Spectrum for the Internet of Things

GSMA Public Policy Position

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Summary

The Internet of Things (IoT) is a hugely important and rapidly growing market with the potential to transform the digital economy. Mobile services play an important role in the wide area IoT market and are rapidly evolving to meet an growing array of different requirements – from smart meters to connected cars. As a result, cellular IoT is becoming increasingly well placed to compete effectively with other IoT solutions thus helping to drive innovation.

However, the viability of cellular IoT is contingent on governments adopting a positive regulatory framework especially as it pertains to mobile spectrum. The GSMA's position is that:

1 **REGULATORS SHOULD ADOPT A SERVICE/ TECHNOLOGY NEUTRAL FRAMEWORK TO SUPPORT CELLULAR IoT**

2 **LICENSED SPECTRUM IS VITAL IN ORDER TO DELIVER THE MOST RELIABLE, HIGH QUALITY IoT SERVICES**

3 **LICENSED SPECTRUM HAS THE CAPACITY AND COVERAGE CAPABILITIES TO SUPPORT IoT GROWTH**

4 **INTERNATIONAL SPECTRUM HARMONISATION IS VITAL FOR A GLOBAL, AFFORDABLE CELLULAR IoT MARKET**

5 **REGULATORS SHOULD WORK WITH THE MOBILE INDUSTRY TO SUPPORT IoT IN 5G SPECTRUM PLANNING**

Background

The Internet of Things is a hugely important and rapidly growing market: The connectivity revolution powered by M2M and the emerging Internet of Things is one of the most important trends in modern technology and is set to transform countless industries. The total number of M2M connections is predicted to grow from five billion in 2014 to 27 billion in 2024[1]. This leap in connectivity means the Internet of Things is major new market that could form a cornerstone of the expanding digital economy – it is expected to be worth $4 trillion by 2025, up from $892 billion in 2015[2].

Mobile services play an important role in the wide area M2M and IoT markets: The bulk of the M2M market (72%) uses short-range, unlicensed connections (e.g. WiFi, Zigbee etc.), however the wide area market is heavily reliant on cellular connectivity[1]. Cellular M2M connections are expected to grow from 256 million at the end of 2014 to 2.2 billion by 2024[1]. The key cellular IoT markets include utility meters, vending machines, automotive and medical monitoring and alerting. This is in addition to current consumer electronics devices which include e-book readers, GPS navigation aids and digital cameras.

Mobile technology is evolving to meet all the demands of wide-area IoT services: The mobile industry already plays a significant role in the wide area M2M market today - most notably via GSM systems for low bandwidth applications, such as vending machines, and through 3G and 4G-LTE for high bandwidth applications such as streaming video. Given the requirements of wide-area IoT services vary much more widely than traditional mobile services, cellular technology standards have continuously evolved to support all use cases.

The latest mobile cellular standard – 3GPP Release 13[3] – supports all the key requirements for cellular IoT technologies, including; long battery life, low device cost, low deployment cost, widespread coverage and support for a massive number of devices. For example, Release 13 technologies are able to successfully support all Low Power Wide Area (LPWA) applications, such as smart metering, where coverage is required very deep inside buildings and the battery life of access points must last many years.

1. Machine Research 2015
2. Machina Research 2016
3. LPWA is supported in 3GPP Release 13 through Narrow Band IoT (NB-IoT), evolved Machine-Type-Communications (eMTC) and Extended Coverage GSM IOT (EC-GSM-IoT)

Position Rationale

1. Regulators should adopt a service and technology neutral framework to support IoT

It is essential that governments provide a regulatory framework for licensed spectrum that facilitates the development and growth of IoT, and does not impose service or technological restrictions that hold back innovation. Operators should not be prevented from deploying the latest cellular IoT technologies in their licensed spectrum bands due to technological restrictions. For example, the latest cellular standard (3GPP Release 13) allows GSM and LTE networks to support LPWA IoT applications in almost all licensed mobile bands. This includes the ability to support personal and IoT connectivity in the same frequency band at the same time[4]. The regulatory environment should be designed to nurture this evolution in the capabilities of mobile networks and allow the market to decide which solutions thrive.

2. Licensed spectrum is vital to deliver the most reliable, high quality IoT services

Licensed spectrum is uniquely able to provide high quality of service guarantees over wide areas, as operators are not at risk of interference and can control usage levels. As a result licensed cellular IoT may be the only choice for services which require concrete assurance levels such as for security and medical applications amongst others. Licensed spectrum also encourages sustainable, long-term investment in networks as access and quality levels are assured. Contrastingly, unlicensed spectrum is intrinsically less suited to wide-area IoT applications, especially those requiring higher quality of service levels. This is due to the fact that permitted power levels are generally low and interference risks over long distances are high - especially as the number of service providers and usage levels scale up. As a result regulators should ensure the IoT market can be allowed to benefit from the unique benefits licensed spectrum brings.

4. IoT and non-IoT services can use different resource blocks within one frequency channel

3. Licensed spectrum has the capacity and coverage capabilities to support rapid IoT growth

There is a good, and growing, amount of licensed mobile coverage (i.e. sub-1 GHz) and capacity (i.e. above 1GHz) spectrum to support the rapid growth of IoT if regulators support service and technology neutrality. In practice, most of the bands that will be used for cellular IoT will be sub 3 GHz or more likely sub 1-GHz. Mobile services in these bands are well established worldwide in mature networks and can be employed to support IoT as well as personal mobile services relatively easily. Crucially, the IoT technologies in the latest mobile standard, Release 13, significantly build on the coverage capabilities of existing spectrum. For example, initial trials have demonstrated that 2G networks require only a software upgrade to enable a seven-fold improvement in the range of low-rate IoT applications and extended device battery life (up to 10 years).

4. International spectrum harmonisation is vital for a global, affordable cellular IoT market

Mobile bands that are widely harmonised around the world enable mass market low cost cellular IoT devices by creating a large enough addressable market to support manufacturing economies of scale. Harmonised mobile spectrum is needed to support all wide area IoT use cases including coverage bands for LPWA use cases and capacity bands for high bandwidth applications like video streaming. In practice, today's 2G and 4G mobile services, which underpin cellular IoT, are already well harmonised regionally and even globally. However, the emerging LPWA IoT market will especially benefit from using one or two cellular bands globally, or at least regionally, in order to reduce the cost of terminals and therefore accelerate adoption. Suitable existing bands include the 900/1800MHz bands and the 850/1900MHz bands which have global reach. Other options include the 700 MHz and 800 MHz bands especially if they are permitted to operate IoT in the guard bands.

5. Regulators should work with the mobile industry to support IoT in 5G spectrum planning

5G is expected to play an important role in the evolution of cellular IoT and therefore suitable provisions need to be made in future band planning. 5G should support the growing number of forecasted end points along with efficient signalling and addressing, while also delivering even lower device costs and making more efficient use of spectrum. It is also likely to provide higher quality of service or even guaranteed service, much lower latency, increased integration within the mobile network, and even longer range. 5G IoT capability is likely to be made available across all existing and emerging 3GPP bands. It is important that governments and the mobile industry ensure the needs of IoT applications are incorporated into 5G spectrum planning.

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