eSIM: A Buyer's Guide for Enterprise

Executive Summary

Global IoT device numbers are expected to continue their explosive growth trajectory in the coming years as industries across major economic sectors fully embrace mobile connectivity to transform their businesses.

In its 2022 Mobile Economy Report, GSMA Intelligence forecast there would be more than 4 billion cellular IoT connections by 2025 compared to 2 billion in 2021, with a great proportion of these being used by industry.

In this era of truly connected enterprise, only eSIM technology can deliver truly global, future-proof, reliable, and programmable connectivity to these devices.

However, many organizations don't know where to begin with eSIM and, if they select the wrong connectivity solution, they may end up stuck with disparate platforms that provide little more than an embedded version of a standard SIM card. Although this will provide some device design benefits, it will fail to take full advantage of the unique abilities of programmable eSIM.

This buyer's guide will outline how to tell the difference between various eSIM solutions in the market, as well as all the basics a business needs to know before taking a technological leap into eSIM.

It will cover: The basics of the form factor; benefits for the enterprise sector; current and future use cases; how to overcome deployment challenges; and major players and what category of solutions they can offer.

What is eSIM?

Embedded SIM, or eSIM, is the natural successor to the physical SIM card, which has been used for many years across consumer mobile handsets and cellular IoT devices.

The technology behind the new form factor is supported and promoted by the mobile industry association GSMA. It offers the same level of security and protection provided by physical cards, but uses an embedded version to house secure elements on devices.

eSIM allows remote provisioning, opening the way for previously impossible levels of flexibility in the management of connectivity for a fleet of devices. This means network providers can be changed without needing to physically swap the card in devices, a major barrier to achieving this in the past.

Previously, changing networks required sending out technicians to the field, far from ideal in terms of time, cost and in some cases this was logistically tough given the location of individual assets.

Being able to quickly update network profiles over the air opens the possibility for OEMs and enterprises to deploy the same hardware in multiple markets and allows a device to move over international borders without having to pay expensive roaming fees.

Industry Momentum

eSIM is gaining traction across both the enterprise and consumer sectors, with a growing number of large device manufacturers and network operators supporting the new technology. Uptake is forecast to continue its upward trajectory in the coming years.

In Strategy Analytics' IoT eSIM Sales by Vertical Industry and Region report, released in 2022, sales of eSIM for IoT applications were forecast to grow at a compound annual growth rate of 23% between 2022 and 2030. This includes those for forthcoming IoT-specific integrated SIM (iSIM).

Analysts at the company noted since the eSIM specifications for M2M were launched by the GSMA in 2016, adoption of both IoT and eSIM have matured considerably. Growth in use of the form factor is partly credited to the recognition of related global standards.

In terms of industries, the report highlighted expected growth across a number of sectors, with the automotive segment tipped to continue to lead the pack across the period. Other business areas making-up a significant chunk of overall adoption by 2030 include industrial, security, transport, utilities, and healthcare.

Expected continued growth in eSIM comes at a time of increased digitalization within many industries and a growing adoption of IoT devices. Wireless connectivity is becoming a key requirement of many advanced industrial and enterprise processes, with cellular offering several key advantages over other network technologies.

Machines connected by Wi-Fi and fixed networks are severely limited in where they can be used, while cellular connectivity meets the requirement for constant global connectivity. The addition of 5G also provides the high capacity and low latency required for advanced industrial applications expected to hit the market soon.

Why eSIM?

eSIM is more than a just a form factor. The benefits of mobile connectivity, after all, can be provided by standard SIM cards.

However, eSIM offers clear advantages compared to its predecessor when it comes to flexibility of service and the ability to use devices – or sell them – in diverse geographical locations.

Enterprises across a wide range of sectors are already recognizing the benefits of this technology for their IoT deployments. The flexibility of this form factor allows user profiles to be changed over the air, improving the usability of devices and transforming business models.

By making changes via a software layer, enterprises can use eSIM to change network providers even when the device itself is physically inaccessible. This is quite regularly the case for IoT devices that operate in remote or mobile locations away from physical human interaction.

Domestically, eSIM offers the freedom to switch providers during an outage, when pricing from host operators change, or when regional coverage from an alternative provider is significantly better. It also allows devices crossing borders to connect to host networks in the new country without having to roam from its previous host network.

Roaming can be extremely problematic for machine devices. It can be prohibitively expensive or completely unavailable from a carrier depending on their third-party agreements.

The right eSIM solution can solve these challenges and open the door to new opportunities.

Outside of network term flexibility, there are other tangible business benefits for the deployment of eSIM.

The technology is able to offer significant SKU (Stock Keeping Unit) consolidation as there is now no need to manage multiple SIMs or connectivity vendors within large-scale businesses. Having a single SKU removes a major accounting and administrative headache of having to deal with multiple contracts for different markets and a multitude of vendors.

From a device manufacturers' perspective, eSIM within a physical form factor can improve product resilience, including weatherproofing, while also simplifying product design to allow the same device to be exported across the globe.

Globally standardized products with high redundancy and network availability can benefit all kinds of industries, including defense, transportation and infrastructure. This covers all types of devices including advanced ones such as drones and robots.

Four Fundamentals of eSIM

- **Redundancy:** Eliminate over-reliance on one single provider and its points of failure

- **Availability and performance:** Delivering low latency, high-throughput anywhere

- **Product simplification:** No need for multiple versions of device SKUs for markets

- **Control and flexibility:** Not getting locked into carrier agreements

Assessing The eSIM Choices

Once an enterprise or OEM has decided to adopt eSIM there are a number of deployment options available on the market. These vary in suitability, depending on exact requirements around customization, personalization and the level of network access flexibility needed.

By adopting the most appropriate solution for them, enterprise devices can improve service flexibility, gain increased domestic reliability, and eliminate costly roaming and contract fees.

However, there are different types of eSIM technology providers, each with their own nuances and limitations. Here, we take a look at the types of businesses offering eSIM solutions and assess their relative merits and potential issues.

MNO

Mobile network operator (MNO) eSIMs tend to be tied back to their own network and reliant on the technology generation available at the time of deployment. They usually lack the ability to switch providers nationally and international connectivity likely comes through the operator's standard inter-carrier roaming agreements.

The latter can prove expensive and is reliant on the supplier in question having stable, favorable relationships, or in some cases any relationship, in whichever country the device is set to be used in. These relationships usually change over time.

Within the operator's home market, devices have a single point of

failure, potentially making them vulnerable to outages or if networks are sunsetted. There is not typically a backup domestic network.

Although cost-efficient for access to their own network, MNO-supplied eSIM is essentially a direct replacement for a physical SIM and offers a similar level of inflexible access. For these reasons, an MNO offered eSIM solution is most viable for a planned single network deployment.

MVNO

Getting eSIM connectivity from a Mobile Virtual Network Operator (MVNO) has many of the same issues as an operator, though usually with degraded performance as MVNO users are often

deprioritized on the serving radio networks while also typically offering a smaller scale of back-end infrastructure.

In terms of connectivity options, these can be limited especially in their host operator's domestic market and actual network availability, performance, and sunsetting of technology is out of their hands.

When relying on this type of provider, there is also risk with the agreement they have with their host provider which could change over time.

MVNOs commonly cannot access elements which are the greatest advantages of eSIM. This is because they have: a reliance on third party contract eSIM solutions, a reliance on roaming (often through agreements provided by their host operator); no support for private networks; little control or flexibility over pricing; and an inability to offer the lowest latency in the market.

Most MVNO players offering eSIM capabilities today are renting or leasing their eSIM platform, which limits flexibility and fails to yield some of the true benefits that the technology offers.

Traditional SIM providers

Several suppliers of physical SIM cards also supply eSIM solutions. Think the likes of Idemia, Thales, VALID, etc.

When using SIM technology specialists, enterprises will often find the eSIM doesn't come with any of the network profiles required for a fast launch and companies will be essentially paying to build their own eSIM solution. They provide neither the connectivity management platform nor pre-integrated networks.

Although this can work for companies with huge scale, budget, and influence, it is not ideal for most enterprises given the costs and timelines associated with arranging carrier agreements and the requirement to foot the bill for integration projects.

"True" eSIM

There are a limited number of "true" eSIM solutions in the market that are ready for global enterprise deployments and full eSIM optionality at scale.

Teal, for example, has its own eSIM platform, runs its own source code, and is not reliant on third parties for integration with the ability to preconfigure with a range of carriers. The system uses a crowdsourcing model, creating a network-as-an-app style system.

If a carrier profile is requested that is not already integrated into the Teal system, they can integrate it into its platform for free on behalf of the IoT enterprise. This is because "true" eSIM platforms like Teal are serious about growing a collaborative 800+ carrier eSIM technology platform.

Imagine accessing thousands of network configurations in an "app store" when you can just select the one that fits your solution and you'll then be directly connected to it, eliminating roaming completely.

Feature	Teal eSIM	MVNO "eSIM"	MNO "eSIM"
eSIM Technology Provider	1st Party (Teal)	3rd Party	3rd Party
Chip Manufacturer	Multi-Vendor	Single-Vendor	Single-Vendor
Datacenter Provider	Operator	Themselves	Operator
Direct Network Enrollment	Yes ✔	No ✘	No ✘
Roaming Networks	When Necessary	Always	Sometimes
Network Onboarding	Whenever you need	No	No
Private Networks	Whenever you need	Not compatible	Not compatible

Deploying eSIM

Customers interested in eSIM come in many shapes, sizes, and roles in the supply chain.

Enterprises often have device hardware ready but want to add eSIM functionality to it. Some take a pluggable eSIM, giving them the flexibility to add it into the product at any point.

OEMs, which add it directly into the technology, usually want a solution that's more configurable than a plug-and-play version.

No matter where and when it enters the product, many of the pitfalls are around the connectivity element and it's worth discussing these with potential providers.

One key issue is around redundancy. It is important to ensure the solutions being deployed offer back-up functionality through multiple networks and different data centers. Not all providers can supply this, but it is a central benefit that makes eSIM stand out from other connectivity technologies.

Using an engaged provider with a suitable platform can massively ease deployments.

Systems can either be admin heavy or light depending on if direct connections can be easily supplied across target markets. Those that can will enjoy a world of options without multiple contracts or paying an expensive third-party to supply roaming.

Security is a major concern for many industries. For those concerned about using inherently insecure SMS technology, Teal's patented system for HTTPS-only activations can enable better and more consistent global activations.

Teal also supports IoT SAFE and private certificate storage direct within the eUICC component for stronger application security.

Of course, as with any business decision, using a trusted and reliable supplier can mitigate the risk of a lot of potential security problems and avoid costly in-house integration projects.

Why Partner with TEAL?

Teal offers a comprehensive solution to OEMs and enterprises looking to embrace the full flexibility and benefits of eSIM for their devices and organizations.

Its patented, GSMA certified eSIM platform has been built from the ground up and can offer all of the advantages and flexibility brought by this new technology.

Among its many benefits, Teal offers more competitive pricing than the likes of MVNOs as it is directly enrolling into the carrier network. Additionally, it's not reliant on a single network operator with limitations on selling off a specific carrier's rate card.

Businesses using their own platform can gain greater control of connectivity and are able to dynamically switch between providers if pricing or coverage changes. This offers greater redundancy, ensures IoT devices are always connected and, ultimately, provides a much better rate for overseas connectivity.

Teal gives customers access to a wide range of MNOs through direct connections without having to flow through a third-party data center, unlike with an MVNO.

Using its solution means there are no more concerns about network sunsets and outages given the ability to dynamically move connectivity to an alternative service provider.

This flexibility is one of Teal's unique selling propositions. For example, Teal is the only eSIM provider in the United States with first-party partnerships offering off-the-shelf native connectivity on the AT&T, Verizon and T-Mobile networks. It has a wide range of networks pre-integrated into its platform but includes the ability to bring your own as new requirements arise.

While many MVNOs claim to offer programable or automatic carrier switching, they are often just relying on outsourced eSIM technology and roaming capabilities within their own mobile core, which are often more expensive and have lower redundancy.

Teal has strong credentials with its customers and within the IoT industry. It was the first US-based company to have its M2M eUICC platform accredited by the GSMA's security accreditation scheme, so you can be reassured your deployment is in safe hands.

With Teal, a true eSIM experience can be achieved, transforming industrial IoT deployments with mobility and true flexibility.

It has already had a significant impact for a range of customers across a whole host of sectors, many of which can be read about on the Teal website: www.tealcom.io.

Case studies

Starship Technologies

Starship is the world's leading robot delivery service on college campuses and cities, using Teal to connect its autonomous robots.

Teal brought simplicity to Starship's operational pain points by providing a single SIM SKU that offers access to multiple native MNO IoT Packet Cores.

The performance of Teal's native core profile has lower latency with better throughput than the business-grade SIMs they were using, which accessed MNO retail networks. Thousands of robots have been deployed using Teal's eSIM technology.

Volatus Aerospace

Volatus Aerospace is major player in the commercial drone and UAV technology sector, providing integrated solutions for global clients in the civil, government and defense markets.

Teal provides Volatus with a single eSIM SKU which gives them the ability to connect drones directly to networks around the world. By avoiding expensive roaming charges, Volatus is able to provide its customers with a low latency, high throughput, and highly redundant solution.

Machfu Industrial

Machfu's industrial IoT solutions are designed to improve performance within Industry 4.0.

Machfu operates in more than 20 countries and required its equipment to be carrier agnostic. Teal is currently connecting its equipment globally with affordable pricing and the ability to connect over the air, with Machfu's customers able to take advantage of pay-as-you-go pricing or volume pricing for those committing.

Safe Fleet

Safe Fleet has unified an unrivaled portfolio of best-of-breed smart solutions for fleets of every type. From equipping school buses with onboard video systems to protecting first responders with innovative fire-fighting equipment, to reducing back strain with ergonomically-designed ladder-racks, the Safe Fleet mission is to ensure that drivers, passengers, first responders, in-the-field workers, and pedestrians arrive home safely.

With Teal's eSIM, Safe Fleet is now carrier agnostic. Teal gives Safe Fleet the flexibility to choose which carrier credentials best support their business needs. Safe Fleet doesn't have to be concerned with pairing a Mobile Network Operator's SIM with the correct modem to support that specific carrier. They can deploy the Teal eSIM which will support the carrier LTE bands that their modems support.

TEAL

Teal's patented, GSMA certified, technology connects any device onto any data network worldwide. With more integrated network operator agreements than any other connectivity provider, Teal gives businesses everywhere the flexibility and control to remotely switch between networks, ensuring the highest level of reliability and performance for any internet of things (IoT) deployment. Teal supports applications across many industries including mobility, robotics, drones, industrial IoT, healthcare, smart cities, and manufacturing.

Find out more at www.tealcom.io

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