ANALYST REPORT
IoT Connectivity

This year will be crucial for commercial deployments of IoT connectivity technologies

Possibly the most common question about LPWA network technologies is which will win, writes Tom Rebbeck, the research director for enterprise and IoT at Analysys Mason. There remains no clear answer, based on what we saw in 2017. LoRa, LTE-M, NB-IoT and Sigfox all announced some notable new networks to extend their coverage

Tom Rebbeck, research director, Analysys Mason

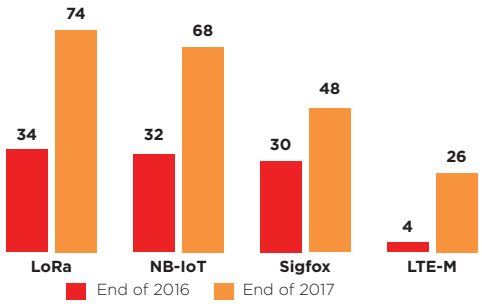
While we cannot identify the winners, it is increasingly difficult to see any other technology challenging these four, at least for large-scale public networks. Furthermore, the continued rollout of all four technologies, plus the increasingly common use of two – or more – technologies by the same operator may well mean that no single technology wins. Network operators may need to provide a portfolio of connectivity options if they are to remain competitive.

There were more than 100 low power wide area (LPWA) network announcements in 2017. This article explores what these developments can tell us about the state of LPWA technologies, before exploring the pivotal role that China is having in promoting narrowband IoT (NB-IoT). While NB-IoT does not have the highest number of network announcements, that honour falls to LoRa, more NB-IoT deployments are for networks of large-scale – massive scale in the case of China. This has positive implications for the Chinese hardware and software vendors supporting NB-IoT, not least Huawei. Finally, this article considers what developments in LPWA mean for 5G.

Current state of the networks at the end of 2017

Much of the focus in recent years has been about which technology will win in the battle between the varying LPWA standards. **Figure 1** shows the number of pilots, deployments or operational networks for each of four technologies, LoRa, LTE-M, NB-IoT and Sigfox. The chart compares the number of networks at the end of 2017 with the position at the end of 2016.

Figure 1: Networks announced, by technology, 2017 vs 2016



[Source: Analysys Mason, 2018]

Before exploring the chart in any detail, caveats are needed. The data, from Analysys Mason's quarterly LPWA Networks Index, includes all public network announcements, and covers pilots as well as full-scale deployments. Private networks, such as deployments of LoRa on a single campus, are not included. The main caveats are:

- Some networks have not been publicly announced. It is not a comprehensive survey as some trials and deployments are not in the public domain.
- Not all of the pilots will result in commercial networks. If an operator has publicly announced a network technology pilot, it is a sign of serious interest though clearly some of these technology options have not or will not be pursued.
- Not all networks are equal – China Mobile's NB-IoT network is obviously far larger than ▶

Proximus' LoRa network in Luxembourg. The chart below does not try to factor in the scale of the network, although we have done this elsewhere with our research.

- While almost all of the NB-IoT and LTE-M networks will ultimately be national networks, some of the LoRa networks will have a more limited reach, perhaps just in one city.

No LPWA winner has emerged yet

In spite of these caveats, the chart does provide some interesting points.

- No winner has yet emerged. All four of the network technologies announced increases in interest during 2017. Even Sigfox, which had fewer announcements than the others, expanded its reach with an extra 18 networks.

- Other competing technologies beyond these four are struggling to gain traction. Not included in the chart are all of the other competing technologies, each of which has less than ten commitments for public networks – this data is captured in our research. We are aware of at least ten other rival solutions. While it is too early to declare any technology a winner, it seems increasingly unlikely that any other technology will gain the scale of support needed to challenge LoRa, LTE-M, NB-IoT or Sigfox.

- NB-IoT and LoRa appear to be accelerating away from Sigfox. At the end of 2016, all three had a similar number of announcements – between 30 and 34, but by the end of 2017, the gap had widened – NB-IoT had 20 more announcements than Sigfox, LoRa 26 more.
- The prospects are that NB-IoT will have the most widespread coverage. While LoRa has slightly more networks than NB-IoT, around a third of the LoRa networks (21) are only for a region or a city. We expect almost all commercial NB-IoT networks to be national. As these are launched, NB-IoT should have significantly wider coverage than LoRa.

- LTE-M gained substantial momentum in 2017. A significant development in 2017 was the increase in interest in LTE-M. A number of major operators, including **AT&T**, **Orange**, **NTT DOCOMO** and **Telefónica**, jointly announced their backing for the technology in Barcelona at Mobile World Congress 2017. Since then a number of operators who are initially deploying NB-IoT, including **Vodafone**, have made it known that they also expect to launch LTE-M in time.

It is increasingly a case of which combination of technology, not which technology

These points lead to a final observation about network deployments – many operators are launching multiple technologies. Of the 26 operators with publicly-announced interest in LTE-M networks, 20 also have plans for other networks;

- 14 will combine it with NB-IoT ▶

Figure 2: MIIT's targets for NB-IoT development in China
[Source: Analysys Mason, 2018]

Timelines	Geographical coverage	Number of base stations	Number of connections
End of 2017	All major cities in China	400 000	More than 20 million
2020	Nationwide coverage	1.5 million	More than 600 million

- four will offer LTE-M and LoRa and
- two, **Softbank** and **Swisscom**, are working with LoRa, LTE-M and NB-IoT.

We are not aware of operators also owning Sigfox networks, though some, such as Telefónica, are selling connectivity provided by a Sigfox network operator.

The incremental cost of upgrading from NB-IoT or LTE-M to both technologies is relatively small. Most estimates put the additional cost at less than an additional 20% – and sometimes considerably less. For many operators, the question will be which technology to prioritise, and when to launch, rather than which to choose.

The reasons for launching multiple networks appear to be tactical as much as strategic. Some operators firmly believe that the different technologies will match different use cases – for example, LoRa may be better suited to stationary, low bandwidth devices like smart meters, while LTE-M, could meet the needs of devices that need mobility, higher bandwidth and support for voice, for example a personal health monitor with an emergency call button.

But, a fundamental motive for offering multiple networks is to hedge investments. While they may not admit it publicly, operators do not know which technology will gain the most traction. They do not want to lose significant, lucrative contracts because they have backed the wrong technology. Deploying both LTE-M and NB-IoT – or LoRa – adds little cost and yet provides a hedge against this risk. For operators launching LoRa, there has been the added benefit of being early to market and gaining experience of what developers want and need from LPWA networks. This experience should help them when other technologies are deployed at scale.

For developers, the lack of a dominant technology may cause frustration

While the deployment of multiple network technologies solves a short-term conundrum for telecoms operators, it is of little help to developers. The situation remains confusing for a developer that wants to launch a service using LPWA technology in multiple countries.
Even NB-IoT, which as discussed above will likely have the greatest coverage, still has some notable gaps. For example, no operator has announced a network in France. Developers have the option of either waiting until a dominant technology does emerge, or also hedging and using modules that can handle both NB-IoT and LTE-M – an imperfect solution that adds both complexity and cost; precisely the things that most LPWA developers want to avoid.

The strength of NB-IoT is supported by China

The Chinese government has been actively driving the development of NB-IoT. The Chinese telecoms regulator, the Ministry of Industry & Information Technology (MIIT), announced aggressive targets as well as guidance to promote the NB-IoT standard in June 2017 (see **Figure 2**). While we do not believe that the 2017 goals were met – the target for 20 million connections, in particular, looks high – it shows the level of ambition China has for NB-IoT. In many ways, the promotion of NB-IoT is part of China's industrial policy and should generate broad benefits for Chinese vendors.

In accordance with the MIIT, all three Chinese mobile operators are investing heavily in NB-IoT networks and device/module manufacturer subsidies. For 2018, both **China Unicom** and **China Mobile** are targeting commercial NB-IoT service in over 300 cities, while **China Telecom** has upgraded over 300,000 base stations for NB ▶

IoT. In addition, China Telecom will subsidise the cost of modules and devices with a CNY300 million (around US$45 million) fund.

The steps taken by the Chinese operators should help the NB-IoT ecosystem globally. The Chinese networks are on a massive scale, which should help reduce prices and resolve initial problems. This should also benefit Chinese companies, such as **Huawei**, that are heavily involved with the technology, as they look to markets outside of China, as well as Chinese manufacturers and application developers.

Developments in LPWA raise questions for 5G

As we have written previously, while most conference presentations about 5G mention IoT as a use case, few IoT presentation mention 5G. Most IoT developers are building solutions that they want to deploy as soon as possible. They do not want to wait for technologies that are not yet standardised, let alone commercially launched. LPWA also raises some difficult challenges for 5G. If technologies like NB-IoT are a huge success, with hundreds of millions, if not billions, of connections, it could undermine the case for 5G supporting IoT – if NB-IoT is sufficient, why would IoT applications need 5G?

The converse may also be true. If LPWA technologies are not a success, then it could also raise question marks about 5G – why would more advanced functionality be required if the basic LPWA technologies do not have a market?

The fundamental underlying question is about demand for the capabilities that only 5G can offer – capabilities beyond those included in current LPWA offerings. If we are to reach a market of billions of IoT devices, it will be through connecting low-cost, simple devices – sensors, trackers, meters and so on. Most of these do not require the low latency, high bandwidth or quality of service guarantees that 5G promises.

While there are some IoT applications that could well benefit from 5G's capabilities, perhaps in manufacturing or to enhance autonomous driving, it is difficult to see these reaching hundreds of millions of connections in the short or mid-term – before 2025. While 5G may help to create new IoT services in the longer term, they are unlikely to drive the business case for 5G investment.

2018 will be a fascinating year for LPWA

With more than 100 networks announced, 2017 was an important year for LPWA but 2018 may well be even more significant. Through this year we will see more of these networks launch commercially and gain traction, especially NB-IoT – most of the networks for NB-IoT have been relatively limited in scope to date. For Sigfox, 2018 will also be a crucial year. It had less success than the three leading other technologies in 2017, and it is less likely to be offered in combination with another technology. Finally, with the emphasis on the commercial deployment of LPWA networks, and unanswered questions about the market for 5G, it may be that focus for 5G turns more to near-term applications, such as fixed wireless broadband and less on more speculative IoT applications. ■