eSIM DELIVERS GREATER FREEDOM FOR IoT OEMs

IoT NOW ANALYST REPORT

TRUPHONE

Traditional SIM card restricts IoT growth for OEMs

The original SIM card (Subscriber Identity Module) – the plastic card inserted into your mobile phone to determine which network operator (MNO) your phone is assigned to – has essentially not changed much since it first came to the market in 1991. It has been well suited to the sales process in specialist mobile retail stores, where the SIM is inserted into the phone at the point of sale

While it has contributed significantly to the growing success of the mobile handset market for many reasons, it is not ideal for other connected devices which are not purchased through mobile phone retail outlets. For IoT applications, such as those using asset trackers, cars, CCTV cameras, healthcare devices, security alarms and smart meters, matching up a specifically configured SIM card with the device it is configured for is often a logistical nightmare for the product manufacturers (OEMs) involved. This is particularly the case where the devices are manufactured in one country then shipped worldwide, with the SIM cards then often being configured in a different country and also shipped worldwide to be matched up individually with those devices. This all adds cost and when errors are inevitably made, these need to be corrected which adds time as well. It is also highly inflexible to customer service changes and is in any case becoming increasingly untenable as the volumes of manufactured devices requiring to be connected have risen sharply in recent years. In essence, the traditional SIM card has been restricting the growth of cellular IoT device use in global markets.

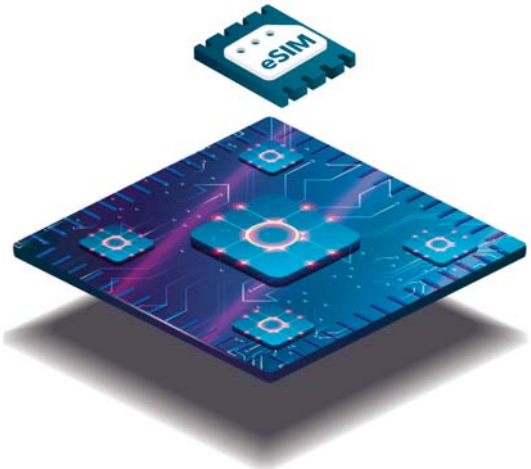
> Changing the MNO means changing the SIM card and that introduces both the same and new logistical issues.

As well as all this, there may be a need to change the mobile operator (MNO) during the life of the device. This could be for coverage issues, or because the tariff is now high compared with other alternatives, or even due to a network shutdown as the network technology is upgraded. Changing the MNO means changing the SIM card and that introduces both the same and new logistical issues. It is usually the case that such devices, once installed, cannot be simply disconnected and sent back to base for the swap. Apart from the loss of service the device is providing, the card may be physically difficult to access. It may be up a lamppost. It may be in a small cabinet out of easy reach. On the other hand, if it is easy to access and in a public location, it may then be open to tampering and even theft if not physically secured in some way. Such issues and more all add cost and further logistical challenges in the use of traditional SIM cards for connected devices.

eSIM to the rescue

To address these and other challenges posed by the SIM card in this market, a new type of SIM has been introduced that is provisioned over the air. Somewhat confusingly, this is called an embedded universal integrated circuit card (eUICC). The major advantage for OEMs of this approach is that the SIM can be inserted into a device's circuit board during manufacture like any other component and then provisioned later with the appropriate network operator profile over the air (OTA) for wherever in the world it happens to be. It converts the SIM into a single stock keeping unit (SKU), thereby helping to streamline production processes and reduce costs. This is particularly important for the OEM market where products may be shipped anywhere in the world and considerably eases the issues for OEMs.

This whole solution, incorporating both the eUICC and the means for updating it remotely over the air, is then called the eSIM solution. The introduction of the eSIM Technical Specification by the GSMA in 2014, and continuously updated since then, provides a technical standard for this type of solution and this has considerably enhanced the prospects for eSIM use in the IoT market. It has dramatically opened up the opportunities for OEMs to use cellular connectivity in their products. It has of course already been widely taken up by the auto industry manufacturers, who have pioneered its use for a variety of telematics and in-car entertainment uses, and is relevant for any application where embedded, wide area connectivity is appropriate. Through the way it works, this solution also changes the ownership of the SIM itself. The traditional SIM card has always been the property of an individual MNO.



TRUPHONE

With the eUICC, the SIM is owned by the OEM or service provider and has a bootstrap network profile installed in it.

It is supplied by the MNO and to change to another requires a physical change of SIM. With the eUICC, the SIM is owned by the OEM or service provider and has a bootstrap network profile installed in it. Wherever the product is subsequently shipped to, when the eUICC is switched on the bootstrap profile sets up a wireless connection so the correct network profile for that location can be downloaded over the air, with no physical intervention.

Majority of new cellular IoT connections to be eSIM-based

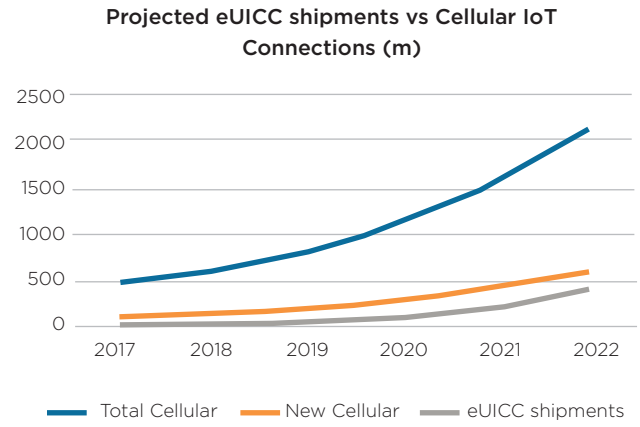


Figure 1: eUICC shipments vs new cellular IoT connections (Source: Beecham Research)

Projections for use of eSIM for M2M/IoT applications show strong growth with market expectations high that nearly two thirds of all new cellular IoT connections – both high and low bandwidth – will be eSIM based in the next few years. Further, since growth of eSIM for low bandwidth NB-IoT and LTE-M is behind and catching up, growth of

The IoT market is just at the start of exploring the new ways of working and the new operational flexibilities that eSIM now offers for IoT business users.

eSIM for high bandwidth connections is well ahead of that. This means that the majority of new cellular IoT connections will use eSIM and its related developments, such as iSIM (integrated SIM), within the next few years. The IoT market is just at the start of exploring the new ways of working and the new operational flexibilities that eSIM now offers for IoT business users.

One of these flexibilities is that if the business user requires a particular experience for their connected devices in a large number of countries, establishing the best rates for that coverage can be complex. It may therefore seem simpler just to opt for a global SIM provided by one MNO that offers coverage using the roaming agreements that the MNO has worldwide. That is then often provided by means of a locked eSIM that cannot be changed for the life of the product. Yet this approach may not in fact provide the optimum geographic coverage for the data rate required within each country and overall may cost more than an alternative that does provide this. If it is locked, it cannot then be changed. The difference is then between a one-size-fits-all global SIM solution that is not designed for the specific requirement and an open and flexible solution tailored to the specific needs of the business user. The former solution cannot adapt to any changes required by the user that come about over time, whereas the latter remains open and flexible to such changes.

A related issue is permanent roaming. In some countries, a device that is roaming permanently in a country when its home country is elsewhere contravenes local regulations and may be disconnected. This is a changing situation and the number of countries where this is an issue may increase over time. This is easily overcome using an eSIM approach, where a new network profile can be uploaded as required.

A further area that may also need to be considered is local country regulations aimed at ensuring that data originating in a country stays in that country. This has implications for choice of carrier in some countries for some applications and this trend is expected to increase over the next few years. There may also be a need for local breakouts, so that data is processed close to where it will be used rather than being sent back to a cloud-based server where latency could be an issue.

All of these issues suggest that eSIM solutions will continue to evolve and become more granular and more flexible over time as their use increases.

At its core, Truphone provides a platform for all of its customers to manage all of their connected devices

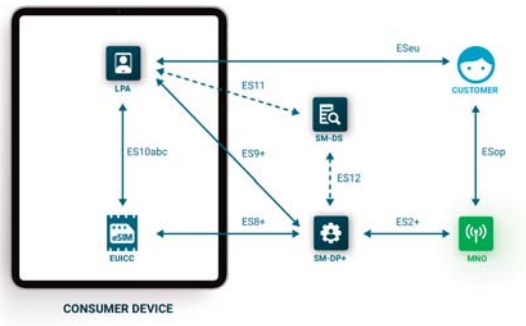


Figure 2: Remote SIM Provisioning System Architecture

Source: Truphone

Truphone for Things

As the name suggests, Truphone originally entered the telecoms market with a voice application for enterprise users and has also been partnered with Apple for eSIM for some time. Its entry into the IoT market is more recent, and this has provided the company with the opportunity to utilise its experience of both eSIM and Multi-IMSI to provide a flexible solution for IoT. In doing so, its principle objective is to make life easy for its customers. Although eSIM is intrinsically quite complex to operate, Truphone's view is that there is no need for its customers – typically not telecoms experts – to be involved in that. Keep it simple.

Figure 2 shows Truphone's version of the GSMA's Remote SIM Provisioning Architecture, which features the interfaces required (ESxx) for secure transfer of network profiles. As this demonstrates, this is a quite complex process with many interface activities required. It also demonstrates the need for one globally accepted specification or standard to maximise the benefits of eSIM in the IoT market. Proprietary specifications, of which there are a number, effectively lock the customer in to one supplier's subscription management system.

Truphone has developed this technology – including the SM-DS (Subscription Manager-Delivery Server) and SM-DP (Subscription Manager-Data Preparation) – in their own infrastructure, which provides full control over the feature set and being able to integrate it in different ways.

At its core, Truphone provides a platform for all of its customers to manage all of their connected devices. Wherever they are in the world, the device will show up. The customer can see what IP address it has, they can control that device in terms of whether it is activated or troubleshoot it and see what is happening in terms of traffic on that device. Alongside that, Truphone supports its own SIM management of those devices as well with its remote SIM provisioning platform, which can be integrated with the eUICC in each device. That could be pushing new profiles to those devices and switching profiles if needed.

Figure 3 shows the main elements of Truphone's eSIM offering. Among others, this includes Entitlement Management, which offers the ability to securely configure devices with the right settings. For example, this may be particularly useful for wearables applications where there is no effective user interface (UI). It can be challenging to configure voice services on a wearable. The integrated Entitlement platform Truphone has developed provides the facility to configure those wearable devices.

Figure 3: Key Elements of Truphone's eSIM Line-up

The company has established various partnerships across the ecosystem

Truphone is now nearing six million eSIM enabled connections on their platform. They are downloading about 20,000 per day, although this is a total mix of data traffic – not all IoT. For example, it includes iPad traffic. In addition, this is not just Truphone's own connectivity. The company has 26 other network operators using its platform to serve their own customers.

The company has established various partnerships across the ecosystem including eSIM partnership with **Synopsys** in the US and **Murata** in Japan, who make LTE-M/NB-IoT multi-mode modules that come linked to Truphone's platform.

What differentiates Truphone? In the company's own words "we have an end to end solution so if you want to have eSIM we can provide the eUICC, the connectivity and the remote SIM provisioning platform to go with it. There are not many who can provide all of these elements and give a global end-to-end solution to an IoT player."

In addition, Truphone maintains an open stance towards eSIM. The whole point of eSIM is to provide the flexibility to change the SIM in the future to somebody else. Truphone is quite open and relaxed if its customers want to move away from Truphone and use another service. It will facilitate that to happen. This is not a usual attitude in the telecoms world but necessary for eSIM and the IoT market to thrive.

Breaking down complexities in IoT connectivity with eSIM

Robin Duke-Woolley, CEO Beecham Research, interviews Steve Alder chief business development officer at Truphone and Michael Moorfield, director of product at Truphone

Robin Duke-Woolley, Beecham Research

Robin Duke-Woolley: How do you describe what Truphone does?

Steve Alder: Truphone is a mobile virtual network operator (MVNO) based in nine countries – UK, US, Germany, France, Spain, Netherlands, Poland, Hong Kong and Australia. We have our own global core network that covers over 200 destinations and connects with many different MNOs, providing global or regional roaming. Truphone was originally one of the first VOIP apps. We still have a large enterprise voice business for international use but recognised that the network is also valuable for Internet of Things (IoT) customers.

The heart of our offer is simple connectivity, but we are strong believers in the potential of embedded subscriber identity module (eSIM). As a result, we have invested in eSIM and are one of the biggest providers of eSIM in the market. We've also recently launched Truphone for Things, our all-encompassing global connectivity solution which breaks down complexities in IoT connectivity by utilising eSIM technology. Truphone for Things enables users to connect devices anywhere in the world in a few simple clicks.

RD-W: For an eSIM solution to be effective, it needs to be able to switch between MNOs and find the lowest cost path for each device out there. How does Truphone cater for that?

SA: The switching between network operators we deal with is invisible to our customers. The Truphone profile attaches to Orange in France, to Vodafone in Germany and so on. We have multi-international mobile subscriber identity (IMSI) technology on the SIM that allows the SIM to look for different networks and always look for the best quality and price. This is great for IoT manufacturers and distributors as they can create a single stock keeping unit (SKU) that doesn't need to be programmed to a local network on manufacture.

A connected device no longer needs to be tied to a network brand, it can connect remotely to any and all of them. Any device shipped around the globe will have out-of-the-box connectivity, on a network of the user's choosing, from the moment they switch it on. All this can be done with the Truphone SIM.

In addition, eSIM technology allows a user to swap the SIM to a new MNO remotely. In IoT you never want to go back to the device to swap the SIM, so with eSIM this can be done over-the-air. It means that you aren't locked into the same operator for the life of the device, it gives more flexibility and choice in the future. Truphone believes in this open policy as it will be good for the growth of IoT.

RD-W: What level of granularity can you provide for different requirements?

SA: Within the Truphone service we have the ability to access multiple networks whether that is for high bandwidth, low bandwidth, low power or other customer requirements.

Michael Moorfield: The SIM that can switch to ▶

Michael Moorfield,
Truphone

Steve Alder,
Truphone

multiple networks is something Truphone has done for eight or nine years as a Multi-IMSI solution. We do that on the back of our MVNO infrastructure and we have 13 IMSIs on our SIM card that allow us to decide the best route given the specific customer use case. One customer might be deploying an LTE-M tracker globally, so we put IMSIs on that SIM that give access to the most LTE-M networks around the world. Another customer with a tablet to roll out globally will need a different set of IMSIs to make sure it has the best and cheapest possible access to LTE service. The eSIM bit then goes on top of that, in that you can then deliver that profile remotely as well.

RD-W: The IMSI profiles that you provide, can they be downloaded over the air or are they inserted into the SIM and that's what gets installed into the device?

MM: Both. Each of our SIMs comes preloaded with our IMSIs but we're adding new ones all the time, so we push those over the air. If you're in a country where we have a new agreement, we can push that new one. We have patents in this area around our SIM management capability in order to do this. So you don't necessarily need to select Truphone at the initial deployment and you can swap away from Truphone if you want to. You can do that all through our platform.

RD-W: Do you follow the GSMA spec for eSIM? Multi-IMSI solutions are proprietary, so swapping out may not be as easy.

MM: Yes – we support the GSMA spec. There are two separate points here. The Multi-IMSI technology we've developed in our profile is proprietary Truphone intellectual property. It all runs within a GSMA standard eSIM so all of our SIM cards are GSMA-certified and our provisioning platform in London and Amsterdam is GSMA-certified. We're a big supporter and part of the GSMA working group.

RD-W: What kind of services are offered from your platform?

MM: At its core, we provide a platform for all our customers to manage all their connected devices wherever they are. For each device, you can see its IP address, you can optimise or troubleshoot it, see what's happening in terms of traffic on each device. Alongside that we support our eSIM management of those devices as well with our own remote SIM provisioning platform.

RD-W: When did you start offering IoT eSIMs?

SA: September 2018, and we are one of the biggest remote eSIM provisioning companies. It's been helped by our partnership with Apple. We've been partnered with Apple for eSIM for a long time. We then also opened up our platform to other operators. We now have 26 operators using our platform to serve their customers, so we are acting there as a service provider for network operators. This is in addition to Truphone's own end user service, where most of our customers are product manufacturers looking for international coverage. ■

Within the Truphone service we have the ability to access multiple networks whether that is for high bandwidth, low bandwidth, low power or other customer requirements

Fox Sports used Truphone SIM cards to broadcast from the tournament

Truphone for Things gets Fox Sports ahead of the game

From providing our services to 10 of the world's 12 largest banks to being a trusted partner of **Apple**'s for the last five years as the first Apple eSIM provider, **Truphone**'s roster of clients is as diverse and influential as our product suite.

Whether we're helping **MSA Security** scale at the touch of a button or keeping **Fox Sports** close to the action, our customers can rely on us to provide them with seamless connectivity, on the ground, wherever they are.

Truphone's use-cases cover a breadth of IoT needs, such as high-volume data for a smaller number of devices, as we do for Fox Sports, or lower volumes of data for asset and fleet tracking purposes, as we do for **MachineMax**.

Below, we'll discuss in more detail how Truphone has helped these two particular customers stay ahead of the game

As one of the largest sports broadcasters in the world, Fox Sports is on-site at every major sporting event, reporting on the biggest stories as they break. These pre-planned large-scale events are the focal point of the year for broadcasters, with multi-millions invested to ensure the best quality coverage.

Rising to the challenge for the Women's World Cup

During the Women's World Cup in France, Fox Sports needed a flexible solution that would enable them to broadcast live footage for its programming, without having to worry about poor connection or breaks in service.

"We were able to replace all of the SIMs with Truphone SIM cards to enable us to be on the Truphone network everywhere we were with the backpacks in France. This allowed us to have one data plan and no surprises at the end of the tournament," says Kevin Callahan, the vice president of Engineering and Operations at Fox Sports

Transforming connectivity with Truphone for Things

Using Truphone for Things – Truphone's cutting-edge IoT technology – Fox Sports replaced all of its regular SIM cards with Truphone SIMs in its LiveU mobile broadcasting packs. These ▶

broadcasting packs, which the Fox Sports team wear physically like a rucksack, were able to connect to the Truphone network at all times, capturing live footage which was sent, in real-time, back to its HQ in the US.

In switching to Truphone's SIMs, Fox Sports could transmit live content to a cell tower which was, in turn, received halfway around the world and broadcast directly into the home. Not only did the implementation of Truphone SIMs afford Fox Sports with a seamless, reliable connection, it also meant that their entire live broadcasting fleet could be managed on one plan with one point of contact.

Why Truphone?

- Seamless, reliable connectivity anywhere around the globe
- One mobile plan, one point of contact – hassle-free

Truphone connects MachineMax's entire fleet in moments

London-based **MachineMax** was selected as one of the Top 50 ConTech Startups in 2019 by CEMEX Ventures and also won the 'Smart Use of Machinery: Technology for Heavy Plant' award at NCE TechFest.

The company produces sensors designed specifically for off-highway heavy equipment – tractors, dumper trucks, excavators, diggers of any brand and any model – and ships them globally. Its customers use the sensors to track their machines and receive efficiency, productivity and fuel-cost insights to help them maximise profitability and reduce emissions.

But while MachineMax could offer revolutionary wireless telematics to its customers, it didn't have a way to simplify connectivity for their vehicle fleets.

That was, until it partnered with Truphone.

How eSIM has changed the MachineMax offer

Truphone's commitment to eSIM (embedded SIM) technology has given MachineMax a huge competitive advantage, and its customers a simple solution for getting their off-highway vehicles connected.

By implementing Truphone's state-of-the-art eSIM technology in its devices – and thanks to Truphone's network which supports 2G, 3G, 4G and CAT-M1/LTE-M networks worldwide – MachineMax is now able to offer connectivity straight out of the box, wherever in the world the device is deployed.

What's more, every eSIM profile in customers' fleets can now be updated and connected remotely and at scale from the Truphone for Things platform. Users have the ability to deploy and manage connectivity for thousands of devices via a simple-yet-powerful interface, at their fingertips.

MachineMax relies on Truphone eSIMs for its wireless telematics

MachineMax's connected-device offer provides the company's customers with complete confidence that their fleet of devices can be tracked, 24/7, no matter the site size or manufacturer.

But it also provides MachineMax's CEO, Amit Rai, with belief. "With the support of Truphone, we are confident we can continue our rapid global expansion whilst providing seamless global connectivity," he says.

A one-stop-shop for IoT connectivity

Truphone for Things joins together previously fragmented elements of the Internet of Things (IoT) ecosystem to provide a 'one-stop-shop' for IoT connectivity.

The company's global mobile network is used to connect devices anywhere – via a range of low- and high-power networks – and full control is provided via an easy-to-use management platform.

So it's little wonder new partnerships such as the one with MachineMax are forming continually as manufacturers seek to unlock the potential of the Internet of Things for their customers. ■

www.truphone.com