



# HOW CHINA IS SCALING THE INTERNET OF THINGS



An insight report from the GSMA  
Connected Living Programme

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# FOREWORD

Already home to more machine-to-machine (M2M) mobile connections than any other country, China is now at the forefront of the development of the Internet of Things (IoT) – the term used to describe the coordination of multiple machines, devices and appliances through multiple networks. By harnessing the potential of continuous connectivity, the IoT promises to bring about another industrial revolution, enabling a step-change in productivity, driving economic growth and enriching our lives.

Underpinned by strong government support and substantial private investment, China's IoT has started to scale and deliver real change across its economy. Connectivity is boosting energy efficiency, streamlining manufacturing, improving healthcare, enabling smart buildings and connected cars, while creating a new consumer market for connected wearable devices, such as smart watches and child trackers. China is fast becoming a global leader in building out the IoT.

China's mobile operators, China Mobile, China Telecom and China Unicom, are forging both domestic and international partnerships with vendors and manufacturers to bring the benefits of connectivity to a wide range of machines, vehicles and devices. Although the IoT relies on many different types of connectivity, including Bluetooth, Wi-Fi, ZigBee and other short-range wireless technologies, mobile networks are playing a critical role in the delivery of IoT services in China, particularly in the automotive and fleet management sectors.

Supported by the GSMA, mobile operators are working with the wider ecosystem to enable device-to-device communication, standardise platforms and simplify business processes, such as billing and subscription management, to lower operational costs and optimise performance.

At the GSMA, the primary goal of our Connected Living programme is to accelerate the delivery of new connected devices and services, and thereby enable a world in which consumers and businesses enjoy rich new services, connected by an intelligent and secure mobile network. GSMA initiatives such as a single specification for remote SIM provisioning for M2M and guidelines for secure and efficient device connection are key enablers furthering scale the market.

This report provides valuable insights into how China has become a global leader in the delivery of the IoT, highlighting developments in key sectors of the Chinese economy, the role of mobile operators and the support provided by the government.



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# Executive Summary

China leads the world in the adoption of M2M services, with 74 million connections at the end of 2014, representing almost a third of the global base. GSMA Intelligence forecasts this figure will grow at a compound annual rate of 29% to reach 336 million by 2020<sup>1</sup>, helping the country achieve its goal of building out an extensive Internet of Things (IoT).

In China, the IoT is benefiting from both government support and productive partnerships between companies from different sectors. Of course, China can also generate enormous economies of scale, while the country's rapid economic growth and development is driving adoption of new technologies, as the urban population grows and the middle class expands.

With the Chinese government seeking to balance supply and demand in key sectors of the economy, such as transportation and energy, major industries are beginning to embrace the Internet of Things. Logistics companies, utilities and manufacturers, in particular, are increasingly harnessing the real-time information provided by connectivity to increase efficiency, lower costs and better manage infrastructure. The market value of China's IoT industry is set to reach more than RMB 500 billion (US\$ 80.5 billion) by 2015 up from RMB 200 billion in 2010<sup>2</sup>, according to the Ministry of Industry and Information Technology.

As it has done in other IT sectors, China's central government is leading the development of standards, supporting the establishment of an IoT standards association and promoting Chinese-developed standards internationally. The central government also selected 202 cities in 2014 to pilot smart city projects. Beijing, Shanghai, Guangzhou, Hangzhou and other large cities have established extensive database and sensor networks to collect, store, and analyse information related to transportation, electricity, public safety, and environmental factors.

**“China is developing its own distinctive and vibrant IoT, combining its enviable economies of scale with innovative new devices and services that meet the specific needs of Chinese consumers and companies.”**

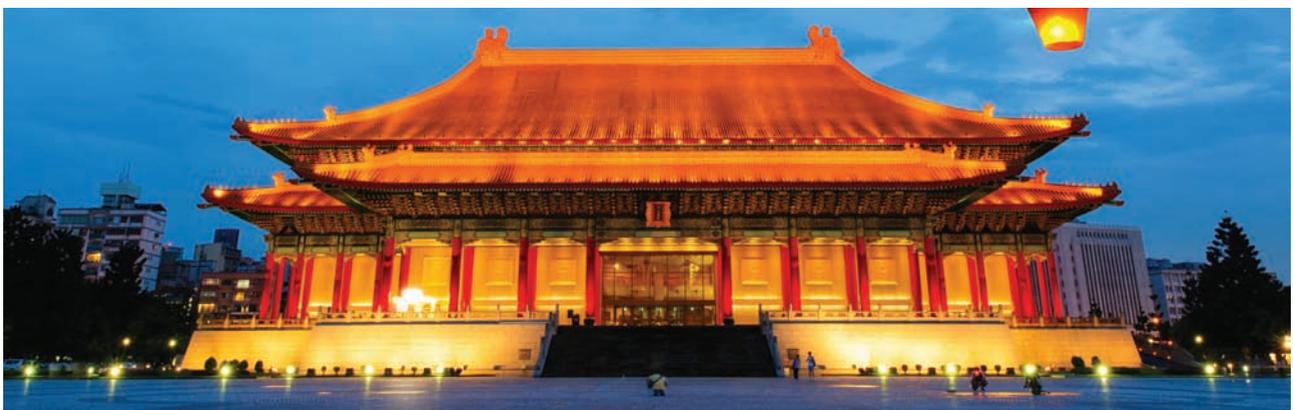
## NEW BUSINESS OPPORTUNITIES FOR MOBILE OPERATORS AND THEIR PARTNERS

China's three mobile operators, China Mobile, China Telecom and China Unicom, are all playing a major role in the development of the IoT. Although the mobile operators' primary role is still the provision of connectivity, they are taking steps to move up the value chain into providing connectivity management services and systems integration. Today, China's mobile operators are typically serving the business-to-business (B2B) market, but they are beginning to partner with other companies, particularly automotive makers, to provide consumer propositions (a B2B2C model).

Indeed, international automakers believe China's connected car market is on the cusp of fast growth. “At the present time, the penetration of telematics and in-car infotainment services is very low in China and the market is dominated by navigation and location-based type services,” says Chao Lin, IT Director at Volvo Cars. “However, more sophisticated services are being introduced and adopted by consumers.” Some automakers are beginning to tap China's new 4G networks to provide drivers and passengers with richer services.

Chinese consumers are also starting to experience the IoT in other aspects of their lives. The government is mandating the use of smart meters to improve energy efficiency in homes, while Chinese companies are at the cutting edge of the global wearables market, producing innovative and low cost fitness bands and smart watches, with built in connectivity. Mobile operators say there is also strong demand for tracking devices that enable parents to keep tabs on their children.

In summary, China is developing its own distinctive and vibrant IoT, combining its enviable economies of scale with innovative new devices and services that meet the specific needs of Chinese consumers and companies.

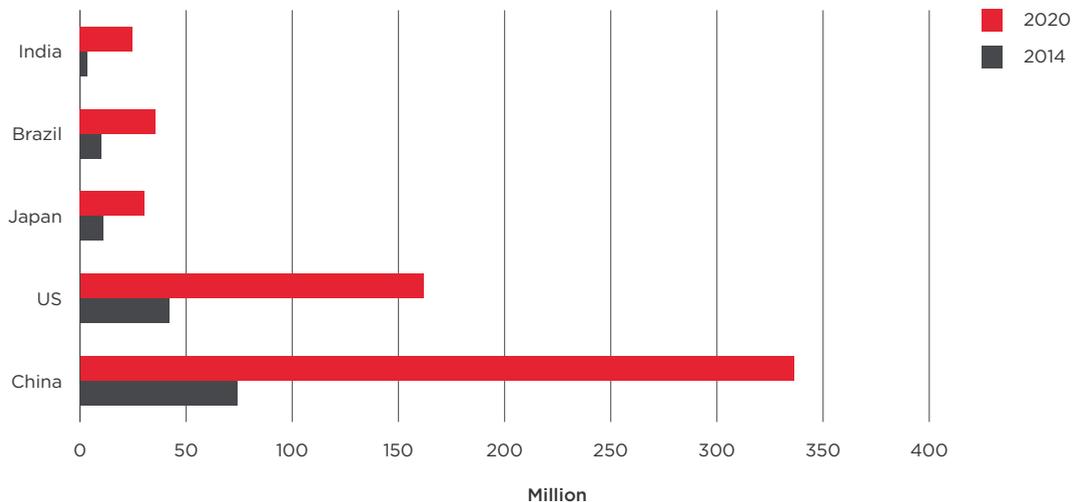


<sup>1</sup> <https://gsmaintelligence.com/>

<sup>2</sup> China's Ministry of Industry and Information Technology: <http://www.theinternetofthings.eu/content/china-will-develop-internet-things-iot-industry-local-governments-should-avoid-excess-invest>

# Overview - From M2M to IoT

China is, by some distance, the world's largest Machine-to-Machine (M2M)<sup>3</sup> market, with 74 million connections at the end of 2014, representing almost a third of the global base, according to GSMA Intelligence. The research arm of the GSMA forecasts this figure will grow to 336 million by 2020, representing compound annual growth of almost 29%.



**Figure 1:** Cellular M2M Connections - selected countries

Source: GSMA Intelligence

Economies of scale, central and local government support and a growing range of cross-sector partnerships are fuelling the rapid growth in the Chinese M2M market. Rising demand, combined with increasing standardisation, has helped reduce the cost of M2M modules in China, further driving adoption rates. These M2M connections are a key part of the emerging Internet of Things (IoT), which involves connecting multiple machines, devices and appliances to the Internet using multiple networks. As well as increasing the effectiveness and efficiency of consumers, the IoT is enabling both entrepreneurs and enterprises to develop innovative new services.

While the IoT is a global phenomenon, China is in the vanguard of deployment. "China offers economies of scale for IoT unmatched by any other single country," says Josh Buita, Senior Analyst, M2M - IHS Technology. "The country's economic growth has resulted in an increase of the country's middle class, a development which will drive demand for some key cellular M2M applications, such as connected automobiles."

Michelle Mackenzie, Principal Analyst, Analysys Mason, adds: "China's rapid growth and development has led to the construction of new cities (Tianjin, for example) and the expansion of existing cities which both require new transport networks and new infrastructure. The Chinese market has, therefore, benefitted from the latest technological innovation in some instances and this includes M2M and IoT technologies."

**"China offers economies of scale for IoT unmatched by any other single country,"**

**- Josh Buita, Senior Analyst, M2M - IHS Technology.**

<sup>3</sup>M2M connections use cellular connectivity to bring machines, including vehicles, online.

# Industry-By-Industry - Better Balancing Supply and Demand

As the government seeks to balance supply and demand in key sectors of the economy, such as transportation and energy, whole industries are beginning to embrace the Internet of Things. These sectors see the potential to use the real-time information provided by connectivity to increase efficiency, lower costs and better manage infrastructure.

## TRANSPORTATION - FUELLING EFFICIENCY

Rising fuel prices and road congestion have spurred more Chinese logistics and haulage companies to adopt M2M-enabled fleet management systems. By tracking the whereabouts of individual vehicles, these systems can help fleet controllers to allocate vehicles in the most efficient way, cutting fuel costs and reducing delays.

Josh Builta of IHS says the pressure to adopt such systems increased in 2014 as China's regulator, the National Development and Reform Commission, continued to raise retail fuel prices, emulating similar increases implemented in 2012 and 2013. "If prices rise again in upcoming years, IHS predicts more companies in China will explore how fleet-management systems can allow them to reduce fuel costs," Builta adds. The government is also introducing rules that require certain hauliers, such as those handling dangerous goods, to use tracking systems.

The IoT also promises to transform transportation for consumers. As annual car sales rise rapidly in China, private drivers are increasingly looking for connected vehicles that

can help them navigate around growing congestion, locate amenities and access in-car entertainment. In some cases, consumers are buying cars with embedded SIM solutions and, in others, they are connecting their smartphones to in-car systems using Bluetooth. Cars with embedded SIM solutions have a built-in capability to monitor vehicle performance, offer connected services integrated with the driver experience as well as a robust emergency call capability in case of an accident. "All of the mobile operators are targeting the automotive sector," says Michelle MacKenzie, Principal Analyst, Analysys Mason [go to page 13 for more trends on China's connected car market].

**"All of the mobile operators are targeting the automotive sector"**

**Michelle MacKenzie, Principal Analyst, Analysys Mason**



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## ENERGY – SMARTER SUPPLY AND DEMAND



With its vast and expanding energy demands, China is aiming to lead the world in the use of connectivity to make more efficient use of electricity by both individuals and businesses. For example, the Chinese government is aiming to ensure that 95% of China's households will have a smart meter installed by 2017<sup>5</sup>. These smart meters can provide utilities and consumers with real-time information on energy usage, helping both parties to better match supply and demand.

The Chinese government's efforts to upgrade the country's utility services infrastructure have led to a massive rollout of connected electricity meters by the two state-run utility enterprises, the State Grid Corporation of China and China Southern Grid. Although these utilities will continue to employ a patchwork of different connectivity technologies depending on geography, cost, regulation, and other factors, analysts say the use of cellular in metering is being propelled by several factors. "One is the rural nature of many of the country's new metering deployments," says Josh Builta at IHS. "It is in these remote and hard-to-reach locations that cellular-connected meters tend to see the highest uptake. Indeed in many of rural areas of China, use of alternative connectivity solutions may not be possible at all. At the same time, use of cellular in the Chinese metering market is undoubtedly being driven by the extremely low price that cellular modules have reached in the country."

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## CONNECTED CONSUMER GOODS



As China's middle class grows, analysts expect increasing demand for connected consumer goods, including smart appliances, surveillance cameras and wearables (see separate section). Sylwia Kechiche, Lead Analyst at GSMA Intelligence, highlights the recent move by leading e-commerce player Alibaba to establish car and "smart living" divisions. Alibaba has even set up a crowdfunding platform on its retail site Taobao that enables companies to raise funds from Taobao shoppers to develop new products.

Another leading Chinese e-commerce firm, JD.com, has launched the "Smart Cloud service" to provide cloud computing support for JD's home appliance partners, such as Chinese consumer electronics and home appliance manufacturers, including Haier, Hisense, TCL, Huawei and Lenovo. The platform will provide cloud storage and data analytics services to consumers.

Xiaomi, the fast-growing smartphone manufacturer, is expanding into the IoT market by designing smart products, such as the Mi Smart Scale, connected light bulbs and air purifiers. In January 2015, Xiaomi announced that it will launch a connectivity module that hardware partners can attach to their devices and will be able to interface with a smart home app from Xiaomi. The module, costing RMB 22 (US\$ 3.5), can be fitted on everything from refrigerators, air conditioners and washing machines which can be controlled by a smartphone giving consumers control over their household electronics.

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## RETAIL – MODERNISING POINT OF SALE



China's retail sector is expanding rapidly as consumers become more prosperous. To make shopping easier and more secure, retailers are increasingly adopting point of sale terminals that use M2M connectivity to process "chip and PIN" credit and debit card transactions. While dial-up landline technologies have traditionally been used by point of sale terminals, the public switched telephone network has limited reach and there is growing demand for wireless POS terminals that enable a consumer to enter their PIN anywhere on a retailer or restaurateur's premises.

Josh Builta of IHS believes demand for M2M connectivity in the retail market will continue to grow quickly: "Even though they already represent a significant market for M2M in China, the penetration of point of sale terminals in China is still relatively low—Chinese suppliers have emphasized to IHS that at least 95% of small merchants in China still do not use any sort of point of sale system—creating vast potential growth opportunities within the industry," he says.

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## AGRICULTURE – A SLEEPING GIANT?



However, some sectors of the Chinese economy, notably agriculture, have barely begun to harness connectivity to increase productivity. "Currently IoT technologies are mainly applied in fields such as logistics, transportation and security, because of government investment, and their application in some traditional industries still lags behind," Guo Feng, a researcher with the Wuxi SensingNet Industrialization Research Institute, has told the Global Times. But that could change as the food industry, in particular, realises the potential of continuous connectivity. For example, IoT technologies can be used to trace the sources of agricultural products as a way to ensure food safety, notes Wang Huan, a senior analyst at Beijing-based CCID Consulting.

**"Even though they already represent a significant market for M2M in China, the penetration of point of sale terminals in China is still relatively low—Chinese suppliers have emphasized to IHS that at least 95% of small merchants in China still do not use any sort of point of sale system—creating vast potential growth opportunities within the industry"**

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<sup>5</sup> [http://vitalsigns.worldwatch.org/sites/default/files/vital\\_signs\\_smart\\_grid\\_final\\_pdf.pdf](http://vitalsigns.worldwatch.org/sites/default/files/vital_signs_smart_grid_final_pdf.pdf)

# The Pivotal Role of Government

The Chinese government continues to play a major role in driving the adoption of the Internet of Things, providing both financial support and strategic direction. Over the past five years, it has unveiled a battery of initiatives to turn the IoT into a major pillar of the Chinese economy.

In August 2010, Premier Wen Jiabao announced that the IoT is critical to China's information and communication technology plans, and a national IoT Centre was established in Shanghai in the same year. China's Ministry of Industry and Information Technology released its 12th Five-Year Development Plan in 2012, with the goal of scaling the IoT market to RMB 1,000 billion (\$163 billion) by 2020. The midterm information and communications technology (ICT) development report of the 18th Central Committee of the CPC Congress significantly expanded the focus on cloud computing and the IoT, while providing preferential tax policies for the software and integrated circuits industries, including IoT manufacturers.

At the same time, the government's IoT Special Fund is promoting IoT research and development, applications and services. Grants are offered to self-funded projects, and loan subsidies support enterprises with bank-loan funding. In 2014, the government upped its annual investment in IoT to RMB 10 billion (\$1.6 billion).

China is now pursuing a strategy it calls Internet+ to drive economic growth through integration of Internet technologies with manufacturing and business, according to Premier Li Keqiang's 2015 Government Work Report. China is seeking to integrate the mobile Internet, cloud computing, big data and Internet of Things with modern manufacturing, fostering new industries and business development, including e-commerce, industrial Internet and Internet finance. In his report, Premier Li outlined policy goals of "three network" convergence, accelerating fiber optic network construction, improving broadband speed and promoting information consumption.

## STANDARDISATION PLAYING A PIVOTAL ROLE

To realise its full potential, the IoT needs to enable a plethora of machines, devices and vehicles to be able to exchange information. Interoperability and compatibility are, therefore, essential. As it has done in other IT sectors, China's central government is leading the development of standards, supporting the establishment of an IoT standards association with the hope that Chinese-developed standards will prevail internationally. When the International Telecommunication Union passed the first general IoT standard initiated by China in 2012, Chinese officials saw it as an important milestone.

China established an inter-agency council in 2013 to coordinate the government's policy and action on IoT. The council members include National Development and Reform Commission (NDRC), Ministry of Industry and Information Technology (MIIT), Ministry of Science and Technology (MOST), the Ministry of Education and the National Standardization Administration. With the support of this council, China issued a Directive on IoT industry development and IoT Action Plan in 2013, specifying 2015 targets in terms of top-level design, standards formation, technology R&D, application and promotion, industrial support, business models, safety, government support, laws and regulations, and workforce training.



## LOCAL GOVERNMENTS PUSH FOR SMARTER CITIES

Many local governments plan to use smart city applications to address key administration challenges, such as congestion and pollution. More than 90 per cent of China's provinces and municipalities have listed the IoT as a pillar industry in their development plans, Xi Guohua, vice minister of the MIIT, announced in September 2014. "Government support is important because the IoT industry is still in its primary stage," he noted.

The central government has selected 202 cities to pilot smart city projects. Beijing, Shanghai, Guangzhou, Hangzhou and some other large cities have established extensive database and sensor networks to collect, store, and analyze information related to transportation, electricity, public safety, and environmental factors. Tai Lake in Wuxi City, for example, is using IoT technologies to monitor and predict the cyanobacteria outbreak and protect the water supply to the city.

In April 2015, the Beijing municipal government signed a deal with Chinese Internet company Alibaba to move public services online, joining other major cities, such as Shanghai, Guangzhou and Shenzhen. Microblogging platform Sina Weibo and Alibaba's small and medium-sized enterprises finance arm Ant Financial are also supporting the project. Weibo, which says there are 130,000 government microblogging accounts registered with the company's web portal, plans to give people access to public services via apps on their mobile phones. Alibaba hopes to clinch deals with 50 Chinese cities for smart city initiatives within the next year.

Mobile operators are also forging partnerships with public sector organisations. Sylwia Kechiche of GSMA Intelligence highlights an initiative between the Beijing Municipal Health Bureau and China Unicom that will support online appointment and health information services for 114 hospitals in Beijing. Moreover, Unicom is working with 112 emergency medical centres and hospitals to develop smart ambulances equipped with an ECG monitor with embedded 3G connectivity and video surveillance. Data collected from the ECG monitor can be sent to the hospital through Unicom's 3G network in real time, enabling staff to prepare for the patient's arrival.





# Operators' Evolving Strategies

China's three mobile operators, China Mobile, China Telecom and China Unicom, are all playing a major role in the development of the IoT. Although the mobile operators' primary role in the M2M value chain in China is still the provision of connectivity, there are taking steps to move up the value chain into providing connectivity management services and systems integration. "Chinese operators are developing sophisticated M2M service propositions that go far beyond the provision of basic connectivity," says Sylwia Kechiche of GSMA Intelligence. "Through partnerships with ecosystem players, they are moving towards providing end-to-end solutions, supported by systems integration, cheaper modules and dedicated charging policies." All of China's mobile operators are active supporters of the GSMA Connected Living programme, often leading to the development and implementation of key market IoT enablers.

To date, most M2M deployments in China have been underpinned by a conventional business-to-business (B2B) approach, but the operators are beginning to enter into partnerships with other enterprises to provide IoT applications and services to consumers (a B2B2C model). "M2M business models in China are still primarily B2B models," says Michelle MacKenzie, Principal Analyst, Analysys Mason. "B2B2C models, for example, in smart home offerings, are nascent in China, although vendors, such as Huawei, Xiaomi, ZTE and operators, such as China Telecom, have been trying to promote them."

**"Through partnerships with ecosystem players, they are moving towards providing end-to-end solutions, supported by systems integration, cheaper modules and dedicated charging policies."**

**Sylwia Kechiche, Senior Analyst, GSMA Intelligence**



# Wearables Keep Consumers on Track

Chinese companies are at the cutting edge of the emerging market for wearable devices, such as fitness bands and smart watches, with built in connectivity. Device manufacturers, such as Xiaomi and Huawei, are very active in this market, as are online service providers, such as WeChat, and mobile operators. In some cities, such as Beijing, consumers can even use a basic activity tracker, called the Shuashua Band, as a transit card to pay for public transportation.



## TRACKING YOUR NEAREST AND DEAREST

One application that is fuelling strong demand in China's wearables market is child-tracking. A search for connected watches for kids on JD.com (one of the largest e-commerce websites) yields 1,245 results. China Mobile estimates there are between 40-50 brands marketing these tracker products. Using cellular connectivity, these devices typically relay location information and updates to carers. If a child is not where they should be, a cloud-based system sends a notification to the parent.

The tracking devices, which are also been worn by elderly, need a cellular connection, so the manufacturer typically buys SIM cards in bulk from one of China's mobile operators. The manufacturer might pay RMB 5 (US\$ 0.8) per month for each SIM card and charge the end-user RMB 10 per month.

China Mobile, which is working with a number of companies producing such devices. "Tracking products on kids are in high demand," says a China Mobile spokesperson. "There are now fourth generation kids tracking devices and some of the manufacturers are working with other companies, such as Disney, to make these designs of these trackers attractive."

Some e-commerce companies, such as Taobao or JD.com, are buying connectivity and the tracker devices from the operator and manufacturer respectively, and then selling these tracker devices to the market through their own retail channels. China Mobile says the "biggest issue so far is battery life - manufacturers are trying to address this issue. The size of the watch gets bigger if the battery is to get bigger to hold more charge."

**"We expect the wearables market to become more creative. China-specific wearables devices will emerge from the market in the next a couple of years from big brands or start-ups."**

**- Yuchuan Yang, Deputy GM, Wearables business unit, MediaTek**

## VERY AFFORDABLE FITNESS BANDS

Another fast growing segment is fitness tracking. Falling prices are fuelling sales of fitness bands that use sensors to count the wearer's steps and then relay that information to a smartphone app. Xiaomi has launched a fitness band that retails in China for just RMB 79 (US\$13). The Mi Band debuted in China in the fourth quarter of 2014, and had sold one million units by the end of the year. Xiaomi's Hugo Barra, Vice President of International, revealed that the device is currently shipping at the rate of one million units per month. Research firm CCS Insight says the Mi Band's price and sales "pose a clear threat to more established suppliers in the fitness tracking segment of wearables."

"The Mi Band is by far the most successful one in terms shipments, taking up around 80% of the fitness tracker market share in China in Q1 2015," adds Jason Low, Research Analyst at Canals. "Huawei TalkBand that doubles as a Bluetooth headset is also well received in China. It is available online through Huawei's online store Vmall.com."

In some cases, Chinese manufacturers are working with established brands in the fitness market. Huawei and Jawbone, for example, have struck a deal that will see Jawbone's health and fitness app integrated into a wide range of Huawei wearable devices and selected handsets. "We expect the wearables market to become more creative," says Yuchuan Yang, Deputy GM, Wearables business unit, MediaTek. "China-specific wearables devices will emerge from the market in the next a couple of years from big brands or start-ups."

More broadly, online communications service provider WeChat has developed application programming interfaces (APIs) to provide wearable devices with a single, centralized, easy-to-access operating system. Starting with the health and fitness market (several newly-launched wearables including iHealth and Lifesense work with WeChat's API), it says it plans to eventually "connect everything."

Jason Low at Canals says the release of the Apple Watch will prompt the introduction of many more smartwatches into the Chinese market. "As Android Wear is missing from the China market, there will be fierce competition from internet service providers as well as vendors to bring their own operating systems and services to the smartwatch platform. It is yet to be seen who will be the leader in this segment," he adds.

# Connected Cars Accelerate

China's connected car market moved up a gear in 2014, as automakers began to tap the new 4G (LTE) mobile networks being deployed by mobile operators. In partnership with General Motors (GM), China Mobile has been offering LTE services since the second half of 2014 for Cadillac, Chevrolet and Buick vehicles. While initially focusing on one car model, Shanghai GM plans to make the OnStar LTE telematics services standard across its portfolio of vehicle brands in the Chinese market.

China Unicom has signed deals with more than 20 car manufacturers and dealers to offer 4G services for more than three million cars. Unicom has also formed partnerships with Alipay and Tencent to provide drivers and passengers with content, such as news and weather info.

International automakers believe that the connected car market in China is on the cusp of rapid growth, as consumers demand navigation services, remote control of air conditioning and locks and usage information. Chao Lin of Volvo Cars says: "At the present time, the penetration of telematics and in-car infotainment services is very low in China and the market is dominated by navigation and location-based type services. However, more sophisticated services are being introduced and adopted by consumers." Volvo sees built-in mobile connectivity as an important selling point that will appeal to many people, especially for luxury car buyers. "Due to a mindset of "car means face", most Chinese would be happy to spend money on a better car as much as possible," says Lin. "It is really attractive that if "remotely engine start", "send to car" and similar services can be provided. Not only to serve the customer better, but also a good show to friends."

In early 2014, Chinese automaker BYD introduced a new car, the Qin, equipped with hybrid power and remote controllers. The Qin driver can use their smartphone to check the car's status, get its location, and control the air conditioner. A smartphone can even be used to drive the car by remote control from several feet away. As well as wanting to make their cars stand out, automakers are deploying in-vehicle connectivity to collect more operational data about the car's performance to help them develop better vehicles and value-added services.

Volvo is working with China Unicom, which operates 3G WCDMA and 4G TDD/FDD LTE networks in China, to provide customers with three years of free in-car services including iCALL, eCALL, VOC apps and Sensus apps.

Volvo believes the Chinese government's drive to create smarter cities will give the connected car market a further fillip. "The Shanghai government has already setup the Public New Energy Vehicle Remotely monitoring centre to track and serve New Energy Vehicles sold in Shanghai," says Lin. "Volvo Cars has also developed a system to integrate with it based on the current telematics solution. We are also working on the hot "car sharing" topic... and investigation of the future business model is on-going."

Volvo is not alone in making a special effort in China. Other global automobile manufacturers are spending the additional money and resources required to develop telematics systems that are specifically tailored to the Chinese market, notes Josh Built of IHS. "The ability to make the car a mobile Wi-Fi hotspot is also viewed as a highly desirable feature in China given the country's growing use of smartphones and tablets," he adds.

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**Chao Lin, Volvo Cars**





## MOBILE OPERATORS PROMOTE EMBEDDED CONNECTIVITY

For mobile operators, connected cars, which rely on cellular connectivity, are a major growth opportunity. According to the Organisation Internationale des Constructeurs d'Automobiles (OICA) data, there were more than 100 million passenger vehicles in use in China in 2013 and 19.7 million were sold in 2014<sup>6</sup>. Today, most cars still ship without built-in connectivity. "Only 8% of the market currently uses embedded SIMs in cars although this will reach 30% by 2018," says Kevin Li, Senior Analyst, Automotive Multimedia & Communications, Automotive Practice, Strategy Analytics. "Remote SIM provisioning and LTE to the car will change things, enabling a lot more content services to be adopted and driving a lot of data consumption. It gives an automaker the ability to install a SIM at point of manufacture and save costs and offer better support." The widespread adoption of the GSMA Embedded SIM Specification will enable automakers to build cars that can be more easily and securely connected to mobile networks worldwide.

China Mobile also anticipates rapid growth, estimating there will be 68 million connected cars in China by 2018. "The connected car is very important for the China automobile market and for China Mobile," says a spokesperson for the operator. "As the 4G network coverage is getting better, we have a better proposition. There are lots of applications in a car that need high speed connectivity," such as entertainment services, as well as navigation, safety and vehicle diagnostics services.

In October 2014, China Mobile and Deutsche Telekom signed an agreement to establish a joint venture to enable the provision of 4G-based vehicle information services to connected drivers. "Connected car is a strategic initiative within Deutsche Telekom Group, while China is of strategic importance for our connected car business," Reinhard Clemens, Deutsche Telekom Board Member said at the time. "The partnership with China Mobile is therefore strategically of utmost importance to Deutsche Telekom." In April 2015, Ren Dakai, Chief Director of Traffic Products, said that China Mobile is aiming to serve 500,000 IoV users this year.

As well as embedding connectivity in a growing number of models, automakers are also supporting in-car solutions that make use of the driver's smartphone's connectivity. "The market is using smartphone connectivity solutions such as Ford SYNC much more aggressively," says Kevin Li of Strategy Analytics.

<sup>6</sup> [www.oica.net](http://www.oica.net)

"There are a number of popular proprietary solutions, such as Baidu's Car Life, which Audi is using, or Apple's CarPlay."

Li believes automakers will need to work closely with online service providers, such as Baidu or Apple, to create tailored, distinctive and compelling in-vehicle services for customers. For example "Baidu is cooperating with BMW on a high definition map – Baidu's map navigation is number one in the market and they want to connect that via car life – one of the key services," adds Li.

As in other markets, automakers and mobile operators are still experimenting with different billing models for connected car services in China. Analysts say it is still unclear which services Chinese drivers are prepared to pay for and how much will they pay. "People don't want to pay for services they won't use and they won't renew subscriptions if the experience is bad," says Li. "Pricing will have to be low as our estimates suggest 10% have a willingness to pay."

Many large Internet companies are also targeting the IoV. Alibaba is partnering with state-controlled SAIC Motor Corp to develop solutions for connected vehicles. Similarly, Baidu, the operator of China's most popular search engine, is working with automakers to develop connected car services. Chinese smartphone manufacturer, Xiaomi, is also exploring partnerships in the connected car sector.

## INNOVATING WITH CONNECTED ELECTRIC BICYCLES

As China's economy has grown, many of the country's hundreds of millions of bicycles are gradually being replaced by either cars or electric bicycles. Both mobile operators and Internet players believe electric bike buyers are increasingly looking for built-in connectivity that will enable them to navigate easier, track a stolen bike and improve safety through the use of sensors and data. A connected bike can be configured to send an alert if it leaves a specific location or to only power on if it receives a PIN code from a designated mobile phone.

China Unicom estimates that there are more than 100 million electric bikes are in use in China and a further 10 million are sold each year. Although Unicom is already providing a connected bike solution in some provinces, it notes the cost of the connectivity modules needs to fall, as the price of an electric bike can be as low as RMB 1,000.

# Conclusions

Thanks both to China's ability to generate economies of scale and far-sighted government support, the Internet of Things is now well established in China's logistics and energy sectors in particular. Now a major wave of new Internet of Things deployments is getting underway in the retail, automotive, home appliance and wearable sectors, driven by growing consumption by an expanding middle class. For China's consumers, connected vehicles, machines and devices deliver both convenience and compelling information that can enrich their lives.

In many Internet of Things deployments in China, particularly connected cars and children trackers, mobile operators are playing a major role, providing increasingly ubiquitous and high performance connectivity, supplemented by value added services, such as security, authentication and billing. For automakers, mobile operators' support for remote SIM provisioning and LTE-to-the-car is a potential game changer, enabling manufacturers to build a rich and rewarding relationship with new car buyers in China's fast growing market.

Meanwhile, in China's wearables market, a hotbed of innovation, intense competition between manufacturers and service providers is pushing down the prices of smart watches, fitness bands and tracking devices, making them very affordable. The net result is that tens of millions of China's consumers are set to own multiple connected devices, joining the country's industries in the vanguard of the Internet of Things.

## The GSMA's Role in Delivering the IoT

Through its Connected Living Programme, the GSMA aims to further develop the IoT market, both within the Asia Pacific region and globally. The initial focus of the Connected Living programme is to accelerate the delivery of new connected devices and services in the M2M market through industry collaboration, appropriate regulation, optimising networks and develop key enablers to support the growth of M2M in the immediate future. The ultimate aim is to enable the IoT, a world in which consumers and businesses enjoy rich new services, connected by an intelligent and secure mobile network.

**Working with its partners across the ecosystem, the GSMA is active in a number of areas to drive forward this initiative:**

- Remote SIM provisioning: creation of fully interoperable specifications for remote SIM provisioning of M2M devices and evaluation of convergence between M2M and smartphone/tablet solutions.
- Future IoT networks: evaluation of the viability of existing networks to meet the low power, low data rate and low mobility use cases, as well as an assessment of the viability of alternative complementary network technologies. For network security, the goal is produce a set of guidelines to address the end-to-end security challenges for M2M services.
- IoT business enablers: to enable operators to capture the IoT opportunity, by fostering relevant, flexible and technology-neutral policies and regulation, and preventing unwarranted regulatory interventions.
- Deployment of GSMA sandbox platform to demonstrate how to monetise the IoT Big Data opportunity.



## About the GSMA



The GSMA represents the interests of mobile operators worldwide, uniting nearly 800 operators with more than 250 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 and the Mobile 360 Series conferences.

For more information, please visit the GSMA corporate website at [www.gsma.com](http://www.gsma.com). Follow the GSMA on Twitter: @GSMA.