES - ENHANCING AQUACULTURE IN INDONESIA

Indonesian mobile operator Telkomsel is working with eFishery, a Bandung-based start-up, to use Mobile IoT connectivity to make fish-feeding equipment more effective and efficient. Telkomsel and eFishery are jointly developing NB-IoT devices specifically designed to support aquaculture. In August 2018, the two companies piloted a new NB-IoT-connected fish feeding solution in the Losarang and Indramayu areas.

For the pilot, four NB-IoT-enabled fish feeders were built and tested in Telkomsel's labs, before being deployed in a customer's fish pond in Losarang. The pilot demonstrated that the NB-IoT connectivity enables a fish farmer to control the fish feeder unit remotely via their smartphone at anytime, from anywhere.

"As an IoT startup in Indonesia, we are committed to implement NB-IoT for eFishery's products," says Gibran Huzaefah, eFishery's co-founder and CEO. "Telkomsel, as the largest operator in Indonesia, has a wide network and wide reach nationwide. It's perfectly suited with our consumers. Most are living in the remote areas."

As of August 2018, eFishery had supplied IoT-based smart fish feeding machines for commercial aquaculture to more than 2,000 fish and shrimp ponds across 19 provinces in Indonesia. It also has several pilot projects in Bangladesh, Thailand and Vietnam. As these initial deployments rely on Wi-Fi for connectivity, they had to be configured manually and plugged into a mains electricity supply. By contrast, the new NB-IoT solution is plug and play and is power-efficient enough to run on batteries.

Reliable connectivity enables fish farmers to monitor and control the feeder remotely and get real-time data synchronisation and regular insights into their ponds' condition. As well as automatically providing feed in the right doses, the smart feeder has a sensor that can measure the appetite of the fish. On average, eFishery's automatic feeding system reduces the amount of feed used by 21%.

Traditionally, fish feeding has been carried out manually, but this can be expensive and inaccurate, resulting in unproductive fish farming. Over feeding has a negative impact on the environment, while wasted feed can have a negative impact on fish health. Optimising feeding represents the biggest challenge in the aquaculture industry, according to eFishery, which estimates that its customers will make a return-on-investment from its IoT solutions in three to five years.

TELKOMSEL'S MOBILE IoT STRATEGY

In support of the Indonesian government's road-map "Making Indonesia 4.0", Telkomsel says it is rolling out Mobile IoT coverage in line with market demand and regulations. Today, Telkomsel is providing NB-IoT coverage in its IoT Labs in the Telkomsel Smart Office Jakarta, in the Bandung Digital Valley and in commercial areas of Jakarta and West Java. During 2019, the operator plans to expand the commercial network to other locations outside Jakarta in Java and Sumatra. Telkomsel says there is strong demand for IoT solutions from the mobility, logistics, agriculture, smart city and health sectors in Indonesia.

Telkomsel has invited eFishery and other start-ups to join its Innovation Centre, which is designed to support the development of an advanced IoT ecosystem that can create commercial products for the market. The Telkomsel Innovation Center (TINC) programme provides start-ups with access to IoT laboratories, mentoring and bootcamp programmes, as well as networking opportunities with the developer community, universities, regula-tors and system integrators. It is designed to be a platform for hundreds of innovators in the country. In its initial incubation stage, the TINC developed a bike sharing scheme at the University of Indonesia in collaboration with Banopolis and smart bin waste management in collaboration with SMASH. In October 2018, Telkomsel and energy company PLN Jakarta joined forces to launch a service that uses NB-IoT to enable smart metering and smart grid monitoring.

"Mobile IoT will change, not only business process, but also business models and daily life," says Alfian Manullang, GM, IOT Smart Connectivity, Telkomsel. "In this Industry 4.0 era, IoT becomes a reality at the enterprise level. Learning about the technologies and process changes will make us a top resource for customers. Thus, we need to prepare a big transformation, not just in technol-ogy implementation, but also to build, engage and increase readiness of stakeholders in the related ecosystem."

As well as enabling the IoT, Telkomsel has just introduced the Mobile Consumer Insight (MSIGHT) service, which analyses big data in support Indonesia's digital transformation. MSIGHT aims to bring telco big data services to the industrial, government and startup communities.

eFishery Smart IoT Fishing Feeder Machine
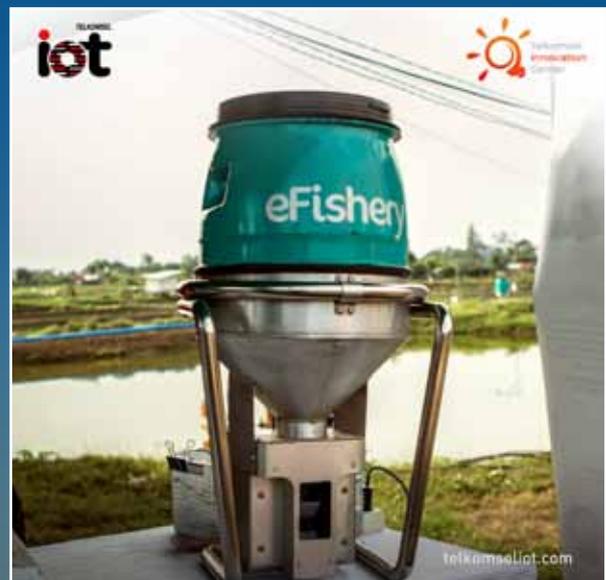
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Conclusions
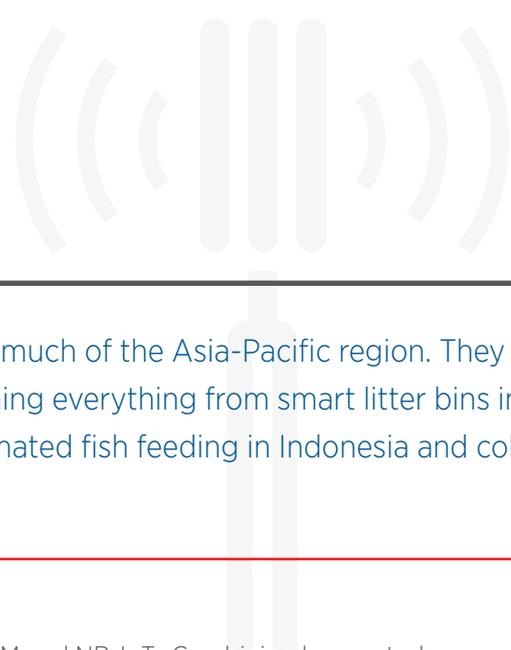
Mobile IoT technologies are gaining traction across much of the Asia-Pacific region. They are being adopted for a wide range of use cases, spanning everything from smart litter bins in Singapore and adventure tourism in Japan to automated fish feeding in Indonesia and cold chain management in Thailand.

The wide variety of use cases highlights the versatility of LTE-M and NB-IoT. Combining low costs, low power and wide area coverage, these technologies are opening up new opportunities for mobile operators, their partners and their customers across many different sectors of the economy from agriculture to heavy industry. As they employ operators' existing infrastructure and use licensed spectrum, Mobile IoT technologies are delivering the reliability and security enterprises need for mission-critical applications.

In the enterprise market, Mobile IoT connectivity is enabling the deployment of so-called Industry 4.0 solutions that deliver new levels of automation, flexibility and responsiveness. Many of the early deployments are being driven by demand for efficient and effective ways to monitor assets and automate processes. Singapore-based mobile operator M1 says "first mover" clients report costs savings of up to 30% due to enhanced productivity and/or reduced operating expenditure.

At the same time, Mobile IoT networks promise to ease the rapid urbanisation that is taking place across the Asia-Pacific region. Mobile IoT technologies are being widely tested for urban IoT use cases, spanning transport, smart buildings and smart city applications, such as waste management and automated street lighting.

In many countries in the region, such as Indonesia and Malaysia, vibrant new ecosystems are coalescing around Mobile IoT technologies. Mobile operators are supporting this process by establishing innovation labs that can act as a bridge between their enterprise customers and device manufacturers and solution providers. These labs can provide access to live Mobile IoT networks for testing purposes, thereby reducing the time it takes to ready a new solution for commercial deployment.

To that end, it is important that the mobile industry keeps pace with the rising demand for Mobile IoT products and solutions across the region. Some mobile operators are calling for more cross-regional collaboration to help customers deploy connected cars, consumer electronics and other IoT solutions internationally.

The ongoing deployment of 5G networks is set to further expand the role of the cellular industry in the Internet of Things. As an integral part of the 5G proposition, the reach and cost-effectiveness of Mobile IoT technologies will complement the wideband connectivity being delivered by the New Radio air interface.

As enterprises in Asia Pacific begin to see Mobile IoT as a core component of their current and future business, the region looks set to continue to lead the adoption of Mobile IoT globally. As a result, Mobile IoT connectivity will transform business processes and business models, fuel economic development, improve daily life, support communities, and help protect the environment.

For more information please visit:
www.gsma.com/IoT