

LTE-M and NB-IoT: Transforming the Scene

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Introduction

The mobile industry has advanced cellular network technologies for the Internet of Things (IoT) in the past 15 years. This article focuses on LTE Cat M (LTE-M) and NB-IoT technologies, comparing them with other IoT-oriented technologies like LTE Cat 1bis and 5G RedCap in terms of capabilities, network roll-outs, adoption, and use cases. The key question lies in comparing these technologies to determine the most suitable option.

The wide area cellular LPWA landscape

The GSMA launched the Mobile IoT Initiative to promote Low Power Wide Area solutions for IoT devices. LTE-M and NB-IoT standards were developed in 3GPP Releases 13 and 14, later integrated into 5G networks. 5G RedCap and eRedCap are planned as replacements for LTE Cat-1 and Cat-4, while LTE Cat 1 and LTE Cat 1bis were optimized for IoT in Release 14.

Future-proofing

The focus is on future-proofing technology for smart city projects and smart meters, ensuring long-term support. LTE-M and NB-IoT, part of the 5G standard, offer extended operational life compared to 4G technologies. LTE spectrum refarming for 5G varies globally, with the US likely to refarm within a decade. Network technology selection considers global deployment, with LTE Cat 1 popular worldwide but alternatives like NB-IoT and LTE-M favored for regional deployments.

Technology capabilities

In this section, we evaluate the features and abilities of the primary cellular network technologies currently accessible for IoT applications. These are summarized in the chart below.

	LTE Cat 1	LTE Cat 1bis	LTE-M	NB-IoT	5G RedCa
Future-proofing					
Availability					
Range/Coverage					
Uplink/downlink speed					
Latency					
Power consumption					
Unit price					

Figure: Capabilities of IoT-oriented cellular technologies

[Source: Transforma Insights, 2023]

It's important to acknowledge that these are not the sole factors to consider. For example, certain applications might necessitate voice calling, a feature not universally supported by all technologies.

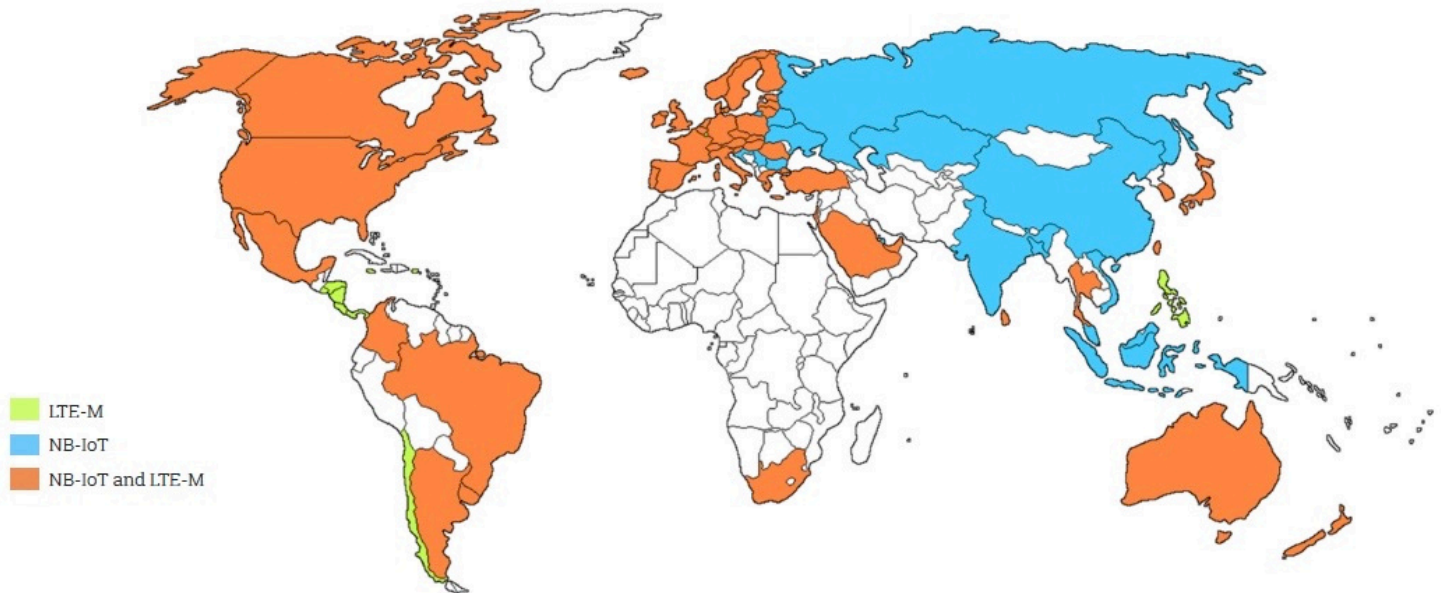
The chart demonstrates that no single technology will suit and optimize every scenario. Each choice involves balancing the application's requirements, capabilities, and costs.

Future-proofing

The importance of future-proofing in smart city and utility projects is highlighted, with a focus on technology support over 10–15 years. Technologies like LTE-M and NB-IoT within the 5G standard offer extended operational life compared to older technologies like LTE Cat 1. The switch-off timeline for LTE networks varies by region, with the US expected to refarm LTE spectrum for 5G within the next decade, impacting support for older technologies. Other countries like Australia, Japan, and South Korea may follow suit, while Europe is likely to support older technologies into the 2030s.

Technology capabilities

When choosing network technologies, availability in the required territories is crucial. LTE Cat 1 offers global coverage but may have limitations. LTE-M and NB-IoT deployments are increasing rapidly globally. In the top 50 IoT markets, most have both NB-IoT and LTE-M networks.



Range/coverage

The presence of a network in a country does not guarantee device availability. Some technologies like LTE-M and NB-IoT offer better in-building coverage for IoT applications than LTE Cat 1. LTE-M and NB-IoT provide up to 15db coverage boost, especially at cell edges and deep indoors.

Uplink/downlink speed

The data link speeds need to match the application requirements. IoT technologies like RedCap offer several hundred Mbit/s, while NB-IoT provides speeds just above 100Kbit/s. LTE-M speeds are around 1Mbit/s, with sensitivity to capabilities varying based on the supported application.

Latency

Latency is crucial alongside uplink/downlink speed. Different applications have varying latency requirements. Technologies like LTE-M and NB-IoT work well for smart metering with high latency tolerance, while sub-100ms latency is essential for real-time control in applications like smart grid load balancing.

Power consumption

IoT technologies like NB-IoT and LTE-M enable long battery life with Power Saving Mode (PSM) and EDRX features. They use less spectrum than LTE, resulting in lower power consumption. The choice between NB-IoT and LTE-M depends on factors like reporting frequency, payload, and firmware updates.

Unit price

IoT deployments often consider costs. LTE-M and NB-IoT have lower unit costs than LTE Cat 1 due to simpler technology. LTE-M and NB-IoT use single antenna designs, reducing hardware costs. Prices range from under USD5 for NB-IoT, USD8-20 for LTE-M and Cat 1, and potentially USD50 for RedCap. Lower power consumption in NB-IoT and LTE-M reduces overall power costs.

Market Growth and Applications

Transforma Insights forecasts significant growth in 5G mMTC connections from 436 million in 2022 to 3.6 billion in 2032. China leads currently but other markets are catching up. By 2032, China will have 38% of connections, with 15% in the US, 18% in Europe, 6% in Japan, and 22% elsewhere. 5G mMTC will account for 28% of cellular connections, growing to 58% by 2032, with significant growth outside China. Various application groups will utilize 5G mMTC technologies, including track & trace, smart metering, and white goods connectivity. LTE-M will be favoured for usage-based insurance and assisted living, while NB-IoT will be used for smart metering and monitoring. Other use cases include access control, road transport, vehicle management, assisted living, and crop management.

Conclusion

Various technology options are available for connecting low-data IoT applications, such as LTE-M and NB-IoT. Enterprises face challenges in selecting the most suitable technology due to annual additions like RedCap and eRedCap. Key considerations include network availability, support duration, and capabilities matching application needs. LTE-M and NB-IoT networks are prevalent globally, offering cost-effective options with long-term support as part of 5G.

Talk to one of our experts at www.SKYDATA-IoT.com.

Source: LTE-M and NB-IoT: A changing landscape by Matt Hatton, the Founding Partner at Transforma Insights, together with SONY, [IoT Now](#)