

eSIM: The Global Market Report 2019

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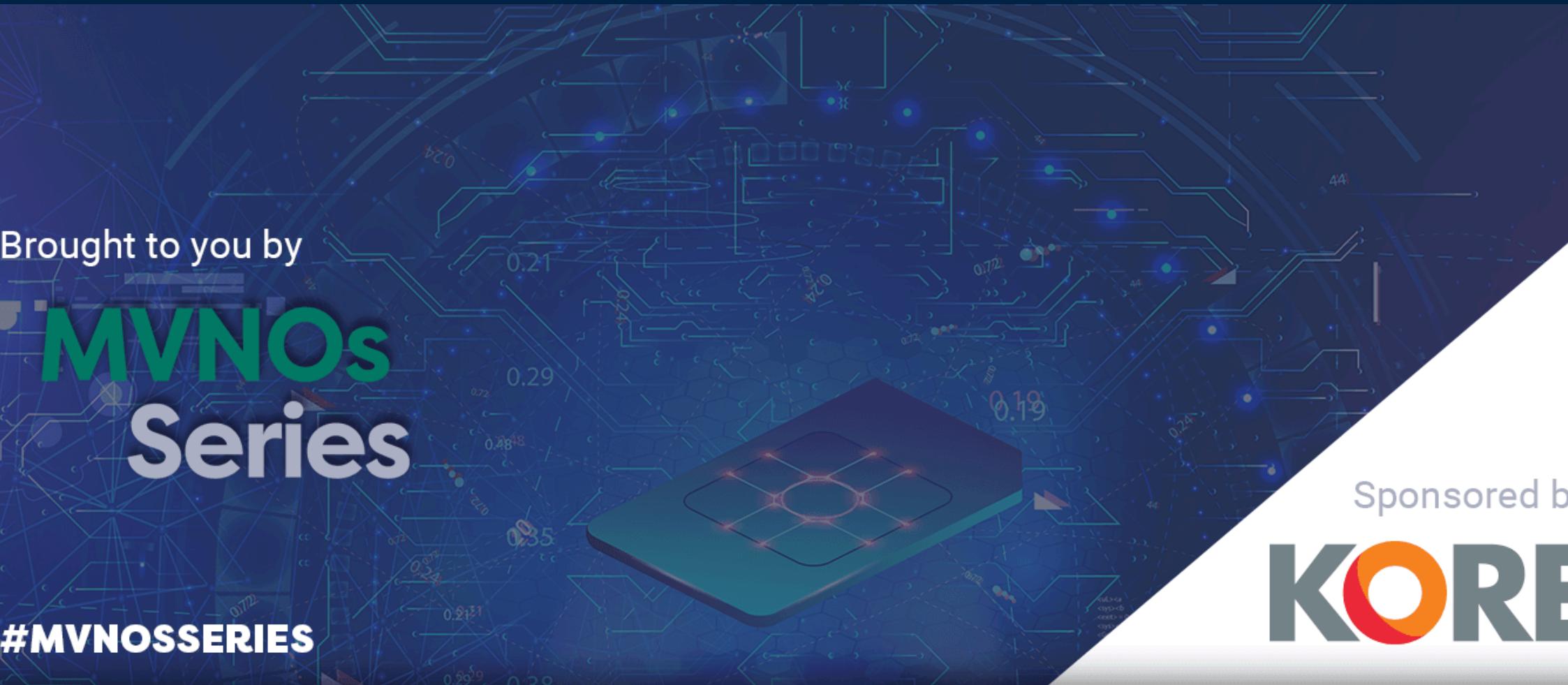
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The Rise of eSIM: Towards Seamless Mobile Connectivity



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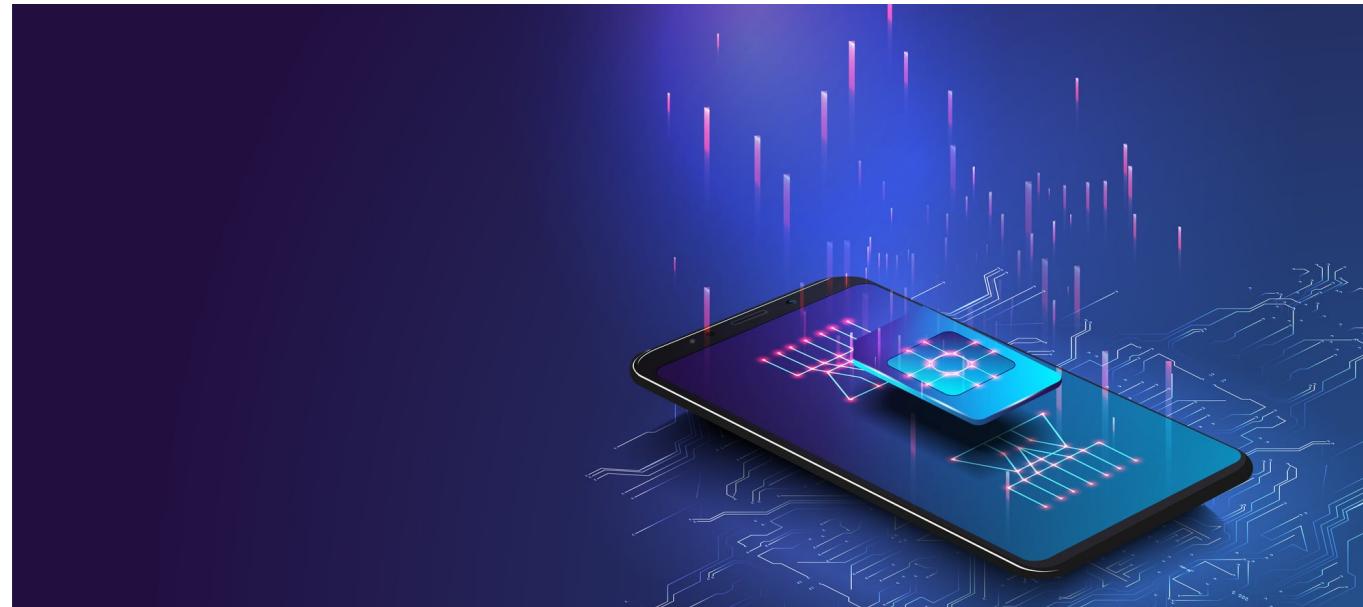
The Rise of eSIM

In a world where connectivity is becoming increasingly integral to how we live, work, interact and transact, the search for new, simpler, faster and more efficient ways to connect has become a full time occupation.

Nowhere is this felt more keenly than the mobile industry. With more than half the world's internet traffic now carried

via 3G and 4G LTE networks, with the Internet of Things creating demand for billions of new devices, and with 5G on the horizon, mobile has the opportunity to dominate global connectivity. According to one estimate, mobile will account for 25.2 billion connections by 2025, contributing \$4.8 trillion in economic value - close to 5% of total global GDP.

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But if the industry is to achieve those heights, one of the challenges it faces is how to make the connectivity path between device and network seamless and universal, meaning any device can connect to any network in any location.

The current model for provisioning mobile device connectivity - having the Subscriber Identity Module (SIM) installed on a removable chip - was designed more than 30 years ago when the market for cellular technology was very different to what it is today. Removable SIM was not developed to meet the demands of mass deployments of connected industrial components, nor for a consumer market where people might want to run several different

The Rise of eSIM

devices on the same network service.

The one SIM, one operator model no longer fits with a society that increasingly views mobility in a global context, with consumers who are no longer prepared to pay a huge roaming premium to connect to local networks when they travel, to industries like vehicle manufacturing which want their smart cars, vans and trucks to remain online seamlessly as they cross borders. The need to remove a SIM and install another one just to change network operator is an inconvenience and a barrier to mobile's continued growth.

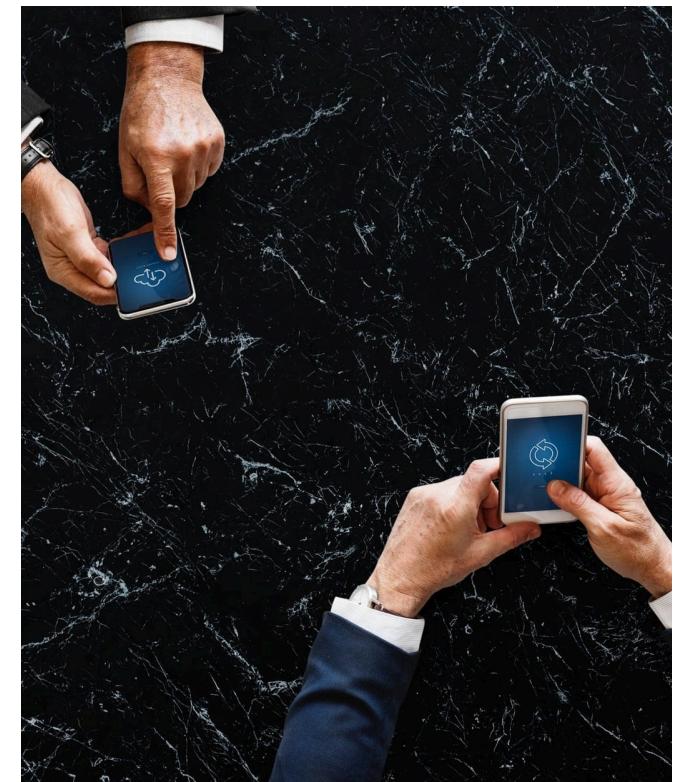
Embedded SIM or e-SIM - the technological development of hard-wiring the subscriber identity module and/or universal integrated circuit card (UICC) into a device rather than leaving it on a removable chip - is widely viewed as a key step forward in achieving seamless cellular connectivity for all devices, wherever they happen to be. Together with the GSMA's work on developing an international standard for provisioning network services over the airwaves, e-SIM is viewed as a means of

providing the flexibility, mobility, convenience and freedom of choice in cellular connectivity which will allow the mobile industry to take full advantage of the next generation of technological developments and changing user trends.

eSIM is a key step forward in achieving seamless cellular connectivity for all devices

In this report, we will provide an update on where we stand with e-SIM development in 2019, and where the technology might be taking us. We will look at the current state of play of e-SIM in the market, focusing particularly on why we've yet to see other smartphone manufacturers follow the lead of Apple and Google in developing e-SIM fitted handsets. We will look at what MVNOs are doing to prepare for e-SIM, we will highlight current and future monetization opportunities and the kind of services the

market is likely to expect, and we will also focus in on the role e-SIM is playing in rapidly maturing IoT markets around the world.



So, What's New in eSIM?



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What's new with eSIM?

A year ago, the announcement by Apple that its new iPhone XS, XS Max and XR handsets were to feature an eSIM as part of a dual SIM configuration was meant to mark a watershed moment for embedded SIM technology. Surely, with arguably the world's most iconic



smartphone brand now embracing eSIM, the world would see a rush of manufacturers following in its wake, and the

beginning of the end for the removable SIM card.

That hasn't quite happened. One of the reasons is likely to be that e-SIM compatibility is not a one way street. Not only do manufacturers have to take the decision to build hard-wired SIMs into their devices, but operators also have to change the way they provision network services to a device - for example, by adopting means of downloading a user's subscription profile onto the embedded SIM, rather than just scanning the profile already contained on a removable chip.

Even though Apple, like Google before it with the pioneering Pixel e-SIM phone, has adopted the GSMA's specifications, the industry has yet to see significant collaboration between OEMs and operators about how remote provisioning might work in practice. This has caused a delay in operators offering e-SIM services that new Apple XS and XR owners can take advantage of, which in turn has probably led to other manufacturers deciding there is no rush to bring their own e-SIM devices to market.

As Andrei Ivanov, Principle Technology Architect and CTO of Canadian telco Telus says, the last 12 months have been characterised by a slow trickle of operators making e-SIM services available for smartphone owners and developing ways to deliver connections. "Initial steps are to make e-SIM available for consumer via a printed QR code mechanism, with a transition to app-based enablement likely in the future," he said.

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Andrei Ivanov, Telus

What's new with eSIM?

Amongst operators, the earliest adopters of e-SIM in the wake of the Apple announcement were international roaming specialists like Truphone and KnowRoaming,



"2G and 3G networks will be shut down [in Sri Lanka] in the near future to minimize operational costs. Therefore future proof technologies such as NB-IoT and e-SIM are expected to be adopted across industry."

Amila Saputhanthri, Dialog Axiata

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"eSIM is an imperative enabler for the future of IoT/M2M, it makes the deployment process simple and efficient," he said. "This year, Telna has expanded its portfolio with white-list branded e-SIM solutions for business and consumers. It is a catalyst in the market."

Gregory Gundelfinger, Telna

which recognised the immediate benefits to their business model of offering seamless connectivity to multiple networks as people travel. Working with Japan's KDDI, GigSky has since built an e-SIM-based travel solution which is provisioned and managed through an app, as described by Ivanov. In terms of e-SIM services in domestic markets, early adopters include the likes of DNA in Finland, and Indian carriers Airtel and Reliance Jio.

Another operator to launch e-SIM services domestically this year is Sri Lanka's Dialog Axiata, although its focus has been largely on delivering eSIM M2M solutions for commercial and industrial markets. Lead Engineer Amila Saputhanthri said: "The physical SIM is one of the main drawbacks in IoT solutions. Therefore the eSIM with remote SIM provisioning capability will attract more users sooner than later.

Gregory Gundelfinger, CEO of global e-SIM and connectivity solutions specialist Telna, agreed that eSIM was enjoying a lot of popularity in the IoT market, but believes it is yet to have anything like its full impact:

"There are multiple innovative IoT use cases coming to market every day and the eSIM has the power to transform and accelerate these developments."

In terms of the future prospects for eSIM, a recent forecast paper from Counterpoint Research predicted that shipments of eSIM-based devices will reach almost two billion units by 2025, with a CAGR of 27%. It anticipates

What's new with eSIM?

that most of this growth will be driven by the smartphone and IoT device markets, although it also expects devices like mobile hotspots, routers, PCs and laptops, drones and smartwatches fitted with eSIM to grow in popularity.

One other interesting observation the report makes is that, despite the GSMA's work to standardise eSIM

Counterpoint Research predicted that shipments of e-SIM-based devices will reach almost two billion units by 2025, with a CAGR of 27%.

specifications, the majority of connected devices in circulation without a removable SIM currently make use of proprietary software alternatives, collectively known as soft SIM. This is largely down to the size of the soft SIM

market in China. The paper's authors predict that embedded hardware versions built to use the GSMA's standard will become the norm over the next few years,

although it also believes integrated SIM (iSIM), in which the UICC forms part of a larger chipset (system-on-a-chip, or SoC) will eventually become more popular in IoT.



Where Does eSIM Fit into the Market?



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eSIM in the Market

Embedded SIM technology has entered the mobile landscape at a time of significant change for the industry. As well as potentially opening up many new windows of opportunity, eSIM is also likely to accelerate trends that are already playing out across global mobile markets.

Telna's Gregory Gundelfinger told us: "eSIM has opened doors to every player in the telco value chain. MNOs and MVNOs are going beyond connectivity. They are evolving to supply solutions in support of IoT deployments per vertical market.

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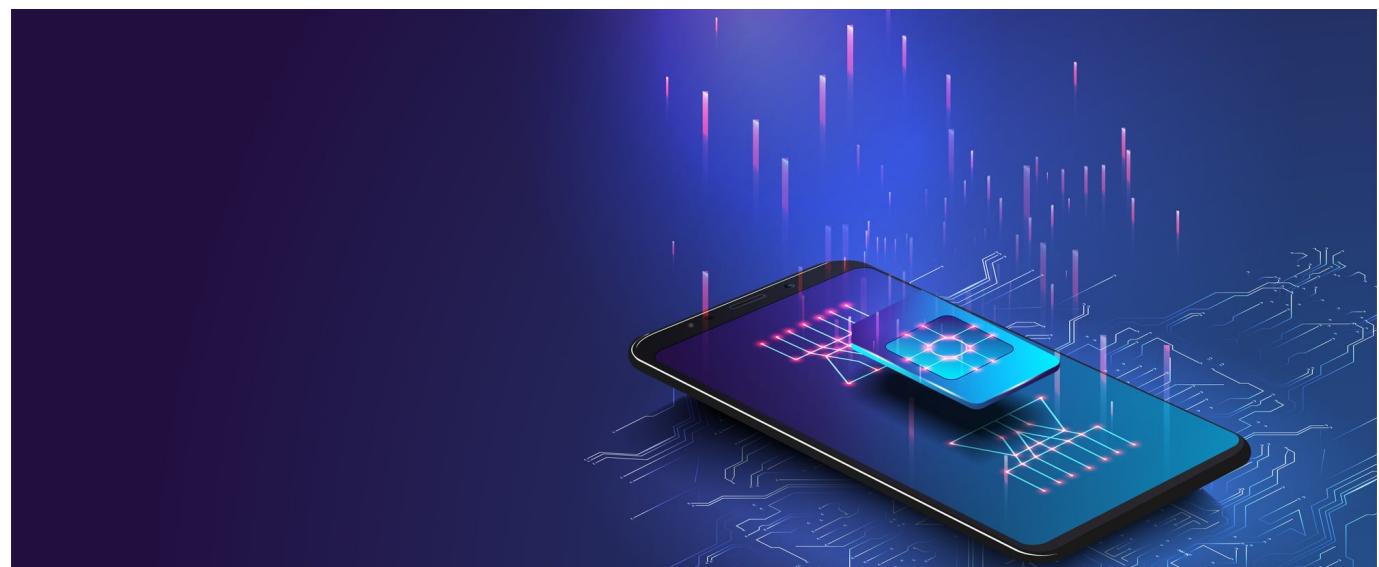
"eSIM has opened doors to every player in the telco value chain. MNOs and MVNOs are going beyond connectivity. They are evolving to supply solutions in support of IoT deployments per vertical market."

Gregory Gundelfinger

"System integrators and OEMs are evolving as well, by integrating e-SIM technology in their devices and adding global connectivity to their offerings. All of them are leading the way in adoption of e-SIM.

"We have seen innovative changes in multiple industries such as broadcasting, maritime and automotive thanks to the benefits offered by eSIM. All IoT sensors are being

simplified now as they no longer require removable SIM cards. Due to the better pricing and flexibility the eSIM offers, the cost per acquisition of customers is falling drastically. Consumers benefit from the freedom to access multiple cellular networks without SIM cards. They can add global or local cellular data plans instantly just by scanning a QR Code."



eSIM in the Market

In consumer markets at least, there has long been a school of thought that operators do not view eSIM as serving their best interests, as it loosens their grip on a valuable stake in the mobile ecosystem. Digital provisioning of network services will make it easier for other players, such as the OEMs and system integrators Gundelfinger alludes to, to offer connectivity directly, posing a new competitive challenge to operators.

Similarly, the option for customers to switch provider simply by scanning a QR code or choosing a new plan through a mobile service app store will erode customer loyalty, further intensifying competition and increasing churn.

But mobile operators have had to contend with new players from outside the telco industry muscling in on their territory for years, especially as the MVNO model has grown in significance. And customers have tired of the long contract lock-ins typical of traditional SIM + handset postpaid deals long before eSIM had taken effect.

According to one survey in the UK, just 5% of phone owners made use of short-term, SIM-only contracts in 2010. By 2017, this had risen to 27%, and is predicted to reach 54% by 2021.

Just 5% of phone owners made use of short-term, SIM-only contracts in 2010. By 2017, this had risen to 27%, and is predicted to reach 54% by 2021.

Consumers are already looking for greater flexibility and value from their mobile packages. Rather than posing a threat, eSIM can instead be viewed as an opportunity for operators to respond to this changing market dynamic, to offer better plans and services, to reach users in new, more direct ways (i.e. through an app store or via phone settings) and to focus on differentiation.

It's a similar story with roaming charges. eSIM will not trash operator revenues from international roaming by making it easier for phone owners to connect to a local service on arrival in a new country.

Roaming revenues have already been in sharp decline. On the back of the EU's decision to ban roaming charges throughout its 28 member states in 2017, Juniper Research estimated that global earnings from roaming took an 11% hit. But a year later, the same analysts were pointing to another effect of the ban on roaming charges - a drastic reduction in 'silent roaming', the practice of people not using their phones abroad to avoid high charges.

The EU's ban on roaming charges saw a drastic reduction in 'silent roaming', Juniper Research reports.

eSIM in the Market

Juniper suggested that the increase in data use as people traveled offset the direct fall in revenues from the loss of roaming charges. Again, in this context, eSIM can be seen as opening the door to lucrative new opportunities for operators who are prepared to develop the right kind of international plans for the consumer and business travel markets.

In terms of where the drive for eSIM adoption and innovation is coming from, Dialog's Amila Saputhanthri says all eyes will be on the Android OEMs in the coming months.

"Apple is the leader in the consumer domain at the moment with their eSIM capable iPhone series," he said. "Android smartphones are also expected to adopt the technology. But their delay is having a negative impact on consumer eSIM adoption."

On the eSIM technology supply side, the main players can be divided into two camps - those developing the eUICC hardware chipsets, the likes of Gemalto, G&D, Workz and

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Amila Saputhanthri, Dialog Axiata

Infineon, and those delivering application-based solutions to support e-SIM deployment, including companies such as KORE, Telna, ARM and Amdocs.

According to Counterpoint Research, the key drivers of e-SIM adoption from IoT end users' perspective will be the logistical benefits and lower maintenance costs involved in provisioning large numbers of devices over a dispersed geographic area.

It predicts the automotive industry will continue to be at the forefront of adoption due to the roaming benefits,



especially for sectors such as fleet management. But it also anticipates all device OEMs will start to see the benefit of not having to install different chipsets for

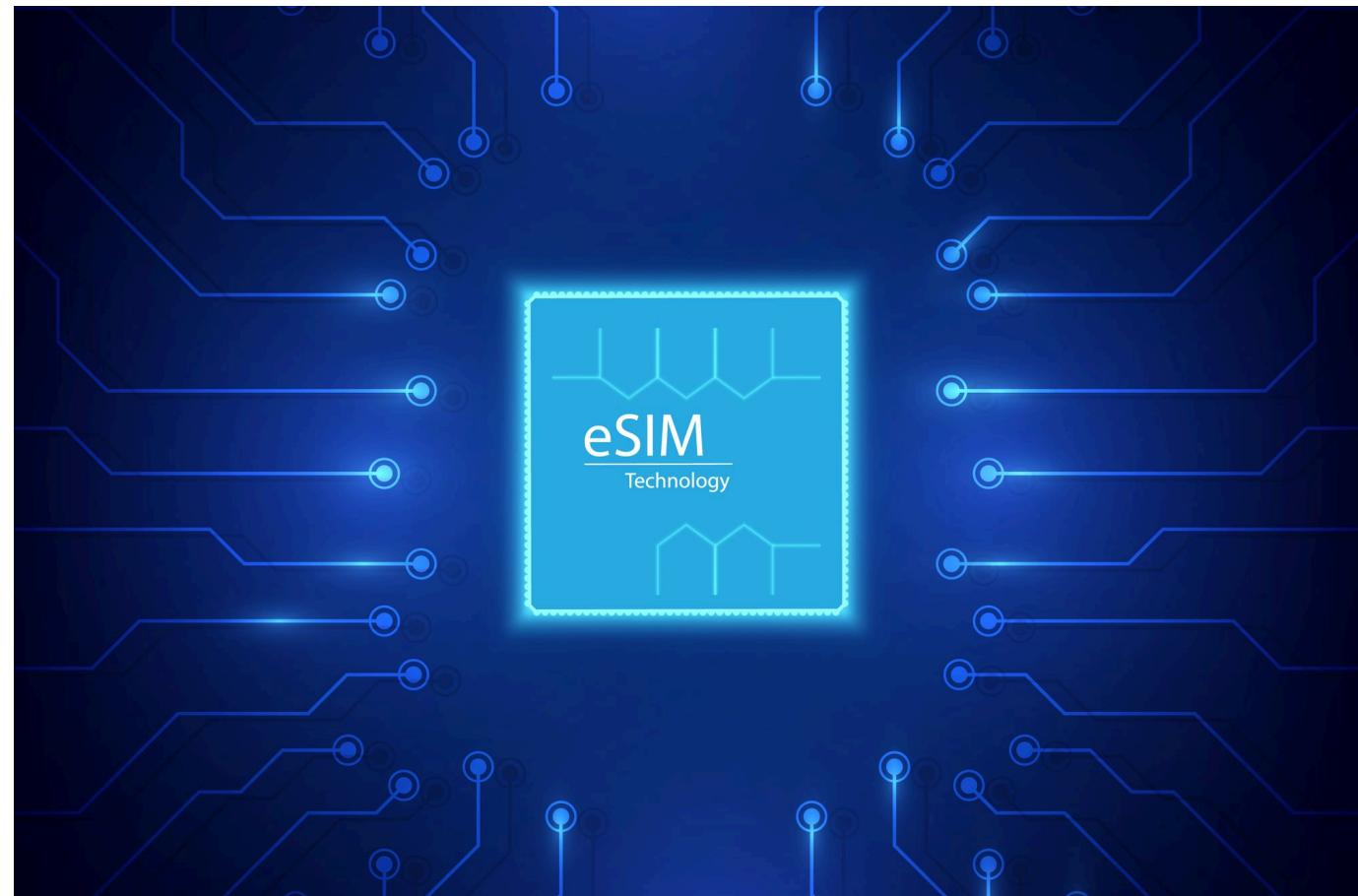
eSIM in the Market

different countries, and also the fact that the e-SIM is much smaller than a removable SIM slot, allowing devices to shrink.

Overall, Counterpoint expects adoption rates from IoT / M2M to exceed consumer use. But Telus's Andrei Ivanov does not believe this is the case at present:

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"Market-wide adoption is still out in the future, where we are at least five years away from 50% market penetration for smartphone users," he said. "IoT OEMS are lagging behind smartphone OEMs and many are yet to update their production processes and electronics blueprints for e-SIM."



eSIM-Enabled MVNOs



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eSIM-Enabled MVNOs

As with most disruptive innovations in the mobile market, MVNOs are well placed to capitalise on the opportunities being opened up by eSIM. The digitalisation of network service provisioning fits well with the increasing number of virtual operators adopting online, digital-only business models. MVNOs have also been at the forefront of the trend towards short term, SIM-only deals, and stand to gain more from any further loosening of contract lock-ins than the big carriers.

In addition, e-SIM is widely seen as opening up more opportunities in the kind of niche markets that MVNOs

tend to thrive in, such as travel and the many different industry verticals adopting IoT.

However, virtual operators do face certain challenges in embracing the e-SIM opportunity, one of them being higher costs compared to removable SIM cards. Dialog's Amila Saputhanthri explained: "eSIMs aren't cost effective when compared with physical SIMs, so this is a major drawback. eSIMs add more operational costs in the form of e-SIM platform subscriptions and capital costs in terms of adding the eUICC to devices."

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Amila Saputhanthri, Dialog Axiata



One of the reasons e-SIM raises opex is that it requires the ability to manage multiple network subscriptions simultaneously, rather than just one. As Telna's Gregory Gundelfinger puts it, "the main technical challenges for companies to launch e-SIM are the integration of multiple connectivity solutions and the barriers of integrating with different networks."

With an e-SIM smartphone, users will be able to run multiple network services from the same device - for

eSIM-Enabled MVNOs

example, different numbers for work and personal use, a specialist roaming contract for travelling, perhaps even separate data packages to take advantage of things like zero rating offers for high traffic applications they use frequently. At the same time, they might want to connect several different devices - a smartphone, a smartwatch, a laptop - to the same data plan.

This creates new levels of complexity for operators, such as the need to manage resources as consumers switch services on and off, activate services on demand, manage hand over between operators, integrate several different devices and their embedded SIMs on the same service. This all raises potential issues with deployment, compatibility, network support and fleet management.

In order to handle this increasing complexity, operators are turning to remote subscription management platforms provided by third parties. While outsourcing might represent an additional operational cost, such management platforms also help to streamline the complete SIM lifecycle in a way which ultimately drives

down costs. Dialog's Amila Saputhantri argues that this is a necessary step on the road to digitalization: "In order for consumers to enjoy the full potential of e-SIM, the purchase flows should be completely digitized," he said.

For Andrei Ivanov of Telus, subscription management platforms deliver their own economies of scale: "Cost efficiency is realised through better availability and lower cost per unit, which can be achieved through multiplexing several subscription management platforms," he said. "The biggest challenge is the readiness of MNO's BSS and channel systems for multi-SIM devices with eSIM."

Gregory Gundelfinger believes that the key to achieving the required efficiency gains and cost savings lies in adopting cloud-based service models. "To implement eSIM in a cost-effective way, companies should use connectivity partners that can handle a Network-as-a-Service (NaaS) model as well as the technical and commercial integrations needed," he said.

"Telna provides a huge amount of flexibility for e-SIM

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integrations with cloud infrastructure and a centralized API platform. It offers scalability on demand and ensures the highest level of network support. It takes care of the network commercial agreements, network infrastructure, eSIM integrations, and delivers the cellular component seamlessly all on an opex-based model. Customers can access Telna's agreements and cloud infrastructure without incurring huge amounts of up-front costs."

IoT & eSIM



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IoT and eSIM

While eSIM opens up choice and flexibility in consumer mobile markets, the benefits it offers to IoT are of a different order. When it comes to the mass deployment of connected devices, perhaps over a very wide geographic area in examples like utilities management, smart city infrastructure and connected vehicles, the physical act of having to remove or insert a SIM card to launch, change or upgrade network connections has proven to be a major barrier to the growth of M2M markets.

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"eSIM marks a new shift of the market, unlocking the true potential for IoT."

Thomas Larsson, G+D Mobile Security

Thomas Larsson, Business Development Director at G+D Mobile Security, said: "eSIM marks a new shift of the market, unlocking the true potential for IoT. Thus far, the growth of global IoT services has been limited by device

makers having to manage separate carriers' connectivity, invoices, device configurations, SIM cards or leverage expensive roaming services."

Telus's Andrei Ivanov told us: "One of the biggest challenges for IoT is serviceability of devices. E-SIM helps here by removing labour to put SIM in the device and by providing remote access to devices through connections enabled by e-SIM."

From there, Telna's Gregory Gundelfinger sees e-SIM offering numerous other benefits to IoT / M2M markets. "E-SIM is a game changer for IoT devices because it accelerates time to market, allows scalability on-demand and faster deployments with lower up-front costs," he said. "E-SIM makes it easier to deploy IoT solutions at a global scale for applications and devices located across multiple geographies. All the devices can be provisioned over the air, managed in real time and connected to different networks depending on what works best for each particular application or timing."

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Gregory Gundelfinger, Telna

From an OEM's perspective, e-SIM makes it easier to develop connected devices according to a single global model that can be distributed worldwide with connectivity embedded, without having to worry about cards made elsewhere and inserted further down the value chain. For end users, seamless connectivity that can be managed digitally gives them the reassurance that networked devices will 'just work' and continue to feed the data

IoT and eSIM

streams that they need to improve their own operations wherever they are deployed.

Of course, for operators and service providers, delivering the kind of connectivity that ‘just works’ for billions of devices across dozens of industry verticals presents technical challenges, one of which is ensuring interoperability between many different types of devices and different networks.

While one of the key purposes of the GSMA standard is to ensure that any eSIM can be provisioned by any service provider in any device, this is not an easy goal to achieve in a huge global ecosystem with many tens of thousands of stakeholders. Dr. Frank Oberhokamp, Business



Development Manager at COMPRION, explained: “Different interpretations [of the standard] on the part of the developers and MNO-specific business cases that cannot be covered 100% by any specification lead to actual interoperability issues.”

Andrei Ivanov believes having separate standards for consumer and M2M e-SIM creates problems for interoperability and even potentially encourages SIM manufacturers to take a proprietary view in their interpretations. “Fragmentation of the standard between consumer and M2M eSIM does not help as operators then need multiple platforms and multiple architectures,” he said. “Unfortunately, incumbent SIM manufacturers see this fragmentation as an additional monetisation opportunity and GSMA is not aggressive enough in harmonising both standards.”

Gregory Gundelfinger argues that cloud portal infrastructures and flexible API integrations are key to achieving interoperability through e-SIM. Use of APIs and open standards-based technologies like the GSMA e-SIM

specifications must also be built into operators’ existing BSS/OSS environments. This will ensure BSS and OSS are up to speed with the requirements of multi-device deployments and are capable of integrating with the likes of subscription management platforms, entitlements management and online carrier portals.

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Andrei Ivanov, Telus

Furthermore, open standards-based OSS and BSS will provide the foundations for closer partnerships between operators and IoT application providers.

KORE Wireless

Helping customers harness the power of eSIM to add value and deliver measurable results.



KORE Wireless

Organisations are increasingly seeking a seamless, reliable IoT connectivity solution to avoid challenges associated with achieving global coverage, managing continuously evolving cellular technologies, and navigating complex manufacturing and logistical processes – among others. With remote SIM card management capabilities, including secure OTA provisioning, eSIM technologies can deliver this solution.

GSMA's standards have helped significantly in the area of interoperability, enabling eSIM-powered devices to work across multiple carriers, however despite the fact that some major cellular carriers are beginning to introduce eSIM solutions, the value is restricted to carrier-specific capabilities as they relate to areas such as coverage and technology compatibility (2G, 3G, LTE, etc.). This is why organisations are increasingly turning to KORE to take advantage of the multi-carrier and multi-profile capabilities our eSIM offerings deliver.

We expect to see fully mature eSIM adoption over the next two to five years, however today organisations are

actively seeking these types of IoT connectivity solutions to alleviate challenges associated with carrier roaming restrictions, managing multiple carrier relationships, 2G/3G network shutdowns, and logistical and supply chain inefficiencies.

"Our focus throughout our eSIM journey has been developing a rich ecosystem of carriers, which is critical to leveraging eSIM technology. But more than switching technology and partnerships, success in eSIM is about realising tangible business benefits. We help our customers understand how to use eSIM to add value and deliver measurable results." – Marco Bijvelds, Vice President, Product Management International.

Stedin is a large regional grid operator in the Netherlands that is responsible for delivering electricity and gas services to more than 2.2 million commercial and residential properties.

Stedin leverages IoT-enabled smart metering solutions for Automatic Meter Reading (AMR) and smart grid purposes

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"Our focus throughout our eSIM journey has been developing a rich ecosystem of carriers, which is critical to leveraging eSIM technology. But more than switching technology and partnerships, success in eSIM is about realising tangible business benefits. We help our customers understand how to use eSIM to add value and deliver measurable results."

Marco Bijvelds - VP, Product Management International

to scale their operations, increase efficiencies, improve quality of service, and more effectively allocate internal resources.

Stedin's smart meter devices are typically deployed for long periods of time, with some designed to be in the field

KORE Wireless

for up to fifteen years. This lengthy lifecycle put Stedin at risk of cellular technology changes or commercial disagreements that would give rise to their need to change networks or connectivity providers during the device lifetime.

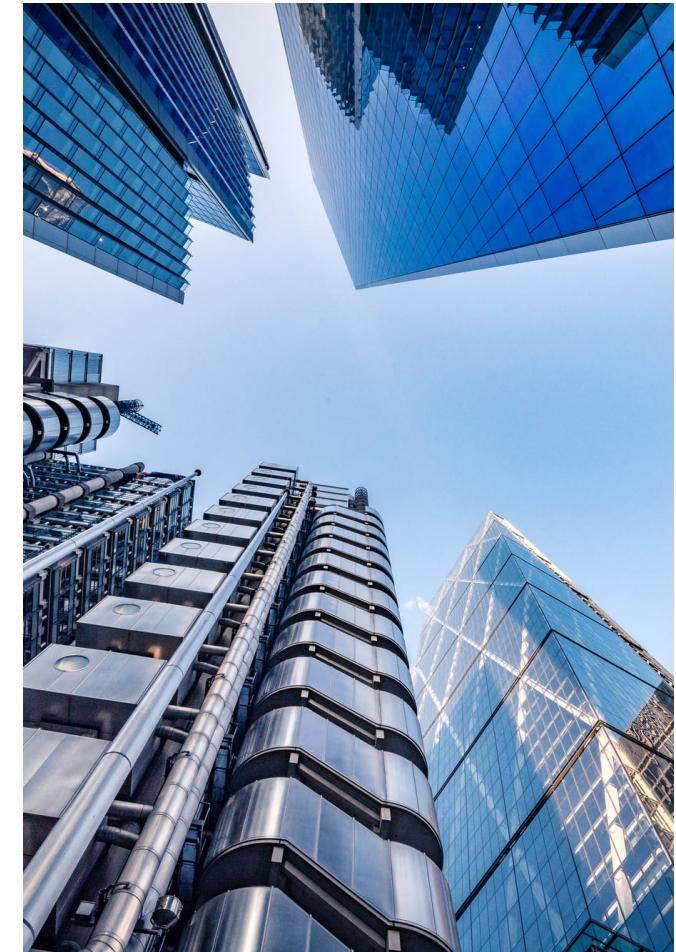
Given the high cost of a smart meter or SIM replacement, the organisation required a connectivity solution that would eliminate technology and carrier “lock-in” without having to physically change the SIM or replace the device.

In addition, the Stedin smart metering solution needed to be compliant with Dutch Smart Metering standards and emerging telecom legislation for the utilities sector.



To alleviate these challenges, KORE worked with Stedin to deliver a multi-faceted advanced connectivity eSIM solution. KORE provided a carrier-independent OTA platform that guaranteed the ability to fully transfer services without physical SIM swaps, facilitated by eSIM technology.

The OTA platform was configured with a Stedin-specific carrier profile enabling Stedin to host its own specific IMSI range to essentially act as an independent carrier to meet regulatory compliance, provide greater support for large scale roll-outs, enhance SIM management capabilities, and ultimately protect the longevity of their connected meters.



Monetizing eSIM



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Monetizing eSIM

As we have already outlined, eSIM currently carries a higher per unit cost than traditional removable SIM cards, which is no doubt a factor in holding back its rate of adoption. Like any new technology, for eSIM to represent an attractive proposition and achieve widespread adoption, it must meet two conditions - it must offer clear revenue opportunities and be affordable enough to deliver positive margins.

There is a sense that each of these conditions follows on from the other. For example, if increased digitisation and streamlining of end-to-end connectivity services does eventually mean e-SIM reduces rather than raises operational costs, that is likely to be when operators, OEMs and system integrators become more proactive in exploring new revenue options for e-SIM.

For Gregory Gundelfinger, the promise is already there, just waiting to be realised. "E-SIM opens significant opportunities to reduce costs, optimize

businesses and create new revenue streams for all kind of industry players," he said. "MNOs and MVNOs, for example, can expand and compete globally, they can offer innovative and flexible e-SIM data roaming as well as provide value added services that complement underlying IoT connectivity.

E-SIM opens significant opportunities to reduce costs, optimize businesses and create new revenue streams for all kind of industry players,

"System integrators, IoT/M2M vendors and OEMs can also complement their standard offerings by choosing the right partner that enables them to add e-SIM and cellular connectivity as part of their solutions."

Dialog's Amila Saputhanthri argues that, in consumer markets, increased digitisation will eventually lead to reduced customer service costs and operational overheads. Instead of buying SIM cards from shops or ecommerce sites, smartphone owners will buy virtual SIM profiles and subscriptions via an app. At present, however, with many operators relying on scannable QR codes to provision services, they are still having to rely on the same kind of models used to sell SIM cards, only selling printed codes instead. The evolution of e-SIM management apps will create opportunities to make significant operational efficiency savings.

Telus's Andrei Ivanov makes the point that e-SIM will create new revenue opportunities if, as expected, it drives sales of product categories like wearables. For operators, as more devices become available on the market fitted with e-SIM, the more opportunities they will have to up- and cross-sell services and packages, for example by offering shared data plans for multiple devices, with the option to add more as required.

The Future of eSIM



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The Future of eSIM

With 5G around the corner promising massive increases in mobile network capacity and speed, there is mounting excitement about a future where wireless connectivity becomes the norm, where every type of device imaginable remains on grid all of the time and enjoys the flexibility of staying connected wherever it goes.



The evolution of eSIM will be crucial to achieving such a vision of anytime, anywhere seamless connectivity. As things stand, how you link network resources to eSIM profiles to individual devices still presents a barrier. With remote provisioning of network services, for example, there is the issue of how and where the device connects to a network to download its eSIM profile in the first place, before it is 'officially' activated on a network.

There are at present three main models for activating network services remotely via eSIM, none of which fully achieve the ambition of seamless, always-on global connectivity.

There are three main models for activating network services remotely via e-SIM, none of which fully achieve the ambition of seamless, always-on global connectivity.

One is the use of a QR code which contains the operator's Subscription Manager Data Preparation (SMDP+) platform address and therefore allows the eSIM profile to be downloaded once scanned. The limitations of this method are that it requires a new code to be purchased and scanned every time you want to change network service, therefore creating a point of friction similar to buying a new SIM card, and it only works for devices capable of scanning QR codes (e.g. smartphones with cameras).

Another method is to have the SMDP+ platform pre-provisioned in the eUICC built into the device, which is then activated as soon as the device is switched on. But this requires a level of collaboration between operators and OEMs which is not yet widespread and, until something like a mobile service app store becomes commonplace for switching providers, it could also lead to provider lock in.

The third option is what is known as the GSMA Subscription Management Root Discovery Service (SM-

The Future of eSIM

DS). Under this system, devices and subscriptions are purchased separately but are matched according to the user's credentials via the digital SM-DS database. When the device is first switched on, it automatically retrieves the corresponding eSIM profile it has been matched with. While this approach appears to be the most digitally sophisticated of the three, Dialog's Amila Saputhanthri points out that the integration requirements between, for example, different operator profiles are still very complex.

Ultimately, it appears that the most viable solutions to achieving seamless initial activation and then maintaining on-going flexibility in new service provisioning will be found, as Gregory Gundelfinger advocates, in cloud-based 'Network-as-a-Service' solutions. This summer, Gemalto announced a new Instant Connect service, a web-based platform which presents an automated solution to service activation without any need to scan codes, connect via WiFi or Bluetooth, or use bootstrap options.

The most viable solutions to achieving seamless initial activation and then maintaining on-going flexibility in new service provisioning will be found in cloud-based 'Network-as-a-Service' solutions.

And for Gregory Gundelfinger, it is service management platforms which are best placed to drive the kind of seamless connectivity experience which will drive demand for e-SIM. "The multi-network ability and Multi-IMSI connectivity hubs provided by companies such as Telna allows end users to automatically choose the best possible cellular network and switch any time required, without physically swapping SIM cards," he said. "This is transforming the industry and expanding the wide range of connected devices globally."

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Gregory Gundelfinger, Telna

Conclusion



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Conclusion

While e-SIM may not yet have had the impact many people were predicting 12 or 24 months ago, it is certainly not a technology anyone should be taking their eyes off. At its core, e-SIM presents a solution to an issue that threatens to hold back the potential of mobile as consumer and enterprise markets alike look increasingly for universal, seamless connectivity solutions - how to automatically connect any device to any network wherever it goes, with no interruption in service.

Compared to the physical SIM, which has dominated the way cellular services are provisioned for three decades or more, the e-SIM represents a radically different way of operating. There are bound to be challenges and teething problems, not least because e-SIM will demand collaboration between operators, OEMs and system integrators at a scale never before seen in the mobile industry. Adopting the GSMA remote provisioning standard is just the start.

For mobile operators, e-SIM offers the opportunity to meet consumer demand for choice, convenience and

flexibility in accessing mobile services. For MVNOs in particular, it creates further incentive to specialise in niche areas like travel or to develop bespoke data plans aimed for specific uses like video messaging and streaming. The option for consumers to run multiple services from the same device, or connect multiple devices to the same plan, opens up new opportunities for operators to diversify and differentiate.

In IoT, meanwhile, e-SIM solves a major logistical obstacle posed by removable SIM cards which has potentially held back IoT adoption - and where it hasn't, has led to the development of proprietary soft SIM alternatives. Whether it is deploying industrial IoT sensors in factories and processing plants, connecting utilities and smart city infrastructure, installing infotainment and telematics systems in connected vehicles, enterprises do not want to be locked into network services, nor do they want to be faced with having to switch hundreds of different SIM cards in hundreds of different devices just to change provider.

For operators, e-SIM and the GSMA standard offers the chance to protect their stake in burgeoning IoT markets against proprietary connectivity solutions, whilst delivering more flexibility, reliability and security to end users. To OEMs, it means being able to build connected devices to a single specification and ship them anywhere in the world, safe in the knowledge that clients will be able to access any network service simply and conveniently via e-SIM.



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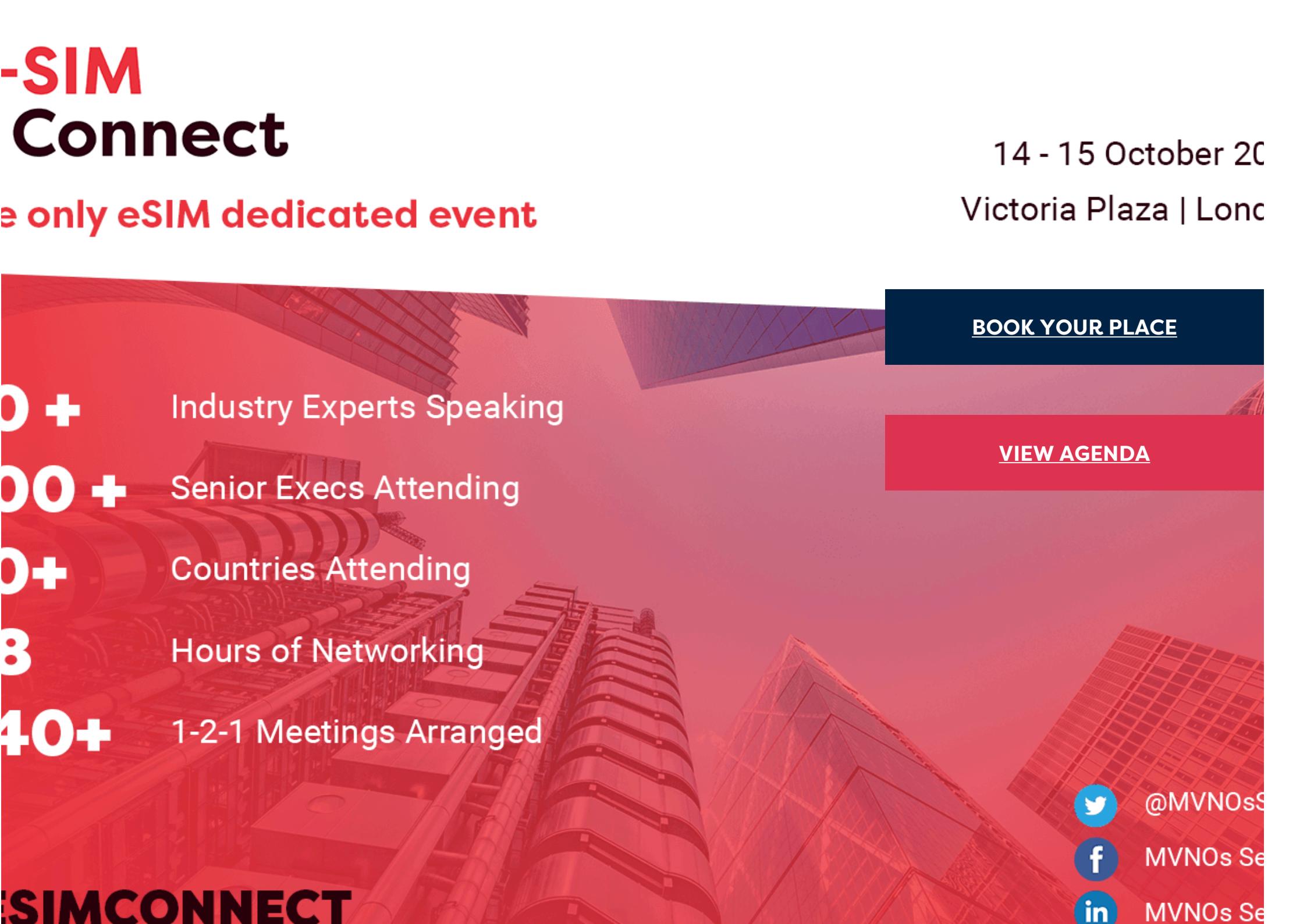
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